Conference Proceedings

6th INTERNATIONAL FISHERIES OBSERVER & MONITORING CONFERENCE

2009

July 20-24, 2009
Portland, Maine USA

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

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Proceedings of the 6th International Fisheries Observer and Monitoring Conference

Edited by Elan Nardi, Daniel Morris, Dennis Hansford, Catherine Purcell, and the 2009 IFOMC Steering Committee, in collaboration with the conference participants.

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U.S. Department of Commerce
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PROCEEDINGS

6th INTERNATIONAL FISHERIES OBSERVER AND MONITORING CONFERENCE

Portland, Maine
July 20th - July 24th 2009

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Acknowledgements

The 6th IFOMC was successful through extraordinary energy and collaboration of all conference participants and through the generous support of many partners and organizations. The Chairman and Steering Committee would like to extend their gratitude and recognition to the following groups for their support of the 6th International Fisheries Observer and Monitoring Conference.

- Principal Sponsor, NOAA's National Marine Fisheries Service in the U.S. Department of Commerce.
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- Conference Supporters: Gulf of Maine Research Institute; Pacific States Marine Fisheries Commission; and Archipelago Marine Research Ltd.
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The 6th International Fisheries Observer and Monitoring Conference International Steering Committee

The Steering Committee was instrumental to the success of the 2009 conference. As pictured below, the members are (left to right)

Back row:
Francis Van Oordt*, Instituo del Mar del Peru*
James Nance, Ph.D., *NOAA Fisheries,USA*
Andrew France, *Ministry of Fisheries, New Zealand*
John P. LaFargue*, NOAA Fisheries, USA*
Catherine Purcell*,* Ph.D., *Knauss Sea Grant Fellow, USA*
Greg Workman, *Department of Fisheries and Oceans, Canada*

Front row:
Dennis C. Hansford, *NOAA Fisheries, USA, Conference Chair*
Lisa Borges, *European Commission, Belgium*
Teresa Turk, *NOAA Fisheries, USA*
Mark Showell, *Department of Fisheries and Oceans, Canada*
Amy Sierra Van Atten, *NOAA Fisheries, USA*
Howard McElderry, *Archipelago Marine Research Ltd., Canada*

Not pictured: Charles Gray, *Department of Primary Industries, New South Wales, Australia*

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Executive Summary

The 6th International Fisheries Observer and Monitoring Conference (IFOMC) attracted over 300 individuals from over 37 countries, and all inhabitable continents around the world. In keeping with the spirit of the past IFOMC conferences, this conference served as a forum for discussion of crucial issues and topics facing fishery observing and monitoring activities throughout the world. This International discussion forum was held at the Holiday Inn by the Bay Convention Center in Portland, Maine, USA. The U.S National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Science and Technology hosted this biennial event.

Even before the official start of the conference, the energy at the preconference events set the tone for the level of participation and interest from delegates. Preconference events included: The Observer Professionalism Working Group; Vessel Safety Training, and “Moving Sushi” a Marine Resource Expedition” presentation.

The Observer Professionalism Working Group was lead by the Association for Professional Observers, Keith Davis and focused on observer specific issues. Vessel Safety Training was led by John Lafargue and John McVeigh (from NOAA’s West Coast Groundfish Observer Program), and Ted Harrington and Kevin Plowman from the United States Coast Guard, and focused on at-sea observer safety techniques and at-sea disaster mitigation measures.

The Moving Sushi presentation was led by Michael Markovina and Linda Schoknecht, of South Africa. This inspirational presentation focused on documenting the current state of Marine Resources and the communities affected by Marine Resource Management decisions from many countries across Africa, Europe, and Asia.

The Data Extrapolation Workshop was led by Vicki Cornish of the Ocean Conservancy and Lisa Borges of the European Commission. This workshop focused on issues involved in analyzing discard data coming from monitoring programs around the world. The objective of this workshop was to establish a set of common best practices in data extrapolation.

The conference consisted of twelve panel sessions, with speakers leading approximately seven minute presentations each addressing important areas of interest such as factors impacting fisheries observers and how observer programs can be developed and expanded. A dynamic question and answer discussion between the audience and panelists took place after each set of panelist presentations. Along with the verbal panel presentations, many posters displayed more observer and monitoring related topics.

We were very fortunate to have a variety of opening speakers extend a warm welcome to the conference delegates. After Dennis Hansford, the conference chairman, made welcome remarks and officially initiated the start of the event, Jill Duson, the Mayor of Portland, welcomed the delegates to her fair city. Guest Speaker John Analla, Chief Scientific Officer from the Gulf of Maine Research Institute, welcomed delegates and spoke on “Sustaining fisheries through collaboration.” Lastly, the keynote Speaker, Rebecca Lent, Director of NOAA’s National Marine Fisheries Service, Office of International Affairs welcomed and addressed the delegates with a talk titled: Looking ahead: Global approach to improving fisheries science and enforcement through observers.” The chairman and international steering committee would like to extend their appreciation to NOAA/ National Marine Fisheries Service’s Office of Science and Technology, Archipelago Marine Research Ltd., Fisheries and Oceans, Canada, The Gulf of Maine Research Institute, and Pacific States Marine Fisheries Commission for generously supporting the 6th International Fisheries Observer and Monitoring Conference.

The concluding session of the conference featured closing remarks from Steven Kennelly (New South Wales Department of Primary Industries), Ernesto Altamirano (Inter-American–Tropical Tuna Commission), Keith Davis (Association for Professional Observers), and Dennis Hansford (NOAA Fisheries Service). These individuals presented conference take away points and conveyed their appreciation to all conference attendee for their dynamic, collaborative and interactive contributions, which made this conference successful.

The following sections briefly summarize each panel session in the words of the respective session moderators.

Session 1: What are the different types of monitoring programs available for collection of fisheries information?

This introductory session was designed by the organizing committee to provide everyone with a background to the diversity, scale and scope of the various monitoring programs occurring throughout the world. The result was an excellent and diverse group of talks in this session that provided a solid start to the conference, covering a wide range of fisheries, oceans and ways to observe and monitor fisheries. The session began with descriptions of some quite large observer programs from places we don't often hear about (Namibia, Cameroon and New Zealand), with the New Zealand talk providing an opportunity to scale the discussion down to small-scale fisheries observer work. Next we looked at combinations of various ways to monitor fisheries including at-sea programs versus dockside work in the US and Canada. Next we headed to Denmark in Europe for an example of using electronic monitoring to improve self-reporting by fishers. Finally, we focused on a truly international example of fisheries monitoring that involves several countries, as the Inter-American-Tropical-Tuna-Commission deals with tuna trans-shipments at sea.

Session 2: How can fishery monitoring information be standardized and how can data quality be improved?

The types and uses of data collected from fishery monitoring and observer programs are exhaustive. Typically data collected range from the species compositions, lengths and quantities of retained and discarded catches, to biological and tissue samples as well as information concerning fishing gear and activity. As costs of data collection increase, there is significant pressure to collect more and more data in each program as well as develop systems that allow for greater data quality, transmission and availability.

It is important within any monitoring and observer program that data are collected in a systematic and standardized manner. There is much debate as to whether data collections and systems should be standardized across different fishery programs. This would allow far greater and efficient comparisons of data among programs, allowing for meta-analyses at scales greater than within each individual program. However, data standardization at such a scale comes at a cost.

There have been significant advancements in fishery data collection systems in recent years, particularly those utilizing electronic capture and transcription of data. These systems can offer more efficient and safer means of collecting data as well as faster times to access and use the data for fishery management decisions. There is a continuing need for refining data systems across all types of fishery programs.

This session addressed a critique of advancements and challenges concerning data quality and standardization. The benefits and costs of standardizing data collection across programs are debated. In the session, we are given overviews of the data collection requirements and standards in the fishery monitoring programs of the European Union and the USA protected species observer program as well as the challenges of standardizing data collection from alternate platforms in small-boat observer programs. We are also provided with demonstrations of the utility of electronic advancements in on-board data collection systems and the need for calibration and training in data collection protocols in fishery monitoring and observer programs.

Session 3: Using fishery monitoring information in assessments and management.

One of the biggest reasons for observer programs is to scientifically document the at-sea activities of a fishery. What are the target species and the level of catch? Is discarding of target and bycatch catch species happening and at what level? These are just a few of the myriad of very important questions that observer programs develop sampling designs to determine. Offshore sampling by observers is not a simple task, but it is critical task that is essential to assessment of stocks, and development of Fishery Management Plans and biological opinions. The speakers in Session 3 used their talks to outline the critical nature of the observer data for fishery management and assessment analysis in areas around the world.

Session 4: How can fishery monitoring information be used to ensure compliance with fisheries regulations?

Panel session four was the first "Enforcement Panel" prepared at these series of conferences. Session 4 Panel members hail from the United States, Canada and the Europe and discussed fisheries compliance, enforcement and how it improves the accuracy of landings statistical systems. Enforcement is essential to combating, reducing and eliminating IUU fishing, and also provides protection and support of fisheries observers.

Enforcement is an essential aspect of fisheries monitoring worldwide, and here in this forum, we are set to have panelists present and discuss important issues that directly relate to fisheries compliance and observer programs worldwide. What technological advancements will aid enforcement efforts in the future? What challenges are being faced by enforcement officials and observers, and what international issues are observers and enforcement officials running into, and how is enforcement essential for data collection accuracy improvement?

Session 5: What factors should be considered when addressing access to fishery monitoring information?

What are the considerations that should be addressed when seeking access to fishery observer information? This question has given raise to valid concerns from resource managers, fishermen, non-governmental organizations, and scientists alike. From perspectives ranging from; data collected by observers contain proprietary information thus making it confidential and non-releasable to information collected on a public resource should be made completely available to the public.

What are the rules for access to and confidentiality of data collected through public versus private funding? How can we gain access to proprietary and fishing operation information? What are the tools for accessing confidential information? What are the tools for proper data storage?

In the U.S., the release of observer information is guided by provisions on confidentiality in the Magnuson-Stevens Reauthorization Act (MSRA Section 402(b)) and Marine Mammal Protection Act (MMPA Section 118(d) (8) and (9)). Under the MSRA, observer information is considered to be confidential and shall not be disclosed, except in accordance with certain exceptions. The MMPA also prohibits the release of information that is proprietary in nature.

This session examined how these concerns are being addressed on an international level. Speakers were welcomed form various countries representing government and non-government organizations and shared their respective approach to accessing fishery monitoring data.

Session 6: What are the major factors impacting fisheries observers?

This session explored a wide variety of factors that affects observers. It includes everything from minimizing risk, safety concerns/health issues to fleet characteristics, outreach tools, support mechanisms and time management. As our observer programs mature and new ones sprout up, we all look to decrease the risk to observers as well as increase observer retention and data quality. The only way our programs can achieve these goals is to take a close look at the factors affecting our observers.

Session 7: How can self reported data by the fishing industry be improved for use in assessments and management?

Self-sampling programs are an emergent issue in fisheries monitoring as observer's programs are expensive, and many countries around the world can only afford small percentage coverage of their fishing fleets. Self-sampling programs can be used to increase sampling intensity, data availability and data quality. At the same time, these programs have the advantage of increasing industry buy-in for scientific advice and associated management measures. In many countries, self-sampling schemes take the form of the so-called reference fleet, i.e. a group of volunteered vessels that are sampled systematically and extensively, and thus constitute the reference for the fishing activity/behavior of the whole fleet.

Several panelists from different countries including Canada, The Netherlands, Norway, Sri Lanka and USA discussed the issues associated to self-sampling programs, namely: incentives for industry participation; programs funding; use of reference or study fleets; protocols for industry training; credibility, appropriate uses and audit methods for self-reported data.

Session 8: What specific issues are important to fishing industry regarding fishery monitoring?

The eighth session was comprised of fishing industry representation from around the world. Our speakers come to us from Portugal, British Columbia, and the U.S. They addressed issues that are important to the fishing industry regarding fishery monitoring. Among the topics our panelists will cover are; the impact of new innovative fishery management strategies on data collection activities, real-time bycatch management strategies, sentinel fisheries or cooperative research as mechanisms to improve fishery monitoring, costs issues and risk-benefit analysis of industry-led fishery monitoring programs, and outreach processes for successful implementation of fishery monitoring.

It is important that viable valid methods are created to sustain our marine resources. This session addresses the primary users of that resource on the importance of working cooperatively with industry in developing monitoring programs and incorporating new technologies to ensure sound resource management. Are fishermen willing to take accountability and responsibility for their utilization of the resource? Are they concerned how the data is being collected and used? Do they want to have strong and open communications with the resource managers?

Session 9: What specific issues are important to non-governmental organizations 9 (NGOs) regarding fisheries monitoring?

Among the concerns are providing a forum for addressing issues important to non-governmental organizations (NGOs) regarding fishery monitoring is such as providing research and scientific advice, assisting in the development of best fishing practices, provision of funding for fisheries resource issues, and influence through litigation and the political processes are among them. But the primary reason involves the idea and challenge of possibly affecting changes for resource management through an organization not in the Federal sector.

As a fellow member of the NGO community, I am pleased to present to you our speakers, Elizabeth Griffin from Oceana, Peter Baker from the Pew Environmental Group, Keith Davis form the Association of Professional Observers, Jay Lugar from the Marine Stewardship Council, and Chris Robbins from the Ocean Conservancy.

Session 10: How can observer capacity be developed and/or expanded?

- Building observer capacity and retaining experienced observers
- Risks of increasing coverage levels too quickly
- Flexible employment arrangements
- Breadth of observer expertise/experience

Observers from around the world record a wide range of information and collect a vast amount of data. The information and data collected is often essential to better management and enforcement of the world's fisheries. There is an increasing need worldwide for more information and data to be collected to assist in the management of fisheries, and observers are often seen as the means to collect the required data and information.

As observer programs are tasked with increasing their capacity levels to meet higher levels of coverage, there are risks associated with attempting to do this too quickly. An observer program's greatest asset is in having high quality observers, and being able to retain high quality observers is a key factor in the success of any observer program.

In this session we learn how established people are able to use their experience and expertise to assist developing observer programs, and how important and beneficial retention of experienced observers is. We hear about a way to measure and manage happiness and hear some ways that established observer programs have tackled the issue of improving their retention of observers

Session 11: What are the monitoring issues with rights based managed fisheries?

Rights Based Management(RBM) is a relatively new idea and is gaining traction as a way to change the standard method of fisheries management that typically restricts harvest opportunities, processing capacity, and gear types. This session features speakers from the USA, Canada and the United Kingdom. It focuses on monitoring methods, observer relations and issues specific to rights-based managed fisheries. There are several rights-based management fisheries operating throughout the world, but are quite diverse with respect to their requirements, structure and implementation. The speakers discussed many of these right based management programs, and will explore new developments and the complexity of challenges and issues specific to rights based management. The session features talks that address the observer collected data, the crucial role of observers in these management setups, data accessibility, and monitoring methods. The session aims to discuss developments of rights-based management programs across several world programs.

Session 12: How can electronic monitoring be used to improve data collection activities?

Electronic monitoring technology typically consists of multiple closed circuit television cameras, a GPS receiver, a hydraulic pressure sensor, a winch sensor, and a system control box. EM has been deployed on variety of fishing vessels to monitor a range of fisheries issues including fishing location, catch, catch handling, fishing methods, protected species interactions, and mitigation measures. There are six presentations within this session, crossing broad geographies, fisheries and fisheries monitoring issues. In addition to these, the use of EM technology has infused the conference in several previous presentations speaking to its applicability in various other applications.

Concluding Session

The closing session was designed to indentify various take away points from as many delegates as possible, and to summarize what was achieved, learned and what could be improved. A variety of closing speakers were identified. Those individuals include Steven Kennelly (New South Wales Department of Primary Industries), Ernesto Altamirano (Inter-American-Tropical Tuna-Ccommission), Keith Davis (Association for Professional Observers), and Dennis Hansford (NOAA Fisheries Service). All closing session speakers summarized the importance of the conference, what they identified as take home points, and the need for continued collaboration on these important issues with even more increased diversity from more countries and programs and interested parties for the 7th International Fisheries Observer and Monitoring Conference. A few examples of take away points include the encouragement to check your data, compare results, and improve your sampling. Collaboration among countries, programs, agencies, organizations, industry, fishers, and all in-between is the key to improving worldwide fisheries.

Opening Session

Moderator: Dennis Hansford, National Marine Fisheries Service, USA

Welcoming Remarks:

Dennis Hansford: NOAA Fisheries Service, USA
The Honorable Jill C. Duson, Mayor of Portland Maine, USA
John Annala, Ph.D, Chief Scientific Officer, Gulf of Maine Research Institute, USA

Keynote Address:

Rebecca Lent, Ph.D - Director of the Office of International Affairs, NOAA Fisheries Service Service, USA

Welcome, Call to Order, and Conference Charge

Dennis Hansford
NOAA Fisheries Service

Welcome to the 6th International Fisheries Observer and Monitoring Conference (IFOMC), and welcome to Portland, Maine. We have a very diverse group of delegates for this conference. We have continued a longstanding vision to develop, promote, and enhance effective fishery monitoring programs to assure sustainable resources management throughout the world's oceans. Your attendance at the conference makes it clear you share that vision and that concern.

One thing that we hope to accomplish to make this successful with your cooperation and participation is to improve the quality of fisheries monitoring data through sharing of best practices. Because this is such diverse group, we all bring a great breadth of experience to the table that will benefit each and every one of us, and that will be the key to the success of the conference. The panel session format of the conference, with each panel followed by opportunities for questions and discussion with all delegates, provides an opportunity to share our varied experiences. It's a format that has worked in the past, and we expect it will be successful in this 6th IFOMC, as well.

We have a wonderfully diverse group of delegates, and representatives from:

Argentina, Australia, Bangladesh, Belgium, Canada, Colombia, Chile, Cameroon, Denmark, Ghana, Egypt, Italy, India, Indonesia, Ivory Coast, Japan, Libya, Morocco, Namibia, Netherlands, New Zealand, Nicaragua, Norway, Panama, Peru, Philippines Portugal (The Azores), Russia, Senegal, Sierra Leone, South Africa, Sri Lanka, Sweden, the Falkland Islands, United Kingdom, United States, and Vietnam. Welcome to you all.

Other core topics for the conference are improving data accessibility, supporting the development of new and innovative data collection methods, and advancing the development of observer professionalism. We've been fortunate to have a working group, the Observer Professionalism Working Group (OPWG), working between the conferences and pulling together information and ideas about how best to support those individuals on the front lines, those observers who deploy on commercial fishing vessels to collect the data that is so much needed by our resource managers. They deserve our support and recognition, and this is the forum for doing just that.

We have put together sessions for interactive sharing of information. Developing this panel format and the topics has been a group effort. Our international steering committee has made all of this happen.

We have had several well-attended and well-received pre-conference events. Lisa Borges of the European Commission, along with Victoria Cornish of the Ocean Conservancy led a workshop on data extrapolation. The room was filled to capacity, and we had to add chairs to support the turnout for the workshop on this important topic and share ideas on improving effort estimation.

Dennis Hansford's opening remarks
NOAA Fisheries Service
USA

Another pre-conference event provided safety training for observers. Safety is an issue of critical emphasis in all of our observer programs in the United States. We are very concerned that our people who are out on commercial fishing vessels and experiencing the same risks as commercial fishermen are prepared to respond to any hazardous situations that may arise. For the observers in the audience and those who have gone to sea, you know how quickly events can cascade and how a small incident can grow into a disaster. John Lafargue, Michael Tork, and John McVeigh, along with support from the US Coast Guard, led vessel safety and survival at sea training. In addition to working on a commercial fishing vessel, they employed a damage control trainer, a tool that gives students an opportunity to patch pipes and hulls. The training the delegates received yesterday may save their lives some day.

Yesterday, we also enjoyed a presentation, titled, "Moving Sushi, Marine Resource Expedition," featuring still photos and videos from a pair of talented South African videographers. That session touched on 42 countries that the couple plan to traverse and document resource management, decisions made and how the management affects the locals. They bring to the forefront the importance of collaboration between industry and government for ensuring successful management of the resource. Steering Committee member Teresa Turk initiated this, and was also instrumental in supporting and coordinating the travel of many of the African and Middle Eastern delegates who are in attendance.

The conference consists of twelve topical panel sessions, each consisting of a moderator and five to seven panelists. Each panelist will make oral presentation, six to nine minutes each. After the presentation, the floor will be opened for questions and answers. The Q&A is really the important part. All delegates will have the opportunity and should speak out and ask questions.

Posters are set up downstairs in the Casco Bay Room. I encourage you to meet the poster presenters and ask questions. Vote for the best posters. Ballots have been provided in your folders. Posters are marked to indicate which are by an observer and non-observer. We'll have awards for the best in each category and the presentation will be made at the lobster banquet.

We are honored today to have the mayor of Portland here to join us. The Honorable Jill Duson, is a former city council member and school committee chair member. She grew up knowing poverty, lack of health care, and limited educational opportunities. It is a great credit to her that she has overcome those obstacles to gain the position she currently holds. She has a reputation for involving citizens from all walks of life in the decision making process, and it is appropriate that she welcomes us to her fair city.

Welcome to Portland, Maine

The Honorable Jill Duson
Mayor of Portland, Maine

Welcome to Portland. Our city is honored to host the Sixth International Fisheries Observer and Monitoring Conference.

Mayor Jill Duson's welcome remarks
Mayor of Portland, Maine
USA

Portland is proud of its long and rich fishing history. Portland is proud to be the home city of the Gulf of Maine Research Institute, a world-class research and education institution, and Portland is the perfect location for a conference such as this. I hope that while you're here, if you have a little extra time, you have the opportunity to visit the Gulf of Maine Research Institute, I hope you'll have a chance to take a walk. We have a beautiful walking trail along the harbor.

I hope if you have the opportunity visit a couple of local events; if you are a baseball fan we are the home of the Sea Dogs, which is a Triple A League feeder team to the world champion Boston Red Sox. For our international visitors, there is a soccer tournament going on Saturday in Fitzpatrick Stadium, which is right next door to the Sea Dog's park. And lastly, at Deering Oaks Park all day Saturday, there is a Festival of Nations, which is an annual celebration of the diversity and features cuisine from many of the immigrant communities in Portland.

But enough cheerleading for Portland and back to the serious business that brings you here. I had a chance to look at your conference program and I appreciate that each session will have a touch of talking at you, and then a lot of Q&A. So at this conference, you make sure that there is the opportunity to talk about and interact around what you most want to talk and interact about.

The fishing industry is an incredibly important element of our city's vitality. It employs our residents, it feeds our economy, and in many ways it keeps Portland in touch with its history and culture. We pride ourselves on having a working waterfront where you can see the boats, smell the fish, and with a little salt and lemon, taste the hard work. We also know that to keep our working waterfront thriving and to keep this industry economically solvent we need to support policies and initiatives that learn from the past in order to plan for the future.

Fisheries monitoring is an essential part of this strategy, as it fosters sound fisheries management. Collaboration among industry members, observers and monitors, technological innovators, scientists and regulators is essential to establishing and maintaining sustainable fisheries. The hardest part to tackling difficult challenges is getting the right people to come to the table and work together. I congratulate you all for seeing the commonalities, the need to look for sustainable environmental and economic solutions for the future of this important industry.

Portland is truly excited to play a part in bringing such diverse groups together to partner in meeting common goals. Industry members can and should have a seat at the table and can help with the development of effective and economically suitable monitoring methods. We applaud the exemplary cooperation between observers programs and industry members to establish a safe work environment in one of the world's most dangerous occupations. Again, thank you for inviting me to part of your conference and to offer this welcome to my beautiful city this morning. Please make time to explore our dynamic and vibrant working waterfront during your visit.

Introduction of Dr. John Annala

Dennis Hansford
NOAA Fisheries Service

The Gulf of Maine Research Institute has graciously agreed to host the conference banquet, so we're going to have our lobster meal on a nice lawn out behind GMRI. They have also offered to give us a tour of the facility. So yes, some of us have experienced and are familiar with the outstanding contributions of GMRI. This renowned world-class organization is key to understanding the ecosystem in the Gulf of Maine.

Speaking of Gulf of Maine Research Institute, our next speaker is the Chief Science Officer for the Institute. John Annala has worked with GMRI since 2004, but prior to that he spent nearly 30 years on marine fisheries research stock and assessments and fisheries management issues in New Zealand. There, he was involved in fishery research and management for both in-shore and deepwater fisheries. He was responsible for managing the stock assessment activities of the Ministry of New Zealand that underpin the operation in New Zealand's quota management system. He was also involved with the observer issues while in New Zealand, which makes his presence here that much more appropriate. He served as an advisor to national governments in Argentina, Australia and Canada on a range of fishery research and management issues and is a member of the National Research Council study reviewing the applications of individual transferable quotas here in the U.S. He has led delegations from New Zealand and other countries, and we are very fortunate to have John Annala here at this conference.

Monitoring and Collaborative Data Collection in the Northeastern U.S.A

Dr. John Annala
Gulf of Maine Research Institute

I'd like to second the welcome from Mayor Duson to Portland. It's a lovely city and hopefully you'll have time to get out and see a bit of Portland and the surrounding area. I know I've talked to a few of my New Zealand friends already and they have taken that opportunity in the lead up to the conference.

Dennis phoned me up a couple of weeks ago and asked me to give a presentation in this morning's session. And I said, "Well what do you want me to talk about? This is not my special area of interest." And he suggested I talk about sustainable fisheries, the importance of collaboration and the importance of fishery observation and monitoring. So that's going to be the area that I'm going to be talking about. Here's an outline of my talk: I'm going to start off by talking about the importance of observing monitoring programs, and I know I'm talking to the converted, so it's going to be very, very high level.

Then I'll give a brief summary of collaborative research in the Northeast part of the U.S. There's a very long history of collaborative research in this part of the world, going back to the late 1800s, and it really has set the stage for a lot of the initiatives that are about to develop in New England. And that will lead me into my third point, which is the development of sectors in New England fisheries. I'll spend a bit of time talking about what sectors are about, and then the future role of observation and monitoring in sectors. Again, at-sea observers and electronic monitoring, potentially anyway, are going to play a very important role in making sure that sectors work. Lastly, I'll speak about GMRI's role in northeast fisheries, and I'll cover the three-part mission of GMRI.

I've always been a strong advocate for very active observer and monitoring programs, run by government agencies, by non-profits, and also by the fishing industry. When I started working in New Zealand fisheries in 1974 – and I'm originally from Maine and New Hampshire – I was grabbed and told, "You're going to go out on a fishing boat for a week." And that really started my career, in terms of valuing the data you can collect off commercial vessels.

I think the approach that we took in New Zealand was to have all of the assessment people, all of the biologists and as many managers as possible get on board fishing boats and learn what the fishing industry is about, what they have to face and how we could work with the industry to collect the information that they actually have their hands on every day they're in the water.

Obviously there's a lot of talk, particularly in New England now about dockside monitoring versus at-sea monitoring and I know that's going to be the focus for some presentations later on in the week. And that spills over into whether or not you should have observers on vessels or some form of electronic monitoring to replace them. Obviously the data collected by observers and by some electronic monitoring programs, things such as catch, like species composition, discards, etc. are very important to the people doing this stock assessment, studying the quotas, and also to the managers. The other area that's very important in terms of observer data is the biological samples that you can collect on parameters such as length, weight, maturity, etc., and sampling is also important for tag returns. Observer programs often have a dual role in terms of dealing with compliance issues such as catch limits and areas.

As I indicated, there's been a long history of cooperative research programs in the northeast region, particularly in New England. The first group (of about eight programs) is those that have been funded and administered by various governments, mostly the National Marine Fisheries Service (NMFS).

The largest in this category in terms of number of projects funded and the amount of dollars spent are the the Northeast Cooperative Research Partners Program and the Research Set-Aside Program. The program has been going since about 2000 and has funded over $20 million in cooperative research with the fishing industry. In the Research Set Aside Program a certain percentage of the quota is set aside, and the researchers submit proposals and then they actually have to negotiate with commercial fishermen to go out, harvest that quota, sell the fish and use the money from the sale of the fish to fund the research (very interesting approach that was started about five or six years ago). It's worked well in some fisheries, less well in others. About $10 million of research has been funded through that program.

In terms of the non-government programs, the Northeast Consortium has been the largest cooperative research program in this region. It’s headquartered at the University of New Hampshire and again, they have funded over $20 million worth of research through that program.

So this shows the history of collaboration in the U.S. It's been going on since the late 1990s, and I think the important point to be made is that during the term of this program, from 1999 to 2008 about $120 million has been spent on collaborative research throughout the U.S. That's a lot of money. It's resulted in a lot of work and a lot of very good results. And in addition to that, many of the NOAA fishery science centers have also conducted cooperative research activities using their base funding.

I'll just highlight two of the programs. One is the Cooperative Research Partners Program, funded out of the Northeast Fisheries Science Center. The three main objectives of the program are to enhance and improve data used for management, to expand communication and collaboration among fishery participants, scientists, and managers – this is extremely important to get scientists out on fishing boats and to actually get them collaborating. Then the third, again equally important, is to utilize fishermen's empirical and ecological knowledge of the marine environment.

One of these programs that GMRI has been very active in is called the Study Fleet. This is an electronic system where a statistical sample of the total fleet or a specific subset of certain fisheries (those in which the data available for assessments is poor) is equipped with electronic logbooks and measuring gear. The vessels are actually paid to report detailed catch location, effort, discards, and the gear they're using, and they also collect other biological information during the course of their normal fishing operations

Another major program is the Northeast Consortium, they took a slightly different track. They established an advisory committee made up of stakeholders, so there were scientists, fishermen, environmental non-governmental organization, recreationalists, and managers who developed the major objectives for the program.

A number of the projects funded through the Northeast Consortium were initiated by fisherman. I know that at GMRI a number of fishermen have come to us over the years. I've lost track of the number – it's up probably close to 100, with a bright idea they had to conduct a bit of research. And we worked very collaboratively with the fishermen to actually shape out the scope of that research proposal and carry out and implement the project at sea.

Dr. John Annala, Chief Scientific Officer
Gulf of Maine Research Institute
USA

So again, the objectives are: develop partnerships between commercial fishermen and scientists, educators and coastal managers, (not to be underestimated, believe me), enable commercial fishermen and commercial fishing vessels to participate in the collaborative research, and to develop selective gear technologies.

One of the gear programs that was funded through the National Marines Fisheries Service funded program, the Cooperative Research Partners Program, won the WWF Smart Gear Award two years ago. That was the eliminator trawl that Phil Ruhle and others developed. And that's been a very good success story. NOAA Fisheries Service is currently implementing the spread of that gear through some cooperative research money funding that they have available in 2009 and 2010. So that should substantially reduce the by-catch of cod in the target haddock fishery. That's been one of the hot-button issues in New England for a number of years.

The third is to help bring fishermen's information, experience and expertise into the scientific framework for fisheries management, and the fourth is to equip and utilize commercial fishing vessels as research platforms. Now again, there's a lot of overlap between the program objectives for the Northeast Consortium and the NOAA Fisheries Service Cooperative Research Partners Program, as there should be. I would be concerned if there wasn't.

Since the program started in the late '90s, early 2000s, there've been now over 1982 collaborative research projects that have been funded. That's a lot of research on the water using commercial fishing boats. The project topic areas have been primarily gear technology, but also fish biology, socio-economics and education, habitats, ecosystems and oceanography and also stock assessment. At last count, between all of the cooperative programs in the New England area, there've been over 500 fishermen engaged in research, and over 200 research scientists. That's a lot of outreach.

I'd like to switch over to sectors and to talk about how the collaboration that's developed in New England has actually contributed to the update of sector development in New England. One of the issues with sector development is that there are landings in over 70 ports around New England (landings of ground fish). So any implementation of sectors is going to be a challenge in terms of observation and monitoring. Landings have come in from more than 600 vessels. In 2006 there were more than 18,000 trips, and more than 32,000 days at sea. This is going to present a very large monitoring challenge.

So what is a sector? A sector is probably likened mostly to a fisheries cooperative. I think most people have heard about the Pollock cooperative in the Bering Sea/Aleutian Islands. That is basically what the sector is. It'll be allocated some proportion of the total allowable catch or quota. By definition, a sector is a group of persons holding limited access vessel permits who voluntarily enter into a binding agreement with each other and the government to limit their total catch to a fixed share of the TAC (total allowable catch). This is going to be a very large move away from the existing system in New England, which is a regulatory system, based on days at sea and trip limits.

In exchange for staying within their allocated TAC, the sector will develop some of its own management measures and thereby avoid the effort controls and trip limits applied to the common pool. One thing that's interesting about the move towards sectors in New England is that vessels can opt not to join a sector and stay in the common pool. So that's going to present some very challenging compliance and monitoring issues. And the overall goal of sector management is to enable fishing businesses to become more economically efficient while allowing fish stocks to continue to rebuild.

A lot of people aren't aware of the good news story in New England with regard to fish stock rebuilding. There are 19 stocks that make up the ground fish complex, and they're mostly on their way to rebuilding to what in the U.S. parlance is called – moving away from being overfished and from being subject to overfishing to a positive state. The total biomass in the Gulf of Maine has increased by sixfold over the last 15 years. That is mostly due to the increase in haddock, but the trend and the abundance of most fish stocks in this area is increasing, and most are on track to reach their rebuilding targets by the target date , however, not all are.

In June of 2009, the New England Fishery Management Council met. The main focus of the meeting was what's called Amendment 16, which is the amendment that regulates the groundfish fishery in New England. The Council passed some very momentous decisions. Effectively they gave sector formation the “go ahead”, and the requirements are that the sectors must submit a proposal one year in advance. A final operations plan, a contract, and an environmental assessment due September 1st, which, (at the time of the conference) is less than six weeks away. The sectors must then design and implement an industry-funded dockside monitoring program by May 1st of next year, again, not that far away, and apply and assume discard rate to their allocated TAC unless they have an at-sea monitoring program in place. There are some real challenges facing the New England fisheries and this move towards sectors, all in a very short time.

What are the advantages and disadvantages to being in the sector? Advantages are that sector manages design and management system for themselves that meet their own needs. The major condition is that overall catch does not exceed their allocation. They can transfer allocations, which are called annual catch entitlements between vessels within the sector, and they have the ability to request exemptions from certain regulations such as rolling closures in the Gulf of Maine. The Gulf of Maine is a patchwork of what are called rolling closures which are certain areas are closed at certain times of the year. So they can request that they be exempt from those.

Disadvantages include significant administrative costs, the entire sector may be shut down if one TAC – a TAC for one species or stock is reached or a member violates certain provisions of the operations plans and following on from that, members are what's called jointly and severally bound to each other. Bad actions of one member may impact the entire sector and their ability to fish.

These are some more specifics: you need at least three people to form a sector, and approval has been given to move forward with 19 sector proposals. There are two sectors in existence already and then there are 17 new ones proposed. As I indicated, vessels that choose not to join a sector will remain in the common pool. Sectors can transfer annual catch entitlements between sectors, not only internally but between. One requirement from the National Marine Fisheries Service is that random dockside monitoring of 50% of the trips need to take place by 2010, so that's monitoring 9,000 trips – not insubstantial – and that's next year, and decreasing to 20% in 2011 onwards.

There's also going to be less than 100% electronic monitoring and at-sea monitoring in 2012, but the move will be towards increasing that substantially. There will be area specific reporting for all vessels. I mentioned the joint and several liabilities; these are the categories that it applies to: overages, discarding illegal size fish and misreporting catch. There'll be weekly and annual reporting of sector catch and activities so that the catch can be monitored as it approaches the TAC.

GMRI has been involved from the beginning in working with the industry to provide them with basic information. For example; about what sectors are, what sectors are about and how they can be developed and implemented, provided assistance to the industry that included catch histories, preparing initial proposals, drafting operations plans, developing environmental assessment documents, administrative training and support and other issues.

We're going to be involved in facilitating development of dockside monitoring programs. We just learned the week before this conference that we were being funded through a pool of money to work with the industry to facilitate that. We are going to be developing a pilot study to develop commercial vessel electronic trip reporting.

This is just a very quick overview of how the future might look, using a combination of electronic monitoring, video monitoring perhaps at sea with the vessel fishing log and dockside monitoring that will form, in some fashion, and official trip records that can be used by the sectors to report on their activities.

Just very briefly I'll touch on other related programs of GMRI. We're a private, non-profit institution, we have three arms: science, education and community. And you will find out a lot more when you visit the Institute. We will be offering guided tours, especially of our very innovative, forward-looking educational facility. We actually have received funding from a combination of foundations, corporate and individuals to bring in 90% of all Maine's fifth or sixth grade students to learn about marine science, and that's at no cost to the school. We bus students from Fort Kent, which is further from Portland than New York City is, at our cost.

The GMRI science program: We are working in fishery ecosystem research and management; we have a team of nine scientists working in fisheries ecology, modeling, economics, gear technology, oceanography. In the area of fishing gear technology, gear technologist Steve Eayrs, who's here as a delegate, has been involved in a number of gear technology programs and in developing an environmental management system which I'm sure Steve can talk about at some stage.

The Marine Resource Education Program is a highly innovative program that we've been running in New England for the past four years, where we teach fishermen, managers, regulators, scientists, etc. about stock assessment and management. Mary Beth Tooley, who sits on the Council, is on the board of the group that oversees the Marine Resource Education Program, and we've recently received funding to extend that to the South Atlantic and to Hawaii.

We recently learned that we were selected to be part of a Cooperative Institute for the North Atlantic Region. This is a NOAA funded institute with four other institutions in the area of marine ecosystem research.

I would like to acknowledge these people: Earl Meredith from the Cooperative Research Partners Program, Rachel Fenney from the Northeast Consortium, Howard McElderry, who most of you know, from Archipelago Marine Research, Bruce Turris from Pacific Fisheries Management, and Cindy Smith and Jonathan Labaree from GMRI who are the drivers behind our sector initiative program. Thank you.

Question and Answer

The question and answer session below captures the dynamic dialog between panelists and the audience. Each discussion is separated by a double line break

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Question
Dennis Hansford
NOAA Fisheries Service
USA

Thank you again, John. There was so much information in that presentation and it raised some questions, at least in my mind. I've asked John if he would field a couple of questions. You mentioned gear technology, and I knew the fishermen Peter and Phil Ruhle, – one of whom unfortunately lost their life at sea, and they've developed some new gear technology. My question is, in developing this under the auspices of the government, does it get the chance to move to the private sector, and how does that work?

Response
John Annala
Gulf of Maine Research Institute
USA

That's a very good question, and there are probably people in the audience that can answer much better than I. As I indicated, there's some money becoming available through – well I'll backtrack a bit: Jane Lubchenco, the new director of NOAA has made quite a bit of money-a total of $16 million to advance sector development in New England, and about $6 million of that goes into what's called cooperative research. My understanding is some of that $6 million is going to be used to build some more of the eliminator trawls or the Ruhle trawl as some people refer to it. Unfortunately Phil Ruhle lost his life in a fishing accident not so long ago. The intention is to get that out for the industry to use.

Now the intellectual property issues around that I'm not quite sure about because it is federally-funded, so by federal law it has to be freely available. It was developed by Rhode Island Sea Grant, which again is a public institution. So my guess is that it has to become freely available.

Question
Vicki Cornish
Ocean Conservancy
USA

It's very helpful for me to see how sector management is developing in the Northeast so I appreciate the overview. I saw several references to electronic monitoring which is great to see that being incorporated as part of the sector management program. I also saw references to at-sea monitors and I was wondering if you could just elaborate a little bit on what the difference is between at-sea monitors and the fisheries observers. Thank you.

Response
Dr. John Annala
Gulf of Maine Research Institute
USA

I think it's yet to be worked out what the difference will be between the NMFS observers or contracted observers and what observers might be contracted by the fishing industry, so it's work in progress as we move down towards the at-sea monitoring and sectors. I know it doesn't answer your question but that's where we're at at the moment. This is all fairly new.

Comment
Lisa Borges
European Commission
Belgium

I work for the European Commission, which is basically the government of the European Union. The eliminator trawl has been tested in the US and now, testing has started in Europe in many fisheries. It has been tested for the North Sea cod fishery to try to avoid the catches and the by-catches of the recovery stock, which is in very poor state. I think we put a lot of value in it and the possible applications of it in the fishery. I write speeches for the Commissioner of Fisheries, and we often support the use of the eliminator trawl. So it's very very present in Europe. Thank you for that.

Comment
John Annala
Gulf of Maine Research Institute
USA

The development of the eliminator trawl was an interesting process. GMRI was funded to work on a different design as well as University of Massachusetts at Dartmouth. So there were three research groups working in parallel on different designs, and the final result was that what is now called the eliminator trawl produced the best results in terms of reducing by-catch of cod and retaining haddock. So that's why that was implemented. So it's a very interesting process of actually putting a lot of minds, taking different approaches to addressing one problem, and getting what I think is the best result.

Question/ Comment

Kelly Schmidt
A.I.S., Inc.
USA

What parameters will you use to measure the success of sectors?

Response
Dr. John Annala
Gulf of Maine Research Institute
USA

That's a very good question. Another proposal we had funded last Friday was to work with a local company called Market Decisions, it's done a lot of socio-economic research in New England to develop a survey to determine what the success rate is of sectors. So it hasn't been developed yet, but we're certainly planning on doing so, working collaboratively with the various regulatory agencies.

Question
Jennifer Lengares
A.I.S., Inc.
USA

Have you had any feedback from the fishing industry and the fishermen as to how receptive they are to this sector program and if it seems like something that's going to be better received than the current regulations that are in place?

Response
John Annala
Gulf of Maine Research Institute
USA

Not everyone is embracing the idea of sectors, so they do have the opportunity to stay in the common pool and fish under not necessarily the current regulations. I think it is fair to say that the reception has been mixed, but by and large positive, viewing it from an outsider's perspective.

Introduction of Dr. Rebecca Lent, Keynote Speaker of the 6th International Fisheries Observer and Monitoring Conference

Dennis Hansford
NOAA Fisheries Service

Dr. Rebecca Lent serves as the director for our Office of International Affairs. Previously, she was Deputy Assistant Administrator for Regulatory Programs at NOAA Fisheries Service, a position she held from 2001 to 2007. In that capacity, Dr. Lent reviewed all of the NOAA Fisheries Service' proposed regulatory actions, including those to support protected resources, sustainable fisheries and habitat conservation in both the national and international forums, which served as a good springboard from that position to her directorship for the International Affairs.

6th IFOMC Keynote Speaker
Rebecca Lent, Ph.D
Director, Office of International Affairs
National Oceanic and Atmospheric Administration
National Marine Fisheries Service, USA

She has broad experiences in dealing with a wide variety of conservationists, businesses and communities. You can see an overriding theme in much of our efforts here is concern for the environment, inclusion, and collaboration. Rebecca exemplifies these ideas. I've been fortunate enough to work with her not only in the realm of science but also in the area of workplace diversity. She's been a staunch supporter of educational outreach for students and programs, such as Blacks in Government.

We are very appreciative that she can find the time out of her busy schedule to welcome us and take part in this conference

Keynote Address
Improving Global Fisheries Science, Management and Enforcement: The Role of Observer Programs

Rebecca Lent Ph.D.
Director, Office of International Affairs, National Marine Fisheries Service, USA

Hello, bon jour, buenos dias, salaam alaikum, good day!

Thank you very much, Dennis. Thanks to all the organizers. It's really a pleasure to be here. It's somewhat humbling. Dennis didn't tell you this but I am actually an economist by training. I'm a resource economist, and I've had a lot of experience working with biologists, oceanographers, and people with the so-called “hard science” background, although I always thought that economics was pretty hard. It's also dismal, so when you blend it with declining stocks, it gets to be tough.

I am humbled to be here and to address you. I've been here since Sunday and I've had the opportunity to watch the crowd come and go and mix and people see each other. I've noticed there's a real camaraderie among the ranks of the observers. It makes me think a little bit about being in a convention of ex-Peace Corps volunteers. I'm not an ex-Peace Corps volunteer, my sister is and some of my best friends are ex-Peace Corps volunteers. I think there might actually be a little overlap between Peace Corps volunteers and observers. But I really am envious of that tight relationship that you have. That's great.

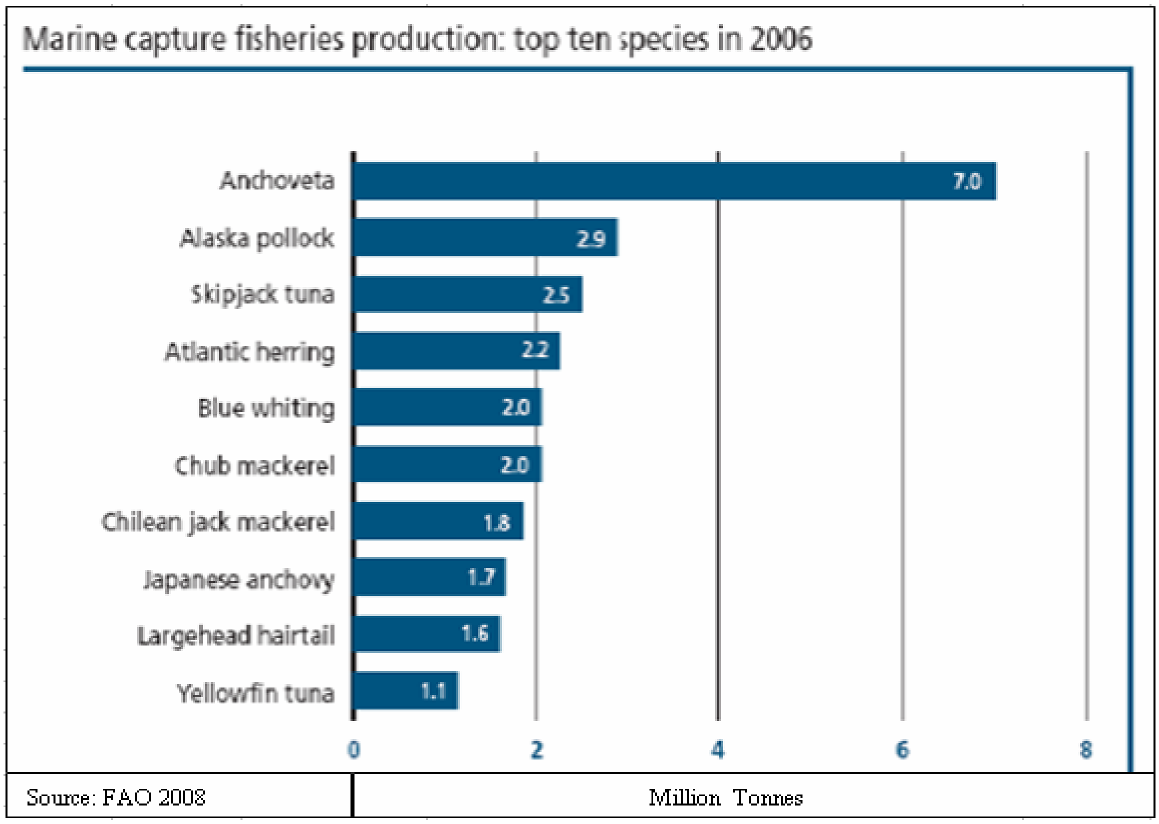
When I was in graduate school at Oregon State I had a friend down the hall from me in my apartment building who was a fisheries biologist, and she went out on a Korean boat. When she came back and told me about her adventures as an observer I thought, "Oh man! Too bad they don't hire economists."

I have had a chance to go out on some commercial fishing boats as a regulator. When you go out on a fishing boat you really learn a lot. You get a sense of how much you can learn and how important it is for us to understand what actually happens on the boat – understand the fishermen, and understand their situation. So it's great to be here, great to see a lot of diversity in this crowd as well. I'm old enough to remember the days when the first women went out as observers, and it was tough. I know some of you were actually trailblazers.

First I’ll give an overview of the status of the world's fisheries, probably stuff you already know but just give you the latest statistics, talk about why generally things aren't so great, as we know and what we might be able to do about the situation, and then what's the role of observers in solving some of these problems, looking at observer programs at the domestic and multilateral level, and then where do we go from here.

So the statistics of capture and production (other than statistics from China which are always filtered out from the Food and Agricultural Organization, statistics) basically show that, things are pretty much flattening out. We've pretty much reached our cap in terms of total marine capture at around 82 million tons at an ex-vessel value of $90 billion.

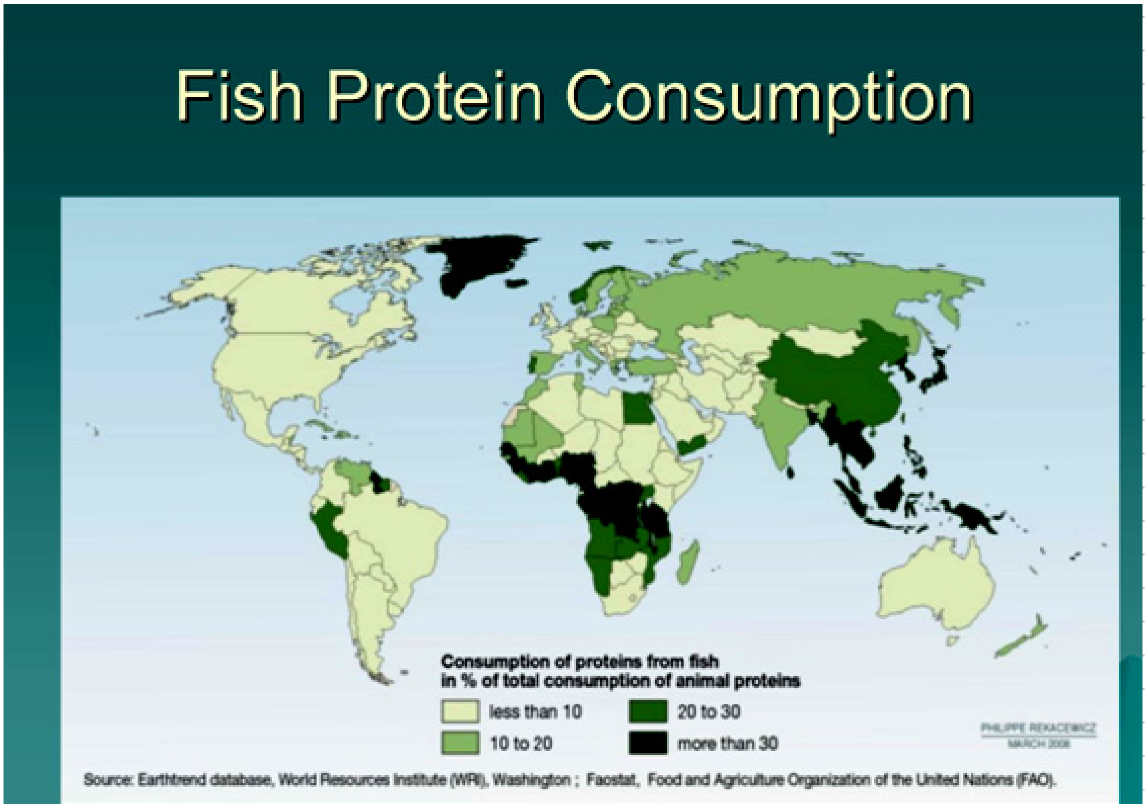
These are some of the top producing Countries: China, Peru, U.S. – those are primarily due to the large volume – The below figure indicates the top production by volume.



Interesting to look at where this fishing happens. As you know as observers, most of this fishing is going on pretty close to shore. That's where the richest fishing grounds are on the continental shelves. But over the years there's actually been an increase in the average depth of the fishing, which means we're going farther out and we're going deeper, and of course there are deepwater trawling issues and concerns.

The above marine capture fisheries production chart is ordered this is by species. You can see some of the large volume fisheries, our friends from South America (the anchovy fishery); Alaskan Pollack, (big volume fishery); the tunas, skipjack and yellowfin. So those are some of the biggest ones by volume. Those top ten are about 30% by volume. So overall if you add up the stocks that are fully exploited, overexploited and depleted, it's over 3/4ths of the fisheries that can stand no more expansion and in fact they need to be retracted.

So what's going on and how are we going to make this situation better? We need to remember that it's not just about the stocks, it's about how the stocks play in our nutrition, in our culture, in our very survival About half of the total animal protein in some developing nations comes from fish products, and as incomes rise and your diet diversifies you are eating more fish. Also, consider the expanding middle class. Think about a country like India where the middle class is just booming and those who are not vegetarians would be eating more fish.



Source: Earthbend database, World Resources Institute (WRI), Washington: Facstat, Food and Agricultural Organization of the United States (FAO).

This chart shows what share of animal protein comes from fish. You can see in some of the developing world, particularly our friends from West Africa, are eating a lot of seafood. It's a very important protein source.

So what's going on? Why do we continue to have overfishing? Why do we have stocks that continue to decline? Well in some cases, there's just no management at all. We're hoping that we're addressing that problem as quickly as we can. In some cases, we don't have enough data, or the data have not been analyzed. In some cases, and this is the most shameful part, I think, we have the data, we have the science, we just are making the wrong decisions. We're not basing our decisions on science. That's one we can do something about. It won't be easy, but we can. Finally, the problem of IUU fishing – illegal, unregulated, unreported fishing, which we'll touch on quite a bit. I will argue that in all these cases, observer programs are critical, and we should be developing observing and monitoring programs.

For the lack of scientific data analyses, sometimes there just isn't a data system in place. You have some efforts out there through development projects, capacity building projects, to improve on the data collection systems. Sometimes the data do come in but they're not analyzed. I will tell you, right here in the United States there are boxes full of forms that have been completed where the data have not been crunched because we don't have someone who can write up the data or we don't have someone who can enter the data and get it into a computer system. There are data out there that have never been analyzed, believe it or not.

Again, a shameful part of our history is poor compliance with data requirements. I'm currently serving as the U.S. Commissioner to the International Commission for the Conservation of Atlantic Tunas (ICCAT). Last year we had a stock assessment for eastern Atlantic and Mediterranean Bluefin tuna, an extremely important stock commercially, recreationally, and a stock that's not in very good shape, frankly. We had a stock assessment. The scientists got together, and only three countries had submitted their data in time for the stock assessment, and they represented 12% of the quota.

I want to congratulate my colleagues from Turkey and Morocco who are here who are two of those three countries. It's a challenge sometimes to get your data in, particularly depending on the timing of your fishery, but it was so bad that the scientists actually had their chair write a letter to us, the commissioners to say, "Don't do this. It's a lot of time and trouble and expense to come to these meetings and we have to fudge around and use this limited data as indicators." That's a problem. We've got to deal with that.

Lack of adherence to science is where with the political will, with the pressure, we can make a difference. But we continue to have fishery management decisions taken (where for one reason or another, primarily I think fishing pressure) to continue overfishing, ratchet down the quotas more slowly than we should, and sometimes even set quotas where the overfishing continues, and that is unfortunate.

Sometimes uncertainty is used as an argument, saying, "Well you know, in the stock assessment the error bars are so huge around these estimates, we just don't feel right putting people out of work for something that's so uncertain." Well, of course, the precautionary approach to management tells us that we should be taking a precautionary approach where we don't have information or where the error bars are huge. Politically, it is difficult. So what do we end up with? We end up with legal overfishing.

Alright, let's talk a little bit about IUU fishing. I think you all know what IUU fishing is. For example, you have a regional fishery management organization, you have a vessel that is flagged from a state that's a member, but they're not complying, or you have a vessel that's flagged from a state that's not a member, and it's coming in and not fishing according to the rules. You could have domestic regulations in EEZ with the closed area and vessels entering the closed area. There are all kinds of forms and we don't want to forget the form which is non-reporting.

I have fresh news from my friend, Michelle Kuruc, who just showed up from the FAO. The estimated economic impacts of IUU fishing globally can go as high as $23 billion. So this is in foregone revenues that might otherwise go into the pockets of legal fishermen. Obviously there's an impact on the resource, not just the target stocks but also by-catch or any affected habitats. There are tremendous social impacts. If you watched the "Moving Sushi" video that Linda and Mike showed us, you know that some of this illegal fishing is right alongside some community fishing, right alongside local fishermen going out in smaller boats. There's also a link with drug trafficking and with human trafficking. Some of the crew on these boats that are out virtually for years, they're indentured slaves.

In addition, those boats can sometimes be used for moving people. So that's another reason to combat IUU fishing. You all know that there's a link between IUU fishing and what's going on off of Somalia with the piracy as well.

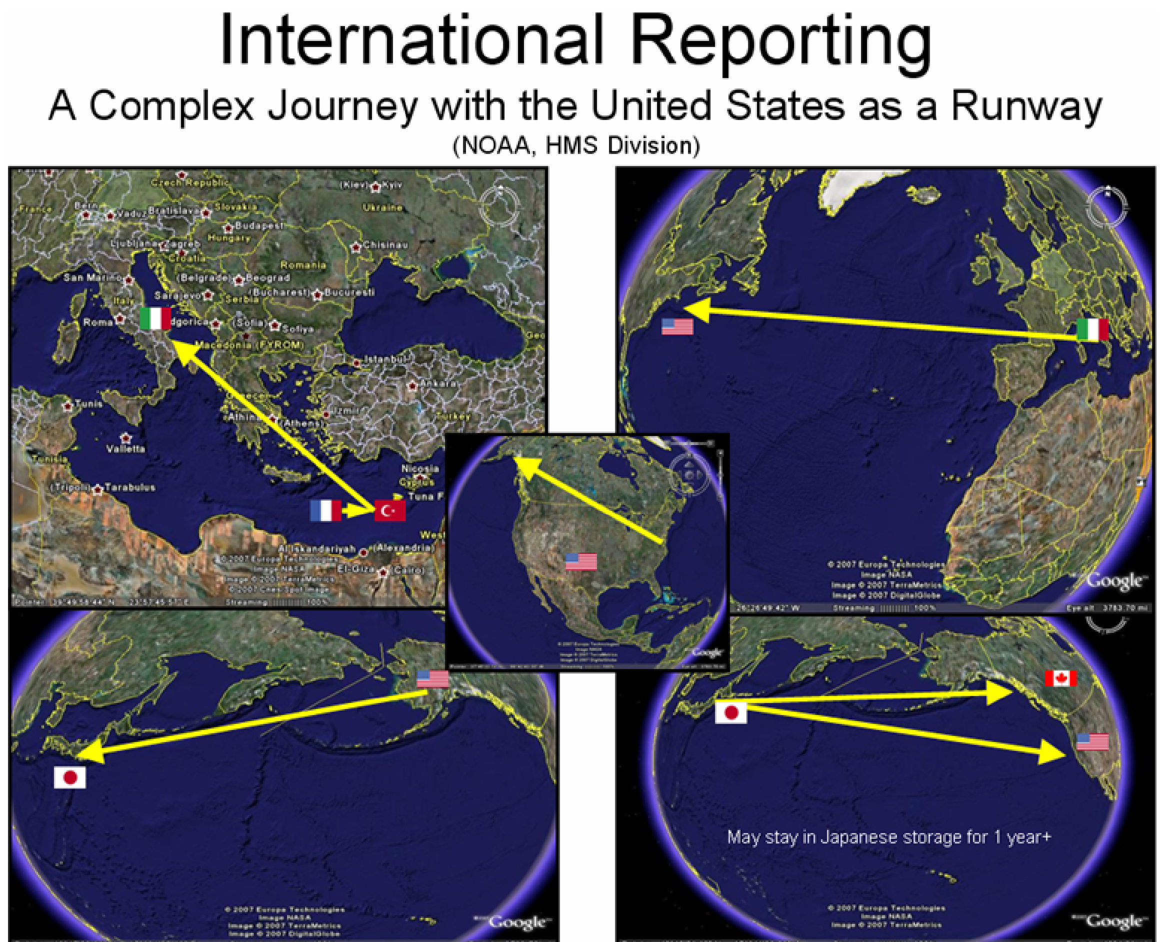
The scientists, of course, lose data. With all the fishing that is going and the produced fishing mortality makes it more difficult to do the stock assessment. In some cases – I know this happens in ICCAT, the scientists actually work with a broader community to try to figure out what the actual catches might have been, based on looking at trade data, or looking at other sources of information and say, "Well, if the actual catches were really that high, this is what the stock assessment results would look like." However, it these are estimates.

I'll focus on West Africa, an area where we've been working closely with our partners. This is a major area of IUU fishing, in some cases up to 40% of the catch is estimated is illegal catch. Sometimes where we have access agreements, we have seen accounting irregularities. You see something like a month report that has exactly 100 metric tons every month – how can that be? They might not have an observer on board. There's a lot of concern about what's going on in that part of the world.

Rebecca Lent, Ph.D
Director, Office of International Affairs
NOAA's National Marine Fisheries Service

So how do we address IUU? One of the areas that folks have been focusing on is tracking the trade. Seafood is one of the most traded products in the world. That's because you can't fish for seafood in Kansas City. Obviously it has to be traded, it has to be moved around. Up to 200 countries are in the export market and a lot of countries are in the import market. Total world exports are over $85 billion, so there's a lot of value added. If we can track the international trade, we can maybe get a handle on what is going on.

There is an interesting example from NOAA Fisheries Service staff who work with highly migratory species in Gloucester, Massachusetts. A French boat caught a tuna, and then they took it to a Turkish farm. It was then shipped to Italy, and then to Boston. The people in Boston said, "Well I'm going to send this to Japan," So it went to Japan, and then Japan said, "Well, we don't really want this fish," Perhaps it was a lower quality bluefish. The whole trip of this fish was nearly a year.



Source: Dr. Rebecca Lent's Keynote Address

It was shipped it back to North America, to Canada and the United States, so that's one fish making a global journey. Think about the carbon footprint. It's pretty amazing.

I should point out that both the United States and the European Community have recently implemented some rules that say we're going to take steps so that we don't buy any more illegal product and avoid importing IUU product. As major markets, along with Japan, we can really make a difference by just saying, "We're not going to buy it." So those processes are underway, we also have some regional fishery management organizations that have implemented trade restrictions and have banned trade from certain countries.

I want to mention the Convention on International Trade in Endangered Species, or CITES. They have increasingly looked to marine species, to the marine world, for things like corals or great white sharks, species where there's a lot of trade – wherever there's a lot of trade or where there's concern about trade as a driver for this illegal fishing. CITES are the people who also ban trade on ivory and bear claws and things like this, but, increasingly, they are looking at the marine world as well.

Last week we heard that Monaco has proposed to list on Appendix 1 -- which indicates no trade is allowed -- North Atlantic bluefin tuna. France has backed the proposal, the UK has backed it, and I just learned that the Netherlands has backed this proposal. It's kind of interesting. France and the UK to a small extent actually fish for bluefin tuna, so it's pretty surprising to see what's going on there.

For some people it's a wake-up call, saying, "If ICCAT, the commission that's supposed to manage these fisheries, doesn't do its job, then someone's going to step in and take trade measures. So ICCAT will still set the fishing quotas, but the price is probably not going to be as high if it can't be exported to Japan."

Now to address observers in IUU fishing: Obviously observers and other monitoring onboard the boat provide the richest possible data. You are looking at bycatch and habitat and fishery information – what's really happening on the boat, not just the target catch. By the time you are looking at the trade of the fish, you are just looking at the target catch, you don't know what the bycatch was when those products were fished, you don't know about the habitat impacts if it was a trawling type gear.

Trade data also exclude domestic consumption. Sometimes that can be a huge hole. That's why in some cases such as Patagonian toothfish, there's actually a catch document that goes with the product, no matter where it goes, even in domestic markets.

The other thing is when you're an observer on a boat, you're actually looking out at the sea and you can see the other boats that are out there and what's going on. Any observer here ever witnessed what looked like a flagless vessel or some illegal fishing going on? Anybody? Is that generally included in your reports that you make back? (Audience member, "yes") Good. I know this has happened in the tuna and dolphin fishery observer program in the Eastern Tropical Pacific, so that's important. You're out there and you're on the water.

And the last point, a point that I repeatedly make in these regional fishery management organizations when there's a lot of pushback on expanding observer programs. We understand that it's difficult and expensive. It can, in some cases, interfere with fishing operations if we don't do a good job of planning all that, but I know you guys are pros at that. But when we are looking for solutions to bycatch, or think of the problem of seabirds, and we're putting in measures, like you have to have line shooters, you have to throw your offal off the side, you have to do all these things: it's really important to get the observer's input on that before we design the measures. What are you actually seeing when the boats are fishing? How does it work? When are they baiting the hook? How fast is that going? What are the danger points? This is where you play a role in helping the managers' design more practical, more useful, and more likely to be complied with. And even once they're in place, taking a look the first fishing season to see how is this working out? That's the practical aspects we really depend on you for. You are our eyes and ears on the ocean, our best and usually only source of direct information on the water. We thank you for that.

Now let me touch a little bit on domestic versus multilateral programs. Obviously in our own countries we're developing our domestic programs – that's the foundation, that's where we start. But increasingly, we're talking more and more about observer programs in the multilateral realm, and that's great.

In the case of some high seas fisheries, it's the only way we are allowing transshipment. I think trans-shipment otherwise might be banned if we didn't have the possibility of observer programs for trans-shipment. We need to work on standardizing and harmonizing data (to the extent that we're providing these observer data for our scientists) even within the national programs. The

IATCC, the agreement for the dolphin conservation program in the eastern tropical Pacific, as you know it's 50/50. You can have up to 50% of your own country's observers and 50% of the international observers, but all the training is the same, all the approaches, all the procedures. So that is really beneficial, and of course, we're working together on some best practices.

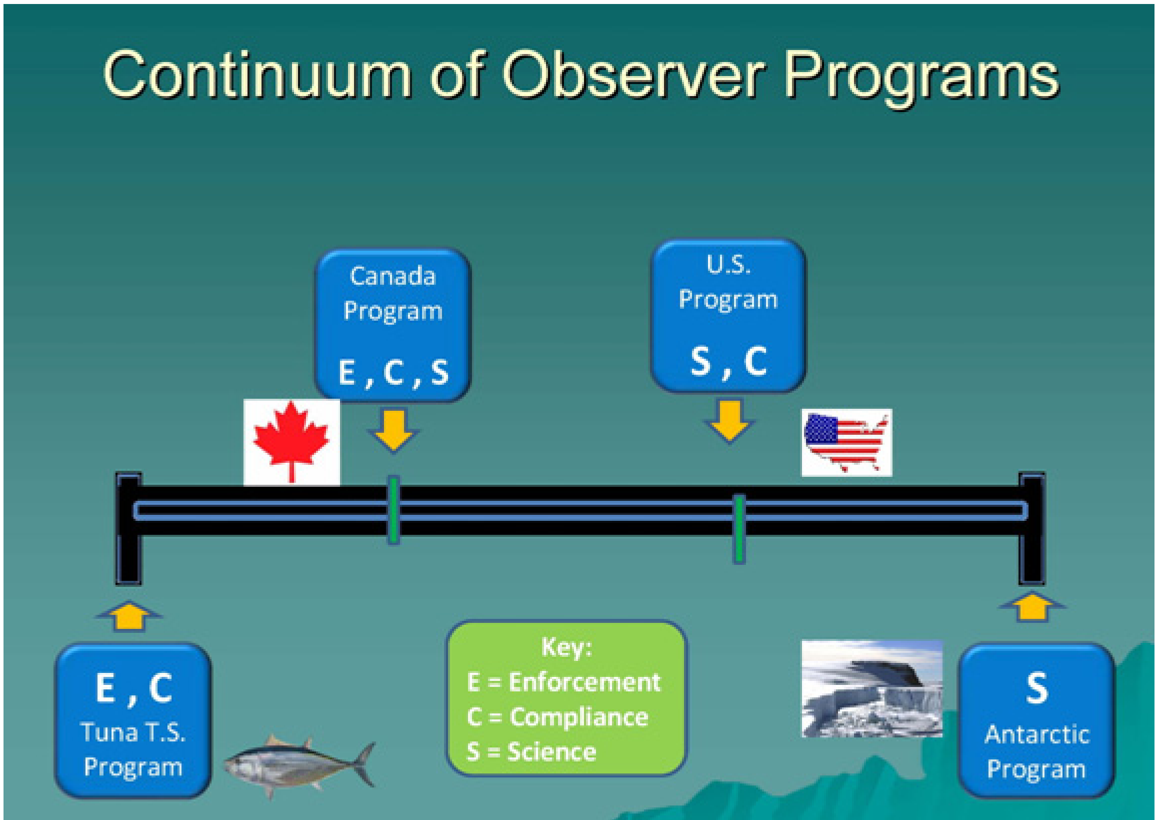
You know that the world is divided up into regional fishery management organizations. Five of them are for tuna. There are a number of other ones. There are two huge new organizations just now under negotiation, and those are in the South Pacific Regional Fishery Management Organization and the North Pacific Regional Fishery Management Organization, also known as SPRFMO and NPRFMO, but these are some new agreements that are being negotiated for the non-tunas; that is to address the high seas bottom-trawling (an issue just under negotiation.)

Rebecca Lent., Ph.D- Director of the Office of International Affairs
NOAA's National Marine Fisheries Service
USA

So that's what the world is divided up into and they are paying more and more attention to observer programs, which is why I'm happy to learn some more about it.

A couple of weeks ago a few of us in the room were at the second summit of the world's five tuna FMOs. They met and talked about things like capacity and enforcement and overfishing. There will be a workshop on monitoring control and surveillance issues that will be hosted by Japan.

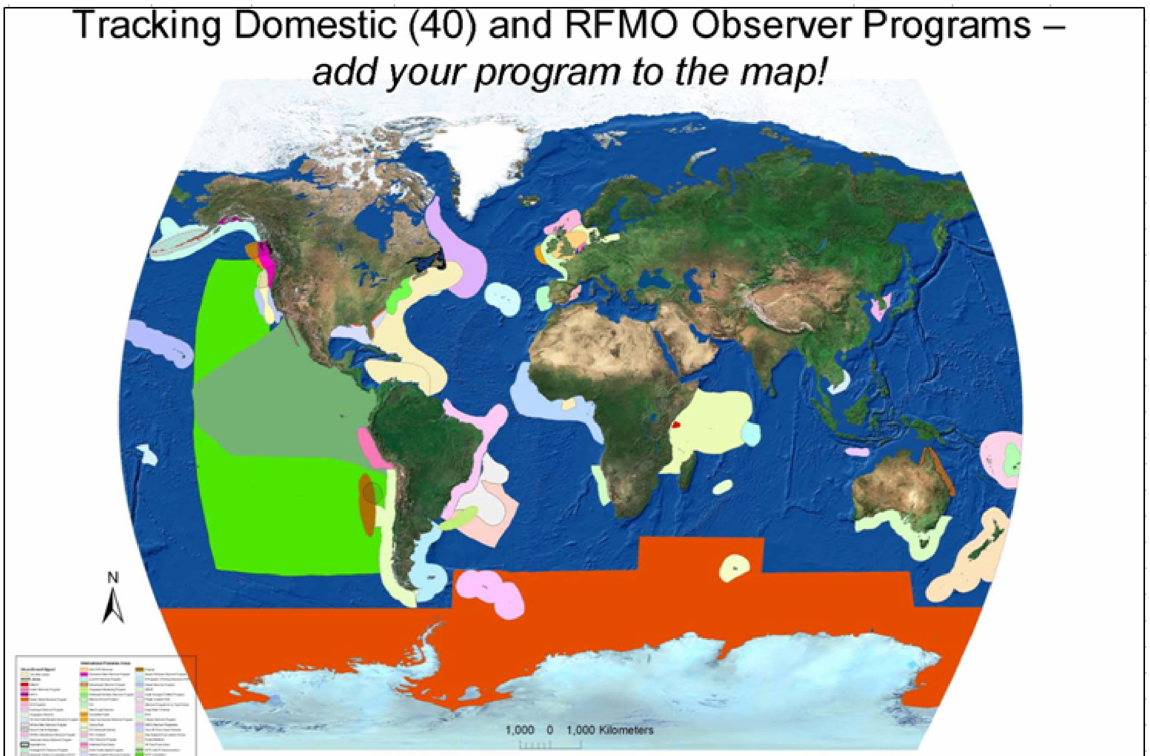
One of the ongoing debates that we have in ICCAT is this: Should observers be out there for the science or should they be out there for enforcement? We're trying to argue that they can do both, but we don't necessarily want observers reporting violations as soon as they see something whacky. There could be some unfortunate accident at sea. We think that really compromises their personal situation. So the idea is (and you know this better than I do) to write down everything that you see and hear, and when you get home you just submit your report and go on about your way. I know in the United States it could be that two years later down the line an observer could be called into a courtroom just to say "This is what happened: they hauled in this stuff and they had this and they kept that."



Source: Dr. Rebecca Lent's Keynote Address

So we see it sort of as a continuum. The tuna trans-shipment program would be at the left end. I would say the tuna-dolphin program is more enforcement oriented, although you're collecting a lot of rich scientific data. You are getting both. The Canadians may be closer to using their programs for enforcement and compliance. The US is closer to science. And down on the right end of the continuum the Antarctic program is purely for science. So it's just a continuum, and I think we can work with this.

I would like to introduce TrudiAnn Prince and Samantha Brooke. TrudiAnn and Samantha have been working on a map that was started a couple years ago. Back then you put your pushpin in the map to show where your programs are. We're looking at, at least 40 domestic observer programs and a number of regional fishery management observer programs (RFMO). Please make sure that your program is on the map. It looks like we're getting the planet covered. Maybe in a few more years there will be no more blue.



Source: Dr. Rebecca Lent's Keynote Address

Obviously what we're looking for in working multilaterally is some regional standardization. That allows us to save a lot of money, save a lot of effort, particularly when we start combining the data and putting the data all in one database and exchanging knowledge and technology. You lose all of those efficiencies if every group is developing its own program on its own. It's a large waste of money.

One of the things that regional fishery management or multilateral approach entails is working with other countries. So we have gone to Ghana and to Senegal and we're on our way to Cameroon to work with our partners in those countries to do joint training. We learn about their program and we try to share some of our technology, and that's a good thing.

Bob Trumble will be speaking about the international consistency in the tuna transshipment program, because tuna are a global product. A boat So it might come around South America, go from one to two to three to four different Regional Fishery Management Organization regions, and obviously you don't want the boat to have to go into port and take a different observer. You want this all to be harmonized so it's seamless.

So what is the future? Definitely there has to be increased monitoring, through observers, through logbooks, through the new technologies that are being used for electronic monitoring. There's a lot of excitement about that. I know folks in Japan are particularly interested in that. Observers are going to be a key component of that, working carefully, collaboratively with the managers, with the scientists, with the fishing industry to make sure this is a good combination. Make sure too that we're distributing observer effort, because it is expensive. We can't do it 100% everywhere – that wouldn't be efficient. We need to make sure we're doing the right distribution and optimizing the resources, both human and natural, and where appropriate, taking a regional approach.

I just want to close with a reminder that observers have pretty tough working conditions, pretty much like our fishermen. You have to have all kinds of specialized training, and I understand the pay is not that great, there are harsh and dangerous conditions, and it is definitely a job that requires a lot of dedication. So for that I want to thank all the people who work for good observer and monitoring programs, and I thank you for your attention.

Question and Answer (Keynote)

The question and answer session below captures the dynamic dialog between panelists and the audience. Each discussion is separated by a double line break

Comment
Dennis Hansford
NOAA Fisheries Service
USA

Thank you, Rebecca. We're going to open up with floor to any questions you might have for Rebecca.

Comment
Bob Trumble
MRAG Americas
USA

When you were talking about IUU, bringing monitoring in to the observer field, and sort of expanding that role – do we need to start looking at the next phase, beyond at-sea monitoring and looking at traceability? How do we get the product tracked across all of these chains, going from the Mediterranean all around the world to finally come back to the U.S. for the second time? There are a lot of ways you can launder that product, and traceability through a variety of mechanism will allow that to happen, but that's – if we start bringing that in, that's a whole new arena. That's almost a project by itself. We need to think about how far do we want to take this? And as we start addressing IUU and some of these issues that are really important that observers deal with, we may need to start looking at some of these other kinds of programs to help with that.

Response
Rebecca Lent
NOAA Fisheries Service
USA

Thank you very much. I think traceability is definitely something that's on the rise. It's part of the so-called eco-labeling schemes that are being adopted. Under the European Commision's program, by saying they are not going to buy any IUU product, they are encouraging countries to have traceability systems to make sure that they know that the product came from a legally-licensed vessel that was part of the regular management program.

I think it has to be on a parallel track, because again, you have the problem that by the time you trace the product it's already fished; something's already happened out on the sea and you don't know what happened. You can surmise based on observer data or logbook data from the legal vessels, but you lose a little bit of information. I think it needs to be dual track. The nice thing about traceability -- entities like the EC who say "we're not going to buy the product -- is it would help countries like the US, So traceability helps stop the flow and maybe that gets back to the illegal fishing and it stops because it's not profitable anymore.

Question
Dennis Hansford
NOAA Fisheries Service
USA

You mentioned about ICCAT and some other RMFOs using other entities to augment their data and information on effort. Is there any movement to formalize relationship with those entities so there's a continuing source for data?

Response
Rebecca Lent
NOAA Fisheries Service
USA

By entity do you mean other companies or other countries?

Comment
Dennis Hansford
NOAA Fisheries Service
USA

When you mentioned it I didn't get a sense of who you were talking about when you said they provided them additional information. I thought maybe NGOs, or what. I guess that's part of my question too. That's why I was asking are there any moves to formalize this relationship? Who are they and is there going to be some formal pathway for ongoing source of data from them?

Response
Rebecca Lent
NOAA Fisheries Service
USA

Generally when I use the word "entity" it's a code word for Taiwan. It can also be used as a code word for the EC 'cause you can't really call the EC a country, but those are big participants in the fisheries.

I would mention, since you brought it up, that ICCAT -- I'm not sure about the other RFMOs -- but ICCAT does use information from the environmental NGOs as part of their compliance assessment process. So at the beginning of the compliance committee meeting for ICCAT, there are reports that come from Greenpeace or Oceana or other NGOs that are out there on the ocean and taking pictures. It's being treated as something that can be introduced. It's not necessarily introduced as gospel, but it is something that countries definitely need to be aware of and respond to. So I hope that answers your question.

Comment
Georg Hinteregger
Observer
USA

Just to follow-up on what Bob Trumble mentioned about traceability: we tagged turtles with pit tags. Are you familiar with those? I know it wouldn't be a suitable technology for smaller fish, but in the case of giant blue fin tuna, would pit tags be useful?

Response
Rebecca Lent
NOAA Fisheries Service
USA

Well, actually tags are used to identify fish and to track them through the documentation throughout the system – the U.S., Canada, China's going to start – Japan does it as well, tagging individual fish. Now they're not tags with electronic monitoring. I think that would be something fairly expensive – it would certainly be thorough. Now the only problem is once you start cutting fish up, you would have to have tags on each piece. When we cut up the shipments under the ICCAT program, and there a lot of people in here that know more about this than I do, the number that's on the original tagged fish goes with each shipment so we can trace it back.

Question
Imam Zainudin
WWF
Indonesia

I'm attending this meeting because we have actually initiated an observer program four years ago. We have advanced activity in our observer program. However, so far we've experienced some challenges. The acceptance for the observer program within Indonesia is actually getting better. Before the Government got involved, the NGOs and industry would fight each other. We are now slowly but surely gaining trust from industry.

The problem right now facing the observer program in our government is the enforcement aspect. We try to supervise IUU regulations from AU, allowing countries to be impacted from this policy. Then we have tried to initiate ideas on how to reduce IUU in our country. We use observers, and we try to conduct workshops with boat captains and enterprises. Now we have gotten buy-in from the government on the observer aspect, as they want additional tasks from the observer/monitoring workshops and to record IUU cases.

Then boat captains indicate that if effort is put forth to record IUU, then the observer would be tossed off the boat. This is very bad. I need your suggestions or recommendations about this issue because I think observers play a very important role. The government agrees about this issue. The industry will have a big problem if this continues.

Response
Rebecca Lent
NOAA Fisheries Service
USA

That is really interesting input from your part of the world. It sounds like a new program that's starting up and you have in this room a wealth of people with a lot of experience in observer programs. It sounds like there are some issues related to having observers there for IUU as opposed to just observations, and I'm sure there's a way to address this in a fashion saying "These are the folks that are going out and just recording what's happening. They don't make any phone calls. They don't make any reports. They hand their report over to the boss and the boss figures out anything that might have come out of that."

I mean it has to be safe for the observers – otherwise the program isn't going to work. I think it helps in the United States and maybe some of the U.S. industry members can help me out here, but when there is an open public transparent process with a lot of participation from industry in designing the program from the get-go, then there's probably going to be more buy-in and people are going to be more accepting of having this stranger on their boat who's going to eat their food and take a sleeping berth. But it needs to be done with caution, with care, with a lot of input from all of the parties concerned: scientists, observers, fishermen – everybody needs to be a part of the process where you design the program and then hopefully it works a little better.

Comment
Dennis Hansford
NOAA Fisheries Service
USA

I would add that during the course of the conference we're going to have sessions that will hopefully give you some ideas on how you can train your observers to deal with the documentation as they recognize infractions and how that's reported up the chain of command. In the U.S. programs we've had our observers face some situations likewise where they are intimidated if they report what they see, and we've cultivated training for our observers in how they can document that, as well as given certain circumstances placate the captains or whoever it is that's causing the intimidation.

The bottom line is it's still something that we encourage them to report on, whether or not they get a chance to document it, which is the ideal course of action. That information needs to get back to the program, and where is the gentleman? We should talk further afterwards, see if we can put you in touch with some of our program managers that may be able to offer you some further insights on how best to have your observers deal with situations like that.

Rebecca, I thank you for taking your time to be here for this, as well as for the duration of the conference.

Panel Session 1:

What are the different types of monitoring programs available for collection of fisheries information?

Moderator: **Steven Kennelly, New South Wales Department of Primary Industries, Australia**

Speakers

Elwin Kruger – Namibia
Overview of the Namibian Fisheries Monitoring System: the role of the fisheries observer program and the challenges it faces

Pierre Meke – Cameroon
The Scientific Observers Program: as a tool for sustainable management of the marine trawl fishing in Cameroon

Craig Loveridge – New Zealand
Inshore small vessel monitoring of cetaceans by observers

Jacob Kritizer – USA
The case for full retention in fisheries: benefits for monitoring

Barry Ackerman –Canada
The integration of commercial groundfish fisheries in British Columbia

Jennifer Watson – USA
A shore based monitoring program in Alaska: catch monitoring and control plans

Jørgen Dalskov – Denmark
The fully documented fishery using electronic monitoring to improve industry self-reported data.Bob

Robert Trumble – USA
Monitoring tuna transshipments using observers

Introduction to the session

This first session of the 6th International Fisheries Observer and Monitoring Conference is entitled, "What are the different types of monitoring programs available for collection of fisheries information?" This introductory session was designed by the Organizing Committee to provide everyone with a background to the diversity, scale and scope of the various monitoring programs occurring throughout the world. The result was an excellent and diverse group of talks in this session that provided a solid start to the conference, covering a wide range of fisheries, oceans and ways to observe and monitor fisheries. The session began with descriptions of some quite large observer programs from places we don't often hear about (Namibia, Cameroon and New Zealand), with the New Zealand talk providing an opportunity to scale the discussion down to small-scale fisheries observer work. Next we looked at combinations of various ways to monitor fisheries including at-sea programs versus dockside work in the US, Canada and Alaska. Next we headed to Denmark in Europe for an example of using electronic monitoring to improve self-reporting by fishers. Finally, we focused on a truly international example of fisheries monitoring that involves several countries as the Inter-American Tropical Tuna Commission deals with tuna trans-shipments at sea.

Overview of the Namibian Fisheries Monitoring System – The role of the fisheries observer programme and the challenges it faces

Elwin Kruger
Fisheries Observer Agency, Luderitz, Namibia

By the time Namibia became independent in1990, many important fish stocks and other marine resources in the Namibia waters had been severely depleted following decades of poorly regulated and unsustainable exploitation[1] . After independence the Exclusive Economic Zone was declared and the new government, realizing the potential role that the sector could play in the national economy, implemented management policies, laws and regulations geared towards optimal and sustainable harvesting of marine resources and the establishment of a local fishing industry. The Fisheries Sector is the third largest contributor to the national economy and in 2007 this sector accounted for 27% of export earnings for the country and by then the industry provided direct fulltime employment to 14 000 Namibians[2].

This study provides an overview of the Fisheries management and monitoring system in Namibia and also highlights the role of the Fisheries observer programme within the system. It further highlights some of the challenges faced by the Fisheries Observer Agency (FOA) in Namibia.

Elwin Kruger
Fisheries Observer Agency, Namibia

The constitution of the Republic of Namibia dictates for the maintenance of ecosystems, essential ecological processes and biological diversity and further require that living natural resources be utilized on a sustainable basis for the benefit of all Namibians, both present and future. In line with this the White Paper on Fisheries Policy laid out the goal of sustainable utilization based on the strategies of rebuilding stocks, establishment of an national fisheries sector, accruement of benefits to Namibians and the empowerment of the previously excluded Namibians due to policies in place before independence[3].

Management measures in place include limiting the number of participants in the fishery by the requirement for Rights of exploitation while output control like TAC's and Individual non-transferable quotas limit fishing effort. Input control measures place restriction on capacity applied in the fishery and is regulated by fishing licences. Other control measures include area restrictions and fishing seasons. In a shift to move away from the single fishery management approach towards the ecosystem approach, Fisheries Managers in Namibia is currently in the process to design management plans for the different fishery that would allow fishing within ecological limits. To this end the country declared its first marine protected area (MPA) on the 2nd of July 2009.

The monitoring regime in Namibia allows for information to be collected from different sources. Inspectors of the Ministry of Fisheries and Marine Resources monitor all the landings of catches in port. Fishing logbooks provide catch and effort data while fisheries observers collect biological sampling data from fishing vessels. In order for such management measures to be effective it requires a rigorous monitoring, control and surveillance system. In Namibia an integrated programme of inspection and patrols at sea and on land, fisheries observers as well as a Vessel Monitoring system is in place to ensure compliance to legislation.

The role of the fisheries observer programme in Namibian fisheries monitoring system is to report on compliance issues while fishing vessels are at sea and also to collect scientific and biological data. Information collected in the sampling programme includes length frequency data for key species, sex determination and sexual maturity data, otolith collection as well as catch composition data including data on by-catch and discard[4]. Observers also verify logbook entries onboard vessels by counter signing. The existence of the observer programme further ensure that the country meets is obligations in terms of International agreements and conventions, like ICCAT, CCMLR and South East Atlantic Fisheries Organization, to which Namibia is signatory to. The table on the right highlights the number of data sets collected by fisheries observers from 2007 to June 2009.

Column1	Number of Stations Sampled	Number of Fishing Days
2007	9174	9888
2008	11756	13843
2009	6330	42960

Number of data sets collected by fisheries observers from 2007 to June 2009

Challenges faced by the Fisheries Observer Agency.

The dependency from the fishing industry as the only source of income to the Fisheries Observer Agency (FOA) is a major challenge as this accounts to about 98 % of the total income. The Ministry of Fisheries and Marine Resources contribute about 2 % of the annual budget. Whereas the levy charged to the industry is based on the number of observer days spend at sea salaries are paid irrespective whether an observer goes to sea or not. This is having a major impact on the sustainability of the Fisheries Observer Agency as the existence of the institution is dependent on the performance of the fishing industry in Namibia.

Whereas the Ministry of Fisheries and Marine Resources are responsible for the basic training of observers and borne the cost associated with it the FOA is responsible for all costs associated with salaries and benefits of Observers for the duration of all training. Thus the FOA has little control over the observer training programme. The negligible training budget allocation also hampers succession planning and career path development.

Other challenges relates to the urgent need for equipment like GPS devices, digital cameras, binoculars as well as computer equipment and office infrastructure. In order to overcome these challenges the FOA identified possible alternative sources of income like deployment of observers on international waters. This could only be realized if skill levels of observers are further developed. A training department also needs to be established within the organization that would take over all training activities.

Notes:

1. Boyer, D. C and Hampton, I. 2001. An overview of the living marine resources of Namibia. South African Journal of Marine Science 23.
2. Namibia Trade Directory 2008.
3. MFMR, White Paper on Fisheries Policy, 1991.
4. MFMR, Grade 1 Observer Training Manual, 2003

The scientific observers programme as a tool for sustainable management of the marine trawl fishing in Cameroon

Dr Meke Soung Pierre Nolasque, Veterinary, Economist (MA)1
Head of the Brigade of Control and Surveillance of Fishing Activities
Ministry of Livestocks, Fisheries and Animal Industries

Cameroon with almost 17,476,497 inhabitants and a coastal length of 402 km, is the core of intense fishing activities. It is a multi-species fishing region, contributing to 1.7 percent to the GDP (2003). Since the 1970's there has been a constant change in the fishing effort strategy in the fishery where shrimp vessels are dominant, 30 on average against 16 trawlers, targeting the pink shrimp (*Penaeus notialis*) and very recently the tiger shrimp *Penaeus monodon*. The various stocks assessments surveys conducted since 1982 and from 2004, 2005, 2006, 2007, show an overexploitation of the coastal resources. Due to economic importance and high value of the target species, depressed catch rates and economic returns are being experienced, which necessitates the need for effective management.

Dr Meke Soung Pierre Nolasque
Ministry of Livestocks, Fisheries and Animal Industries,
Cameroon

Due to the business environment and the decrease of the resource base, most of the vessels in the area buy fishing licenses in two or three countries. Since the early 1990s, due to lack of national investors, the country implemented the so called Time-charter. Moreover, after the Cameroon self ban on exports of shrimp products to Europe Union countries, all the shrimps fished by those vessels are exported fraudulently to neighbour countries, contributing to heavy losses in terms of export taxes estimated at 2 billion cfa f/annum since 2002. The losses in value from lack of landing and declaration of catches was estimated at 15 billion cfa francs per annum for around 1117 million tons of shrimps and 4 billion cfa francs for fish 7500 m. tons (Meke, and Njifonjou, 2007). (Take 1US$=500 cfaF.).

The Ministry of Livestocks, Fisheries and Animal industries is responsible of the fishery policy through licensing. However, there have been an increasing number of vessels. No closed season has been decided yet. Economic objectives of the fisheries have never been considered. Law enforcement, one of the weaknesses of the management has gone through very important changes with the creation of Monitoring Control and Surveillance Brigade in the Department of Fisheries and Aquaculture. Since 2006, a vessel monitoring system (VMS), with satellite Argos, is operating and only vessels equipped with transponders/transceivers are allowed to fish. A plan against illegal and unreported fishing (IUU) has been validated. Within the framework of the GEF/UNEP/ 201/project, Cameroon conducted some sea trials on the use of the BRDs and TEDs in the trawl fishery and experienced two years scientific observations on some shrimpers. This contributed in building a knowledge base on by-catches and discards from shrimp trawlers.

This paper, examines how effective can be a scientific observer programme in fishing effort data collection, as well as other biological and socio-economic data for a sustainable management of fish resources. In management strategies, the government should make a choice between heavy investment on VMS associated with patrol boats or set up a thorough efficient scientific observer programme or a combination of both.

Notes:

1. The author submitted a lengthy paper which is reproduced as an appendix to these proceedings.

Monitoring inshore fisheries using observers

Craig J Loveridge
Ministry of Fisheries, Wellington, New Zealand

Introduction

In October 2008, our Minster of Fisheries decided to prohibit set netting and trawling in various inshore areas. These measures were intended to avoid, remedy and mitigate the effect of fishing related mortality on Hector's and Maui's dolphin populations. These iconic dolphins are endangered and protected by New Zealand law.
The new measures were predicted to have a large impact on the inshore fishing industry. The Minister's decision acknowledged that there was uncertainty related to actual dolphin distribution and the level of negative fishing interactions. Increased monitoring of the inshore fishery was needed to determine if the new measures were effective. Increased monitoring would also be used to assess levels of remaining risk in areas where dolphins and fishing still overlapped.

Methods

The best way of satisfying the increased monitoring objectives deemed to be placement of observers aboard inshore vessels. Inshore observing had been attempted in the past, but achieved coverage had been very low (~0.5%) and relatively expensive. This would not have resulted in enough coverage to be able to ascertain the effectiveness of the closed areas, so a new model needed to be developed.

University students provided a ready source of labour during summer. This correlated well with the most intensive fishing period. Groups of newly trained observers were based in ports where active vessels where known to operate from. Each pre-identified vessel was issued with a placement notice so that they were obliged to carry an observer for the programme period. Each observer was specifically trained to record marine mammal and fishing interactions on small hand held GPs units. Initially 45 observers were trained and the programme aimed for 900 sea days of coverage over the summer period.

A high level of coverage was needed for various reasons including:

- Reduction of chance of, and bias, due to altered fisher behaviour
- Detection of fishing interactions and captures
- Assessment of the effectiveness of management decisions
- Determining the remaining overlap between dolphins and fishing operations

Results/Discussion

Increased observer coverage in inshore fisheries using traditional methods would have been prohibitively expensive and impractical. Using the new model 963 sea days were delivered against a plan of 900. 30% of the inshore fishery was observed and the coverage was achieved at a 25% reduced cost. This was the greatest amount of coverage achieved to date in the inshore fishery.

Overall there was a high level of "buy in" and co-operation from fishing industry. However, the coverage requirement on top of area closures meant that some previously active fishers tied up their vessels during summer. A minority of fishers refused to comply with the placement notices and continued to fish without carrying an observer. Fortunately, other fishers who had not been initially approached offered to carry observers.

The programme recorded 115 protected species captures (mainly seabirds). Encouragingly, there were no captures of either Hector's or Maui's dolphins.

The programme showed that Hector's and Maui's dolphins are found outside the closed areas and that there is still interaction with fishing operations. A full analysis of the data is required to determine the effectiveness of the management decisions and the level of risk remaining to the dolphin populations. This observer coverage is set to continue, and the requirement to carry observers will be shared across the inshore fleet.

The case for maximized retention in fisheries: Implications for monitoring

Jacob P. Kritzer*[1], Alan Lovewell[2,3], Christopher Brown[4], and Emilie Litsinger[1]
Environmental Defense Fund, Boston, Massachusetts, U.S.A.[1],
New England Fishery Management Council, Newburyport, Massachusetts, U.S.A.[2],
Monterey Institute for International Studies, Monterey, California, U.S.A.[3],
Rhode Island Commercial Fishermen's Association, Point Judith, Rhode Island, U.S.A.[4]

Introduction

Maximized retention is a fisheries management policy that aims to minimize wasteful discards by either encouraging or requiring that all or most fish caught are retained and brought to port. There are ethical, economic and ecological reasons for adopting a maximized retention policy, as well as potential drawbacks in certain cases (e.g., when discarded fish would have survived and reproduced). However, in most cases maximized retention is likely to provide the greatest net benefit, and is therefore receiving increasing interest across the globe. Enforcing maximized retention calls for effective monitoring, but monitoring limitations can in turn determine which policy options are feasible. We examine the implications of maximized retention for monitoring.

Methods

We briefly review several case studies to highlight approaches, benefits and challenges faced with a maximized retention policy, and then discuss general lessons from these examples.

Results and Discussion

Norwegian Discard Ban

In 1987, Norway implemented a ban on discards for 19 species of pelagic and demersal fishes and invertebrates. Monitoring is based on a combination of at-sea surveillance by the Coast Guard and dockside monitoring by the Directorate of Fisheries. Although this approach cannot detect all violations in the absence of observers on vessels, the Ministry adopted the ban as a matter of principle even in the face of incomplete effectiveness[1].

Scottish Discard Reduction Strategy

Norway has called for other European nations to take equally aggressive action in reducing or eliminating discards, and Scotland has arguably been the nation that has done most to answer the call. Scottish fisheries policy calls for reduction and eventual elimination of discards. However, inability to effectively monitor a ban has resulted in this being a goal rather than a requirement to date. Instead, Scotland aims to achieve maximized retention through a combination of spatial and gear controls resulting in more selective fishing[2].

British Columbia Groundfish

British Columbia's groundfish fishery operates under a catch shares system involving allocation of tradable individual vessel quotas. Full or maximized retention is not required for all stocks. However, 100% monitoring by either at-sea observers or video systems, depending on gear, allows full accounting of catch and deduction of discards from quotas using assumed discard mortality rates. This incentive-based approach has resulted in a significant decrease in discards[3].

Pacific Whiting Shoreside Fishery

Shoreside whiting, one component of the larger U.S. Pacific groundfish fishery, faces problems with salmon bycatch. Rather than requiring discarding of salmon at sea, Amendment 10 to the groundfish FMP calls for maximized retention to account for salmon bycatch mortality in port. Since 2007, vessels in the fishery have been required to employ electronic monitoring systems, which will now be used to enforce maximized retention for vessels allowed to land salmon under an exempted fishing permit[4]. Receivers of the product in port will require third-party catch monitors. This system sets the stage for implementation of a forthcoming ITQ system.

Southern New England Winter Flounder

This stock is severely depleted, and in fact cannot meet rebuilding timelines even with F=0. Some harvest is inevitable due to interactions with other stocks, so catch limits based on estimates of unavoidable bycatch have been adopted. An industry proposal under consideration calls for creation of a study fleet that would be allowed to retain all flounder caught in the large mesh fishery in exchange for receiving higher levels of observer coverage, collecting biological information on all fish caught, and providing biological samples as requested by NMFS.

New England Community Supported Fisheries
One non-regulatory approach to achieving maximized retention is creation of community supported fisheries (CSFs)[5]**,** which currently operate in Port Clyde, Maine and Gloucester, Massachusetts. CSF shareholders share risk with fishermen, accepting whatever is caught each week, including high-value species and most others. This can potentially be achieved without monitoring, relying instead on fishermen's own motivations for economic efficiency and ecological sustainability to reduce overall catch, fuel consumption and fishing effort.

Summary
A common theme is the importance of effective monitoring in achieving maximized retention policy and of monitoring limitations in determining which policies are possible. One benefit of a maximized retention policy is that it simplifies the monitoring goal to ensuring that regulated fish return to port, enabling greater use of cheaper and safer video tools and dockside biological sampling. However, some at-sea observers will still be needed to collect biological information at high spatial and temporal resolution. Therefore, it is critical to clearly outline management and scientific goals in order to determine the most efficient and effective monitoring system.

Notes:

1. Norway Ministry of Fisheries & Coastal Affairs. 2009. Norwegian fisheries management, our approach on discard of fish. Fact sheet available at http://www.regjeringen.no/upload/FKD/Brosjyrer%20og%20veiledninger/fact_sheet_discard.pdf
2. Government of Scotland. 2009. Sustainable Scottish fisheries and MSC certification. Policy paper available at http://www.scotland.gov.uk/Publications/2009/05/13115802/2
3. Branch, T.A., K. Rutherford and R. Hilborn. Replacing trip limits with individual transferable quotas: implications for discarding. Marine Policy 30: 281-292.
4. National Marine Fisheries Service. 2007. Issuance of an exempted fishing permit for a maximized retention and monitoring program for the Pacific whiting shoreside fishery. Environmental assessment.
5. Campbell, D. 2008. Community supported fishery project: charting a new course. Rural Cooperatives 75: 4-41.

The integration of commercial groundfish fisheries in British Columbia

Barry Ackerman
Department of Fisheries and Oceans
Canada

The groundfish fishery in British Columbia (BC) is comprised of seven fleets: trawl, halibut, sablefish, outside rockfish, inside rockfish, dogfish and lingcod. Collectively the fleet comprises approximately 1,250 licences with 27 active vessels that engage in about 14,600 days at sea annually. The landed value, defined as the price paid to the commercial harvester, of the groundfish fisheries in 2007 was $133.5M. The groundfish fisheries are complex to say the least. The fleets collectively catch approximately 140 species with 61 of which are managed by a separate total allowable catch (TAC) delineated by species and area. Prior to 2006, the seven primary groundfish fisheries were licensed and managed separately. The fleets employ different gear and fishing methods to target individual groundfish species or groups of groundfish species. Unfortunately, none of the fleets were capable of restricting their harvest to target species, and the resulting harvest of non-directed catch raised significant conservation concerns. In 2006, based on an industry proposal, Fisheries and Oceans Canada approved a pilot program that attempted to integrate the management of the commercial groundfish fisheries. The new arrangements include an inter-fleet reallocation system, full accountability of catch (retained and released) by individual harvesters, wider application of quota management and a comprehensive catch monitoring program. The two key elements of the monitoring program are the use of 100% at-sea monitoring (either by at-sea observer or by electronic monitoring) and 100% dockside monitoring. Harvesters are required to hail in and hail out for each fishing trip and must fill in an integrated groundfish logbook.

The logbook requires the harvester to record by set the number of pieces of all fish retained and released. A 10% sample of the fishing events is randomly selected for image interpretation. Viewers identify the following: retrieval event, all catch by species including whether they were retained or released and size (legal or sublegal). The results of the image interpretation are compared with the catch recorded in the logbook and the level of agreement is examined. The random selection serves as an estimate of the total removals as well as an audit of the logbook data quality. In addition, a comparison between the offloaded catch by piece to the retained catch that is recorded in the logbook is also examined. Failure of a harvester to meet the standards established results in 100% viewing of the electronic monitoring data collected for that trip. The implementation of the integration program has resulted in improved catch data and reduced wastage of fish. During the three years of the pilot program, no TACs have been exceeded and in fact, there have been many TACs that have been under harvested. In addition, individually accountability of all catch has increased the incentive of harvesters to fish in a sustainable manner.

Furthermore, the pilot program has established new institutional arrangements whereby representatives from each of the fleets co-operatively manage the commercial fishery with the Department. Industry commitment and participation in this process was a vital component of the success of the program.

A shore-based monitoring program in Alaska: Catch monitoring and control plans

Jennifer Watson* and Alan Kinsolving
Sustainable Fisheries, Alaska Regional Office, NOAA Fisheries Service

Introduction

Limited access privilege programs increase the burden on fishery managers to provide highly defensible estimates of catch, especially when those estimates directly impact quota holders. NOAA Fisheries in the Alaska Region has dealt with these issues by clearly articulating goals for the management of quota-based fisheries and imposing new and more stringent monitoring as these programs have been developed. The catch weighing and monitoring system developed by NMFS for catcher/ processors and motherships is based on the vessel meeting a series of design criteria. Because inshore processors vary more in size, facilities and layout than at sea processing vessels, NOAA Fisheries in the Alaska Region developed a performance based catch monitoring system more appropriate for inshore processors. Under this system, each plant submits a Catch Monitoring and Control Plan (CMCP) to NMFS for approval. The plant is inspected by NMFS annually to ensure that the plant layout conforms to the elements of the plan. The goal of a CMCP is to ensure 1) all delivered catch can be effectively monitored by an observer; 2) that the observer can effectively conduct their sampling duties; and 3) that all catch is accurately sorted and weighed by species. CMCPs have been implemented as part of the American Fisheries Act pollock fishery, the Crab Rationalization crab fisheries, and the Central Gulf of Alaska Rockfish Pilot Program.

Element of CMCPs: the Performance Standards

Performance standards detailed by each inshore processor include:

1. Describes how all delivered catch is sorted and weighed by species. Details the space for sorting catch, the number of staff devoted to sorting and the rate that catch will flow through the sorting area.
2. Designates an ‘‘observation area.’’ The observation area is the location where an individual may monitor the entire flow of fish during a delivery and ensure that no removals of catch have occurred between the delivery point and a location where all sorting has taken place and each species has been weighed.
3. Designates a ‘‘delivery point.’’ The delivery point is the first location where fish removed from a catcher vessel can be sorted or diverted to more than one location. .
4. Provides an observer work station that includes: a platform scale; an indoor working area, a table, and a secure and lockable cabinet.
5. Designation of a plant liaison, responsible for orienting new observers to the plant, ensuring that the CMCP is implemented, and assisting in the resolution of concerns.
6. Identify State of Alaska approved scales used to weigh catch and ensure these scales produce a printed record of each delivery.

Benefits of CMCPs

The performance standards created for CMCPs have many advantages over design criteria regulations. The goals of ensuring all quota catch are sorted and weighed while allowing an observer to view the process may be met in many ways. Limiting processors to meeting the requirements with one method specified in regulations would not be cost effective and could create unnecessary inefficiencies in processing. Each shoreside processor is tasked with identifying how they will meet these goals given the complexity, size, and type of their facility.

Because the performance standards set forth objectives and the processors are asked to design and describe the methods to meet those objectives, CMCPs allow the shore based facilities to innovate as new technologies develop. As a consequence, the process of developing CMCPs is complex. NOAA Fisheries and the plant management work closely together in an iterative process to make modifications to the plant. This approach fosters an open working relationship with NOAA fisheries and the fishing industry to solve challenges as they arise after a CMCP is approved and operating.

Disadvantages of CMCPs

CMCPs are tools to be used by NOAA fisheries staff, enforcement observers or other agencies. As such, CMCPs are only effective if a human presence exists at the processor to ensure this monitoring tool is in effect.

CMCPs were designed to monitor wholesale diversions of quota catch and the focus of the performance standards is to minimize the amount of bycatch that makes it past the sorters. CMCPs were not designed to monitor small quantities of rare species bycatch.

Infractions against performance based standards may be more difficult to enforce and penalize than design criteria regulations because the exact violation may be more difficult to pinpoint in the regulations. Given the open working relationship created by the iterative process of approving and inspecting CMCPs, enforcement actions have been rare.

Future for CMCPs

The catch of most target quota species is readily determined using observer and landings data because these species must be retained, landed, and sold for the vessel owner to receive earnings from that catch. However, prohibited species bycatch may not be retained for profit and its catch often limits the catch of economically valuable target species. The greater the potential to limit the target species catch, the greater the incentive to not have prohibited species catch identified and estimated. This is particularly applicable to shoreside processors. The factory areas of processing plants are large and complex. Preventing observers from seeing the limiting bycatch would not be difficult. In order for hard caps to be effective, CMCPs must be modified for individual fish tracking at shoreside processing plants. These modifications might include reducing the complexity of the sorting operations, providing secure storage of the limiting species, and providing the opportunity for all interested parties to observe the counting of the limiting species.

Fully documented fishery – Using electronic monitoring to improve industry self-reported data

Jørgen Dalskov
National Institute for Aquatic Resources, Technical University of Denmark

Introduction

Although the fisheries policy of the European Union is partly formulated in terms of Total Allowable Catches (TAC) it is widely recognized that there is a major discrepancy between the actual outtake of fish stocks and TAC reported landings. This discrepancy is caused by discards, high grading, illegal landings and area misreporting partly due to increasingly complicated and non-transparent regulations. In order to minimize this discrepancy and achieve higher accuracy in the data which forms the basis for fisheries advice, the Danish Government has proposed a new reporting and quota paradigm based on actual catches rather than reported landings.

The foundation for this new paradigm is to give the individual vessel operators the responsibility to provide detailed reports of actual catches while verifying these with Electronic Monitoring (EM) in the form of cameras and logging of fishing operations (GPS, hydraulic sensors etc.). In order to ensure proper incentives for the operators, participation in EM programs is followed by increased quotas. Importantly, these increased fishing possibilities can be allotted without causing further strain on fish stocks due to the reduced discard and elimination of unreported outtake. Finally, an added benefit of the proposed paradigm is that by giving the industry a responsibility in terms of self-reporting they will experience a much tighter link between their operations and the stock assessment that forms the basis for quota allotment and other fisheries policies. Whether EM can be used in Danish fisheries is tested starting September 2008 and ending August 2009.

Methods

A call for commercial fishing skippers and crews that voluntarily would like to participate in an EM trial was launched in the Danish Fishermen's Association magazine. Eighteen vessel owners showed their interest. Six vessels were selected; four trawlers, one gill netter and one Danish seiner. In order to ensure proper incentives for the fishing skippers and crews participation in the EM trial they were given increased quotas by multiplying their vessel of cod quota with a factor adapted according to the ICES stock assessment on cod.

Electronic Monitoring using CCTV cameras and GPS and other sensors has proven it usefulness (McElderry[1])**.** In order from day one to have a setup that would work a contract with Archipelago Marine Research Ltd. and National Institute for Aquatic Resources, DTU Aqua was signed. Archipelago provided EM equipment together with technical and scientific assistance. DTU Aqua staff was trained in maintaining the EM equipment and the software to be used to analyze collected sensor and video data.
EM equipment was installed on the six vessels during the first and second week in September of 2008. The data collection will end ultimo July 2009 and the report to be finalized ultimo August 2009.

The skippers' obligation for reporting was: Recording of haul by haul information in the official and an additional extended logbook, recording of catches of cod above and below minimum landing size and length measurements of all or maximum of 50 specimens of undersized cod per haul. Throughout the project meetings between the participating skipper and crews and DTU Aqua are held regularly for mutual exchange of information.

Results/Discussion

Since the EM equipment has been installed until May 2009 the six vessels have in total been absent from port for 478 day and have conducted 1018 fishing operations. The EM equipment has been recording sensor data for more than 99% of the time at sea and the video data coverage from first fishing operation until arrival to port is almost census data.

In general there has been a high agreement between recorded data and the data derived from analyzing the sensor and video data. When comparing the size grade distributions of landings of cod made by the trial vessels and all other Danish vessels fishing in the same area. Figure 1 is showing all vessels and figure 2 the trial vessels proportion per size grade of cod. It can be seen that trial vessels are landing significantly more size grade 4 and 5 than all other vessels. This is a clear indication that high grading takes place. A shift can be seen from January 2009 probably due to an increase of quota by 30%. This quota setting may be more in line with the available resources of cod.

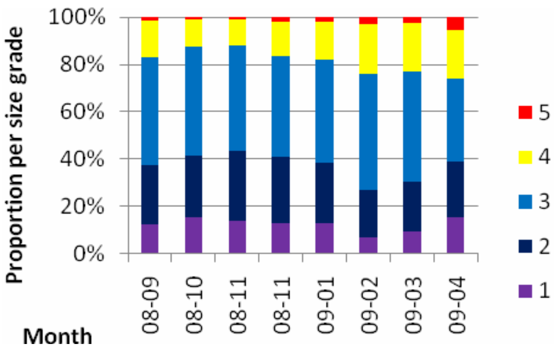


Figure 1. All other vessels

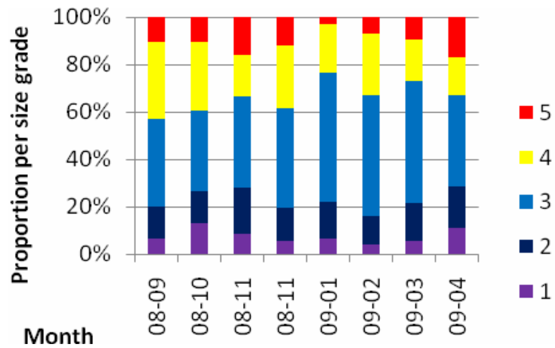


Figure 2. Trial vessels

The skippers have been focusing more on the avoiding undersized cod than usual and carrying out more sustainable fishing as all catches of cod had to be deducted from their vessel quota. Furthermore, the skippers and crews have has changed views from being positive in using EM to towards colleagues promoting fully documented fishery as future setup for the Danish fishing industry, full documentation for the consumer, increased transparency of total catches and thereby an overall reduction in misreporting, illegal landings and reduction of discards.

Jørgen Dalskov
National Institute for Aquatic Resources
Technical University of Denmark, Denmark

Notes:

1. McElderry, H. 2008. At-Sea Observing Using Video-Based Electronic Monitoring. Report prepared for the Electronic Monitoring Workshop held by The North Pacific Fishery Management Council, The National Marine Fisheries Service and The North Pacific Research Board, July 2008.

Monitoring transhipments of tuna using observers

Robert Trumble[1] Graeme Parkes[2]
MRAG Americas[1], MRAG Ltd[2]

The International Commission for the Conservation of Atlantic Tunas (ICCAT) expressed grave concern about the existence of organised tuna laundering operations that were handling a significant volume of catch by illegal, unreported and unregistered (IUU) fishing and transhipping under the names of legitimate, licensed fishing and carrier vessels. A suite of recommendations consistent with FAO measures to combat IUU were introduced between 2002 and 2006 including Recommendation 06-11 establishing a set of control measures which included monitoring transhipments from large scale tuna longline vessels (LSTLVs) to carrier vessels by trained observers. The subsequent ICCAT Regional Observer Programme (ROP) was implemented in May 2007 by a consortium comprising of MRAG and Capricorn Fisheries Monitoring (CapFish).

Observer candidates are recruited on the basis of their experience of fisheries control and monitoring and only those approved by ICCAT are required to complete a training programme endorsed by ICCAT. Observers are deployed onboard carrier vessels following an official request and notification process. During each deployment their responsibilities are to monitor each transhipment, verify the LSTLV identity, the location, amounts and species transhipped. Outputs of each deployment are reported to the ICCAT Secretariat. Other measures in place include a Memorandum of Understanding (MoU) between the consortium and carrier vessel operators, which supports the aims of the ROP as laid out in the Recommendation. Since May 2007 there have been 58 deployment requests.

Other RFMOs have implemented similar observer programmes, which are based on the ICCAT model. These are the Inter-American Tropical Tuna Commission (IATTC), the Indian Ocean Tuna Commission (IOTC) and the Commission for the Conservation of Southern Bluefin Tuna (CCSBT). IOTC and IATTC have had operational ROPs since the beginning of 2009, with IOTC having 52 deployment requests and IATTC having 15. CCSBT utilises the other ROPs to obtain data relating to southern bluefin tuna. ICCAT and IOTC ROPs are also managed by the consortium of MRAG Ltd. and CapFish, whilst the IATTC ROP is managed by MRAG Americas.

Carrier vessels often cross RFMO boundaries to conduct transhipments in adjoining RFMO Convention Areas. As such, in June 2009 ICCAT and IOTC signed an MoU which stated that *'for continuity purposes and to minimize costs, the same Observer actively deployed on a particular carrier vessel in one area may stay on the vessel and automatically maintain monitoring of the carrier vessel in the new area.'* The co-ordination between MRAG Ltd., CapFish and MRAG Americas has enabled such an agreement to be feasible. The level of cooperation and systems developed by the observer providers has maintained a high standard of observer performance whilst allowing successful adaptation to the different requirements of individual RFMOs.

This capacity for a standardised approach with sufficient flexibility to reflect specific demands of each RFMO provides a practical foundation upon which to develop transhipment observer programmes further[1].

Notes:

1. Submitted by the MRAG and Capfish Private Consortium.

Question and Answer

The question and answer session below captures the dynamic dialog between panellists and the audience. Each discussion is separated by a double line break

Comment/Question
Amy Van Atten
NOAA Fisheries Service
USA

My question relates to the dockside monitoring work. There were several programs there, from Namibia to the Alaskan program, with basically 100% dockside monitoring required, with some pre-landing notification. I was wondering what the time frame is for a pre-landing notification, and how that is handled if that time-frame cannot be met? Is there a waiver system?

Response
Jennifer Watson
NOAA Fisheries Service
USA

In our system we have observers stationed at the processing facilities, so the observers are informed of the radio schedule and they're onsite and the observers are informed, I believe, an hour before the offload occurs.

Response
Barry Ackerman
Department of Fisheries and Oceans
Canada

In Canada it's a requirement for fishers to hail in at least 24 hours before they come in, but realistically what does occur from time to time is that they'll give as much as four, five, six hours notice. We, as in Alaska, have observers that are situated in the landing locations and the landing locations are restricted, so if a vessel or the observers are available they'll be there to meet the boat. If not, they may have to wait 24 hours for the observer to get there and they can't start their offloads until the observer is present to observe the offload.

Comment/Question
Amy Van Atten
NOAA Fisheries Service
USA

I was just particularly interested in Namibia as well, because they were restricted to landing in two ports, but they had to provide some advance notification to the ministry if they wanted to offload in a different port.

Response
Elwin Kruger
Fisheries Observer Agency
Namibia

Namibia is basically the same as in Canada. They have to give notice 24 hours in advance, but I think sometimes even up to four or five hours is also acceptable. And they cannot also start offloading before an inspector is on the site.

Comment/Question
Alpha A. Bangura
Ministry of Fisheries and Marine Resources
Sierra Leone

It's a follow-up to the question to the Namibian presenter. You've mentioned that fish are landed in only two areas. In African Fisheries, artesanal fisheries play a large role. Is it that both industrial and artesanal fisheries can land fish at only two places?

Response
Elwin Kruger
Fisheries Observer Agency
Namibia

Thank you for the question. Basically in Namibia there are no artesanal fisheries in places – only commercial fisheries.

Comment/Question
Paul MacGregor
At-Sea Processors Association
USA

We conduct the Pollock Cooperative Fishing Operations in the Bering Sea, and this is for Mr. Ackerman. I'd be very interested in knowing if you've had occasion to compare the by-catch profiles of vessels that operate under electronic monitoring on the one hand versus vessels having an observer on board, same vessel type, same fishery?

Response
Barry Ackerman
Fisheries and Oceans
Canada

For our trawl fishery it's 100% observer coverage, so it's a mute point. For our hook and line fisheries there have been some studies that have been incorporated. What it initially led us to was the realization that we needed 100% at-sea monitoring on that fishery itself. In terms of the details about the difference between EM and the at-sea coverage, I would defer that to my friends at Archipelago at this stage of the game. They probably have more pertinent information right off the tops of their heads.

Comment/Question
Paul MacGregor
At-Sea Processors Association
USA

Well as a follow-up then, have you ever had occasion to try electronic monitoring on a trawl vessel?

Response
Barry Ackerman
Fisheries and Oceans
Canada

Not at the same time as an observer. No, we have not gotten to that stage yet.

Comment/Question
Greg Croft
East Coast Observer Program
Canada

With 100% dockside monitoring and 100% at-sea, either observer or electronic might be ideal. What does it cost?

Response
Barry Ackerman
Department of Fisheries and Oceans
Canada

It's not cheap, by any stretch of the imagination. The at-sea observer cost is over $500.00 a day. The dockside, or the EM monitoring is probably about half that cost, so there's a significant savings going into the EM program. The buy-in for the at-sea program for the trawl fishery in particular is that the industry itself is very clear and has stated that without the at-sea program they couldn't defend their fishery. They are fully supportive of that. Also, our programs are cost-recovered from the industry to the extent that about two-thirds are paid by the fisherman themselves and one third is paid by the government at this stage.

Response
Bob Trumble
MRAG Americas
USA

I've had a chance to talk to a couple of folks about the BC system, and they told me that in the absence of this integrated program, some of the fisheries probably wouldn't be occurring because in the prior open-access fishery, faced with this cost recovery program, there were too many fisherman – and nobody was making enough money to pay for it.

So with the cost recovery they basically would have gotten put out of business. So by consolidating and generating some profits to pay for the cost recovery, they ended up with a viable fishery even though they're paying for these additional costs where they might otherwise not have had a viable fishery at all.

Comment
Steve Kennelly
NSW Department of Primary Industries
Australia

Actually an additional point was made in that fishery, where the results from the electronic monitoring gave industry enough information to be able to improve their TACs eventually.

Comment/Question
Vicki Cornish
Ocean Conservancy
USA

My question is for Craig regarding the New Zealand fishery, where you were monitoring Hector's dolphins in Maui's dolphin by-catch. You know we're always looking for ways to run these observer programs more efficiently and cost is a huge factor. And I was just intrigued by the cost savings that you were able to achieve through the change from your traditional observer method to the new method. But I really didn't get a sense of what caused those cost reductions. Was it the logistics of how you placed observers, the advance notice that was required to fishermen? Could you just elaborate on that? That's a pretty significant change in coverage, from 0.5% to 30%, with – what did you say? – a 20% reduction in cost. It's just very intriguing how you did that.

Response
Craig Loveridge
Ministry of Fisheries
New Zealand

I was talking to my manager of the program and he was saying the main cost savings were in logistical features. When you send a single observer to a port you have to provide them with accommodation, possibly a car, so they can meet vessels and go from place to place to meet vessels, and there are also issues with transport around. When you've sent a group of observers to a single port you can consolidate a lot of these costs, so you only need one source of transport. As mentioned, we had an observer in port, a senior observer who was there specifically to cater for any needs that they had so that they could pick them up if they needed and transfer them to other places.

The other issue was that there was no changeover. In the traditional model, because an observer would be bouncing from vessel to vessel they may come in with a vessel on a Tuesday and want to go to the next vessel, but if that vessel left on a Monday, they've got to wait around for a couple of days in port until they can catch up with the vessel again. When you've got observers assigned to specific vessels, whenever the vessel went fishing, the observers went with it. So there was a lot less down-time and there was a lot less time where observers were onshore waiting for trips to go. And, also, we did have a period of reasonable weather as well, so there were periods in which we got consistent coverage for long periods of time.

Comment/Question
Michele Kuruc
Food and Agricultural Organization
Italy

I want to first just compliment the panel, the whole series of presentations was extremely interesting.

What I'd like to contribute really is a point of information that was prompted by Bob Trumble's presentation on trans-shipment. I just wanted to have the audience know that the FAO is also working on a new tool to combat IUU fishing, and Bob mentioned that the tuna RFMOs are working on a global registry of vessels.

One of the things that the FAO is working on is a comprehensive global record of fishing vessels, refrigerated transport vessels and supply vessels in an attempt to bring together in a single place in a single database, basically a one-stop shop of information that includes basic vessel identification information as well as lots of other information about vessel movements, detention records, all sorts of valuable information that observers in particular might find very interesting to consult prior to embarking on a vessel.

It's a long-term project, as you can imagine, since it's on a global scale, and the countries of the world also need to certainly approve it, but it is well underway. Thank you.

Comment/Question
Ebol Rojas
Association for Professional Observers
Mexico

Bob, Tuna trans-shipment observer programs are an excellent example on how standardization works - standardizing the data forms, trans-shipment declaration, and other relevant documents. There is an opportunity for an international fisheries observer certification across all the tuna RFMOs – I mean that, since the deployment is working across the operational organizations like ICCAT, IOTC, IATDC, western Southern Pacific Fisheries Management Area, is there opportunity for unification of the certification, so one observer will be able to deploy in any area of the RFMO?

Response
Bob Trumble
MRAG Americas
USA

We're not certifying the observers as such but we are training them all to the same standards and using the same protocols for observing. So in essence it's pretty comparable to having a certification across programs – just one of the advantages of having a consortium using the same procedures. But certainly there are some reasons for looking at a program that would certify observers so that observers could more easily go from program to program. We're looking at a single program here that just happens to cover a bunch of regions, but if observers wanted to move to other kinds of programs, certification might make that easier. Could be difficult to get everybody to agree, however, on exactly what should go into it.

Comment/Question
Kim Dietrich
Consultant
USA

My question is mostly to Barry. I know in the sea bird world there's been a lot of talk about – and also this is kind of instigated from the data extrapolation workshop yesterday – a lot of talk about the percentage of the EM data that's verified for some of the rare event species. I think the general thought is that 10% is not enough. Are you folks addressing any questions of rare event species that you might have? I'm sure there are some fish that fall into that category as well.

Response
Barry Ackerman
Fisheries and Oceans
Canada

That is one area where there are some shortfalls within the program. What we are continuing to do is to work with the industry to see if we can address some of those concerns. With regards to seabirds in particular, it's mandated by license that they have torey lines and all the stuff that goes along with that as part of their license conditions. Those are strictly enforced. But you are right, that is one of the areas that needs to be addressed and we will and are continuing to work with our industry people to see if we can come up with some mechanisms that make it worthwhile for them – as regards cost and accurate information.

Response
Bob Trumble
MRAG Americas
USA

I think that you have a real super-advantage here. At least you have the data. So if you wanted to go back and do a special program, say see how much data would you need to evaluate to find these rare events 50% of the time and you could double it. At least you could go back and look at a lot of data as a pilot program, come up with those kinds of statistics or procedures, and then you could simply implement it. But it's just difficult to come up with the research to specifically lay that out and do it.

Comment/Question
Sidi Ndaw
Office of Maritime Fish
Senegal

You said you expect to launch an observer program in Cameroon next year. What kind of program do you want, do you expect? Just how many observers? I ask because this year you attended a workshop in Senegal about an observer program. Do you think it will help you for your program? Thank you.

Response
Pierre Meke
Ministry of Livestock, Fisheries and Animal Industries
Cameroon

The kind of observer program that we want to launch in Cameroon is a full-coverage program, and I show you the figures here: we are losing almost 30 billion CFA per year because of IUU fishing. And I show you also what we are going to lose in terms of launching an observer program is just one-tenth of that value. So if we invest the money to launch a full coverage observer program, I think we will have a lot of benefits on that program. So Senegal, of course, it was good training. I continue to say thanks to NOAA to enable me to participate in that training, and we also have a workshop scheduled this year in Cameroon with NOAA. We expect that out of that training we'll be able to harmonize procedures on data collection, because it's not good if Cameroon has a special program and that data cannot be exchanged or be useful to another country. So I think that from our programs in Africa and even all around the world, if you harmonize data and procedures and analysis, then there will be benefit to everybody. Thank you.

Comment/Question
Howard McElderry
Archipelago Marine Research Ltd.
Canada

I also want to compliment the speakers on excellent presentations. A few things to throw into the pot here – Jake, I wanted to just add one more benefit to your case for maximized retention fisheries. I think operating in that kind of context creates a real motivation on the part of industry to be looking for more selective fishing because there is a cost associated with carrying fish that they're not interested in.

The point I really wanted to address was kind of a connection between Jennifer and Barry where I heard two different kinds of examples where there's more of an impetus put on the part of industry to try to solve the problems through catch monitoring, the agency putting standards forward and industry coming back with some ideas around how to achieve that. And I think that the leadership that we've seen with the industry in BC shows how well that model can really work. I'm just wondering if you guys see the same sort of parallel that I noticed there. But I think there's a word of caution about the level of over-proscriptiveness that the agencies need to sort of stay away from and allow that leadership. And I think it kind of comes towards the type of bottoms-up approach that Jørgen talks about with the Danish fishery. Thank you.

Response
Jennifer Watson
NOAA Fisheries Service
USA

I agree. No, I think some of the advantages are working with industry and allowing that – giving them a goal of what we need and then them being able to come forward and tell us how they would possibly achieve that goal, give us some buy-in to the program, and then they will be a lot more likely to comply with something they develop themselves.

Response
Jørgen Dalskov
National Institute for Aquatic Resources
Denmark

We have in Europe seen, at least in the European Union 2000 provisions, that that particular fisheries regulation hasn't worked. I think we have used a stick for 25 years or 27 years and it didn't work. Now to our mind we think that we should go a new approach, where the fisherman has to show exactly what they are doing, but again they can have a carrot instead of the stick. So to my mind it's extremely important that we cooperate very closely with industry, otherwise it doesn't work.

Comment/Question
Teresa Turk
NOAA Fisheries Service
USA

I'll just ask my first question to Barry: I noted in your presentation that for the long line vessels you only have electronic monitoring. And then that electronic monitoring is only sampled at the 10% level. Have you done a lot of studies that justify your reduction to 10%, and have you seen anything like a protected species, marine mammal interactions with the gear that have been missed by subsampling only 10% of the catch?

Response
Barry Ackerman
Fisheries and Oceans
Canada

No. I guess when we started out with the program, we were looking at 100% video monitoring, and the cost of that was phenomenal. And what we had to realize is that by putting the incentive back on the individual fishermen for being properly accounting for his fish in his log books at a 10% and a random basis that we can provide, what we feel is that we are getting defensible numbers in terms of what is being seen on the ground.

In terms of the interactions with marine mammals, I would defer this to Andrew Fedoruk, who's going to be talking about this a little bit later on in his discussion of the system itself. But just off the top of my head I would say there's very little interaction.

Comment/Question
Janell Majewski
NOAA Fisheries Service
USA

I'm from the West Coast, and my question is for Barry. You said that the observer data and the vessel logbook data and the fish ticket data are all combined. I'm wondering how long it takes you to get that back to the fleet so they can deal with their monitoring?

Response
Barry Ackerman
Fisheries and Oceans
Canada

For the trawl program, from the time of the landing and the observer leaves the vessel to the time that the vessel receives a report card, or what we call a quota status report, is 48 hours.

Comment/Question
Brian Belay
MRAG Americas
USA

Craig mentioned the change in the selection process for your vessels. Could you go into a little more detail and what your original selection process was, and then what you changed it to? Was it random, systematic? How did you select those vessels the second year around when you selected the vessels ahead of time that you assigned the observers to? Were there statistical changes that you had to account for that change in selection?

Response
Craig Loveridge
Ministry of Fisheries
New Zealand

The programs only happened once, last summer, so basically there were two methods of concern that were of particular interest. They were inshore trawl vessels and inshore seine net vessels. Our fisheries have very good records, so we know which vessels are using which methods. We also know a lot about our vessels in terms of their length, the maximum number of crew that they have on board, and the size of the engine in the vessel.

So we knew the areas we were interested in, that is, the areas that the Hector's and Maui's populations are found in. So we went through our database of commercial catch to work out which vessels had reported fishing in those areas using those methods. That gave us a list of – and I can't remember the actual numbers - but it probably gave us a list of 300 or 400 vessels. We then worked out which of those vessels were active during the summer, which was going to be the period we were interested in doing these observations, so that knocked the list down. And then we also used the Maritime Safety Authority to find out how much room they had on board to see whether they could comfortably carry observers, and that knocked it down a little bit more to a list of vessels that we felt could carry an observer over the summer and would be fishing in the areas where they may see Hector's and Maui's dolphins, and would be using either seine netting or trawling, which were the two methods we were interested in.

Then it was a process of sending letters. Every vessel that was on the initial list was sent a letter to inform them that these observations were going to be carried out this summer and that they may be issued with a placement notice, and then after that it was down to the hard work of the people in the observer centers, this is mainly Chris Ramp, who spent a lot of time on the phone contacting individual vessel owners and finding out a bit more about the vessels if we didn't know already that they were a vessel that could take an observer. And then by that time we'd got down to about 50 or 60 prime vessels and he basically selected 50 of those and told us where to send the emplacement notices.
But he did spend a lot of time calling them up individually to actually talk to them to see whether they could take an observer, but there were initial letters, so they were aware that placement notices were coming.

Comment/Question
Graeme Parkes
MRAG Ltd.
UK

I have a question to Elwin Kruger regarding the Namibian observer program. If I understood correctly, you mentioned that the observers countersigned the logbooks, and I was interested to understand better the capacity in which they're signing the logbooks, because this has been raised as an issue in some of the programs that we run. For example, what happens if the observer signs something that subsequently proves to be inaccurate or wrong or indeed a situation arises during an observation where the observer feels unable to sign, and so there's a potential impasse and difficult situation?

Response
Elwin Kruger
Fisheries Observer Agency
Namibia

Basically the observer will only sign the logbook if he agrees that the information is recorded accordingly, and if he does not agree he simply does not sign and he will then complete a violation report, which will be handed over to authorities to investigate.

Comment/Question
Mike Markovina
Moving Sushi Marine Resource Expedition
South Africa

A lot of the observations we made on our trip was transshipment of fish from industrial trawlers via artesanal vessels onto the shore at multiple landing spots, and that fish is always removed into international markets relatively quickly. In your professional opinions and experience, how do you think we can relate the sort of success stories of what you have done back to the developing world? Can we apply the monitoring observation program within artesanal fisheries, which play such a fundamental role in Africa?

The second point to that question is about the Cameroon observer program and how dependent would that be on the fees that you would collect from certain vessels?

Response
Pierre Meke
Ministry of Livestock, Fisheries and Animal Industries
Cameroon

Yes. To get the funds to run the observer program in Cameroon the law states that every fisherman is to contribute to fishery management and should be able to pay for an observer to embark to pay for a vessel embark on board. So we expect that all the fishermen will contribute and pay for the programs of the observers. The salaries are basically paid by the government and the fishers’ contributions add to the government money to help the observers to be more efficient in data collection.

Moderator
Steve Kennelly
NSW Department of Primary Industries
Australia

And the first part of the question about rolling out some of the work that's been done in other fisheries into artisanal fishery work. Did anyone want to talk to that?

Response
Jacob Kritzer
Environmental Defense Fund
USA

I have a slightly different case, but similar. A colleague of mine is doing a project in Belize with the fishermen and fishery managers there, and it's not a matter of factory vessels offloading onto artisanal vessels, it's really the artisanal vessels themselves who catch the fish and where they land them. They're supposed to go through cooperatives but more and more they are going straight to resorts and hotels, and a lot of information is lost and therefore it becomes very difficult to assess and manage the stocks. They haven't come up with an answer yet. One thing we're thinking about, though, is targeting the buyers, and trying to collect data through those who are buying things like lobster and conch. If that doesn't work, we may try targeting the next level of consumers and trying to use different marketing methods to apply market pressure to ensure that they go through the channels that get that data that's being lost.

Moderator
Steve Kennelly
NSW Department of Primary Industries
Australia

We tried to pull a session together at the previous conference two years ago on rolling out observer programs into artisanal fisheries, but we only got a few interested papers. But there are those few abstracts and some papers about examples of that sort of rollout that exists in certain parts of the world. I'm not sure if anyone here, possibly not on this panel, but I'm not sure if anyone in the audience is familiar with that sort of work? If so, you might be able to catch Mike later on and talk to him about it. But I do recall seeing some abstracts about that sort of work going on in quite challenging environments. And there have been successes in that.

Comment/Question
Lisa Borges
European Commission
Belgium

My question is for Jørgen. I would refrain myself from discussing the benefits of the stick and carrot policy on the European Commission Common fisheries policy. My question is actually related to the graph you showed. You said that you compared the data from EM to the observer's data and you have data from 2008 and 2009. Now in 2009 there was a prohibition of discarding legally-sized fish, and I was wondering if your observer program has noticed a change in the discarding behavior of the fishermen?

Response
Jørgen Dalskov
National Institute for Aquatic Resources
Denmark

Discarding fish above the minimum landing size has been banned in the Danish regulations for the last ten years, I think. So I know it's illegal to discard fish above the minimum landing size, but even though, when there's such a tight restriction, they do it anyway, and also do it when observers are on board but not in the same extent as no observers on board.

Comment/Question
Georg Hinteregger
NMFS Observer
USA

Those of you who know me know I'm particularly interested in service delivery model issues, and I was wondering if Barry could tell me how it works over there. British Columbia is really amazing – to see how the industry has taken the lead in getting all this accomplished, and I'm wondering about the technical details - like does the industry have the option to contract with other providers, other than Archipelago, for this service? Is this contemplated for the future and do you see issues if more than one provider is certified to provide these services?

Response
Barry Ackerman
Department of Fisheries and Oceans
Canada

First of all with regards to our provision of the at-sea program, we rely on a single service provider to provide that service to the department and to the industry. That is awarded out through a contract through a regular request for proposals, a bidding process (normally on a three- to five-year time period), but we do only have one service provider. We made that decision probably 20 years ago in going to that model, rather than the multiservice provider model. We felt there were more benefits to it, and the quality and control of the data and information coming in was far better under the single service provider.

For the dockside monitoring elements of the fishery, each fishery individually contracts out for that service. We are fortunate that we have one company that provides that service for all the ground fish fisheries and that's Archipelago, so we really have benefitted from the knowledge and the expertise that we've developed over the years in coming up with a program that works in a very cost-efficient manner for the industry itself. But for all intents and purposes it is a single-service provider by contract through tendering process.

Comment/Question
Jenna Christiansen
NOAA Fisheries Service
USA

Barry, you had mentioned that there were about 280 vessels working currently in your fisheries, and I was curious, how many did you have prior to these ITQs and the 100% dockside and at-sea monitoring programs?

Response
Barry Ackerman
Department of Fisheries and Oceans
Canada

Prior to our integration program there were approximately 2,000 vessels, and there has been consolidation. Our hook and line fisheries that weren't involved in ITQ processes had an unlimited number of licenses. So it was sort of the last open fishery that was available in Canada, in contrast with our licensing scheme in there. But there were about 2,000 active vessels before integration, and now we're down to about 270 to 300 vessels – somewhere in that range. So there has been significant rationalization of the fleets and concentration of the vessels, too, in a positive manner. While there has been some job losses, what we're finding is that the jobs remaining in the fishery are much better jobs and long-term jobs, rather than just a single week here or two weeks there. It's now full year-round employment.

Comment/Question
Jenna Christiansen
NOAA Fisheries Service
USA

With regard to your monitoring funding – has it always been two-thirds industry, one third government? Did it start off that way or did you have full government funding initially?

Response
Barry Ackerman
Fisheries and Oceans
Canada

No, we started off with the requirement for cost recovery. Much to the chagrin of the industry, and a very large letter writing campaign, and all kinds of stuff that went on, what we ended up doing is providing the offset to cover the administrative costs of the program. The cost of actually putting the observers on the boats or the cost of the actual deployment of the EM equipment on board the vessels is borne by the industry. It's the administrative costs of the program that the department picks up at this stage of the game, and hopefully that'll continue – at least that's the industry's intention anyway, but with government spending the way it is, who knows?

Comment/Question
Jennifer Lengares
A.I.S. Inc.
USA

My question is actually directed towards Jake regarding maximum retention. In a program like that, is there are allowances for fish that are caught that are alive and that can be released alive at sea, and if so is there a way to monitor those allowances to ensure that the fishermen are only throwing live fish overboard and if it's already caught dead that they have to bring it in - is there's any kind of program like that in place for that type of idea.

Response
Jacob Kritzer
Environmental Defense Fund
USA

That's a really good question. The slide I glossed over for fear of getting in trouble with my time limit went into that a bit, which is one of the things that motivated the change in my title from benefits to implications – exactly that sort of problem. If you require that everything that's caught is to be kept, you could actually be taking out of the water some animals that would have survived and reproduced. So I think it's something that needs to be looked at. I think it's going to be unique to each fishery, and therefore I don't think there's a simple and straightforward answer to the second part of your question, which is "can it be done and how can it be done?" I think that's really going to depend on what the gear is, how much time the animal has spent caught in the gear, whether it's a net or hook or a gill net and the biology of the beast. You know, certain species of fish, skates, for example, are often rumored, at least, to have fairly high post-release survivorship; a small pelagic that's been packed in a net for a few hours may not. So it's really going to be case-specific. Obviously, protected species are often going to go right over the side. It's those kinds of issues that have shifted the focus of us looking at these questions from full retention, as a kind of a very black-and-white approach, to maximized retention, to keeping things that are basically being removed from the population one way or the other, whether they're coming to shore or not. But it's a really good point, and we're just starting to look at this question. The more I look at it the more I realize how complex it is. It's not straightforward by a long shot.

Concluding Session Statement

Steve Kennelly
New South Wales Department of Primary Industries
Australia

I just want to wrap up a few things about what I think we got out of this session. A broad diversity of countries, observer programs, methods and issues were canvassed here in the last two hours, and I found it fascinating to hear about the fisheries and the sophistication of the observer programs and monitoring programs that are being implemented in Africa by those two gentlemen.

We heard about the very strong legislative basis of Namibia's fisheries management, and I didn't realize how sophisticated that work is, with 100% coverage in port monitoring (which is easy when you've only got two ports, but you know, you're still doing it), and VMS systems and so on. I didn't know Cameroon meant "shrimp", but also the strength and weaknesses of the observer program in Cameroon were very significant lessons for us all. It's very interesting to learn about the objective way they went about assessing various models and ways of doing observer work and surveillance work before going and launching into a big program, and it has put them in a very good position.

We also learned how one can implement a very good observer program in small-scale fisheries in New Zealand to look at issues to do with dolphin by-catch. We also heard about how a maximum retention management system can actually ease the burden on observers in certain circumstances, but we also heard about the many pros and cons of that model.

We heard a lot about how Canada brought in a program to account for all mortalities in a very multispecies, multi-method group of fisheries, which is quite a challenge. And we also heard about the CMCP in Alaska, and how it can work cooperatively on the factory floor and manage to make improvements in the way people operate in the fishery and also the observer data collected. And we also learned that most of the observers in that program were bachelors!!

We then heard about an excellent example of an empirical assessment of the value of electronic monitoring systems in Denmark which demonstrated the importance of using EMs as a tool by which industry can improve their position in arguing for increased TACs by being able to prove their data better.

And then we learned about a truly global and truly international attempt at bringing together an observer type program across the planet, which I think eventually that's going to be a precursor to a pretty massive system. So I want to thank our panellists and the audience for a very enjoyable and enlightening two hours.

Panel Session 2:

How can fishery monitoring information be standardized and how can data quality be improved?

Moderator: **Charles Gray, New South Whales Department of Primary Industries, Australia**

Speakers

Larry Beerkircher –USA
Standardized data collection formats: How important are they?

Bjorn Stockhausen – Italy
The data collection regulation of the European Commission.

Kyle Baker – USA
The development of national standards for protected species observers in the U.S.

Michelle Passerotti –USA
Challenges to data standardization between on-board and alternative platform observation of small vessels.

Bob Stanley –Australia
Introducing e- Monitoring into the mix of AFMAs monitoring options: Insights, benefits and costs.

Oscar Guzman –Chile
Computer science technology applied to data collection and data management.

Matthew Grinnell –Canada
Evaluating the reliability of at-sea observer release estimates in British Columbia groundfish trawl fisheries.

Introduction to the session

The types and uses of data collected from fishery monitoring and observer programs are exhaustive. Typically data collected range from the species compositions, lengths and quantities of retained and discarded catches, to biological and tissue samples as well as information concerning fishing gear and activity. As costs of data collection increase, there is significant pressure to collect more and more data in each program as well as develop systems that allow for greater data quality and efficiency.

It is important within any monitoring and observer program that data are collected in a systematic and standardized manner. There is much debate as to whether data collections and systems should be standardized across different fishery programs. This would allow far greater and efficient comparisons of data among programs, allowing for greater meta-analyses at scales greater than within each individual program. However, data standardization at such a scale comes at a cost. There have been significant advancements in fishery data collection systems in recent years, particularly those utilizing electronic capture and transcription of data. These systems can offer more efficient and safer means of collecting data as well as faster times to access and use the data for fishery management decisions. There is a continuing need for refining data systems across all types of fishery programs.

In this session we are provided with a critique of advancements and challenges concerning data quality and standardization. The benefits and costs of standardizing data collection across programs are debated. We are given overviews of the data collection requirements and standards in the fishery monitoring programs of the European Union and the USA protected species observer program as well as the challenges of standardizing data collection from alternate platforms in small-boat observer programs. We are also provided with demonstrations of the utility of electronic advancements in on-board data collection systems and the need for calibration and training in data collection protocols in fishery monitoring and observer programs.

Standardized data collection formats: How important are they

Lawrence R. Beerkircher
NOAA Fisheries Service, Pelagic Observer Program, USA

Introduction

It has become a common theme in the fisheries observer community that national and even international standardized formats (data forms, data units, coding systems, etc.) for observer programs are sorely needed. Proponents of standardization cite benefits such as increased utility to a larger number of data end users, decreased costs when training observers who have previously worked for another observer program, and increased mobility of observers between programs. While standardized formats certainly should be developed for use by start-up observer programs, the need to convert existing programs to standardized criteria is less of a settled argument.

Methods

I closely examined three supposed benefits and ideas behind standardization and deconstructed in detail the implications of implementing standardized schemes. I wanted to consider if the benefits were real, or if they were real, were they offset by negatives? The three suppositions were (1) standardization of codes and forms allows easy movement by observers from one program to another, which therefore decreases training costs and increases observer performance, (2) standardized data and coding systems facilitates easy use of the data by multiple end users, and (3) standardization is a priority for fisheries managers. In addition to these examinations, I also explored the idea of who the “customers” were for observer data, and if which of those customers would be best served by standardization.

Results/Discussion

The first supposition assumes that standardization will allow an observer, trained in one program, to easily move to another program, without requiring a full training, thus saving time and money. Unfortunately, since observer programs are as diverse as the fisheries they observe, it is unlikely that standardization would have large benefits, except for possibly certain “core” training elements such as safety. Training on the collection of gear characteristic data, species identification, and specialized sampling (e.g. the removal of otoliths, collection of biopsies) which takes the most time in US observer programs, would not overlap in most occasions. In order to realize the supposed cost benefit of standardization, programs would have to train observers on gear and species that the program never sees, thus extending the time taken during training and eating up the savings. Even the standardization of safety training will not result in the full potential of cost savings unless the training is implemented in a mandatory, top-down standard for use when observers transfer in. Finally, the preliminary results of the Observer Professionalism Working Group's Support and Opportunities committee focused interviews indicate that observers do not feel that the current lack of standardization is a significant impediment to movement between programs. In the case of the first supposition, it is unlikely that any real benefits exist.

The second supposition is that data standardization will lead to greater facility of use by a larger number of end users. This benefit is undeniable, but also seems inevitable to result in end users taking little or no time to review any supplied documentation or metadata. They would then at best lose the opportunity to learn about the fishery, and at worst employ flawed assumptions that reduce or eliminate the validity of their end analyses. Standardization will also require consensus by end users on the format of the data, something that seems difficult to achieve. Finally, end user proponents of standardization cite the time and effort required to convert data from program-output to individual user format. The time and funding required by end users to create conversion programs cannot be looked upon as a reason to move toward standardization, because even if program standardization is adopted these conversion programs will be needed anyway to convert existing legacy data to the new format.

The third supposition involves the idea that fisheries managers want standardization. As above, this concept is likely reality, but it is important to consider the desire for standardization relative to other needs. I estimate the cost to implement standardization in the US Pelagic Observer Program to be at least $173,550, which represents about 25% of the yearly cost to deploy observers on vessels in this program. At least in this fishery, managers express concern more often about low coverage levels in certain time and area strata than they do about the need for standardization. It seems unlikely that in the face of funding difficulties, managers would prefer standardization to increased coverage. Managers often communicate desires through memoranda, emails, conference calls, and workshops; but priorities are only communicated by funding. The relative lack of funding to promote standardization (at least in the U.S.) should be enough to illustrate how important the subject is to managers.

Lawrence Beerkircher
NOAA Fisheries Service, USA

Observer programs, and those who fund them, need to closely weigh the true costs of conversion to standardized formats versus the actual benefits before making decisions to implement these formats. Moreover, observer programs need to consider their primary objectives and "customers" (which are generally regional and specific in nature), whether or not they are meeting those objectives and pleasing those customers, and if changing to standardized formats would negatively impact their primary objectives and customers, before implementing standardization. In summary, the United Nations, a diverse organization devoted to world peace, finds it possible to exist by transacting business in various languages and even alphabets. Surely, if world peace does not require speaking the same language, counting fish must not?

The data collection regulation of the European Commission

*Björn Stockhausen[1], John Anderson[1], Jenny Nord[1], Doug Beare[1,2]
[1] European Commission, Joint Research Center, Maritime Affairs Unit
[2]IMARES, Wageningen

<u>Introduction</u>

The European Commission administrates the vast sea areas surrounding the Member States of the European Union. One of the instruments to manage the marine resources within the Common Fishery Policy (CFP) is the Data Collection Regulation (DCR), which recently underwent extensive revision to improve scientific advice and efficiency.

<u>Methods</u>

The Data Collection Regulation (DCR) of the European Commission (EC) was implemented in 2001. Its purpose was to collect biological and economic data relating to fisheries targeted by fishing fleets belonging to EU Member States (MS). Although it was a good first attempt to collect the relevant data necessary to improve EU fisheries management, it has been widely recognized for some time that issues exist in relation to the quality of the data and the differing data collection methodologies employed by the Member States. Thus, in 2005, the EC started a consultation process to develop a new, improved regulation that would better assist fisheries management decision making; the Data Collection Framework (DCF). In force since the beginning of 2009, the new framework includes several improvements.

Bjorn Stockhausen
European Commission, Italy

<u>Results</u>

The new DCF features, inter alia, data collection on the basis of métiers, data to allow for an assessment in terms of Ecosystem Based Fisheries Management (EBFM), the collection of economic and socio-economic parameters, a more coherent data handling from the vessel to policy makers and other end-users, and a possible penalization of Member States in case of non-compliance.
These improvements will contribute to the more precise and comprehensive assessment of data, to more efficient policy decisions and to a more sustainable exploitation pattern of European marine resources.

The development of national standards for protected species observers in the U.S.

*Kyle Baker[1], James Wilder[2], Teresa Turk[3], Howard Goldstein[4]
National Marine Fisheries Service, Southeast Regional Office[1], Alaska Regional Office[2], National Observer Program[3], Protected Resources Division[4]

Introduction

Protected species observers (PSOs) are commonly required in the U.S. to reduce the potential for adverse effects on protected species (i.e., threatened and endangered species and marine mammals) during some activities. Requirements to use PSOs are typically issued by the National Marine Fisheries Service (NMFS) under the authorities of the Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA). A lead permitting agency or other permit holder is typically responsible for implementing monitoring and mitigation measures. Data collected by PSOs during seismic survey activities can provide reliable information regarding the effectiveness of monitoring and mitigation requirements, scale of impacts, improve protocols, and identify data collection needs for future activities. Currently, PSO requirements can vary considerably between project type and geographic region, resulting in inconsistencies in data collection requirements. Standardization of observer requirements will resolve many current issues and improve the effectiveness and management of PSO programs.

As a result of meetings with observer and industry stakeholders regarding the seismic PSO program and review of reports and administration of the existing program, an independent approach to observer hiring, training requirements, and performance measures were identified as core areas that could benefit from standardization. A Protected Species Observer Working Group (PSOWG) was formed in 2008 to review PSO programs needs and recommend actions for the development of national PSO standards for the two existing seismic survey PSO programs in the Gulf of Mexico and Alaska. The PSOWG has been a cooperative effort between NMFS and the Minerals Management Service (MMS), the lead federal agency with oversight of oil and gas activities on the U.S. Outer Continental Shelf who has been considering PSO needs for their programs nationally. Particular attention was given to the large observer programs that currently exist for seismic surveys occurring in the U.S. Exclusive Economic Zone.

Results/Discussion

The PSOWG report and recommendations for implementation of national PSO standards using seismic surveys as the modeled activity are expected to be available in summer or fall 2009. Implementation of the program within NMFS and MMS will depend on the future decisions of those agencies. Several observer standards or national policies have already been developed by the NMFS National Observer Program (NOP) for monitoring fisheries. These existing policies may be utilized or modified for their applicability to the development of standards for a national PSO program for non-fisheries activities. The PSOWG has recommended actions on key issues needed to implement national standards. The core PSO issues identified pertain to training, PSO eligibility, safety, data collection, data management, and reducing conflicts of interest. The national PSO program model involves the coordination of stakeholders primarily responsible for implementing different core areas of the program (Table 1). Typically, federal agencies monitor or provide oversight to ensure that mitigation and monitoring measures are properly implemented; however, it is typically the PSO providers who carry out requirements by hiring PSOs and managing day-to-day monitoring and data collection activities.

Stakeholder Groups			
NMFS	**Permitting Agency (MMS)**	**PSO Trainer**	**PSO Provider**
Training standards	Provider agreements	Conducts training	Employs PSOs
Trainer agreements	Data reporting	Inventories equipment	Deploys PSOs to Industry
Data collection standards	Data quality assurance	Provides other services	Travel/accommodations
Data management	Provide mechanism for		Prepares reports
PSO eligibility	industry payment or funding		Insurance
Safety and health	of PSO training and services		Data quality assurance and
Provider Requirements			quality control

Table 1. The roles of the main players in a standardized seismic survey PSO program

National standards are expected to clarify roles and responsibilities and result in several benefits to stakeholders. National standards will provide expectations to the industry and PSOs during project planning. A national PSO program will promote effective communication between PSOs, program staff, government agencies, and industry. Figure 1 shows the possible agreements that may be needed between the major stakeholder groups. Clarifying roles and expectations can avoid conflicts of interest and make the PSO program more transparent to any perceived biases. Standardized requirements will provide consistent eligibility requirements for PSOs working anywhere in the U.S. PSOs will be better trained in safety and health issues, and covered under safety and health requirements for observers in NMFS NOP. The infrastructure necessary to carry out PSO functions may be created and maintained if standardized nationally. Consistent data collection methods and practices will improve data quality, monitoring of take, evaluating mitigation effectiveness, and better inform adaptive management strategies. Public meetings may be needed between stakeholders detailing expectations to meet the new standards of the PSO program, reduce conflicts of interests, and maintain the overall integrity of the program. Overall, a standardized PSO program will improve coordination among stakeholders and better support the management of protected species.

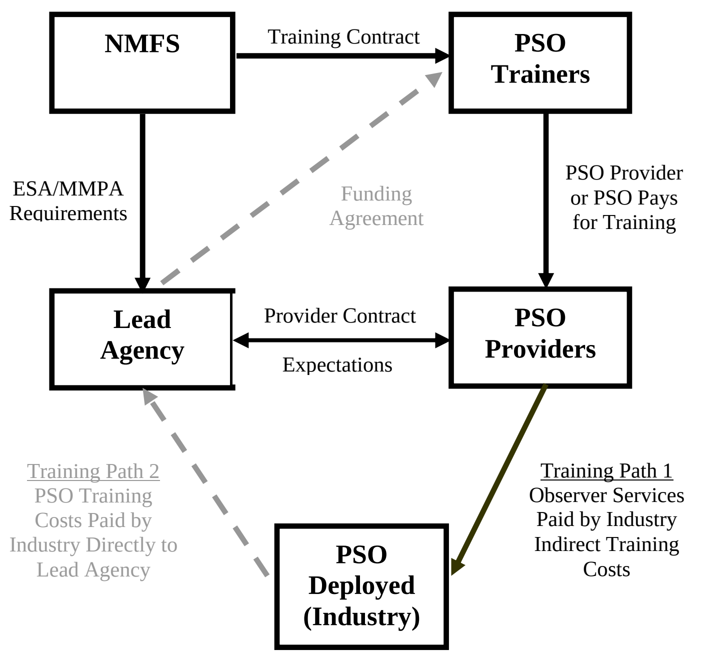


Figure 1. The interaction between stakeholders and agreements that may be needed to implement a standardized PSO program.

Challenges to data standardization between on-board and alternative platform observation of small vessels

*Michelle S. Passerotti[1], Trip Kolkmeyer[2], Barbie L. Byrd[2]
IAP World Services / National Marine Fisheries Service, Southeast Fisheries Science Center, Panama City Laboratory, Panama City, Florida, USA[1], National Marine Fisheries Service, Southeast Fisheries Science Center, Beaufort Laboratory, Beaufort, North Carolina, USA[2]

Introduction

The southeast gillnet fishery observer program (SGFOP) was first implemented in 1993 to monitor protected resources interactions in the king mackerel, *Scomberomorous cavalla*, fishery operating in the southeast US. Since that time, the gillnet fishery has undergone many changes requiring adaptation of the observer program on all levels. Presently, the southeast US gillnet fishery is primarily made up of small vessels (~ 7 – 12 m in length), many of which frequently change gear type and target species to follow species abundance patterns or fishery closures[1]. Because of their small size, varying gear set-up and vessel layout may preclude fisheries observers from safely observing fishing operations while on-board. Additionally, some vessels may not have space for observer safety, sampling, or protected resources gear, further complicating efforts to cover them. Data collection from this fishery is of high importance, however, not only for protected resources monitoring but also for quantification of catch and bycatch. One possible way to overcome these issues is the use of an alternative platform (AP) for observing, namely a small outboard vessel manned by a NMFS vessel operator and the observer.

Methods

The southeast gillnet fishery observer program is currently collaborating with personnel at the NMFS laboratory in Beaufort, NC, to investigate the potential for use of an alternative platform (AP) approach within the southeast gillnet fishery. The NMFS Southeast Regional Office funds an AP program coordinated by the Beaufort laboratory for the purpose of monitoring interactions with marine mammals[2] , and more recently, sea turtles. In June 2008, an observer from SGFOP was deployed to Cape Hatteras, NC, and accompanied AP program observers on two trips via a small outboard vessel operated by the AP program. These trips resulted in observation of 3 gillnet sets by the SGFOP observer utilizing the AP method, with data collection in SGFOP format. The observer then generated an internal report addressing the feasibility of integrating the AP method into current SGFOP protocol. Issues and concerns raised from the internal report are currently in review by both programs in an effort to reconcile the two methods and move forward with integration.

Results/Discussion

Several issues for reconciliation were raised: 1) Using the AP method, species identification, number of fish caught, and disposition and number of discarded fish can be difficult to obtain due to the distance required to avoid obstruction of fishing activity; 2) collection of direct measurements and biological samples is unlikely unless the fishing vessel is boarded or fish are transferred between vessels, which can be difficult to implement consistently; and 3) guidelines for observer safety must be created to manage the hazards involved with small vessel operation by fisheries observers.

Although the AP method works well for monitoring fishing gear for entanglement of protected resources, it poses some challenges for other goals of the SGFOP. Inherent problems exist in standardizing data collection between the on-board and AP methods currently in use. We are currently working to address these issues. Finding solutions to these problems will greatly enhance the ability of the SGFOP to gather valuable data from small vessels, for which observation has been largely absent in the past.

Notes:

1. Passerotti, M.S. and J.K. Carlson 2009. Catch and Bycatch in U.S. Southeast Gillnet Fisheries, 2008. NOAA Technical Memorandum NMFS-SEFSC-583, 18 p.
2. Kolkmeyer, T., B. Guthrie, B.L. Byrd, and A.A. Hohn. 2007. Report on the Alternative Platform Observer Program in North Carolina: March 2006 to March 2007. NOAA Technical Memorandum NMFS-SEFSC-558, 20 p.

Introducing e-monitoring into the mix of AFMAs monitoring options: insights benefits and costs

Bob Stanley
Australian Fisheries Management Authority, Australia

Robert Stanley
Australian Fisheries Management Authority
Australia

When considering e-Monitoring and its worth in the matrix of options for the monitoring of fisheries Australian Fisheries Management Authority decided upon a staged approach. The stages included a proof of concept stage where we identified and trialled the systems to determine the capability of the systems, their relative strengths and weakness against the other monitoring options. The proof of concept stage also allowed us to showcase the technology to the fishing industry. The interest and support from industry was encouraging and they indicated a preference to progress e-Monitoring further. The second stage was to undertake a cost benefit study that benchmarked e-Monitoring costs against the costs of existing observer programmes. This study identified a number of different thresholds in a range of fisheries where e-Monitoring would be cost effective when compared to observers. The third stage was to bring together and model all the monitoring options such that we had a detailed understanding of the strengths, weakness, flexibility, extendibility and costs of each of the monitoring options. The presentation will outline the key features and elements in the costs and capabilities of the monitoring options that AFMA has identified as preferable as it moves to going operational with an all of fleet e-Monitoring system in the Eastern Tuna and Billfish Fishery.

Computer science technology applied to data collection and data management

*Oscar Guzman[1], Mauricio González[1], Juan Carrasco[1], Claudio Bernal[1,]
Carlos Vera[1], Marco Troncoso[1]..
Instituto de Fomento Pesquero, IFOP, Chile[1]

Introduction

IFOP, as non profit marine research institute, has the mission to provide to the Under Secretariat of Fisheries in Chile, the technical information and scientific basis for the regulation of Chilean Fisheries. The scope of the data requirements is following:

Fisheries and biological data requirements
7 long term programs to monitor main national fisheries; 4 permanent specific fisheries research projects; 6 no permanent specific fisheries research projects

Coverage of data sampling
9 Sampling centers along Chilean Coasr; 48 Sampling points; 3,300 annual surveys onboard industrial vessels; 14,400 annual surveys to small craft fisherman; 20,500 annual inquiries of fishing log books; 2.9 million sample units of fish, crustaceans and benthic.

Methods

With the intention to improve the process of data production, since year 2005 a group of scientists of IFOP has developed a new computer science system for data collection, data management, and automatic publication of fishing and biological indicators in Web Page. The project was financed by the Governmental Corporation for Development of Production (Corporación de Fomento de la Producción CORFO, www.corfo.cl)

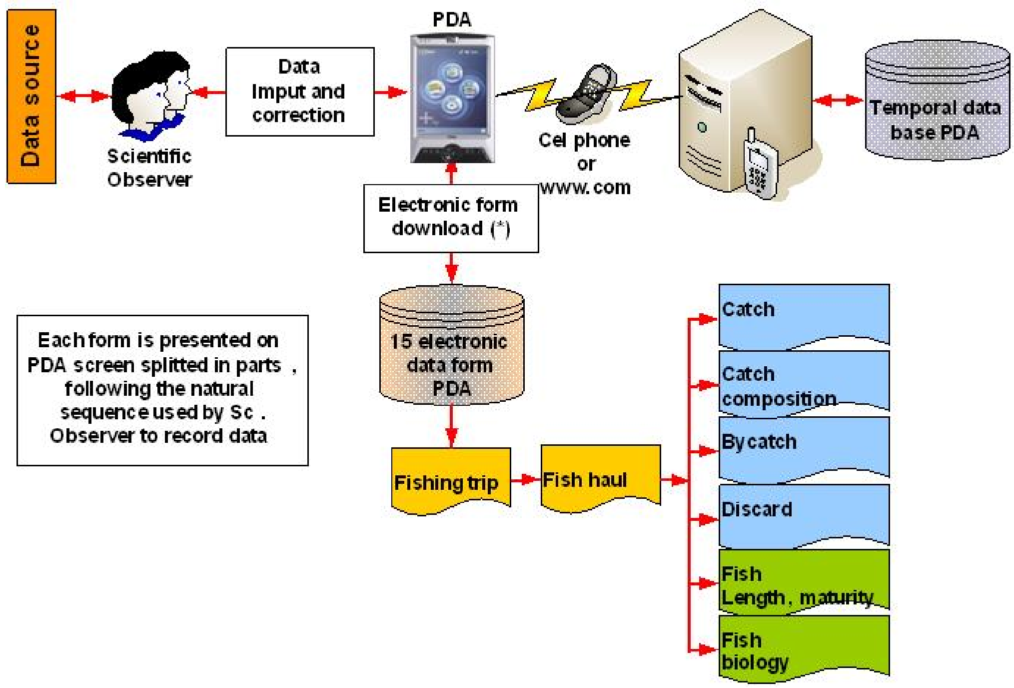


Figure 1. Data collection and transmission with Personal Digital Assistant. *Electronic data form download to PDA, implies that Sc. Observer must connect PDA to data base, select the fisheries in which will collect data, and download automatically to PDA the needed forms.

Results

The general configuration of the system is displayed in figures 1 and 2.

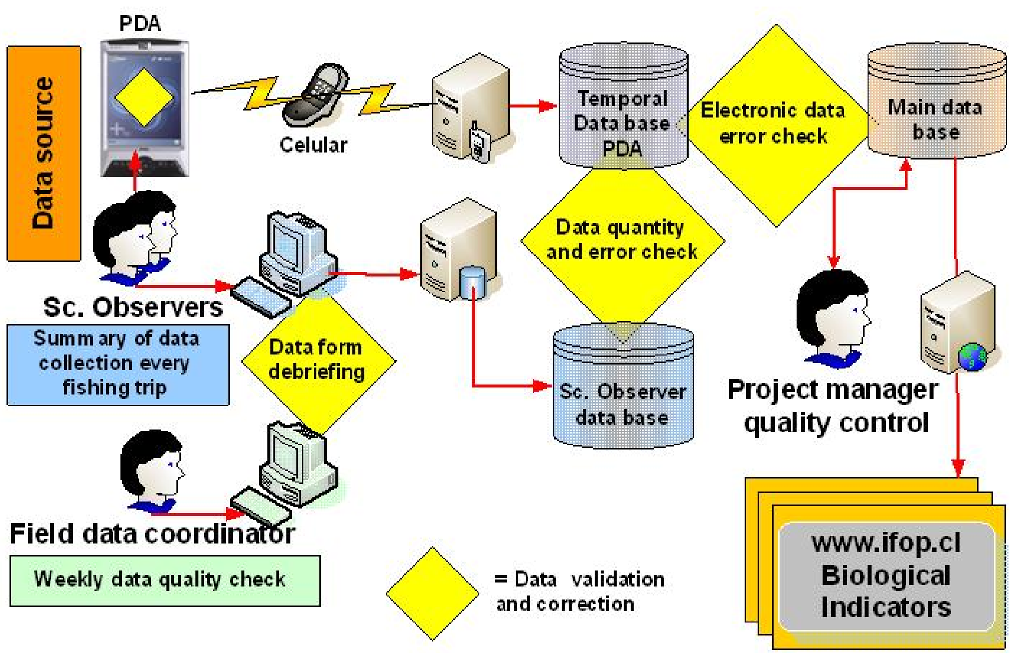


Figure 2. Procedure for data quantity and error control

Main attained changes:

ACTIVTY	Year 2006	Year 2009
Time delay between data collection and input in main data base.	80 days delay	15 days delay
Report of data requirement fulfillment regarding quantity, opportunity and coverage.	No report	Monthly report
Report of data error	No report	Monthly report
Automatic publication of Biological Indicators in Web Page.	No report	Monthly report**

****Monthly report per fisheries including trends of last 5 years of following indicators: landings, effort, size distribution, mean size and sexual maturity indices.

Evaluating the reliability of at-sea observer release estimates in British Columbia offshore groundfish trawl fisheries

*Matthew H. Grinnell[1], Sean P. Cox[1], Rick D. Stanley[2] and Andy B. Cooper[1]
1. School of Resource and Environmental Management, Simon Fraser University, BC, Canada
2. Pacific Biological Station, Fisheries and Oceans Canada, BC, Canada

Introduction

The at-sea observer program (ASOP) for offshore groundfish trawl vessels in British Columbia, Canada has collected essential catch monitoring data, including estimates of at-sea releases, since 1996 when the individual transferable quota (ITQ) management program began. ASOP estimates of at-sea releases (releases), in particular, are used by scientists to assess fish stocks and by managers to set, allocate, and monitor quota sharing among vessels. Observer estimates of releases directly affect vessel profitability because some of these releases are deducted from the individual vessel quota. For example, because the ITQ management program holds harvesters individually and financially accountable for dead marketable-sized releases, economic incentives may favour low reporting rates for releases of marketable or dead fish. Therefore, it is critical to evaluate at-sea observer programs because elements of human nature could affect the reliability of at-sea release estimates and the equitable treatment of quota sharing among vessels.

In this study, we evaluate the potential reliability of fisheries observer estimates of at-sea releases of sablefish (*Anoplopoma fimbria*) and Pacific halibut (*Hippoglossus stenolepis*) that are both caught incidentally in British Columbia's bottom trawl fisheries. We develop a regression tree approach to: (1) quantify the importance and relationship between physical, biological, and social predictor variables and release rates; (2) quantify discrepancies between reported release rates and expected (i.e., predicted) release rates given the regression tree model; and (3) determine whether individual observers tend to systematically under- or over-report releases.

Methods

Harvesting of sablefish and halibut in British Columbia is managed by the ITQ management program where vessels are allocated fixed (but transferable) proportions of the total quota. Sablefish is a high-value species that is caught incidentally by bottom trawl vessels targeting flatfish. More than 95% of trawl fishing events between 1996 and 2006 reported zero at-sea releases of marketable sablefish. Pacific halibut, on the other hand, are commonly encountered during bottom trawl fishing operations for a wide range of species, and the majority of tows report at least 20% dead-released halibut. Retention of Pacific halibut by trawl vessels is prohibited, yet vessels must have halibut quota to account for the weight that is released dead.

We assessed the reliability of release estimates for sablefish and halibut using a randomized regression tree approach known as the random forest (RF). The RF attempts to predict the proportion of marketable-released (MR) sablefish or dead-released (DR) halibut on individual trawl tows. Regression tree predictions use up to 26 and 24 predictors for sablefish (58,315 tows) and halibut (59,124 tows) respectively. Predictors include environmental (e.g., year, month, depth), social (e.g., observer experience, skipper/observer familiarity), economic (e.g., vessel quota remaining, fleet quota available), fishing event (e.g., total catch, end time, observation method) and vessel-specific (e.g., hold capacity) factors. Fishing events for which the RF model predicts a high release rate for either species, yet only a low proportion was recorded by the observer, are further investigated using linear mixed-effects (LME) models. The LME attempts to estimate individual effect sizes (i.e., "observer effects") for each of the 322 and 324 observers that encountered sablefish and halibut, respectively.

Results

The RF model accounted for 47% and 23% of the variability in reported at-sea releases of MR sablefish and DR halibut, respectively. The three most important variables for MR sablefish are the year and month of the fishing event, followed by observer experience. The marginal effect of each predictor (after averaging over the other predictors) indicates that MR rates of sablefish were higher in the 2005-2006 fishing year, and lower during the months of January through May, and lower for observers that have more than 40 days experience at sea. The three most important predictors for predicting DR halibut are observer experience, followed by the depth of the tow and the year. Like the sablefish observers, lower rates of DR halibut are reported when observers have more than 40 days experience. Lower DR rates are also reported at depths between 50 to 200m. Although year is important, predicted rates were fairly consistent across years.

Although interactions between predictors can make direct interpretation of marginal effects difficult, the model predicts that observers with less than 25 days experience at sea report approximately 10 ± 2% (mean ± 2x standard error) more MR sablefish, and 5 ± 2% more DR halibut than observers with more than 50 days experience. The two least important predictors for both sablefish and halibut were "observation method" (i.e. whether the data was reported by the observer or skipper), followed by "end time" (i.e. whether the fishing event ended during the day or night). The observation method may have low importance because more than 98% of tows are reported by observers.

As expected, our analysis of individual observer reporting rates using LME indicated that observers both over- and under-estimate releases relative to model predictions; however, some observers show greater tendencies toward under-reporting. For example, the bootstrapped 95th percentile range of observer effects is less than zero for 8 of 322 observers that encountered sablefish, and 27 of 324 observers that encountered halibut. Using RF predicted release rates as "true" rates, these observers under-reported a median weight of approximately 1 tonne (t) of MR sablefish, and 11 t of DR halibut in total over the 8-year period considered. These differences are small compared to total (i.e., for all observers over the 8-years considered) reported MR sablefish and DR halibut, equal to 127 t and 1,051 t respectively.

Discussion

Our analysis showed that "observer experience" is among the most important predictors of at-sea releases of sablefish and halibut, and in both cases predictions tended to be lower for observers with less experience. This result suggests that the "human factor" cannot be ruled out as an influence on reported at-sea release rates. However, because model predictions are not referenced by an independent baseline, agreement between observed and predicted releases does not necessarily imply accurate release reports. For example, we would be unable to detect widespread over- or under-reporting if it were occurring equally among all observers. On the other hand, the potential under-reporting levels observed in our analyses were small compared to total reported MR sablefish and DR halibut. Reports of MR sablefish and DR halibut are relatively consistent between the majority of observers. Thus, the analysis does not provide strong reasons to suspect that at-release reports are unreliable for their intended purpose.

Question and Answer

The question and answer session below captures the dynamic dialog between panelists and the audience. Each discussion is separated by a double line break

Comment/Question
Keith Davis
Fisheries Observer
Association for Professional Observers
USA

I wish to address the UN translation programs. The U.N. has translators to ensure that a site can be comprehended. I suppose if we did have translation databases for all the programs in place so that all the like data from one program to another could be utilized together then no one would be arguing for standardization. You mentioned that what is important is the customer of the data. I say that we all should at least consider looking forward, beyond the boxes of our programs to ensure that the data that is collected can be at least potentially utilized in the future beyond its current utility, as Bob suggested, with foresight to reuse the data into the future. That is what standardization can help with.

In terms of funding, you are right that the initial cost will be high, but don't you agree that standardization would save money even on the a local regional level especially on the larger level due to greater efficiency and utilization of the data resources, observer trainings and recruitment of observers?

Response
Lawrence Beerkircher
NOAA Fisheries Service
USA

In regards to the U.N point about translation programs yes, you can say that those translation programs and the translators exist, and if we had them in fisheries it would be great. However, if we move to standardization and standardized data formats, you're going to require those translation programs anyway because you're going to have all this existing legacy data that needs to keep being used in terms of time series.

So you are going to have to develop those translation programs, no matter what, to translate the legacy data. Either way you're going to have to do it if you went into standardization.

Do I agree if you'd save money in the long run? I suppose way down the line you'd save money in the long run. The issue would be by the time (I can't help but speculate that) you got finished, there would be a whole set of new questions that needed to be answered to bring back up to speed onto what new information needed to be put into a standardized format.
So, yes, I agree that way down the line, in the long run there would probably be a cost

savings. I think you really need to poke at that a little bit and do some real cost benefit analysis as much as possible to figure that out.

Comment/Question
Donald MacIssac
A.I.S., Inc.
USA

I also have a question on data standards. What's the future for data standards since it's unlikely that the observer program is going to rebuild their databases and all their data forms or data structures on the backend (which I think you alluded to in your abstract) using data warehouse technology? The software is already out there. A lot of businesses use it to extract transformed data, and load it into a dimensional model for analysis.

Response
Lawrence Beerkircher
NOAA Fisheries Service
USA

Yes, absolutely. I think that's the way it really should go, in terms of the data standardization. The various programs certainly can contribute, especially the IT infrastructure. I think at the NOAA level it could easily be done. But rather than pay a person at each individual observer program to fix legacy data, having a few people at national level design that fix of translating the data would be a lot more cost effective.

Question/ Comment
Gregg Williams
International Halibut Commission
Canada

I have a question for Matthew. I appreciated your talk on the BC trawl fishery. Two questions come to mind. The first, you stated at the outset that your interest was in getting a better picture, if you will, of the total mortality of sable fish. I was just wondering why you didn't include the unmarketable discards and only took account of marketable discards.

Response
Matthew Grinnell
Simon Fraser University
Canada

I just considered marketable discards with respect to unmarketable discards, looking at the proportion. If you look at the economics of discarding, that's one proportion where there may be an economic incentive to have lower reported rates of marketable releases. In terms of total mortality, the weight of marketable dead fish does count towards the TAC. But the weight of unmarketable fish does not come into effect there.

Comment/Question
Gregg Williams
International Halibut Commission
Canada

My second question had to do with what I call the new observer effect. Based on your variable of observer experience or number of days at sea, estimates were quite a bit higher, for more experienced observers. Do you have any ideas, hypotheses for that particularly?

Response
Matthew Grinnell
Simon Fraser University
Canada

I think there could be a number of reasons. One of them could be that new observers may not have the confidence to come up and talk to a skipper as much as with a more experienced observer, to say that they're reporting these releases as being of marketable size. If an observer were to do that, it may give the skipper the chance to, retain the fish instead of releasing them. I'm sure there could be other reasons as well. It could be that new observers are possibly less accurate in estimates at first. So these results are more showing the relationship but not the reason for that.

Comment/Question
Dennis Hansford
NOAA Fisheries Service
USA

I give you kudos on trying to establish standards to your protected resource observers and bring them under some of the similar guidelines that the NMFS fishery observers have to abide by. But my question is in your flow chart for the training. It goes from NMFS to the protective resource observers. I was just wondering who would pay for that? Is that going to be from the Minerals Management Service side of the house or from the NMFS side of the house?

Response
Kyle Baker
NOAA Fisheries Service
USA

That's a really good question and one that hasn't escaped others from asking either. Actually, we're in the middle of discussing that with the minerals management service and discussing a couple of mechanisms to have industry pay for that. Industry right now is absorbing these costs through the contracts with individual companies who are already providing the training for their employees. So we just need a different mechanism to remove that direct agreement with industry and protected species observers and move that, preferably, to the NMFS side of the house.

Comment/Question
Dennis Hansford
NOAA Fisheries Service
USA

As a follow-up, as you adopt some of the NOAA fisheries observer guidelines, does that then give the protective resources observers the same kind of protections as MSA observers? Are they going to be considered eligible for the same compensation as MSA observers injured at sea? There are specific recourses for them.

Will that then apply to the protective resource observers?

Response
Kyle Baker
NOAA Fisheries Service
USA

Truthfully, I'm not certain. We want to apply the eligibility in health and safety standards to protective species observers, because there's multiple agencies involved here – in the fisheries program, NMFS is primarily responsible for observers.

In this arrangement, under the ESA and MMPA, we're essentially requiring certain mitigation measures of other agencies to follow, and they can decide to implement them or not. So it's really other agencies' responsibility. So there's a dual responsibility here where NMFS is developing standards for training, and that linkage to actual deployment between NMFS and MMS is still being discussed. So that's a really good question and an issue we'll need to investigate more.

Comment/Question
Kim Dietrich
Consultant
USA

These questions are directed at Kyle. Will these standards that you're developing be open to public comment? Will they be published in the Federal Register, etc.?

You mentioned that you were trying to parallel those eligibility standards with the fisheries observer standards. I'm wondering if you know what percentage of the current protected species observers would basically qualify under those standards, and if it's a high proportion, will they be grandfathered into the new system?

Response
Kyle Baker
NOAA Fisheries Service
USA

Yes. We did discuss grandfathering. At a minimum, we would want everybody to get up to speed to the current requirements. So there might be some catch up. There will be grandfathering. We don't want current observers to be left and drop off the face of the earth. That's not our intention whatsoever. As new observers come in they will be required to meet all the new standards. You have posed some good questions and ones we are thinking about and will address.

Comment/Question
Kim Dietrich
Consultant
USA

Will there be a public comment period on those standards?

Response
Kyle Baker
NOAA Fisheries Service
USA

We have a lot of work to do. I'd imagine we're going to have to put it out for comment. We're going to have stakeholder meetings. We're going to get everybody's input that needs to have input.

Comment/Question
Craig Loveridge
Ministry of Fisheries
New Zealand

Michelle, you were showing the two methods that you used to monitor the catch and ensure fisheries, have you done any trips where you've employed both methods at the same time? or will that be something you do in the future?

Response
Michelle Passerotti
IAP Worldwide Services
USA

No we haven't. But it could be a good approach to see where exactly our issues are going to lie. It's a problem that we've been having over the past three or four years as the fishery shrinks in size. With regulations we've lost a lot of our big shark gill netters. So that the boats are getting smaller, the targets are getting smaller. So it's just something that's popped up recently, and we've said, "Hey this other program works well. Let's see what we can glean from it that maybe we can apply to ours." But we haven't gotten that far and that's definitely something that we could address in the future.

Comment/Question
Masud Hasan
SAR and CO Ltd.
Bangladesh

I have a question to Bjorn Stockhausen. We know the European Commission is very much conscious about antibiotics and growth hormones that are imposed in the shrimp Aquaculture sector. My question is whether the European Commission has taken necessary steps to defend these health hazards and growth hormones and nitophuranes in the same sector, and the shrimps that are imported in the E.U. countries, what regulations are you meeting?

Response
Bjorn Stockhausen
European Commission
Italy

It's rather a question of food safety now, right? I think it's not covered within the common fisheries policy. It's more covered first in food safety, but otherwise, like regulations which relate to the importation of product trade and food safety.

Comment/Question
Masud Hasan
SAR and CO Ltd.
Bangladesh

You're saying E.U. has regulations on food safety on shrimp (only for shrimps) Shrimp are grown as an aquaculture product, and growth hormones that can be health hazardous are sometimes incorporated. This is very much harmful for human consumption. I would think the EU has regulations on this.

Comment/Question
Jann Martinsohn
European Commission
Italy

As Bjorn said, this is relating rather to European safety standards. There's a regulation called 178 which is concerned with that. It's actually the business of the European food safety agency. I mean, we could certainly discuss this in privacy but it has nothing to do directly with the common fisheries policy Bjorn was referring to.

Comment/Question
Pierre Meke
Ministry of Livestocks, Fisheries and Animal Industries
Cameroon

My question is for Mr. Guzman, who presented the use of computer science for data collection and data management. I think what you have just showed is a solution for managers who want always to see on the spot how the fishery is moving and to pay their money. I would like to know the number of species that you are monitoring in your system and if you have a program, a software that you are using? Is it modularized to support broad use or is it just localized in Chile?

Response
Oscar Guzman
Instituto De Fomento Pesquero
Chile

I do not remember exactly the number of species but we are talking about 200 or more. It was in the slides. The software we develop is for Chilean purposes, but of course, we are open to share that with other countries.

I would like to add one more subject regarding those electronic data acquisition systems and standardization. The key issue is training. The Chilean government has a special regulation that allows the companies or institutions to invest up to three percent of taxes into training for the laborers. So, these are very good ways to get financing and to apply these to the laborers and the scientific observers.

Comment/Question
Pierre Chavance
French Institute for Development
France

I work in tropical tuna observer program. I think that the main question is not standardization of collecting system, but more the ability to exchange data between different systems that should collaborate for assessment, for example. So I think it's certainly necessary at a certain point to agree on units, on codes, on concepts but not necessarily at the level of collecting data.

My question is do you have any experience in the assembly? Is there any experience to develop this kind of platform, exchange data platform between different systems to be able to (for certain types of analysis) to exchange data?

Response
Lawrence Beerkircher
NOAA Fisheries Service
USA

There are a variety of issues with that. The way that I'm familiar with is through ICATT, with the tuna management. Generally from there the data goes to our stock assessment scientists, which then go to the stock assessment meetings and use the data there. It does not come back to me that there's a problem. In the shifting of data between one person to another, the other issue which might be more a U.S. issue than anything else are these observer data are confidential. Therefore, you run into big problems in terms of sending information over the internet.

Moderator/ Comment
Charles Gray
NSW Department of Primary Industries
Australia

I'd just like to thank all the presenters in conclusion of this session, even in the previous sessions, for their time and efforts in putting together their talks. I encourage everyone to go away and think about their data and how they can improve the quality of the data that they are collecting.

Panel Session 3:

Using fishery monitoring information in assessments and management

Moderator: **Jim Nance, National Marine Fisheries Service, USA**

Speakers

Charles Gray – Australia
Use of observer-based surveys in monitoring and assessing environmental conditions imposed on developing fishries.

Kimberley Murray – USA
Sea turtle bycatch in U.S. Mid-Atlantic gillnet gear: characteristics, magnitude, and opportunities for conservation.

Lisa Borges – Belgium
The evolution of a discard policy in Europe.

Lee Benaka- USA
Fisheries observers and bycatch reduction research.

Francis Van Oordt – Peru
The Peruvian Anchovy fishery observer program and its role in monitoring interactions with top predators.

Alpha Abdul Bangura – Sierra Leone
Fisheries observer program in Sierra Leone and its implications for fisheries management.

Justin Monin Amande – Cote d'Ivoire
Estimating bycatch and discards from observer data in tropical tuna purse seine fisheries: the case study of silky shark (*Carcharhinus falciformis*) in the Indian Ocean tuna purse seine fishery.

Introduction to the session

One of the biggest reasons for observer programs is to scientifically document the at-sea activities of a fishery. What are the target species and the level of catch? Is discarding of target and bycatch catch species happening and at what level? These are just a few of the myriad of very important questions that observer programs develop sampling designs to determine. Offshore sampling by observers is not a simple task, but it is critical task that is essential to assessment of stocks, and development of Fishery Management Plans and Biological Opinions. The speakers in Session 3 used their talks to outline the critical nature of the observer data for fishery management and assessment analysis in areas around the world.

Use of observer-based surveys to assess conditions imposed on developing fisheries: an example from a shark fishery in Eastern Australia

*Charles Gray & William Macbeth
Cronulla Fisheries Research Centre NSW
Australia

Strict conditions often regulate the development of fisheries, including, defined limits on the composition and quantities of targeted catch, by-catch (by-product) and discards, habitat interactions, interactions with rare and threatened species and ecosystem impacts. Observer-based surveys can be used to monitor and assess fisheries in accordance with imposed conditions and to assist the development of longer term management plans for sustainable fisheries. An example is provided from eastern Australia where an observer-based program is being used in the development of small-scale shark fishery.

A range of line-fishing methods is used to commercially catch finfish and sharks in New South Wales coastal and continental shelf waters as part of the Ocean Trap and Line (OTL) Fishery. The Environmental Impact Statement (EIS) for this fishery identified that the composition of the shark component of catches was little known and that discarding was poorly understood and potentially of high risk to sharks. This was compounded during the mid-2000's when there were substantial increases in fishing effort for, and catches of, sharks by commercial line fishers (Figure 1). The mean (± se) annual catch of sharks (by processed weight; all sharks combined) in the OTL fishery between 1998/99 and 2004/05 was 173.2 (± 9.8) tonnes, ranging between 144.2 (2003/04) and 219.7 tonnes (2001/02). Subsequent to 2004/05, the annual catch of sharks increased considerably to 457.2 tonnes in 2006/07; an increase of 200% over a two-year period.

Fishers (5 businesses) primarily responsible for the increase in shark catches indicated that it was due to them specifically targeting the sandbar shark (*Carcharhinus plumbeus*), using setlines and trotlines in waters that were not traditionally fished. Unfortunately, information regarding the species composition of these particular catches was not possible owing to the systematic use of the species category 'Shark, Unspecified' by the fishers on their catch returns (Figure 1) and the unsuccessful attempts to place scientific observers onboard sandbar shark fishing trips.

This latter fishing activity was deemed separate from that of traditional line-fishing and in response to this situation specific conditions and restrictions were imposed on fishers who continued with this activity (above those imposed on traditional fishers). These restrictions were devised on the basis of: 1) intensive consultation with fishing industry representatives and advisory councils; 2) a review of comparable shark fisheries elsewhere in Australia and the world; and 3) an urgent need for intensive research into the fishing operations, composition of catches and biological characteristics (e.g. abundance, distribution, population structure, growth and reproduction) of the main species involved. In summary, fishers participating in the newly defined sandbar shark fishery between 1 September 2008 and 30 June 2009 obtained restricted permits that included a Total Allowable Combined Catch of 100 tonnes of sandbar shark for the season, a bycatch trip limit of 4 carcasses of other whaler, hammerhead and mako species up to a combined 200kg, prior reporting of impending fishing to compliance officers and the mandatory hosting of observers on fishing trips. The cost of this program was paid through the purchasing their specific access permit.

The early data obtained from the on-board observers quickly identified that catches of sharks contained a considerable mixture of species, with sandbar sharks comprising only about 40% of catches, with several other whaler species including dusky and spinner sharks being of considerable significance. The new information obtained from the survey allowed management to swiftly alter the conditions of the permits that relaxed the bycatch trip limit and moved the TACC to include all species of sharks captured for the 2008/09 season. New management plans for the

entire shark fishery are currently being developed in consultation with the wider industry, including the traditional faction. These plans are now being developed based on the scientific data obtained from observer surveys.

The observer survey has also provided the avenue to collect valuable biological material (vertebrae for age determination, size and sex composition, reproductive data) of sharks and has been very valuable in helping educate fishers to correctly identify species of sharks.

In summary, the observer-based survey was vital in collecting the required information for in-season adaptive management of the fishery and it will also continue to collect vital data to develop better management systems for sustainable shark fisheries in the future.

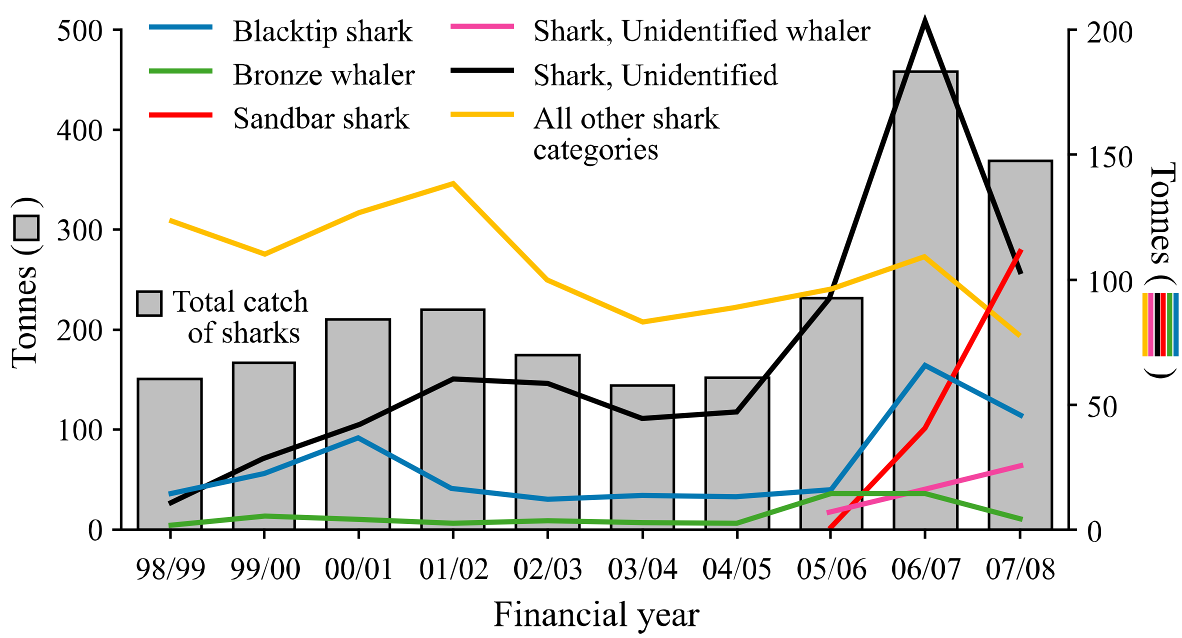


Figure 1. Catches of sharks (by processed weight) in the NSW OTL fishery during the decade between and including the financial years 1998/99 and 2007/08, as reported via the fisher-dependent catch-reporting system (NSW DPI, 2009). Column data (left y-axis) are for the total catch of all sharks combined (includes shark-like rays but excludes stingrays and stingarees); line data (right y-axis) are for the main relevant catch-reporting categories (or groups of categories) comprising the total catch of sharks, as used by fishers during that period.

Sea turtle bycatch in U.S. mid-atlantic gillnet gear: characteristics, magnitude, and opportunities for conservation

Kimberly T. Murray
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Introduction

Bycatch of sea turtles in commercial fishing gear is a conservation problem demanding innovative solutions for mitigation. From 1995-2006, fisheries observers in the Mid-Atlantic documented captures of loggerhead, green, Kemp's ridley, and leatherback turtles in sink gillnet gear. To date, the characteristics, rates, and total magnitude of sea turtle bycatch in gillnet gear in the Mid-Atlantic region have not been examined in detail. Assessing both the distribution of turtle bycatch and factors influencing bycatch rates can help identify areas of elevated risk of bycatch [1], [2]. In some cases fishing effort can be steered away from these bycatch "hotspots", so that fishing effort can continue while minimizing the potential for turtle bycatch [3]. Furthermore, understanding fishing gear characteristics that influence bycatch or bycatch rates can help lead to gear modifications designed to reduce bycatch [4]. The purposes of this paper are to: (a) describe characteristics of observed sea turtle bycatch in sink gillnet gear; (b) evaluate environmental variables and fishing practices correlated with bycatch rates of loggerhead sea turtles; and (c) estimate and report the total average annual loggerhead bycatch in U.S. Mid-Atlantic sink gillnet fisheries.

Methods

Data collected by fisheries observers were used to characterize sea turtle bycatch in sink gillnet gear, including the temporal and spatial distribution, fishing characteristics, species composition, and sizes of turtles captured. In addition, these data were used to develop a Generalized Additive Model (GAM) to evaluate and predict bycatch rates (turtles/ton fish landed) of loggerheads. A modeling approach could not be taken to estimate bycatch rates of other turtle species (Kemp's ridley, green, leatherback, and unidentified) due to the relatively low number of observations. Estimated bycatch rates were then applied to commercial gillnet landings over the same time period to estimate total bycatch of loggerheads.

Results

Bycatch characteristics

From 1995-2006, fisheries observers reported a total of 41 loggerhead, 5 green, 5 leatherback, 8 Kemp's ridley, and 13 unidentified turtles incidentally caught in gillnet gear. Loggerhead captures occurred from south of Cape Cod (41° N) to North Carolina (34° N) in all months except January, in depths ranging between 1.8 and 76.8 m (mean = 28.0 m), and in surface water temperatures (SSTs) ranging between 8.6 and 27.8°C (mean = 17.2°C). Bycatch of green and Kemp's ridley turtles occurred south of 36°N from March through December in waters 2-38 m deep, in SSTs between 12.2 and 26.9°C. Bycatch of leatherbacks occurred north of 39°N from July to December, in waters 18-68 m deep and at SSTs between 12.2 and 21.1°C. Mesh sizes of nets capturing loggerheads ranged between 7.6 and 30.5 cm, with most (n = 25) of the observed captures in 30.5 cm nets targeting monkfish. Bycatches of other turtle species occurred in nets having mesh sizes between 3.3 and 30.5 cm.

Sizes (curved carapace length [CCL] from notch to tip) of the observed loggerheads ranged between 52 and 101 cm (n = 12 turtles, mean = 65.3 cm). Sizes of the observed Kemp's ridleys ranged between ~28 and 44cm, and the size range of observed green turtles was between ~28 and 38cm. Observers did not measure any of the observed leatherbacks. Turtles were captured alive (52%), dead (40%), and in unknown condition (8%) when observers could not adequately see the turtle.

Estimated Rates and Magnitude of Bycatch

Bycatch rates of loggerheads were correlated with latitude, sea surface temperature (SST) and mesh size. Higher bycatch rates occurred in southerly latitudes, and increased with increases in SST and mesh size. Predicted bycatch rates on commercial gillnet trips ranged between 0.0 and 5.2 loggerheads/ton landed. From 1995-2006, the average annual bycatch estimate of loggerheads was 350 turtles (C.V.= 0.20, 95% CI over the 12-year period: 234-504).

Discussion

This study highlights areas and mesh sizes with elevated risk for loggerhead bycatch in U.S. Mid-Atlantic gillnet fisheries. The combination of fishing in low latitudes, in warm SST, with large mesh had the largest effect on estimated bycatch rates. The largest bycatch reduction gains could potentially be achieved in the southern Mid-Atlantic below 38°N, in large (>17.8 cm) and medium (>=14 cm and <=17.8 cm) mesh gillnets. Some turtle conservation measures are already in place in the southern Mid-Atlantic. Large-mesh gillnet fishing has been prohibited since 2001 through a series of rolling closures designed to reduce bycatch of sea turtles. These rolling closures, however, did not eliminate loggerhead bycatch. During 2002-2006, when rolling closures were in place on an annual basis, more than half of the estimated bycatch occurred in mesh smaller than 17.8 cm south of 38°N, and in mesh larger than 17.8 cm north of 38°N. The closures do not encompass mesh sizes smaller than 17.8 cm, nor areas north of 38°N. The current rolling closures are likely reducing the probability that loggerheads are captured south of 38°N in large-mesh gear because they are placed in areas that historically had high bycatch rates. However, other opportunities to reduce bycatch exist in smaller mesh gear, and north of the northern most boundary of the current rolling closure.

"For more information, see http://www.int-res.com/abstracts/esr/v8/n3/p211-224/"

Notes:

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The evolution of a discard policy in Europe

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Disclaimer: The views expressed in this paper are Lisa Borges' personal opinions and do not necessarily represent the views of the European Commission

Introduction

The European Commission (EC), as the executive body of the European Union, has the mandate of proposing future policies in fisheries management. In European waters the practice of discarding part of the catch at sea is presently legal (with one exception described below), and in some circumstances compulsory. Discards due to management measures such as minimum landing size, TAC limitations and/or quota limitations and bycatch restrictions are a common occurrence in European waters. Nevertheless, low or no economic value is the main cause of discards, and is where highgrading, i.e. discarding smaller size specimens to maximize profit, is a particular case.

Discards have become more important in the public eye in Europe with increasing public awareness to ocean conservation, with the intensification of overexploitation of fisheries resources, and, recently, with the public acknowledgement by the fishing industry of widespread discarding of commercial species.

The EC, in line with the increase public awareness, has proposed measures to, if not banned altogether, to at least reduce discards significantly. Since 2006, specific EC initiatives were taken to consult stakeholders in order to shape a future discard policy. The EC discard policy goals were published in a communication[1], after which a consultation paper, that included several implementation options, was released [2].

At the same time, scientific data collected by observers on board was analyzed with the specific objective to identify and prioritize European fisheries with high discards[3], to determine baseline discard levels and to finally determine feasible discard reduction targets[4]**.** In 2008, an EC implementation proposal[5] that followed was based on a progressive reduction of discards by fishery, where specific discard reduction targets were set over a period of time. The specific technical measures to be implemented were left open to the industry to devise them. The idea behind was that, as long as the average reduction target was reached, fishermen were free to try different options, with the aim of increasing industry responsibility and acceptability of the regulation.

The issues

At the end of 2008, an international incident raised further public awareness on discards. A UK vessel was caught on camera discarding five tones of commercial size fish (mainly saithe), immediately after leaving Norwegian waters, where discarding is prohibit. The video was broadcasted in many European countries causing a widespread public demand for a discard ban. This incident, allied to the slow pace of implementation of the fishery approach described above, considering the many different fisheries in Europe and the long timeline for the discard reduction targets to be reached, increased significantly the political pressure for the EC to deal quickly with discards.

Furthermore, at the same time, some Member States argued for increases in Total Allowable Catches (TACs) in order to decrease discards of commercially size species. This was the reaction of national administrations and industry to an increase of discards of commercial size fish of an emblematic European stock: North Sea cod. Industry reports, backed up by scientific data from observers on board, showed a marked increase in catches of cod above minimum landing size. This increase has since been attributed to an abundant 2005 year class. North Sea cod is caught in a mixed cod-haddock-whiting fishery, highly dependent on incoming cod year classes, with the majority of landing (>80%) of juvenile cod aged 1-3. The 2005 year class has now been heavily exploited, with little benefit to the stock, which remains below B_{lim}.

Results/Discussion

The issues described above have resulted in a rethink of the European discard policy. The approach taken now is the prohibition of highgrading in the North Sea and Skagerrak in 2009, to be extended to all European fisheries from 2010, with the long term objective of a total discard ban. However, questions have been raised if the highgrading ban is being implemented, due to the abandonment of the fisheries approach that may reduce industry acceptability and, at the same time, to the planned reduction of fisheries control costs by limiting control at land.

The events mentioned previously highlighted, on the other hand, the difficulty of protecting a unique strong year class of stocks under severe fishing pressure and in poor state. Is the highgrading ban the solution for saving a year class? Or should it be complemented by other measures (effort reductions, technical measures)? The answer is of particular importance considering that two other cod stocks (western and eastern Baltic Sea) are presently experience high recruitment but its fisheries are largely based on recruiting year classes, and thus there is a window of opportunity to safeguard stock recovery.

The case of the Northeast Arctic cod may shed some light. In 1973-74 the largest ever recorded year class recruited to the fishery. A prohibition to discard cod was established in 1977. Although this measure was adopted too late to save the 1970 year class, in combination with low TACs, additional technical measures and good enforcement, it prevented the 1983 year class to be overexploited[6]**.** By the mid 90's the stock had recovered and it is presently extremely abundant. However, the similarities between Northeast Arctic cod stock and the stocks in the North and Baltic Sea are small, particularly in two fundamental aspects: the number of species caught in the fishery and the level of control. The mixed species nature of fisheries and low enforcement in Europe cast some doubt to the efficiency of a highgrading ban to reverse recruitment overfishing. Nevertheless, this measure applied to the single species cod fishery in the Baltic and associated to improvements in its exploitation pattern and lower fishing pressure, may be sufficient to safeguard the future of the Baltic cod stocks.

Notes:

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The Peruvian Anchovy Fishery Observer Program and its role in monitoring interactions with top predators

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The Peruvian Anchovy *Engraulis ringens* is the key species in the Peruvian Upwelling Ecosystem, and plays important roles both as predator and prey to different components of the system [1]. Peruvian Anchovy is a small pelagic fish, with short-life span and which congregates in large schools becoming an important prey item for predators and target for fisheries as well, making this fishery the largest one in the world, reaching in the last years volumes of six million tons caught annually.

Today, the Peruvian Industrial Purse Seine Fishery is comprised of around one thousand vessels, of which about 50% are steel haul vessels, while the rest are wood hauls. Steel vessels catch by large most of the anchovy in this fishery, reaching about 80% of the total catch in Peru. This important fishery has suffered several strong impacts in the last decades, due to intense overfishing in the 70’s and an extraordinary El Niño 82-83 event, that collapsed the fish stocks, and afterwards although fishing has been controlled, warm events have seriously affected it [2,3].

The purse seine fleet has increased both in the number of vessels and in search capabilities in the last years. Although most of the vessels are equipped with echosounders, and other fraction with sonars as well, they often use seabirds and radio communication to detect fishing areas. The fleet operates within 80 nautical miles from the coast, focusing its activities around the shelf break, and along the whole Peruvian coast.

The LOOP comprises 20 to 25 observers that allocated themselves on industrial vessels, and have gathered data on about three thousand to five thousand fishing sets per year. Because most of the effort is concentrated in the northern-central area, most of the observers are allocated here. This way the program records real time information on fishing effort and fishing areas. The observers also collect an important amount of data from the catch each set. Sampling anchovies they register size structure of the catch, producing important information to assess recruitment, and close fisheries in case of high juvenile presence. Also when requested, observers could sample gonads from anchovies for further reproductive assessments at headquarters. Observers are equipped with basic tools to fulfill theirs tasks such as ictiometer, plastic buckets, pocket springs balances, radio-telephone for quick communication. By-catch of other commercial or non-commercial species, including large vertebrates such as protected species, is also an important component recorded by the LOOP.

This fishery has gone through several adaptation in management since it last collapse in the 70`s. Today we can account for spatial bans that aim to protect this species and other resources close to shore, forbidding all industrial fishing within the 5 nm from the shore. Fishery closures were established for spawning seasons and also closed areas when high incidence of juveniles occurred in the catches. Today, a system of individual quotas has been established for the Peruvian Anchovy fishery and will be monitored closely, expecting results in the fore coming months.

Satellite vessel monitoring systems have also been implemented and enforcement is in progress using this tool, facing with a particular issues that at out of the present work.

LOOP plays an important role in monitoring this fishery, including both the target species and other species involved in it. Therefore, observers are constantly trained due to new staff included in the program, and also to improve data quality and continuously standardize the collected data. In this process, it has become an important role of the observers to monitor interactions with top predators (small cetaceans, seabirds, and also sea turtles). Observers register interaction with this species, recording the presence or occurrence of individual during fishing activities, either present or interfering with the fishing set or haul. Also, they would record any occurrence of mortality of this species as a result of the fishery. It is clear now that several species of gulls are common during fishing activities, as well as guano seabirds, endemic to the Humboldt Current. Also an important species present during fishing operations is the South American Sea Lion, which occur mostly while the fish is being hauled to the vessel, according to observers and fishermen. The program has reported the presence of Waved Albatrosses during fishing operations, which is a new to this fishery. This species is under significant pressure apparently from habitat degradation and also interaction with fisheries, so this new reports are an important warning of potential interactions. This unique data also contains information on fish school features, which allow us to assess foraging dolphins' behavior, to better understand foraging patterns of this group of mammals along the Peruvian Coast.

The Logbook and Onboard Observer Program is an important tool used in the adaptative management of the Peruvian Anchovy Fishery and is constantly updating and improving its methods both in data collection and analysis[4]. Although some biases should be dealt with, such as coverage and vessel selection, the quality and the amount of data provided by LOOP is of utmost importance for management.

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Fisheries observers and bycatch reduction research

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National Marine Fisheries Service, Wood Hole, Massachusetts, U.S.A.[2]

Introduction

Fisheries observers are critical partners in successful bycatch reduction engineering research. This presentation describes the role of observers in two projects funded by NMFS's Bycatch Reduction Engineering Program (BREP). The BREP was established by Section 316 of the Magnuson-Stevens Fishery Conservation and Management Act, as amended through January 12, 2007. The mission of the BREP is to develop technological solutions and investigate changes in fishing practices designed to minimize bycatch of fish (including sponges and deep sea and shallow, tropical corals) and protected species (including marine mammals, seabirds, and sea turtles) as well as minimize bycatch injury and mortality (including post-release injury and mortality). The BREP awarded approximately $1.4M in FY09 for internal NMFS projects to fulfill the BREP's mission. BREP projects for FY08 are described in the first BREP Report to Congress (http://www.nmfs.noaa.gov/by_catch/docs/brep_report_final.pdf)

Methods

Gulf of Mexico Pelagic Longline Bluefin Tuna Mitigation Research

Research was conducted in 2008 by the Engineering and Harvesting Branch of NMFS's Southeast Fisheries Science Center (SEFSC), Mississippi Laboratories, to evaluate the efficacy of a new 16/0 "weak" circle hook design in reducing the bycatch of bluefin tuna in the Gulf of Mexico yellowfin tuna fishery. All vessels participating in the experiment carried NOAA-trained observers who were well-versed in the experimental design. Each observer was trained in:

- Safety;
- Fish, marine mammal, and seabird identifications;
- Data collections; and
- The Operation of a pelagic longline fishing vessel.

Observers collected data as described by the SEFSC Pelagic Longline Observer Program. Observers recorded:

- Time and location of each section of gear as it was deployed and retrieved;
- Sea surface temperature; and
- Section number, treatment (hook model), time on deck, length, and species for each animal captured.

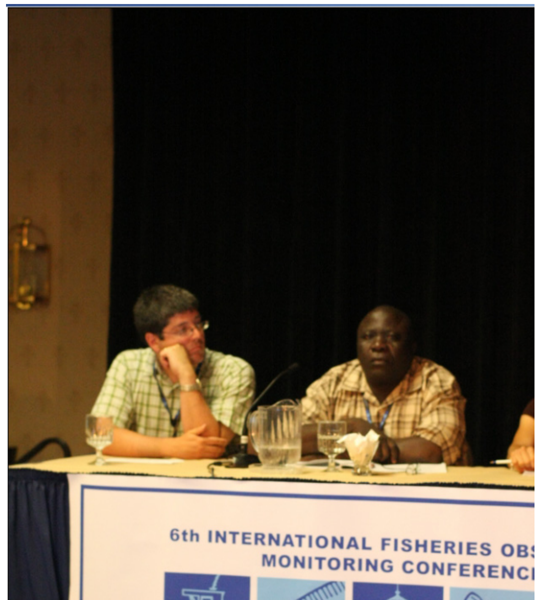
Observers also applied a carcass tag to each fish kept to match the dressed weight of the fish during unloading at the dock to the particular data collected on that animal at sea.

Gear Modifications to Reduce Harbor Porpoise Interactions in Commercial Gillnet Fisheries

Research is being conducted by NMFS's Northeast Fisheries Science Center (NEFSC) to determine and document conservation benefits for reducing harbor porpoise bycatch resulting from differing hanging ratios (0.5 vs. 0.33) in the sink gillnet fishery in the area south of the Cape

Cod South management area. All hauls during this experiment are to be observed by a trained data collector or NMFS-certified Observer on NMFS data sheets, recording:

- Catch of targeted species as well as harbor porpoise and other bycatch;
- Length frequencies of the targeted catch
- All gear and haul characteristics including time, temperature, location, soak duration, and depth will be recorded as per standard NEFSC protocols.



Left: Lee Benaka, NOAA Fisheries Service, USA

Right: Alpha A. Bangura, Deputy Director of Fisheries Ministry of Fisheries and Marine Resources, Sierra Leone

In addition, the observer provider will meet with the observers between trips to help address any unforeseen sampling issues and to ensure that the goals of the project are being met.

Results/Discussion

Data collected by observers are very important to the success of bycatch reduction engineering research. NMFS's Office of Sustainable Fisheries requested funds for 2011-2015 to cover the necessary observer monitoring for projects that would be carried out under a fully funded BREP. The Office of Sustainable Fisheries will continue to ensure that observer resources related to bycatch reduction engineering research are carefully considered in NMFS's long-term planning and budgeting efforts.

Fisheries observer programme in Sierra Leone and its implications on fisheries management

Alpha A. Bangura
Deputy Director of Fisheries Ministry of Fisheries and Marine Resources
Freetown
Republic of Sierra Leone

Sierra Leone lies on the West Coast of Africa is bordered on the West, North and Northeast by the Republic of Guinea, Southeast by Liberia and Northwest by the Atlantic Ocean. The country is endowed with abundant marine resources in the form of coastline fishing of 500km and over 200 species of fin fish and shell fish of which 80 species of scientific and economic importance are commonly encountered. The fishery sector provides food, employment and income. The Artisanal (small scale) fishery is important for the sustainable development of coastal communities and the overall fisheries contributes 9.4% to the GOP.

The Ministry of Fisheries and Marine Resources is the constitutionally mandated institution for the management and conservation of the fisheries and all living aquatic resources. In enforcing this constitutional mandate, it established and maintains Fisheries Observer program responsible for the collection of fisheries data from industrial vessels and major dockside communities. The Observers and dockside workers collect data on fishing events such as fishing area, fishing time, total catch, species combination etc.

Data collected is analyzed to provide vital information needed for making scientifically informed decisions for the conservation and management of the fisheries resources. Such management decisions include the effort control measure (access limitation), input control, (mesh size), area limitation (Insure Exclusion Zone), import/export obligation, biological control, MCS etc. Enforcement of fisheries law is carried out by the Maritime Wing (MW) of the Republic of Sierra Leone Armed Forces which is poorly resourced in terms of patrol boats/vessels, logistics and adequate finding.

Notwithstanding the usefulness and importance of MCS activities, the observer program in Sierra Leone is faced with institutional weaknesses such as poor funding to support effective fisheries observer program, shortage of trained observers, poor working conditions, lack of logistics and centralized infrastructural base (fish harbor) to provide dockside services. It is therefore recommended that the observer program be adequately supported in terms of proper employment and attractive conditions of service for observers, appropriate training, provision of necessary logistics and adequate funding from government, bilateral and multilateral donors/institutions.

Lastly, the Maritime Wing (navy) which ensures enforcement and compliance be adequately provided with appropriate patrol crafts/ boats, accessories and training.

Estimating bycatch and discards from observer data in tropical tuna purse seine fisheries: the case study of silky shark (*Carcharhinus falciformis*) in the Indian Ocean tuna purse seine fishery

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[2] University of Abobo-Adjamé (Abidjan, Côte d'Ivoire)

Data collected through 20 observer fishing trips were used to quantify the number of silky sharks taken as bycatch by the French tuna purse seine fishery of the Western Indian Ocean. 1,385 immature silky sharks of which 85% was discarded at sea and 15% retained aboard, were observed as bycatch during 685 fishing sets observed from October 2005 to April 2008. Zero-inflated negative binomial regression models fitted with Bayesian methods were used to explain silky shark bycatch as a function of fishing mode (free vs. fishing aggregating device-associated (FAD) schools), area, and season. Model results showed that silky sharks occurred in 24% of the fishing sets with an expected number of sharks per set estimated to be 2.02 (Sd = 6.13). The probability of added zeros is expressed as a logistic function of the fishing mode and the quarter, however the count regression feet better without covariates. FAD was shown to have a strong positive affect on the number of silky sharks caught, an expected value of 5.2 sharks being taken in FAD-associated schools versus 0.5 shark in free schools. There were significant differences in silky shark bycatch between seasons due to their probably of presence with higher bycatch than average in July-September. Results are discussed within the context of the ecosystem approach to fisheries for the analysis of ecosystem effects of fishing.

Question and Answer

The question and answer session below captures the dynamic dialog between panelists and the audience. Each discussion is separated by a double line break

Comment/Question
Keith Davis
Association for Professional Observers
USA

My question is for Mr. Bangura from Sierra Leone. With the limited resources that you have to provide support to observers, in regards to enforcing regulations and backing up observers when they do their job correctly- Do you have concerns for the overall quality of the data as a whole that is being collected, taking into consideration that some observers may be influenced or harassed out at sea and be influenced not to do their job correctly because you may not have the support to provide to them to back them up in the field?

Response
Alpha A. Bangura
Ministry of Fisheries and Marine Resources
Sierra Leone

The ministry or government is, of course, aware of the problems. I talked of inaccuracies and the type of data collected by observers. This can only be eliminated when government takes over the payment at provision of logistics and good conditions of service. So that will, more or less improve the quality of information that observers are collecting out there.

Comment
Keith Davis
Association for Professional Observers
USA

I think it would be advisable to have some international support for countries such as yours.

Response
Alpha A. Bangura
Ministry of Fisheries and Marine Resources
Sierra Leone

In fact, if you look at the recommendations made, the second to the last slide was talking of bilateral, multilateral cooperation in supporting observer programs. Definitely, we don’t have the resources and we don’t have the logistics. Very soon we’re going to get the support of the U.S. government to train observers, but this is a one time offer. There is a need for sustained support for some time for us to get started on a very sound footing. You are, more or less, correct. We’re looking forward to any support that would, more or less, help us improve our data collection.

Comment/Question
Steve Kennelly
NSW Department of Primary Industries
Cronulla Fisheries Research Centre
Australia

My question is to Lisa Borges, and perhaps to Kjell Nedreaas from Norway, about the difference in the discarding policies between European Union countries and Norway. How much of this can be seen as being due to almost the perfect situation in Norway where you have single species, highly selective gear and a discard band that sort of works there, because of the fact that they do have highly selective fishing gears and fairly minor specific fisheries. Although, even in some of their multi-species fisheries, they still get around some of the discard banding problems by using highly selective fishing tools.

How much of the cause between the differences are due to that highly selective nature of their fisheries?

Response
Lisa Borges
European Commission
Belgium

I would talk a little bit about the Norwegian system, and maybe the Norwegians in the room might disagree with me. I do think that the measures taken worked particularly in the stock I mentioned because of the mono-specific fisheries. They really only catch Cod because they have high control. I had the chance to ask the Norwegian Coast Guard how many vessels they had just to control their fishery. For that fishery they had 17 patrol vessels. We don't really have that level of control in Europe.

Now, I do know that I like to be a little critical of the Norwegian System, and I know that fisheries in other parts of Norway don't have as much control. Also, discard regulations are not as implemented as they could be on the stock I mentioned before, because the diversity of the fisheries is a little bit higher, and of course you have lower control. I do know that it works pretty well in Norway because there's also a cultural compliance that does not exist in Europe. However, I think that Europe is diverse, and I keep on saying that diversity of species increases with latitude. Northern European countries are mono-specific fisheries in high control and high compliance, and Southern countries tend to more loosely follow the law. For lots of species, it is more difficult to have some of the measures implemented like a ban for example in the Baltic, at least in my work experiences. Your question about the technical measures was a good point, because they are trying to increase the mesh size. The Commission attempted this, and the fishermen did not receive it well, and changed their gears in a way that was absolutely no improvement in the fishing exploitation pattern of the fisheries. Now that we have this two year recruitment year class approaching the Commission discussed that there is no point of increasing mesh size because fishermen will go around it.
Ideas for a solution to this are open to the floor or anyone with suggestions. I would like to see fishing effort reductions or area closures to go around the low control level and maybe to put a discard ban in place there.

Comment
Kjell Nedreaas
Institute of Marine Research
Norway

Well, I should say that there are many things we would like to improve, including not only better documentation, but better sampling and so on. We are sometimes accused of not having that when it comes to our discard ban, due to the poor sampling and documentation we have. I am very much is favor of the system we have and I believe its working. There are fisheries where we are not that clever in enforcement and in control, ensuring everything goes as we want it to. But, this is another issue that we improve on. When I return home from this meeting, after receiving all the input I've received here, I will write a suggestion for a better sampling method of discards, even if we should not have any discards in Norway. Although it is forbidden, we would still like to document it better. We were/are applying some of these improvements in the North Sea in collaboration with the .E.U. In 2007 Lisa was referring to discards of Cod in the North Sea. Of ten Cod that the E.U. Fleet caught, eight of them were discarded. In fishery biology, we are talking about two important concepts. The first is recruitment overfishing which deals with ensuring there are large enough spawning stocks, to produce new recruits. We can not compromise this, because we are then compromising natural laws. So, recruitment overfishing is something that we have to avoid. The other concept is growth overfishing, which is more up to managers. What kind of fishing pattern do we want and how do we want to utilize that growth potential that nature serves up? This is up to managers. Finally, I would say that Norwegian discard ban is built on the following concepts. Its requirements to change fishing grounds, its temporary area closures, and here talking with all these observers we have in the audience. Most of you observer programs today work on following the fishery. But, those observers we have in Norway, which I can define as observers, they are employed in order to manage and monitor these temporal closure programs. This is an important task, and should be an important task for observers in the future. Its important to not only passively follow the fleet but more actively go in and collect data from closed areas, whether they are temporary or not. Then we have a U.S. ban on discards and a list of species we have a ban on. Also, we have a lot of special regulatory measures, at least selective gear technology with sorting grids, and mesh sizes. The eliminator trawl that we heard about yesterday is something that we would definitely look into more.

Response
Kjell Nedreaas
Institute of Marine Research
Norway

I'm not sure I answered the last question properly. I was asked about whether Norway has a single species or mixed species fishery. In Norway we have a one species fishery, not mixed fisheries. Yes, the further North you come the more single species there may be. We are no dependent on a single species fishery to act. We use these sorting rates in addition to mesh size. For instance, in the Barents Sea, in the shrimp fishery we have four or five species that we catch together with shrimp. So, I would say lets try to find multispecies criteria which are possible in some instances. There is another method that we are following- we have strong regulations against by-catching unwanted endangered species. If we are dealing with a species that is not endangered, we take a more bio-economic approach to a solution. A Multispecies fishery is a bigger challenge, but it does not mean we should stop doing anything because of that.

Response
Lisa Borges
European Commission
Belgium

I think nothing should be a reason not to do something to protect stocks and to try to manage things and bring it back to normal and in good health. I think that a perspective that some of the countries might not have is that when you're managing 27 countries with very difficult realities, there's always a little bit of balance between a law that might apply to every country . The position of the Commission is always to say the law that applies to everyone, because everyone should be treated equally.

I just wanted to highlight the fact that the common fisheries policy is now under review. We are doing a reform. We have a whole year of consultation with stakeholders. We will hope that anything that is considered now in the common fisheries policy is open to discussion. TACs efforts, ITQs, the regionalization of technical measures, funding and subsidies for the fishing fleets, anything is open to discussion, and maybe the new common fisheries policy will have something that could deal with those discards in a different fashion and different ways within the different regions

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Question/Comment
Dennis Hansford
NOAA Fisheries Service
USA

My question is for Francis Van Oordt. You mentioned your program is voluntary coverage and collected a vast amount of data through that voluntary participation. My question is in regards to what you mentioned about some of the issues you're dealing with in estimate in mortality biases. What about your vessel selection? In a voluntary program you tend to get people who are for what you're doing and you're missing a segment. So in dealing with some of your biases, are you looking at vessel selection bias and how do you approach that?

Response
Francis Van Oordt
Instituto Del Mar Del
Peru

Yes, I'm not sure if I mentioned it, but 80 percent of the fleet are larger boats. Our observers would definitely choose the bigger more comfortable boats, or those boats that would take them. There is a bias there as well. We are trying to deal with that, it is being worked on.

Comment
Dennis Hansford
NOAA Fisheries Service
USA

I think in a couple of other presentations, I saw some of the same issues and it raised in my mind, some of the same questions dealing with vessel selection biases, and in terms of Kim's presentation as well. Geared devices, relative to some of the things that Lee had mentioned, I wonder is you two are talking about some bycatch reduction gear for gill nets that would eliminate or reduce some of the turtle takes that you are seeing

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Question/Comment
Pierre Meke
Ministry of Livestock, Fisheries and Animal Industries
Cameroon

My question is for Kimberly on the issue of gill nets for monitoring the sea turtle bycatch. I recall in a fishery in Nigeria we tried to do an FAO project- we tried to put on TED's, turtle excluder devices. However, when the boat left the port they had the TED on. When they were out at sea, they would take off the TED, and continued to fish without any device. The problem is that they would continue to catch turtles. In the case of the gill nets here, one of the solutions you suggested was to increase the mesh size. Maybe this is good, the small turtles can go through the nets, but what about the bigger ones? I believe in terms of policy implication, would you think that the best way may be to only bind the gill nets in that fishery?

Response/Comment
Kim Murray
NOAA Fisheries Service
USA

Just a point of clarification, I was saying one thing that you could look at further was restricting that ban to mesh sizes less than seven inches. Most of the turtles that we were catching were less than 75 centimeters. But they wouldn't be small enough to go through a five inch gill net mesh. But your point about whether or not a total ban would be an alternative option, I mean, ideally we want to allow the fishermen to continue their way of life and minimize that bycatch to the best that we can.

The ESA does, prohibit the taking of turtles; however, there are exceptions that can be made to allow an acceptable level to be taken in the fishery so long as it doesn't jeopardize the turtle population. So, if we can get a good assessment of what an allowable take level could be it might be possible to allow the fishery to continue fishing rather than a total ban. I think when the impact on the turtles is going to be extreme then you would have to consider a measure like that. Hopefully there would be alternative sources for the fishermen.

Comment/ Question
Vicki Cornish
Ocean Conservancy
USA

This question is for Lee Benaka about the bycatch reduction engineering program. This appears to be a new program that was implemented, or at least established under the Magnuson Stevens Reauthorization Act. I'm wondering what Congress's intent was behind implementing that program. How is it meant to expand the current cooperative research program that was focused on bycatch engineering, and reduction engineering? If Congress was really interested in pulling together an advanced effort on bycatch reduction, why wasn't there any funds to really get that program going? What do you see as the future for the program, in light of these funding constraints?

Response
Lee Benaka
NOAA Fisheries Service
USA

Thanks, Vicki. That's a great question and an issue that I've thought about a lot over the past few years. If you just look at the language in the Magnuson Reauthorization Act, it's fairly vague. It says that the agency shall create a regionally based bycatch reduction engineering program but it doesn't really say how much money it should be spending on it. It didn't identify a specific authorization of funds for that program. When this language is being bandied around before the Magnuson Act was reauthorized, we did go through an exercise of determining what we call the 100 percent requirements for such a program.

It went out to all the science centers and regional offices and ended up with estimates around the country of needing around $6,000,000.00 to $8,000,000.00 per year that would allow us to hire new people to do the gear research as well as funds to carry out the research. At some of our science centers and regions, we only have one person really who is dedicated to working on bycatch reduction engineering research. In other regions and science centers we do have more than one person. The best example is the southeast fishery science center with the Pascagoula lab that has a staff of five or six people who spend a lot of their time on the gear research.

So, as you know, at NOAA fishery service the funding and planning is done on a five year cycle looking at several years in advance. So right now we're getting into the fiscal year 12 to 16 planning process. Each year since the bycatch reduction engineering program was established, we've put in proposals for the 100 percent funding. For various reasons, it hasn't been funded to that level. We did get an increase for fiscal year 2009 of around $500,000.00. For fiscal year 10 we're looking at ways to take money that's already planned for the budget, some increases, and figure out ways that our program can link into it. For example, there is some additional money for annual catch limit implementation.

So we're looking at ways, trying to identify fisheries where bycatch might prevent a fishery from having as high an annual catch limit as possible. If there's a bycatch gear solution that would allow the annual catch limit to be higher than we're going to make a case that some of that money should be spent on bycatch research. Now the big buzz word in the NOAA Fishery Service long term planning and budgeting is catch shares. A lot of resources are being devoted and are planning to be devoted to implementing new catch share programs. So that'll probably be another effort in the future is to figure out how bycatch reduction will relate to catch share programs.

There is talk of catch share programs targeted at bycatch catch shares for particular fisheries, so that might be another angle. But for 12 to 16 we're still going to put in another full request. As far as I can tell, whether it's a stand alone request or whether it's lumped in with a bunch of other stuff, it's hard to say. There might be a thought among the budget folks as you go up higher through NOAA. That Magnuson Reauthorization was 2006. It's old history. We're doing new things now, and the time is gone. But, we're going to keep trying to make the case that there's a program that was established that's not fully funded, and it's important to get full funding for it.

Comment/Question
Vicki Cornish
Ocean Conservancy
USA

Is that 100 percent program requirement that you solicited from your various regions, is that available to the public?

Response
Lee Benaka
NOAA Fisheries Service
USA

I'm not sure if it is. I can provide at least the summary of it. Feel free to contact me. I think there's reference to it in the annual report to Congress, or at the least the process that was gone through. But if anyone's interested in more details about that let me know and I can get back to you. Thanks.

Panel Session 4:

How can fishery monitoring information be used to ensure compliance with fisheries regulations?

Moderator: **Mark Showell, Department of Fisheries and Oceans, Canada**

Speakers

Sarah Wetmore –USA
Northeast Fisheries Observer Program: Facing challenges in a changing program.

Joe Arceneaux –USA
An introduction of the IATTC Tuna Transshipment Observer Program (are we looking at a real solution to a worldwide problem?)

Greg Workman –Canada
The accuracy of yellow eye rockfish catch estimates from British Columbia groundfish integration project.

Garland Walker –USA
Observers and the enforcement process.

Nathan Lagerway –USA
Enforcing observer victim crime.

Todd Dubois –USA
Law enforcement concerns in international observer programs.

Jann Martinsohn – Italy
Towards the integration of new technologies based on molecular biology, genetics, chemistry and forensics into a European framework for fisheries monitoring, control and surveillance.

Introduction to the session

Panel session four was the first "Enforcement Panel" prepared at these series of conferences. Session 4 Panel members hail from the United States, Canada and the Europe and discussed fisheries compliance, enforcement and how it improves the accuracy of landings statistical systems. Enforcement is essential to combating, reducing and eliminating IUU fishing, and also provides protection and support of fisheries observers.

Enforcement is an essential aspect of fisheries monitoring worldwide, and here in this forum, we are set to have panelists present and discuss important issues that directly relate to fisheries compliance and observer programs worldwide. What technological advancements will aid enforcement efforts in the future? What challenges are being faced by enforcement officials and observers, and what international issues are observers and enforcement officials running into, and how is enforcement essential for data collection accuracy improvement?

Northeast Fisheries Observer Program: Facing challenges in a changing program

Sarah Wetmore
National Marine Fisheries Service, USA

The Northeast Fisheries Observer Program (NEFOP), traditionally a science-based program, over the past several years has expanded to include an in-season quota monitoring data collection component. This transition, along with development of an Industry Funded Scallop Observer program, has had significant impacts on Northeast Fisheries Observers, and the program in general. Investigation into several years of associated observer data and observer performance describe the influences of regulatory and program complexities and their affects on training, retention, data quality, and overall achievement of program goals.

An introduction of the IATTC Tuna Transshipment Observer Program (Are we looking at a real solution to a worldwide problem?)

Stuart Arceneaux
NOAA Fisheries Service, Pacific Islands Region, USA

In June 2008 at the 78th meeting of the Inter-American Tropical Tuna Commission (IATTC) a resolution was passed to establish a program to monitor transshipment activities. Resolution C-08-02 Resolution on Establishing A Program For Transshipments By Large-Scale Fishing Vessels. This resolution replaces the earlier C-06-04The resolution comes into force on January 1st, 2009 and applies to all carrier vessels of each IATTC party and cooperating non-party that tranship at sea. The formative concerns are outlined in the preamble, included below.

The Inter-American Tropical Tuna Commission (IATTC):

Taking account of the need to combat illegal, unregulated and unreported (IUU) fishing activities because they undermine the effectiveness of the conservation and management measured already adopted by the IATTC;

Expressing grave concern that organized tuna laundering operations have been conducted, and a significant amount of catches by IUU tuna longline fishing vessels have been transshipped under the name of duly licensed vessel;

In view therefore of the need to ensure the monitoring of the transshipment activities by large-scale longline vessels in the Convention Area, including the control of their landings;

The IATTC transshipment observer program is based on the Regional Observer Program (ROP) of the International Commission for the Conservation of Atlantic Tunas (ICCAT). The Pacific Islands Regional Observer Program of NOAA Fisheries Service in Honolulu, Hawaii hosted the training. Using ICCAT's pre-existing ROP as the model for the IATTC's program (and the IOTC), is a step towards implementing a consistent standard. Transshipment observers would be able to be deployed wherever the need in whichever oceanic region. MRAG accessed a pool of trained observers with experience in two important areas. One, they had experience identifying tunas caught in pelagic longline operations. Two, the observers had some basic familiarity with certain Asian cultural issues. The PIRO observer training staff had access to two subject matter experts in the area of tuna transshipment, Ebol Rojas and Ethan Browne.

Independent estimation of yelloweye rockfish catch from electronic monitoring data[1]

*Greg Workman, Rick Stanley, Norm Olsen, Andrew Fedoruk
Department Fisheries and Oceans, Canada

The Canadian Groundfish Integration Pilot Project (CGIPP) is an industry led initiative that began in 2006. The intent of the program is to rationalize five separate hook and line or trap fishing sectors. Prior to rationalization by-catch in one single-species or multi-species fishery was often the target of another. This resulted in unaccounted for, under reported or unreported catch or discard mortality. These non-target catches were essentially unknown making it difficult to manage individual species amongst sectors.

Two key elements of the project were to 1) develop a monitoring system that provided accurate estimates of all retained and discarded catch and 2) implement Individual Vessel Quotas (IVQ), wherein each vessel has access to a fixed portion of the annual Total Allowable Catch (TAC) for a given species. The Monitoring system comprises a 100 % fisher logbook (FL) program requiring vessel masters to maintain a log of piece count s by set by species for both discarded and retained catch, a 100% dockside monitoring program (DMP), where each vessel is met when offloading and their catches enumerated, and a 100% electronic monitoring (EM) or at sea observer monitoring (ASOP) program.

Under the CGIPP fisher's are also required to land 100% of their rockfish catch. Rockfish are caught by all hook and line sectors, as directed or incidental catch, and have a near 100 % mortality rate associated with capture due to barotraumas. Yelloweye rockfish are easily identified on video, high value, at low levels of abundance and are a species of concern to the Committee on the status of endangered wildlife in Canada (COSEWIC) therefore validating the catch of this species is of significant interest to both industry and resource managers.

Sector	Total catch in pieces		
	Fisher logs	DMP	%Difference
Halibut (Outside)	39,880	39,988	0.3%
Halibut/Sablefish (Outside)	10,411	10,128	-2.7%
Lingcod (Outside)	2,008	2,056	2.4%
Rockfish (Inside)	554	519	-6.4%
Rockfish (Outside)	14,159	14,063	-0.7%
Sablefish (Outside)	292	304	4.1%
Dogfish (Inside)	1,581	1,563	-1.1%
Dogfish (Outside)	3,499	3,531	0.9%
Total (Outside)	70,249	70,070	-0.3%
Total (Inside)	2,135	2,082	-2.5%
Total (Coastwide)	72,384	72,152	-0.3%

Table 1. Total catch of yelloweye rockfish in pieces by sector as recorded in fisher logs and DMP FY08/09

Several audits are performed to evaluate the veracity of the fisher's logbooks, first the DMP piece counts are compared to fisher's reported retained catch, second 10 % of the video footage (VF) from each trip is reviewed and the results compared to reported event or set by set information in the FL and thirdly the FL is compared to sensor log of GPS locations and times for specific events. As long as there is no more than a 5% difference in piece count for the first two audits the Fisher log (FL) will be accepted as the official trip record, if there is a greater than 5 % difference addition video may be reviewed or the skipper may be asked to carry an observer.

In Table 1, note that the greatest difference between FL and DMP is a little more than 6%, in general there is good correspondence between these two sources of catch information. Here we derive a third estimate from the random review of video footage (VF). Because video is collected at the time of capture it cannot be corrupted by misreporting or discards and can be used to produce an unbiased independent estimate of total catch, in doing so we can validate fisher's retention of Yelloweye rockfish. We use standard stratified sampling estimators[2] to extrapolate the 10% random sample of events to total catch across sectors by treating each gear sector as a stratum and each event within a stratum as an observation. For any combination of strata the stratified mean is the weighted sum of the individual stratum mean estimators. The estimator of the stratified total is the product of the stratified mean and the total number of events. We then bootstrap with replacement, N=1000, to generate a 95% confidence interval around the estimate of catch.

Sector	Total piece counts					
	VF	Lower 95% CI	Upper 95% CI	Fisher logs	DMP	% Difference
Halibut (Outside)	34,547	27,704	42,043	39,880	39,988	-13.4%
Halibut/Sablefish (Outside)	11,144	7,153	15,596	10,411	10,128	7.0%
Lingcod (Outside)	2,310	1,810	2,858	2,008	2,056	15.0%
Rockfish (Inside)	536	335	772	554	519	-3.2%
Rockfish (Outside)	16,991	12,120	22,894	14,159	14,063	20.0%
Sablefish (Outside)	359	31	1,109	292	304	22.9%
Dogfish (Inside)	1,282	908	1,695	1,581	1,563	-18.9%
Dogfish (Outside)	4,496	2,380	7,430	3,499	3,531	28.5%
Outside	69,847	51,198	91,930	70,249	70,070	-0.6%
Inside	1,819	1,243	2,467	2,135	2,082	-14.8%
Coastwide	71,666	52,440	94,398	72,384	72,152	-1.0%

Table 2. Comparison of VF-estimate, FL and DMP piece count by sector, Region and Coastwide FY08/09

In Table 2 we compare the estimates derived from video extrapolation (VF) with both dockside monitoring (DMP) and Fisher Log estimates of total Yelloweye rockfish catch. The percent difference shown is the difference between the VF estimate and the Fisher log, differences range from -18.9% to +28.5%. While these differences appear large relative to the proscribed 5% tolerance on variation from counts the actual Fisher log estimate always falls within the 95% CI of the extrapolated VF estimate of Yelloweye catch and overall coast wide and across sectors there is no significant difference between the Fisher log count and estimates derived from the video review (-1%). Agreement between Video estimates, fisher log and DMP estimates indicate there is negligible unreported discarding or dumping of this species in these fisheries. Furthermore this review of the CGIPP catch monitoring program indicates that it is providing sufficiently accurate total catch estimates of Yelloweye rockfish for manager to feel certain that quotas are not being exceeded.

Notes:
1. This presentation summarizes work published as: Stanley R.D., N. Olsen and A. Fedoruk. 2009. Independent Validation of the Accuracy of Yelloweye Rockfish Catch Estimates from the Canadian Groundfish Integration Pilot Project. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 1:354–362
2. Scheaffer, R.L., W. Mendenhall, and L. Ott. 1979. Elementary survey sampling, 2nd edition. Duxbury Press. Belmont, California.

The observer's role has both a scientific and enforcement function

Garland Walker
Attorney, NOAA General Counsel for Law Enforcement, USA

I would like to focus on three topics:[1] the evolution that I have witnessed regarding the way that observers in Alaska are *perceived* by the Agency and by the monitored fleets;[2] the current cooperation between the North Pacific Groundfish Observer Program (NPGOP), Enforcement and General Counsel, and;[3] the latest issue of protecting the confidentiality of observer data[2].

1. PERCEPTION. When I arrived in Alaska in 1996, my impression in dealing with observers (and with the observer program) was that they did not wish to be viewed as doing enforcement monitoring. Indeed, I believe observers, whether consciously or unconsciously, felt that the observer's purpose aboard a vessel was purely scientific; they wanted to be viewed as separate from any enforcement function. (And there is no argument by me that an observer's function aboard a vessel is primarily to gather scientific data.) Both the observer program and the enforcement program, whether consciously or unconsciously, cooperated in and perpetuated this view not by what they did but by what they failed to do.

Garland Walker
NOAA GCEL

Both the observer program and the enforcement program in the initial development of this relationship failed to acknowledge that regardless of the perception that he Agency desired to project for observers, as long as the observer reports back to the Agency, the observers very presence on the vessel will naturally be viewed by the vessel as having an enforcement component. Moreover, the observer sees whatever he/she sees and, if they see a violation then they are expected to report it. Simply put, it is impossible to separate the observers' scientific observations from observations that might have an enforcement function.

It was with the acceptance of this truism that the on-board observer has both a both a science and enforcement function that the observer program and the enforcement program started to effectively coordinate with each other. This acceptance also allowed the Agency to more clearly articulate to and plan with the fleet in light of these dual functions. This was good for observers, the observer program and enforcement. With better coordination came the genesis of a very successful relationship between the observer program, the enforcement program and the observed fleets.

It can not be over emphasized that the fleet is a crucial component in this relationship. This is because it is the fleet that ultimately carries the observers on their vessels; its where the rubber boots meet the deck. It is on these vessels that observers must live and work. Therefore, in order to be truly honest with the fleet, consistent in the regulatory requirements that govern a fleet, and protective of observers on these vessels, I believe that observer programs must accept that when observers are placed on a vessel, they will be viewed as serving two masters -- science and enforcement.

If I have any piece of advice to pass to observers and developing observer programs it would be to not run from this fact. Rather, observer programs need to acknowledge and plan from their inception that the observer's role has intrinsically both a scientific and an enforcement function.

2. CURRENT PROCEDURES; COOPERATION BETWEEN THE NPGOP, NMFS Office of Law Enforcement (OLE) and GENERAL COUNSEL (GC). Others on the panel will likely detail the cooperative efforts between the NPGOP, OLE and GC [4]. However, I want to make clear that *in NOAA, observers are not authorized to be and are not expected to act as enforcement agents*. With that said, observers do play a vital part in helping NOAA enforce its regulations[5]. In the evolution of the observer's role as referred to above, NOAA has tried to find that appropriate balance between the observer's dual functions. In the Alaska region, this is how we have done this. In the observer's initial training, OLE agents train observers to *recognize but not enforce* potential regulatory violations. On deployment, observers note in their log any potential violations that they witness. After deployment, observers are debriefed by an OLE agent stationed at the NPGOP. If potential violations are noted by the observer, the observer is asked to write a statement attesting to his/her observations. Other OLE personnel are then assigned to investigate the potential violation noted in the observer's statement. If the violation proves to be factually founded, an administrative penalty or a civil or criminal charge can result and lead to a trial. The trial would be handled by myself or another federal prosecutor. The observer likely would be a crucial witness in any prosecution. Simply put, in Alaska, cooperation and coordination between NPGOP, OLE and GC is early, often, and continuing.

3. THE LATEST ISSUE: PROTECTING THE CONFIDENTIALITY OF OBSERVER DATA. NOAA is concerned with insuring and, under many statutes, has a legal obligation to insure, the confidentiality of any observer information that might reveal the identity of a vessel, person, fishing location, or proprietary business practice. This is a surprisingly complex issue. Currently, aggregation of data (i.e., unless data is aggregated from at least three or more sources, it will not be publically released) and removal of personal and business identifiers are among the methods being explored to insure confidentiality of observer data prior to any public release. The processes to insure the confidentiality of observer information is currently being further refined by GC, OLE and the observer programs.

Notes:

1. All comments are the author's subjective views and are not intended to represent the views of the NOAA, any program administered by or under the authority of the Agency or any other person employed by the Agency.
2. As to specific issues or questions about the operation of the (NPGOP), I would encourage you to speak directly with any of the representatives of the NPGOP that are at this conference. As to specific field enforcement issues, I would encourage you to speak directly with any of the representatives the NMFS Office of Law Enforcement who are at this conference.

3. It should also be noted that the NPGOP, OLE and GC all work together to develop and review any regulations impacting the observer program.
4. Personal communication (12/29/08). Patti Nelson & Ren Narita, NOAA Fisheries Monitoring & Analysis Division, 7600 Sand Point Way N.E., Building 4, Seattle, Washington 98115.
5. United States vs. Enrique Reynaldo Deras, Case No. 3:07-mj-00014-DMS (D.AK., filed Feb. 16, 2007), United States vs. Eduardo Ornelas Morales, Case No. 3:07-mj-00084-DMS (D.AK., filed May 1, 2007), and United States vs. Lauti Fale Tuipala, Case No. 3:08-mj-00085-DMS (D.AK., filed April 15, 2008).

Enforcing crimes against observers

*Nathan Lagerwey and John Kingeter
NOAA Fisheries Service, Office of Law Enforcement, Alaska, USA

In 2008, there were 421 observers certified by the North Pacific Groundfish Observer Program (NPGOP) who served 703 deployments totaling 39,322 data collection days on Alaska vessels and at processing plants[1]. Because of the isolated and confined environments in which these observers live and work, observers are uniquely vulnerable to workplace crimes.

Over recent years, there have been several prosecuted observer cases in Alaska Federal Fisheries. Charges included harassment; sexual harassment; assault; interference; tampering with equipment, data, & personal effects; mechanical and physical sample bias; and coercion. Some of these prosecutions resulted in criminal prosecutions and jail time[2].

Nathan Lagerwey
NOAA Fisheries Service, USA

Crimes against observers can result in severe personal trauma and professional, social, and economic cost to the victim and resource. Careers can be cut-short by the physical and psychological damage. Perpetrators, vessel owners, and operators can be held jointly and severally liable. And, marine resource managers, researchers, and budget planners may see crucial data lost or compromised.

<u>Methods</u>

Within the Alaska Regional Fisheries Management Organization (RFOM), observer related cases are investigated by the NOAA Fisheries Office of Law Enforcement, Alaska Enforcement Division (AKD) under the Magnuson Act or MMPA authority. Since 1998, the AKD has provided dedicated staff to investigate observer reported violations and to maintain a partnership with the NPGOP. The goal of the partnership is to work together on compliance, policy, program development, rule making, and observer training. These combined efforts help to reduce the negative impact of crimes committed against observers and ultimately against government programs, marine resource management, honest stakeholders, and research science.

The NPGOP, in partnership with the AKD and University of Alaska, trains observers to document potential violations while they are deployed[3]. Observers then complete statements during debriefing, and the NPGOP forwards the statements and supporting documents to the appropriate authority. Statements involving marine resource jurisdiction are forwarded directly to the AKD[4].

Based on observer statements, AKD initiates a variety of law enforcement efforts to help protect observers, improve and validate data quality, and ensure honest industry reporting. Law enforcement efforts include:

1) Investigations & Prosecutions
    a. Intelligence Tracking
    b. Notification and Voluntary Compliance
    c. Verbal or Written Warning
    d. Summary Settlement – Agent/Officer discretion.
    e. Civil Prosecution – NOAA GC Attorneys
    f. Criminal prosecution – U.S. Attorneys
2) Victim Support
    a. Victim/Witness Assistance and Protection
    b. Sexual Assault Response Team (SART)
    c. Referral to Victim/Witness Services
    d. Adherence to Victim/Witness Bill of Rights 42 U.S.C., 10606(b)
3) Community Oriented Policing & Problem Solving (COPPS)[5]
    a. Partnerships with NPGOP and other NOAA divisions.
    b. Observer training and education.
    c. Stakeholder outreach and education.

Results/Discussion

This presentation provides an overview of crimes against observers and data collection within the Alaska RFMO and of the partnership between the AKD and NPGOP. The intent is to stimulate discussion that might help to improve similar international, national, and regional partnerships and law enforcement efforts that can serve to minimize the impacts of crimes against observers, data, and the resource.

Notes:

1.50CFR §679.50(b) - The purpose of the Groundfish Observer Program is to allow observers to collect Alaska fisheries data deemed by the Regional Administrator to be necessary and appropriate for management, compliance monitoring, and research of groundfish fisheries and for the conservation of marine resources or their environment.

50CFR §679.50(j)(ii)(B) - Observers must accurately record their sampling data, write complete reports, and report accurately any observations of suspected violations of regulations relevant to conservation of marine resources or their environment.

2. NPGOP, NorPac Database - During calendar years 2006 – 2008, 1005 observer statements were forwarded from the NPGOP to the AKD.

3. http://www.cops.usdoj.gov/default.asp?item=36, COPPS is defined by the U.S. Department of Justice as, “a philosophy that promotes organizational strategies, which support the systematic use of partnerships and problem-solving techniques, to proactively address the immediate conditions that give rise to public safety issues such as crime, social disorder, and fear of crime.”

4. NPGOP, NorPac Database - During calendar years 2006 – 2008, 1005 observer statements were forwarded from the NPGOP to the AKD.

5. http://www.cops.usdoj.gov/default.asp?item=36, COPPS is defined by the U.S. Department of Justice as, “a philosophy that promotes organizational strategies, which support the systematic use of partnerships and problem-solving techniques, to proactively address the immediate conditions that give rise to public safety issues such as crime, social disorder, and fear of crime.”

Law enforcement concerns in international observer programs

*Todd Dubois, NOAA Fisheries Service, USA
Engelke-Ros M, USA

Regional Fishery Management Organizations (RFMOs) require high quality, unbiased observer data to conduct stock assessments and make appropriate fishery management decisions. The NOAA Offices of Law Enforcement and General Counsel for Enforcement and Litigation (Enforcement) play a critical role in the development of the U.S. position on the international observer schemes at the RFMOs to which the United States is a party. In this capacity, Enforcement has been advocating for the adoption of provisions that provide for the safety of observers, protect data integrity and ensure that observers are not prevented from carrying out their duties.

As has been the case with many domestic observer programs, international observer programs have struggled with balancing their scientific data collection and compliance monitoring roles. The position of Enforcement is that there are elements of both roles in all observer programs. Observers “observe” and, because their observations may be the best available information on fishing activity, the data that they collect needs to be available to scientists, fishery managers, policy-makers and enforcement. RFMOs have increasingly begun to adopt conservation measures (e.g., bycatch mitigation measures, bottom fishing measures with move-on rules, etc.) for which compliance can only be effectively monitored through the use of observer data.

Increasing reliance on observer data to meet a myriad of science, management and compliance needs creates incentives to circumvent the observer and introduce sample bias (e.g., through mechanical or physical pre-sorting) or otherwise impede an observer’s ability to carry out his/her duties (e.g., through harassment, interference, etc.) and emphasizes the importance of including a law enforcement perspective when designing international observer schemes. In addition, it has long been the position of Enforcement that, regardless of the overall compliance role of observers in any given observer program, law enforcement personnel must be allowed access to observer data. Through the involvement of law enforcement and legal counsel in the development of international observer schemes, instruments can be drafted that support the intent and goals of the observer program and fishery managers while providing adequate protections for observers and for the integrity of the data that they collect.

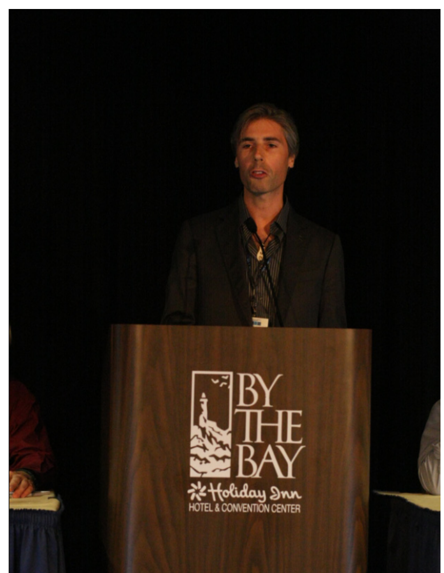
At their recent summit meeting, the five tuna RFMOs agreed to convene a workshop on Monitoring, Control and Surveillance in 2010. Among other things, this Workshop will undertake the development of a Model Scheme of Observation. There seems to be a trend among new and recently-amended schemes towards modernizing international observer schemes by clarifying the obligations of both vessels and observers and enhancing accountability.
The effort being undertaken by the tuna RFMOs will provide an excellent opportunity for the international community to expand on this trend by agreeing on minimum standards for observer programs including provisions addressing protection of the observer, protection of data integrity, access to data and accountability.

The increasing importance of partnerships between observer programs and law enforcement in the RFMO context would benefit from a dedicated workshop on "Legal issues in Observer Programs" at a future International Fisheries Observer Conference. Workshop topics could include domestic and international law, international fisheries treaties, privacy laws, confidentiality of observer collected data, legal uses of observer data, consequences of observer involvement in court proceedings, development of sampling protocols that support compliance measures, evidentiary uses of observer information and protection of observers at sea.

Towards the integration of new technologies based on forensic genetics and chemistry into a European framework for fisheries monitoring, control and surveillance

Luca Arnaudo[1], Alessandro Ghigi[2], Floriana Folisi[1] and *Jann Th. Martinsohn[1]
European Commission, DG Joint Research Center, Institute for the Protection and Security of the Citizen[1]
The FishPopTrace Consortium[2]

Introduction



Jann Th. Martinsohn
European Commission, Italy

Monitoring, Control and Surveillance (MCS) are key to the European Union (EU) Common Fisheries Policy (CFP), and the availability of efficient law enforcement measures is indispensible for fisheries management schemes.

The importance of effective MCS strategies is highlighted by the global problem of Illegal, Unreported and Unregulated (IUU) fishing. Having reached huge levels, IUU fishing threatens marine ecosystems, undermines sustainable fisheries management and hampers socio-economic development. The value of IUU fishing amounts worldwide to an estimated €10-20 billion annually[1], more than twice the value of total landings by the EU fleet[2].Moreover, there are numerous cases where fish (product) has been sold using false labeling, showing that worldwide criminal conduct extends into the fisheries supply chain. MCS by remote sensing and electronic reporting is well established and referred to in the EU legislation. In contrast, a corresponding EU-wide MCS infrastructure, based on forensic genetics and chemistry, is currently not available, despite there being a great potential to combat illegal fishing, support fairness and transparency, and for species and origin verification for traceability along the fish (product) supply chain ("ocean to fork").

Examples, where these analyses have been successfully applied, clearly demonstrate their feasibility and benefit for MCS. However, to fully integrate new technologies based on forensic genetics and chemistry into an elaborate and coherent EU or international MCS framework, cooperation between all stakeholders will have to be established.

Methods

Controlling for compliance with existing fisheries regulations depends on an identification system capable of answering the following questions swiftly and reliably:

- What fish species is it?
- Where was the fish caught?
- Is it possible to trace the fish(product) above and below in the food supply chain?

Species identification through DNA analysis, even on processed products, is established. Projects like FishTrace[3], or the international Fish Barcode of Life Initiative (FISH-BOL)[4], provide online catalogues compiling reference DNA sequences derived from voucher specimen, allowing samples to be identified without prior species knowledge. These catalogues are publicly accessible and control authorities can employ "in-house" laboratories or academic research institutions to use those for species identification. On the contrary origin assignment of marine fish remains more challenging: Populations (stocks) of marine fish species mostly exhibit extensive gene flow between regions, and the detection of genetic differentiation heavily relies on sophisticated statistical techniques. To assign samples with sufficient confidence, large numbers of polymorphic genetic markers and comprehensive population data sets are required.

FishPopTrace[5], an international project funded under the EU 7th Framework Programme, aims at developing end-user tools for fish population structure analysis and fish(product) traceability. Validated panels of Single Nucleotide Polymorphism (SNP) markers for geographic origin assignment will be generated for the commercially important fish species cod (*Gadus morhua*), hake (*Merluccius merluccius*), herring (*Clupea harengus*) and common sole (*Solea solea*). The use of otolith microchemistry for fish origin assignment will also be explored. Developed tools for MCS will be scrutinized by applying forensic standards.

Discussion

IUU fishing has high priority on the international policy agenda. The FAO international plan of action to prevent, deter and eliminate IUU fishing was adopted 2001. However, as it remains a growing problem, in 2008 the European Community adopted a regulation providing a legal framework to fight IUU fishing, entering into force on 1st January 2010[6].The central pillars of this regulation are a catch certification scheme, international cooperation, and support to developing countries. Independent control measures will be crucial for the implementation of this regulation. Here DNA and chemical analysis can provide powerful tools, revealing deceit reliably, rapidly, in a cost effective manner, and along the entire supply chain. The potential of genetic analysis was also emphasized in a recent European Commission proposal for a CFP control reform[7]. Species identification by DNA analysis is already applied frequently to reveal fraud, as shown in the U.S.A[8] and Europe[9]. Origin assignment of fish based on DNA technologies or chemistry for fisheries MCS is still uncommon. However, in Denmark, a fisherman who declared a false origin of cod was recently convicted based on evidence obtained by genetic analysis, and meanwhile the Danish control authorities established a permanent collaboration with the Danish Technical University for the of use genetic analysis in fisheries control[10]. Despite these achievements, a coherent EU or international approach to ensure the availability of such technologies to control and enforcement authorities, as well as acceptance in courts, is lacking. Forensic validation would greatly support this aim, but enhanced cooperation and a mutual dialogue between all relevant stakeholders is also urgently needed. FishPopTrace facilitates the integration of these tools into MCS schemes by following an elaborate technology transfer approach. This implies engagement with stakeholders such as the industry, control/ enforcement authorities, international organisations, and policy-making institutions to identify requirements in the context of law and policy frameworks. Moreover, emphasis will be put on relevance, costs and potential for uptake.

Notes:

1. Agnew, D.J., *et al.*. 2009. Estimating the worldwide extent of illegal fishing. PLoS ONE 4 (2), e4570.
2. European Commission DG Mare Press Corner
3. http://www.fishtrace.org/
4. http://www.fishbol.org/
5. https://fishpoptrace.jrc.ec.europa.eu
6. Council Regulation (EC) No.1005/2008 establishing a Community system to prevent, deter and Eliminate illegal, unreported and unregulated fishing. Official Journal of the European Union L 286/1.
7. European Commission 2008. Proposal for a Council Regulation establishing a Community control system for ensuring compliance with the rules of the Common Fisheries Policy. COM(2008) 721 final.
8. Personal Communication. P. Raymond. NOAA Office of Law Enforcement. 263 13th Avenue South St. Petersburg, FL 33701, U.S.A.
9. Annual Report 2007/08. Institute for Hygiene und Environment Hamburg Germany.
10. Personal Communication. L.B. Erikson. Danish Fisheries Inspectorate.

Question and Answer

The question and answer session below captures the dynamic dialog between panelists and the audience. Each discussion is separated by a double line break

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Question/Comment

Joe Arceneaux
NOAA Fisheries Service
USA

Within the European Commission, do the observer programs play anything as far as product identification or ensuring, like the example you raised? Baltic Cod was not from North Sea or vice versa.

Response

Jann Martinsohn
European Commission
Italy

Actually, this is an EU members' state affair and indeed, observers and inspectors are capable of identifying fish or fish products. Interestingly enough, in Denmark actually what is going on (I find this quite impressive and would like this to happen all over Europe) is that inspectors work together with the academic institutions, in this case the Danish Technical University. They have a little kit which can take sample tissues for example, and can send them back to the university lab to perform genetic analysis in order to identify the fish species or where the fish comes from

Comment/Question

Larry Beerkircher
NOAA Fisheries Service
USA

This question is for Todd. If you want to use observer data for enforcement compliance in a less than 100 percent coverage fishery, it seems to me that the starting point of unbiased compliance would be getting observers out on selected vessels to begin with so they could witness those violations. So given relatively scarce enforcement resources, is there any priority placed on allocating investigations and compliance enforcement to issues of observer refusals and safety issues before those of the actual fisheries violations that are witnessed by the observers?

Response
Todd Dubois
NOAA Fisheries Service
USA

Our perspective is that refusals and definitely avoiding observer coverage is critically important. It certainly has varied, based on enforcement resources, but I think that we've got a very good handle on it in the United States. I don't know I would welcome comments from other countries as far as whether this is an issue for them. But you're absolutely right. If we can't get observers on the vessels that the program decides need to be observed for those less than 100 percent programs you're undermining the entire credibility of the system and of the data. So the Office of Law Enforcement feels that's a critical piece and we do take those very seriously.

Comment/Question
Kim Dietrick
Consultant
USA

Nathan described really well the laws that protect U.S. observers from certain behaviors while being deployed on U.S. vessels. But I'm wondering if there are similar international laws protecting observers from, sort of, similar behaviors while onboard fishing or transshipment vessels in international waters?

Response
Joe Arceneaux
NOAA Fisheries Service
USA

Within the transshipment programs the roles and responsibility of both the captain and the vessels and the observers are clearly defined. Currently what's happened is that the observers maintain good contact with MRAG, which is their contractor. I think there have been a few instances of things that were brought down through miscommunication, and were resolved really quickly, once the secretariat of the particular RFMO was in contact with the reefer company. There are a few minor things I can think of but I won't go into them, but they were resolved rather quickly. I don't know that they actually have the weight of say an international legal instrument. But there is some written documentation, maybe on a case by case basis, that seems to be adhered to.

Response
Todd Dubois
NOAA Fisheries Service
USA

I can only speak initially from the United State perspective – the Office of Law Enforcement and the Office of General Council has worked very closely with the Office of International Affairs and the RFMO as well as the State Department to really push for the observer schemes to ensure that we have safety protocols, observer data bias issues to cover all that. In fact, I think CCAMLR down off Antarctica and the tooth fish issue is the most recent example.
I may defer somewhat, if after you want to speak – with Megan, the enforcement attorney from GC, she can probably answer that better from the CCAMLR perspective. But it basically comes down to the conservation measures and the observers schemes, and we have to continue to push collectively to make sure that we have strong support in those conservation measures and then that the nations involved in that implement the domestic regulations necessary to protect the observers and enforce those conservation measures.

Question/ Comment
Jason Vestre
West Coast Groundfish Observer Program
USA

First of all, I have to say I am definitely grateful for enforcement support. I couldn't do my job otherwise. There would be too much fear. I've spent years establishing good working relationships with the fishermen in my port, and this talk of enforcement makes me nervous. I'm a little bit nervous to be in the same room with a special agent. Somebody mentioned programs don't want to be associated with enforcement. I definitely do not because of these relationships. So my question, I think maybe for Mr. Walker, do you make any effort on the prosecution end to exclude the observer from the prosecution? Or are we the trump card you put on your forehead?

Response
Garland Walker
NOAA GCEL
USA

Well, Jason, I guess the answer to that question is like a lot of legal questions and that is, "it depends". What I mean by that, of course, is if the observer is the only person who observed that violation then there's little choice than to use the observer as a witness. Now, having said that, we don't try to use the observer as a hammer, I guess you would say. If we can keep the case out of court, if we can prove it in other ways we would try to do that if the observer has a hesitancy to appear in court or for whatever reason. We try to take the personality or the circumstance of the observer into consideration, but we still ultimately need to do our job, and you can certainly understand when there is a violation, we need to prove that. So it depends if we have to use the observer's testimony or have to use the observer in court. The bottom line is we always try to work with our witnesses and with the observers to use them in whatever fashion they're comfortable with.

Question/Comment
Georg Hinteregger
Observer
USA

My question is for Sarah Wetmore. During your excellent summary of your complex mission in the northeast, you alluded briefly to difficulties that observers experience on scallop vessels. You mentioned that this is industry funded. I thought perhaps that this was the source of the problem that some of these observers were experiencing.

I was surprised to hear that your scallop observers are having these kinds of difficulties since I understand that scallop vessels are allowed additional catch to compensate for the cost of carrying the observer, and that that additional allocation often exceeds the actual costs. So, in many cases it's actually profitable for them to carry an observer. It motivates them to cooperate with the program. Do you think that it would be helpful to sever the direct link between vessel profit and observer compensation? I understand the industry funded multi-observer provider model has been authorized for the Northeast, do you anticipate more such problems with observers in the future?

Response
Sara Wetmore
NOAA Fisheries Service
USA

Thank you for your question. There are a bunch of questions in there. I guess, at first, I would have to think back to the beginning of this program, and there are some difficulties that the observers do have because of the different compensations when a vessel is allowed to go into an access area versus an open area. So that is real. They are allowed to keep more catch, when they have an observer onboard, in an access area, so we did find that there were some observer affects. There's a poster from a couple of my colleagues here that describe that affect.

I did mention that we do have vessel call-in coordinators that try to anticipate fleet behavior and actually communicate a lot with fishermen and try to avoid any kinds of observer affects. The call-in coordinators definitely, reselect and reselect particular vessels that are avoiding coverage, so we are trying to balance things out. As far as changing this paradigm, I'm not sure that I have thought about it enough. Maybe some of my colleagues here would like to answer that question, but there are a lot of positives to the program as well.

Comment/Question
Lisa Borges
European Commission
Belgium

I have more comments for Garland and Todd. I understand when you talk about making laws a little bit more implementable and simple by working together with control people. The department I work for in the European Commission was recently restructured because we realized that the conservation people put all of these management plans and measures in place to reduce exploitation, but the control people work in a different department, and when they found themselves with laws, kept on saying, " I don't know how we are going to do this". Now, the control people and the conservation people are working together on the same team. I understand that the observer role in a program always has that imminent enforcement part of it".

I am always worried when enforcement and science mix. Two and a half years ago in the last conference, I gave a talk about what happened in Ireland- when the observer data of the scientific program was called into a major police and prosecution case for misreporting landings. Now, the cause of that was actually the complete collapse of the data collection system in Ireland, which collapsed the stock assessment process, resulting in no scientific advice management for two years

Now they are back up and working with the industry getting data. Being the Chair of the data extrapolation workshop, there is so much that you can do with statistics data. If you are observing, it is completely biased because of enforcement. You definitely have a problem. Although I understand your point, which we are trying to resolve, but be aware that data quality is a huge issue and I do not know how to resolve that.

Response
Garland Walker
NOAA GCEL
USA

Thank you, Lisa that was a very good point. I think it's not uncommon in all of the programs, and I think it's a very delicate balancing act. I think part of it is the partnership; one, it helps ensure that if there are laws put in place or there are the observers put in that situation or if the data is going to be used for enforcement purposes the expectation is laid out up front so that the industry is aware of it, and that we sell it collectively as both the scientists, the managers and the compliance of the value of us all working together to develop a program that takes into account everybody's sensitivities and issues. I'm not sure if it's true or not to say that data integrity is completely affected if there is a compliance function or not. I welcome the opportunity to talk to you later.

Question/Comment
Craig Loveridge
Ministry of Fisheries
New Zealand

I have a question for Joe on the tuna transshipment program. Joe, I'm presuming that the tuna popsicle, come out of the hole fairly quickly and they are transferred fairly quickly, so they observer doesn't have a lot of time to count all of the fish. I was wondering if you considered using some sort of electrical monitoring system that the observer could set up so when the transshipment was over, maybe they could review what happened. If it was times or parts of the process they were unsure of, maybe that they got their count wrong or they were unsure of a species at all.

Response
Joe Arceneaux
NOAA Fisheries Service
USA

No, but that doesn't mean it's a bad idea. Yeah, you're right. I think there is a good opportunity in the case with monitoring transshipment operations that you could very well have a role documenting the units very commonly come across as a string either with video or photographs in a case that actually does happen. We're still trying to make it better. We haven't decided not to do that and I think there is certainly, potentially a role for using some electronic monitoring or electronic augmentation of the system to keep track of it for verification, validation, and what not.

Question/Comment
Pierre Meke
Ministry of Livestocks, Fisheries and Animal Industries
Cameroon

This question is directed to Nathan Lagerway. Despite the cost, we have to pay for the observer. We need them onboard all the vessels at the end of the day because they are our witnesses to know what is going on. But in terms of enforcement, I believe that the protection of observers will depend on the way we use the information. I mean, there is a need to put a time lock between the reports given by the observers and the prosecution phase. They should not be a direct link between the information brought by the observer and the prosecution phase. We can give a time lag for the assumption. I would like to know do you have records or statistics on all the cases you've raised here about, for example, sexual assaults and so on? What did you do? What happened? What kind of measure did you take later on when you have registered all these cases? Were those significant in your fisheries?

Response
Nathan Lagerway
NOAA Fisheries Service
USA

The incidents of sexual assault are pretty rare. In regards to what you mentioned about separation and time the observer is onboard the vessel- in Alaska fisheries we have observers that are aboard vessels for a couple months at a time, generally (trip length could be a matter of days to up to three months) so the first thing that we always consider, if the observer is still onboard the vessel, is how is what we're doing going to affect that observer aboard the vessel, Is the observer coming off of the vessel? Does the observer want off the vessel? There are a lot of things that we have to balance before enforcement takes any action. That's further complicated whenever you have an observer that's still observing the same vessel and, or the same fleet, because there may be rumors that go through the fleet. I don't know if that answers the question.

Panel Session 5:

What factors should be considered when addressing access to fishery monitoring information?

Moderator: **Dennis Hansford, National Marine Fisheries Service, USA**
Speakers

Roger Fleming – USA
Public access to fishery observer data as a critical component of management.

Shelly Bond – Canada
Data sharing and data accessibility in Canada.

Amy Van Atten – USA
When it rains it pours- a programs struggle to balance data collection and data dissemination.

Keith Hagg – USA
A case study in agency implementation of statuses- The confidentiality requirement and associated expectations under the Magnuson- Stevens Fishery Conservation Act.

Introduction to the session

What are the considerations that should be addressed when seeking access to fishery observer information? This question has given raise to valid concerns from resource managers, fishermen, non-governmental organizations, and scientists alike. From perspectives ranging from; data collected by observers contain proprietary information thus making it confidential and non-releasable to information collected on a public resource should be made completely available to the public.

What are the rules for access to and confidentiality of data collected through public versus private funding? How can we gain access to proprietary and fishing operation information? What are the tools for accessing confidential information? What are the tools for proper data storage?

In the U.S., the release of observer information is guided by provisions on confidentiality in the Magnuson-Stevens Reauthorization Act (MSRA Section 402(b)) and Marine Mammal Protection Act (MMPA Section 118(d) (8) and (9)). Under the MSRA, observer information is considered to be confidential and shall not be disclosed, except in accordance with certain exceptions. The MMPA also prohibits the release of information that is proprietary in nature.

This session examined how these concerns are being addressed on an international level. Speakers were welcomed form various countries representing government and non-government organizations and shared their respective approach to accessing fishery monitoring data.

Public access to fishery observer data as a critical component of management

*Roger Fleming, Esq[1], Tom Rudolph[2]
Earthjustice, Maine, U.S.A[1]
Cape Cod Commercial Hook Fishermen's Association, Massachusetts, USA[2]

Introduction

It is widely recognized that the ocean and the fisheries resources within it are public trust resources belonging to all of us as citizens. As public trust resources, the government agencies entrusted to manage them must do so with an eye toward ensuring they are managed for the long-term best interests of all living and future citizens[1]. Integral to this is the public's right to know how its resources are being managed and to have the opportunity to participate effectively in resource management decisions.

The availability of fisheries data is critical to effective public participation and sound management. Stakeholders and the public must have access to data to so they can help craft management solutions, make informed decisions, and participate effectively in our representative democracy. Inclusion of new language on fishery observer data confidentiality in the Magnuson-Stevens Reauthorization Act of 2006 (MSRA), however, may create long-term management problems, depending upon the nature of the implementing regulations crafted by NOAA Fisheries. In the absence of such regulations, the language created problems for stakeholders in 2007 - 2008 because NOAA Fisheries, in at least some cases, appeared to put a freeze on data releases.

Fortunately, the situation has improved under the new Obama administration, as White House directives on government transparency have helped to unclog the information pipelines with embrace of the concept that openness in government should prevail[2]. However, problems remain. Data important to fisheries management are often aggregated or spatially blurred in ways that severely limit stakeholders' ability to participate in the management process effectively. Also, clear procedures for access to information are not available and there is confusion over what may be released and how. Finally, the process appears to strain NMFS resources and may be inefficient.

Our nation has long recognized, as reflected in laws like the Freedom of Information Act, that open government makes for better decision-making and there is a presumption that the information held by the government is available to the public unless certain exceptions prevent its release[3]. This presumption of disclosure also suggests that agencies should take affirmative steps to make information public rather than waiting for specific requests from the public[4].

Methods

A compelling example of the problems described above from the New England fisheries will be illustrated and explored. Potential solutions will be explored.

Results/Discussion

In November 2007 the New England Fishery Management Council (NEFMC) initiated a re-examination and overhaul of the monitoring system in the Atlantic herring fishery. In response, in November 2007, the Cape Cod Commercial Hook Fishermen's Association (CCCHFA), a longtime participant in this management plan, promptly requested comprehensive observer data in order to undertake analyses of the existing program as a necessary precursor to designing new measures through the fishery management plan amendment process. NOAA Fisheries initially approved the data request, but subsequently rescinded approval prior to delivery of the data. The agency finally delivered limited data in January 2009. In the interim, significant work had been done on the new monitoring amendment and stakeholders like CCCHFA had to rely on internal analyses by NOAA Fisheries. These were valuable, but also in large part different than those CCCHFA would have undertaken.

New regulatory guidelines addressing the MSRA's confidentiality provisions must ensure timely public access to fisheries-related information. The MSRA modified section 402(b), but importantly did not change the provision providing the Secretary with clear authority to release or make public confidential fishery observer information, so long as the release does not directly or indirectly disclose the identity or business of any person who submits such information[5]. The public is still waiting for updated confidentiality regulations in response to the MSRA's changes. Public access to such information is critical to ensuring that fisheries management decisions are made in a manner consistent with the government's public trust responsibility for the nation's marine resources.

We recommend that NOAA Fisheries take the following steps: 1) recognize that the fisheries data they collect is largely gathered with public funding and pertains to their management of a public resource for the long-term benefit of all citizens, 2) embrace the presumption that such information should be publicly disseminated, unless an exception clearly applies, as a critical part of good management, 3) in view of the apparent current policy of responding to data requests expeditiously, strive to improve upon the timeliness of responses to information requests so that stakeholders can effectively participate in the management process (and do not re-institute freezes on data releases), 4) make the deliberations over the new MSA confidentiality regulations transparent and subject to a definite timeline (and immediately inform the public about the (ongoing) rulemaking process), 5) make raw observer data public to the maximum extent possible in near real time to expedite its availability and free staff from the burden of conducting multiple custom queries, and 6) recognize that any data not made public must be subject to rigorous outside auditing with specifications designed with public participation.

Roger Fleming
Earth Justice, USA

Notes:

1. Mary Turnipseed, et. al, The Silver Anniversary of the United States' Exclusive Economic Zone: Twenty-five Years of Ocean Use and Abuse, and the Possibility of a Blue Water Public Trust Doctrine, 36 ECGLQ 1 (2009).
2. Presidential Memorandums to the Heads of Executive Departments and Agencies re: Freedom of Information Act, and Transparency and Open Government, 74 Fed. Reg. 4683, 4685 (January 26, 2009).
3. The Freedom of Information Act, 5 U.S.C. § 552 as amended by Public Law No. 110-175, 121 Stat. 2524 ("Openness Promotes Effectiveness in Our National Government Act of 2007").
4. Presidential Memorandums.
5. 16 U.S.C. §1881a(b)(3).

Data sharing and data accessibility in Canada

Shelley A. Bond
Fisheries and Oceans Canada Science, Maritimes Region
Bedford Institute of Oceanography, Nova Scotia, Canada

Introduction

Science Branch of the Department of Fisheries and Oceans Canada (DFO) in an on-going effort to improve the management of scientific data holdings has implemented the Management Policy for Scientific Data. Scientific data held by DFO are a valuable national resource which must be properly managed for the benefit of the citizens of Canada. One of the basic principles of this Policy to be discussed here is that data must be made available to the user community at large.

In the Canadian Maritimes Region DFO's Science Branch manages, in accordance with the Policy, the catch, effort, and sampling data collected by fishery observers. These data represent over thirty years of investment and are a rich source of data collected over a large geographic area from a wide range of fishing activities. DFO provides appropriate subsets of these data upon request to DFO scientists and fishery managers, NGOs, consultants, universities, and other researchers. This practice further enriches the understanding of the Marine environment to the ultimate benefit of all Canadians.

Basic Principles

The Basic Principles of the Policy are:

1. "Fisheries and Oceans Canada (DFO) scientific data sets are valuable national resources that have been acquired through decades of investment, enabling the Department to maintain world leadership in aquatic sciences and aquatic management. These data are irreplaceable, and must be protected and managed to ensure long-term availability.
2. Because of the complex and often unique nature of scientific data, it is essential that DFO Science/Oceans maintain responsibility for their quality control, management, archiving and dissemination.
3. To ensure proper management and archival of data, all scientific data collected by the Department must be migrated to a 'managed' archive immediately after the data have been processed.
4. To obtain maximum benefit to the Department and to the user community at large, scientific data must be made available in a timely manner with full and open access, consistent with

Departmental, national and international obligations with respect to its data holdings.
5. To obtain access to international data and information that are pertinent to Canadian needs, Canada must be able to exchange its data with other world data centers[1]…".

DFO further recognizes that 1) the privacy of individuals must be maintained when providing access to data 2) to obtain access to international data that are pertinent to Canadian needs, Canada must be able to exchange its data with other parties and 3) to avoid improper use or misinterpretation of the data a knowledgeable contact person should be identified.

Exceptions to the Policy are:

- "DFO investigators have written approval from the Regional Science/Oceans Director to delay access to the data; in such cases, the letter of approval will include the rationale for the delay, and an agreed-upon date for the release of the data;
- There are third party agreements, privacy concerns, or legal restrictions;
- The data are of commercial benefit to DFO, in which case they will be managed according to Departmental intellectual property management regimes and prevailing policy. The data would be protected under s.18 of the Access to Information and Privacy Act[1]."

Discussion

In an effort to facilitate access to the observer data for external parties DFO provides discoverable metadata on the Internet. This information is available through various discovery portals including GeoPortal, GeoConnections, and the Global Change Master Directory.

Potential users are asked to complete and sign a data use agreement available online through the metadata which outlines restrictions on the use of the data as provided, identifies a knowledgeable contact person to provide the appropriate result set and assist in proper interpretation, and states that DFO has the right to review the results of the analysis before any publication.

To protect the privacy of individuals DFO uses the three vessel rule, i.e. there must be more than three vessels involved in the subset of data. Nothing which identifies the vessel or the observer is provided to external parties.

These practices 1) enhance DFO's relationships with external organizations 2) improve the overall quality of the data as errors discovered during analysis are reported 3) facilitate peer review and 4) increases the understanding of the marine environment. All of which ultimately benefits the Canadian public as a whole.

Notes:

1. Management Policy for Scientific Data. On line at http:/www.dfo-mpo.gc.ca/science/data-donnees/policy-politique-eng.htm

When it rains it pours – A program's struggle to balance data collection with data dissemination

Amy S. Van Atten
NOAA Fisheries Service, Northeast Fisheries Observer Program, Massachusetts, USA

The Northeast Fisheries Observer Program (NEFOP) is a multi-purpose program, providing observer coverage in over 30 different fisheries in eleven states from Maine through North Carolina. NEFOP data are used to monitor real time quota catch levels, evaluate bycatch patterns of declining fish stocks, sea turtles, sea birds, and marine mammals, and other protected species, and collect basic information to assess the status of marine resources. During times of regulatory change with significant actions that impact fishing communities and the marine environment, observer data becomes of particular interest. During these times, there tends to also be Congressional interest to increase observer coverage. Observer Programs can quickly become overwhelmed as they are tasked with additional funds, as they must coordinate additional training and certification of observers, modify contracts, recruit more debriefers, respond to more compliance issues, process more data, and respond to additional data inquiries. One recent regulatory change was the Standardized Bycatch Reporting Methodology (SBRM) Omnibus amendment that requires an annual discard report based on NEFOP data to be prepared by the Northeast Fisheries Science Center (NEFSC) and provided to the Fishery Management Councils. The annual discard report includes: (1) the number of observer sea days scheduled for each fishery, by area and gear type, in each quarter; (2) the percent of total trips observed, by gear type, in each quarter; (3) the distribution of sea sampling trips by gear type and statistical area in each fishery; (4) the observed catch and discards of each species, by gear type and fishery, in each quarter; and (5) the observed catch and discards of each species, by gear type and fishery, in each statistical area. Another recent change was with the Magnuson-Stevens Reauthorization Act (MSRA) amended Section 402(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) to require the confidentially of observer information. This authorizes NMFS to release confidential information in "any aggregate or summary form that does not directly or indirectly disclose the identity or business of any person". The Agency is working on standardizing the release of observer data.

Amy Van Atten
NOAA Fisheries Service, USA

In the last two years, there have been significant regulatory actions in the Scallop Fisheries Management Plan requiring the development of an Industry Funded Scallop Program, the Herring Management Plan, the Multispecies Groundfish Management Plan, and the Squid, Mackerel, Butterfish Plan all relating to monitoring needs. The NEFOP must balance staffing needs to meet coverage requirements, reporting requirements, respond to hundreds of specialized requests for data summaries, research interests, and sample collection projects, and further develop automated processes for allowing access to observer data, while trying to minimize the total costs of observer programs. Regular funding to support long-term employment of data analysts and computer programmers can help to ensure specialized training and skills to meet sophisticated data warehousing and web-supported access that meets the confidentiality regulations.

A case study in agency implementation of statutes – the confidentiality requirement and associated exceptions under the Magnuson-Stevens Fishery Conservation Act

Keith A. Hagg
NOAA, Office of the Assistant General Counsel for Fisheries

Under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the National Marine Fisheries Service (NMFS) must maintain the confidentiality of any information submitted in compliance with the Act and any observer information[1]. The Act includes exceptions that allow for the disclosure of confidential information if certain conditions are satisfied[2]. In addition, the Act authorizes NMFS to publically release confidential information in an aggregate or summary form that does not directly or indirectly disclose the identity of any person who submits such information[3]. The first step in implementing statutory language is to determine whether the language is clear on its face or ambiguous and subject to interpretation[4]. For aspects of the statutory language that are ambiguous, courts will defer to an agency so long as its interpretation is reasonable[5]. In interpreting and implementing ambiguous aspects of the MSA's confidentiality requirement, exceptions to the requirement, and the authorization to release information in aggregate or summary form, NMFS considers various – and often divergent – interests such as those expressed within the agency, the fishing industry, non-government organizations, research institutions, and federal and state law enforcement among others. Factors to consider include legal constraints, protection of proprietary information, the need for release of information to advance law enforcement, scientific research, and transparency in NMFS implementation of other provisions of the Act, and the importance of consistency when responding to requests for information.

Notes:

1. Management Policy for Scientific Data. On line at http:/www.dfo-mpo.gc.ca/science/data-donnees/policy-politique-eng.htm
2. 16 U.S.C. 1881a(b)(1), (2) (2009).
3. 16 U.S.C. 1881a(b)(1)(A)-(H), (2)(A)-(C).
4. 16 U.S.C. 1881a(b)(3).
5. Chevron, USA Inc. v. National Resources Defense Council, 467 U.S. 837, 843 (1984).
1 Id.

Question and Answer

The question and answer session below captures the dynamic dialog between panelists and the audience. Each discussion is separated by a double line break

Question/Comment
Craig Loveridge
Ministry of Fisheries
New Zealand

I'm actually part of the information management group. Part of what we do is we process regular requests for information from the Ministry of Fisheries, and a lot of those requests deal with observer data.

We operate under a piece of legislation called the Official Information Act, which is very similar to the U.S. Freedom of Information Act where we have to balance the public good of releasing the information versus the sensitivity associated with the information, and observer data is considered sensitive for reasons that it does contain trade secrets and commercial information. It's sensitive because if it were to be released improperly there could be problems with future provision of that information.

So for us in New Zealand there's always a balancing act between how much public interest there is in releasing the information versus what level of information we will release to that source. If there's high public good we'll generally release more information at a greater level. If there's reasonably low public interest or public good then we'll release more summarized information. My group does that on a regular basis. I have something I'd like Roger to consider and to talk more about if he could. I mentioned that in New Zealand one of the things we often have to do is balance the sensitivity of observer information against the future provision of information. The fact that if we were to release information improperly then we may not be able to get an observer out into the fishery again, because the fishers may not take an observer, or they may seek to impair their observer's workload in some way because they felt that there was some secret that was released improperly or details of their fishing operation were released improperly. I'd like to know whether that is – because that comes to your recommendation on point five- observer data publicly available to the highest level possible. I'd like to know whether you feel that in your situation that's a likely thing that might happen, that future provisions might be impaired or endangered if observer data is released at too fine a level?

Response
Roger Fleming
Earth Justice
USA

The short answer to your question is yes. There is a level at which I think that there is risk to the long term provision of accurate data. As I sat here and I listened to the presentations, I guess the image that was created in my mind is that there's something of a sliding scale here. The issues that we're putting on the table have to do with really at what level the data is protected and the timeliness of the provision of that data, which is also an important issue.

Now when I look at section 402 or even if I look at the broader provisions of the Freedom of Information Action, I think that there's clearly focus on data that might directly or indirectly disclose the identity or business of a person. That's from the

Magnuson Act. Or, as we've discussed, commercial trade secrets, commercial or financial information from the Freedom of Information Act. I don't think that my clients would quibble much with these specific exemptions from disclosure. One way to look at it is Keith's discussion of what is reasonable. I think that my clients and our firm's perspective is that this is a public trust resource. The fact that the public owns these resources should heavily influence the level of aggregation of the data. I think that there is a point at which the accuracy of the data may be compromised. I also think that there are other tools to address those issues. Simply put, there is a command and control approach to this as well. It's a privilege to fish. To some extent, fishermen just need to recognize that it is a privilege, and that as a part of that privilege they need to accurately and precisely report information.

I guess my final point would just be that from our perspective we need to try something new. Because right now, if you look at a case study that we highlighted, we don't really feel that there is accurate and precise data being collected right now, at least in that one particular fishery that we've focused on, so something needs to change. Hopefully by injecting some more public trust perspective into this we can move it in the right direction.

Response

Craig Loveridge
Ministry of Fisheries
New Zealand

Thanks, Roger. Just as a follow-up, again from the New Zealand example. There is one provision in the official information act that when somebody requests data from the government, because the government holds the observer information, we have to respond to that within 20 working days. So that's in our legislation as well, and, yes, I look forward to talking with some of the panel members later.

Comment
Amy Van Atten
NOAA Fisheries Service
USA

I can provide a bit more information, because I personally received the data request from the case study that Roger described. The request itself was very extensive. It required over seven pages of script writing. It included multiple databases, so it was a complex request. At the same time we were waiting for the final reauthorization of the Magnuson Act, which was redeveloping the confidentiality guidelines and regulation for release of observer data. Prior to the reauthorization we had a different approach to releasing observer data.

In light of what was going on, the timing of the request was bad. We were still trying to develop national standards. We had an initiative to come to an agreement between 13 different national observer programs on what level of aggregation we could provide data requests, and this is because we have some companies that request information from multiple observer programs, and we needed to have a standardized approach that we could all live with. We have now developed those policies. The data are available to the managers within 24 hours in some of the fisheries we observe, and 90 days for the detailed data for other fisheries. We generally handle our requests.

Our data requests are generally responded to between three hours and two weeks. We usually have a fast turn around time for data requests; it depends on the rule making process, and what's going on at that time. Also, I presented over 150 slides and made presentations on this particular fishery, (the herring fishery) at council meetings and committee meetings to address fishers' concerns of river herring bycatch. I would like to further emphasize that the lack of accurate and precise data that's not being collected, is a result of the difficulty in observing fishing operations and not the collection of observer data itself.

Question/Comment
Debra Duarte
NOAA Fisheries Service
USA

Do you feel that the public's right to the access of observer data supersedes the fisherman's right to confidentiality of their trade secrets?

Response
Roger Fleming
Earth Justice
USA

I think it's a balance. I think that, from our perspective, as I described it's a public resource. I would tilt the balance in the favor of disclosure. I think that when you're looking, for example when you're going through the aggregation or summary process your concerns or specifically stated in the statute directly or indirectly, disclosing the identity or the business of any person. But I think you can provide pretty detailed information for the public without specifically identifying directly or indirectly the individual. It's always been difficult for me to fully comprehend how, for example, providing relatively detailed information on where bycatch might be occurring. For example, how that might impact an entity's commercial interest. So that's my response, I would tilt the balance more toward disclosure unless it's a specific statutory exemption.

Comment
Debra Duarte
NOAA Fisheries Service
USA

Well, I'm the one that performed the aggregation for the case study you mentioned. So if you have any better ideas for how we could perform such aggregation in the future, I'd love to talk to you.

Question/Comment
Elizabeth Griffin
Oceana
USA

I do think the fish and the data are a public resource and should be treated as a public resource, so it concerns me to hear the speakers from the U.S. government talking about this process to put out new regulations. I'm concerned that there hasn't been much public input in the process. Have you done any reaching out to stakeholders to see what NGOs and fishermen want from the data and what could be done within the constraints of the Magnuson Act to make the data useful to stakeholders?

Response
Keith Hagg
NOAA General Counsel
USA

I mentioned in my presentation, that NMFS is going to post revised regulations under section 402 that will tell the public how it is approaching the issues that we're talking about now through revised regulations for the handling of confidential information under Magnuson. We have the requirement to maintain the confidentiality of the information and there are some exceptions to that requirement. The section of the act that we're talking about is taking some time to revise, but I hope that this will come to a conclusion in the next couple months and we will issue a notice for public comment. We certainly want to see what the public has to say and all the interest groups that have any concerns.

Response/ Comment
Amy Van Atten
NOAA Fisheries Service
USA

Elizabeth, we do provide a lot of data summaries to NGOs, at the NGOs request. Multiple NGOs will request data. They do get the data in an aggregate form in a very fast turn around time. Aggregated refers to having three observed vessels within that strata, whatever that strata is, based on the level of data that they're requesting. If it can't be done with three trips then we roll it up to the next level to which it can be released.

Response/ Comment
Roger Fleming
Earth Justice
USA

This relates to the point that Elizabeth was making in her question, which is, essentially, public input on the process for use of and access to data. The agency talks about aggregation to the level of three vessels. I'm not sure how that was determined. I don't think the public has had an opportunity to weigh in on that type of aggregation or aggregation by "area" either. I'd like to emphasize Elizabeth's point, which is that the process can be improved through public involvement. Even hearing the comments from people from other countries here today has triggered a lot of different thoughts in my mind about how this can be improved. I strongly encourage the agency to get this out to the public for public input while it's still in a relatively formative stage.

Comment
Dennis Hansford
NOAA Fisheries Service
USA

It does sound like we're hearing from both sides, and I agree. I'd like to hear from a more international aspect. When I first started this session, I prefaced it by saying that the U.S. is walking a tight wire trying to have a nice balancing act, protecting the confidentiality of observer data while being responsive to data requests. While it might seem straightforward with our laws about whether or not data, observer data in particular, is releasable; there is, as Keith pointed out, some clarification on the regulation is needed. When that is completed, there will be an opportunity for the public to comment on it.

Question/Comment
Keith Davis
Observer/APO Board Member
USA

I'm speaking pretty much on behalf of Elizabeth Mitchell who was supposed to be on this panel.

The way I understand that process, in 1994 it started off the data being identifiable to a person. Then that evolved to the three boat rule restricting the public access to observer data from three or fewer vessels fishing within a 10 square nautical mile area. Now it seems like it's becoming more restrictive as far as the rules would protect the identity of corporations or industry cooperatives, and I think that could really be very restrictive to the public access of the data. Single companies could fish an entire ecosystem and it wouldn't fall under public scrutiny, as far as I understand it. For instance, in the North Pacific I've worked on vessels that have been in experimental areas where there are only one or two vessels in that area. It's a new area where we're catching species that – I don't know – different stuff that may not even be categorized, way out in the western Aluetians, and that may be just one instance. I just wanted to follow-up with what Liz Mitchell stated in her abstract. It is only through transparency that the public develops trust in NOAA decisions to end over fishing and marine ecosystem destruction.

As far as the cooperatives, can you make any sort of comment about is it moving toward restricting it to the public access to cooperatives and going beyond the three boat rule?

Response
Amy Van Atten
NOAA Fisheries Service
USA

We have a couple of fisheries in the Northeast; the red crab fishery comes to mind. We do like to use the cooperative because it's the identity of a business. So, there might be multiple vessels observed, but they are all owned by one vessel. Another fishery is the Menhaden Fishery in the Mid-Atlantic. When we say we don't release the data or the data are confidential, it means that we don't release the information on catch at a "tow by tow" or trip level. Linking the latitude and longitude, for example with catch information is something that we are trying to avoid doing by aggregating on a larger level. It is not that their information in unavailable, but that it can't be released to the exact catch location or latitude and longitude.

Question/Comment
Keith Davis
Observer/APO Board Member
USA

I think by aggregating in some instances it could destroy the utility of the data at that level.

Response
Amy Van Atten
NOAA Fisheries Service
USA

Yes, and I think that's what the concern is in public access. That information is directly available to the managers and to the scientists doing the stock assessments. Managers and scientists have that information at the detailed level. They have direct access through an access agreement. So they're aware of it and they are performing the analysis. It's just when the public wants to do their own analysis, that data at that level might not be available.

Comment
Jorgen Dalskov
National Institute for Aquatic Resources
Denmark

As Bjorn Stockhausen mentioned, the European Union implemented a new data collection framework last year. According to this data collection framework, all members have to give open access to all data collected, not to primary data level but to detailed level. The difference between primary level and detailed level, that's just the identity of the vessel. That means they almost have access to raw data. All member states have to deliver the data if someone applies for the data. All member states have to deliver the data within 20 working days. If member states don't do that the financial support from the Commission, which is up to 50 percent of the total cost, can then reduce their support by two and a half percent. In Denmark the whole program is six million euros per yea, so if they deduct two and a half percent of the six million euros it will really be a problem for us. We're facing that now. I'm pretty sure it will probably create chaos in all European countries but we'll see.

Question/Comment
Steve Kennelly
NSW Department of Primary Industries-Cronulla Fisheries Research Centre of Excellence
Australia

In my state, when people put freedom of information requests in they're charged $50.00 for an administrative fee. When the request gets assessed, if it is estimated to cost much more than $50.00 to process it, a quote is given to the applicant. These can run into thousands of dollars. This tends to slow down bogus requests, allowing real ones to be dealt with. I was just wondering if you have a similar situation where you charge for those sort of requests?

Response
Amy Van Atten
NOAA Fisheries Service
USA

Yes, we do. We're able to charge fees for the FOIA requests. We generally haven't done that but we can charge for any of the materials it costs and the hours that it would take to complete the request. The case study that Roger gave was actually not a FOIA. It was just a casual data request. All of our FOIAs do come with stringent guidelines. I think it is also a 20 day turn around.

Comment/ Response
Steve Kennelly
NSW Department of Primary Industries-Cronulla Fisheries Research Centre of Excellence
USA

And just one final thing, I just wondered at what point does the confidentiality protections on observer data, how that plays out in a criminal court if there's a subpoena for data from an observer, for example, who is subpoenaed to give information. Is he protected using that law or is it required? If the judge directs him to give information, does he have to obey the subpoena?

Response/ Comment
Amy Van Atten
NOAA Fisheries Service
USA

Yes. We release the information through a subpoena.

Comment/Response
Roger Fleming
Earth Justice
USA

Amy is correct about the charges. There are criteria for getting fees waived under U.S law. One of the things FOIA encourages agencies to do is once a data request has been made for those agencies is to make that data request public. That would be one way, for example, to potentially slow down the rate of the request. For a broad request, like in the case study, there's a lot of information that was requested, and a lot of information that was provided. There may be several data requests that are completely avoided if that information is made easily accessible to the public.

Response
Amy Van Atten
NOAA Fisheries Service
USA

And one last thing about the fees, the observer programs never see that money. I don't know where it goes but it certainly doesn't come to the program.

Comment
Lori Steele
New England Fishery Management Council
USA

I'm the herring fishery management plan coordinator for the New England Fishery Management Council, so I am responsible for the development of this new amendment for catch monitoring in the Atlantic herring fishery and have been part of the process that Roger and Amy have referred to in their case study. I don't really have a question, just a comment. I just wanted to acknowledge the hard work and long hours of labor that Amy and her group have done to contribute to the management process. In my opinion, Amy and her group have gone above and beyond to provide information to the public and to respond to all of the various needs and requests from everyone in the public for the data.

I've seen the data provided at meetings, in letters, in papers, in memos, verbally, every which way possible and in response to just about every question I've ever seen asked of Amy and her group. I can't even think of a way that the data could be provided that it hasn't already that would lend itself to the management process or to any of the stakeholders who are participating to try to help us develop a catch monitoring program that we're developing in this fishery. I just want to recognize that because I don't know how it works in other observer programs across the country but I do think that the fishery sampling branch in the northeast region goes out of their way to interact with the public and provide the information to the best of their ability within the constraints of the Magnuson Act. I truly believe that the process without Amy and her group would be far less transparent and much more difficult for all of the stakeholders involved.

Question/Comment
Lisa Borges
European Commission
Belgium

I want to clarify what Jørgen discussed, before the Data Collection Regulation; basically we had a kind of "Freedom of Information Act" that we paid to have access to the data. We should have access to the data that we paid for, in a clear manner. The problem was when we requested data to be analyzed by scientists from the member states, they would not provide the data; they would say they had problems, or wouldn't meet the deadlines.

They would not share the data between scientists, and at the end we found ourselves (the Commission) not having a way to force them to provide the data that we had paid for and that was public. Then we made a change, we said if you do not provide the data, we will not give you funds. In all honesty it might cause a lot of problems for the institute; however, this was actually in accordance with all the scientists to ensure some of the countries make their data available to the entire scientific community in ICES.

They had a lot of difficulty in getting data from colleagues because of national Administrations. This is the way that we, as the Commission, as the regulators found a way to put a little clause in the law. Now finally to say, you know what, if you do not give the data then we stop paying the money. And I suppose it's a little bit of a stick, then pushing them to give the data. And we are hoping, we as the Commission, but mainly the scientists that work with us to provide scientific advice, that we will improve the access to the data that has been there that we've been paying for years. I wanted to make clear that we tried to be positive on this, thank you.

Many scientists in ICES had difficulty in getting data from colleagues because of national demonstrations. So, this is a way that we as the European Commission/regulators decided to address accessing member countries' data. If you don't provide the data then we will stop providing the money. The European Commission and scientists that work with us to provide scientific advice hope to improve the access to data that we have been paying for, for years.

Comment/Response
Amy Van Atten
NOAA Fisheries Service
USA

I find that an interesting approach. With the U.S. structure it would not work, because the scientists directly access our database. They can do their own data retrievals directly from our databases-(by signing an agreement). I was thinking about applying that approach to some other programs that collect data independently and that we have trouble obtaining information from, e.g., cooperative research programs.

Comment
Dennis Hansford
NOAA Fisheries Service
USA

A lot of our issues come in when non-government organization and the public want to do their own statistical analysis on the data without our input. Using our observer data that we use to determine management decisions for the resources and not having some input with private source wanting to do with their data can lend to some conflicting results. History has shown that we do want collaboration, without it progress can be slow to non-existent.

Question/Comment
Martin Loefflad
NOAA Fisheries Service
USA

I have partly a comment and partly a question. Confidentiality is a big issue for us in Alaska. It is the key to the cooperation we have had for 20 years with the industry. At the same time, we recognize the huge interests of our public in transparency. We've tried to balance that very fine edge, which I hear a lot of that same discussion going on today. It's a tough one. There are no easy answers to it. Just a comment, though. My point being, we have for 20 years tried to protect the confidentiality of that information, because it's a big concern for our industry and the fact that we put people on their business operations out there floating around.

That being said, we have a long history of getting as much as we can out there in the public record when our council is making decisions which impact everybody. At the same time, we've put an awful lot of our information out on the web, to the extent that we can when we aggregate it. You can Google us up. You can download it. You can see it. It's there, to the extent that it's aggregated. It does limit the information and I've heard that already. Just a comment is, again, anytime you talk about confidentiality you're going to get multiple perspectives. I think Keith did a nice job of summarizing where NOAA is coming from. I just wanted to add to that just a little bit, which is that he mentioned there's a proposed rule that he's working on that should be coming out by the end of the summer.

That's a proposed rule for anyone not familiar with the U.S. government process that anyone in this room can comment on. The agency will then take those comments and distill them, respond to some. We'll respond to every comment, basically, and use that in forming a final rule. That is a very important process because those comments actually matter. So I'd encourage anyone interested to comment on that rule. Last point is that in Alaska when there have been particular issues that have come up on a fairly small scale, there is a mechanism that if the industry is in agreement that they can actually release that information that we hold confidential.

That's a creative solution if you have an agreeable body that you're working with. So you're working gets harder the bigger you get. So the more people the harder it is to get agreement. But if you have agreement with people and those people want to put their stuff out in public they can sign a waiver with the agency and the agency will disclose it. So that's an option for you, to consider.

Response
Amy Van Atten
NOAA Fisheries Service
USA

We have recently created an access agreement. It hasn't quite gone as far as voluntary disclosure of data to the public but voluntary disclosure of the detailed data to the fishing association. So that's some progress there.

Panel Session 6:

What are the major factors impacting fisheries observers?

Moderator: **John Lafargue, NWFSC, National Marine Fisheries Service**

Speakers

Alexander Woods – New Zealand
Minimizing the risk to observers from foreign charter vessels operating in New Zealand's EEZ.

Jeffrey Pulver – USA
Description and logistics of the U.S Gulf of Mexico Reef Fish Observer Program.

Simon Gulak – USA
Multi-resistant bacteria: Concerns for observer programs and their field staff.

Matthew Walia – USA
Factors affecting observer safety in the Gulf of Mexico.

Sandra Vieria – USA
Anger management much? Using video dramatizations and hands on drills to desensitize observers with conflict and teach them how to resolve it successfully.

Jennifer Lengares – USA
Assisting observers in bridging the gap.

Jennifer Patton and Mike Orcutt – Canada
Observer support mechanisms.

Cassandra Donovan – USA
The art and science of juggling the increasingly complex observer workload.

Introduction to the session

This session explored a wide variety of factors that affects observers. It included everything from minimizing risk, safety concerns/health issues to fleet characteristics, outreach tools, support mechanisms and time management. As our observer programs mature and new ones sprout up, we all look to decrease the risk to observers as well as increase observer retention and data quality. The only way our programs can achieve these goals is to take a close look at the factors affecting our observers.

Minimizing the risk to observers from foreign charter vessels operating in New Zealand's EEZ

Alexander J Woods
New Zealand School of Fisheries, Nelson Marlborough Institute of Technology
Nelson, New Zealand

If an observer cannot be placed on a particular vessel because conditions on that vessel may constitute a risk to the observer's health and welfare there is a risk that any fishing activities of that vessel that might pose a threat to the Quota Management System (QMS) will go unobserved. If the vessel operator says that only male observers can be carried because of deficient toilet or bathing facilities or lack of space this then compromises the equal opportunities obligations of the employer (Ministry of Fisheries) as well as making observer placement more difficult.
It was clear that the work of the Ministry of Fisheries Observer Programme was being compromised by the range in nationality, age and design of some of the charter vessels operating in New Zealand and in October 2007 the Ministry of Fisheries (MFish) and the Seafood Industry Council (representing stakeholders and quota owners) formed a joint Foreign Charter Vessel (FCV) review group tasked with identifying and addressing the risks associated with the current operation of FCVs in New Zealand's (NZ) Exclusive Economic Zone (EEZ).The perceived risks posed by the operation of some FCVs were two-fold:

1. A risk to observer and fishery officer health and safety
2. A risk that FCV operations would compromise the integrity of the NZ fisheries management regime

MFish held the view that tighter control over the operation of FCVs was required. The review group was tasked with identifying potential solutions to these issues. However the scope of this paper is limited to addressing the risk to observer and fishery officer health and safety only.
Methods

By December 2007, a number of measures had been agreed upon by both parties and these formed the Initial Position Paper on the management of this issue. MFish announced its intention to consult with industry on these issues with a view to implementing a one year period for compliance to occur, starting on 1 June 2008.

<u>These measures included:</u>

- All vessels >46m (both domestic and foreign flagged) to adhere to an approved standard of accommodation, food and amenities for observers (the Observer Standard)
- Increased level of coverage onboard FCVs – the level of coverage to depend on the level of risk associated with that vessel
- FCV vessel to submit valid vessel safety inspection certificates as part of their registration application, issued by Maritime NZ
- FCVs that have operated in NZ waters for longer than 12 months to be in a Safe Ship Management (SSM) programme

The Review Group met twice in the first half of 2008 to consider feedback from vessel operators and resolved to improve safety on board FCVs by:

- Introducing an approved standard for observer food, safety and amenities
- Implementing a process to ensure FCVs provide a safe working environment for MFish staff and contractors (this will include a pre-trip safety induction and personal safety check for each observer)

The review group met for the last time in May 2008 and in June MFish released its decision to industry.

Results

The joint review group was of the opinion that this collaborative process had been successful and industry could work with the new observer standard and safety regime. The observer standard states that:

- Observers must be provided with sufficient potable water and wholesome food for the duration of their trip
- Sleeping accommodation must have unobstructed emergency escapes and have clear floor space of not less than 1.0 sq m
- Minimum berth dimensions will be 6ft 3 inches by 2 ft 3 inches
- Accommodation shall also contain both a reading and a working light, lockable clothes locker, table/desk/draw/seat, book rack and clothes hooks
- Observers must have access to the galley outside meal times and abide by any health and safety requirements in place there
- The galley shall be equipped with sufficient facilities, equipment and utensils to enable the observer to prepare hot and cold drinks and light meals
- Toilet facilities must be clean, hygienic and lockable and equipped with adjacent wash hand basins with running water and soap dispensers
- Toilet paper must be supplied and disposed of in a clean and hygienic manner
- There must be clear headroom of not less than 1.9m at the observer work station

All aspects of this standard were to be fully adopted by I July 2009. Failing to comply with the Standard is an offence under the Fisheries Act 1996 and may lead to prosecution.

Description and logistics of the U.S Gulf of Mexico reef fish observer program

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Introduction

A mandatory observer program for the reef fish fishery was initiated for federal waters of the Gulf of Mexico in August of 2006, as dictated by Amendment 22 of the Gulf of Mexico Fishery Management Council's Reef Fish Fishery Management Plan. There are approximately 887 permitted vessels in the fishery[1]. Most of these vessels have never carried an observer in the past and were unfamiliar with observer programs. The Magnuson-Stevens Fishery Conservation and Management Act provides the authority to mandatorily place observers aboard the vessels and requires that the vessel provide 48-hour notification prior to departing. Difficulties were encountered in the initial stage of the program due to vessel size, trip length, and gear type. The vessels selected departed from ports ranging from Brownsville, TX to Key West, FL a driving distance for observers of approximately 1,695 miles[2]. The vessels ranged from 24 to 65 feet in length with trips varying from 1 to 20 days in duration[3]. There are currently four different gear types utilized in the reef fishery; longline, bandit reel, handline and spearfishing. Each gear type required a different sampling protocol for the observer and varied by what species the vessel was targeting. All of these obstacles have been overcome through creative ideas by staff and successful cooperation with the fishery to implement the reef fish observer program.

Methods

The program randomly selected vessels quarterly based on season, gear, fishing effort and region[3]. Permit holders were contacted by certified letter and, if necessary, by phone if no response was received regarding the certified letter. Once onboard, the sampling protocol was to obtain latitude, longitude, depth, environmental parameters and detailed gear information for each set during the entire trip. The observers identified every fish caught to species level if possible. Length and weight for each fish was obtained prioritizing undersized and non-target species first as not to affect mortality of released fish. The condition of fish when boarded was recorded based on appearance, whether alive or dead, and if there was a stomach/air bladder and/or eyes protruding. Finally, a fate was obtained for each fish caught and the mortality of discarded species was determined based on a sink or swim methodology once the fish was released. All protected species interactions were documented as well.

Results/Discussion

Based on archived data from August 2006 through May 2008, in the longline fishery, the vessels covered by the program ranged from 36 to 65 feet with an average length of 46.4 feet[3]. In the vertical line fishery (both bandit reel and handline combined) the vessels ranged from 24 to 65 feet with an average length of 38.4 feet[3]. The diversity of vessel size makes living conditions on board the vessels highly variable, as many are not able to accommodate an observer without some compromise to the crew. Usually this requires the observers to bring their own sleeping accommodations, such as a mattress or sleeping bag. From August 2006 through May 2008, there were 31 longline trips on 28 unique vessels for a total of 649 sets and 353 sea days[3]. In this same time period, there were 110 trips in the vertical line fishery on 72 unique vessels for a total of 2,708 sets and 445 sea days[3]. Longline trips, in this same period, ranged from 4 to 20 days with an average of 11.4 days and in the vertical line fishery from 1 to 17 days with an average of 4.0 days[3]. Since space can be very limited on these vessels, it is necessary for the observer to bring the minimal amount of sampling gear required as dictated by the length of the trip. On longline trips it is possible to obtain data for the entire trip (i.e., every fish recorded for each set) unless hampered by illness or weather conditions. However, for the vertical line fishery this is not always possible due to what species the vessel is targeting (generally either snapper or grouper). The grouper fishery is usually able to be 100% sampled by observers as most reels utilize 1-2 hooks. However, in the snapper fishery vessels routinely use reels that utilize 20-40 hooks with up to 7 reels fished at once[3]. On these vessels it is necessary for the observer to subsample the reels while recording the entire fishing effort of the vessel so the total catch can be extrapolated for the set. In summary, a successful observer program has been initiated in a complex and difficult fishery.

Notes:

1. NOAA Southeast Regional Office. 2008.
2. Google maps. 2009.
3. Scott-Denton, E., P. Cryer, J. Gocke, M. Harrelson, J. Pulver, C. Smith, R. Smith, and J. Williams. 2009. Observer coverage of the reef fish fishery in the U.S. Gulf of Mexico (in preparation).

Multiresistant bacteria: Concerns for observer programs and their field staff

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Introduction

Since the introduction of antibiotics into clinical use, bacteria have evolved resistance mechanisms. Hospitals provided a selective environment with intensive use of antibiotics and lower immune response of patients. Monoclonal outbreaks led to endemism of certain strains. Currently, the most important resistance problems on a global scale are caused by methicillin-resistant *Staphylococcus aureus* (MRSA). This bacterium is now being passed throughout communities on a regular basis, earning the classification “Community-associated MRSA” by the United States Center for Disease Control and Prevention[1].

The observer programs in the southeastern United States have a history of covering small fishing operations. The majority of vessels are not larger than 21 meters, with many less than 15 meters. Around the clock fishing, cramped living conditions and inadequate hygiene facilities increase the susceptibility to infection of all those onboard, including the observer.

Methods

After bacterial infections in 2006 and early 2007, information concerning *S. aureus* was gathered from observer programs, medical professionals, U.S. C.D.C. and peer reviewed journal publications. The Panama City observer programs began incorporating training presentations to increase the awareness of field staff to MRSA, with prevention as the main goal. *Hibiclens* surgical scrub, *Hibistat*[2] wipes, hand sanitizing gels (for water short situations) and finger nail brushes were added to field equipment. Through cooperative effort, safety protocol was standardized by 2008 among the three programs in the Southeast Fisheries Science Center.

Results/Discussion

The majority of infections occurred in 2007 (four infections in 3004 sea days, Fig. 1). Introduction of hygiene protocols led to fewer infections in the subsequent year (two infections in 4403 seadays). Cases that manifested after a deployment and/or, for various reasons, were not reported are not presented.
Once MRSA has established itself on a fishing vessel, staphylococcal life characteristics hinder disinfection and allow subsequent reinfection as a trip progresses. Trip length varies between one and 50 days and can delay proper treatment significantly. If passed to the observer, resistant bacteria can survive indefinitely in the nostrils and future infection can occur after returning from sea.

Aspirin has been found to reduce the virulence of *Staphylococcus spp*.[3]. However observer programs cannot recommend the use of over the counter medications. Individual hygiene and respect of protocol is ultimately the responsibility of the observer. This fact and the contagious environment at sea guarantee that bacterial infections will remain an issue with field staff.
Upon serious infection, treatment is limited to medical professionals on land. Minor infections are treated with triple antibiotic ointment and kept as clean and dry as possible. The Panama City programs are currently investigating the use of honey[4], which has been shown to inhibit growth of

18 strains of MRSA and 28 strains of Vancomycin-resistant *Enterococci* (VRE)[5]. Although there have been no confirmed cases, VRE and/or Vancomycin-resistant *S. aureus* is may be a source of infection aboard fishing vessels in the future.

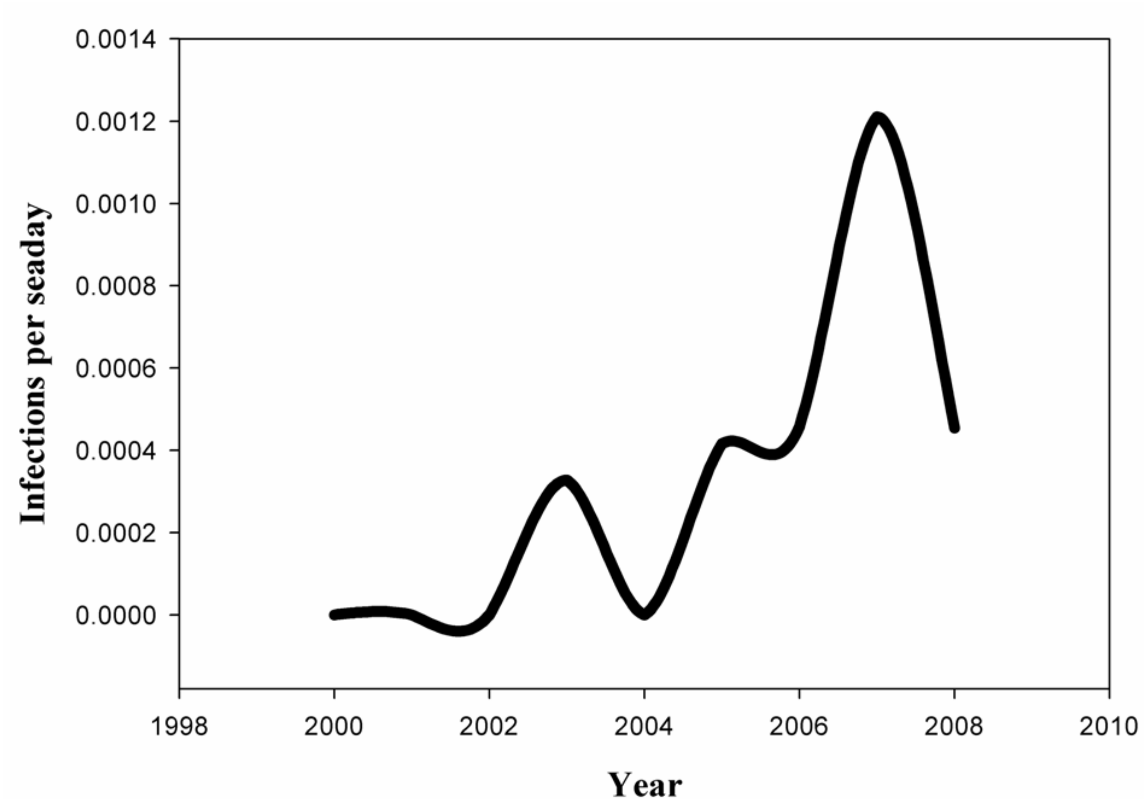

Figure 1 Infections per seaday in southeast U.S. observer programs from 2000-2008

Notes:

1. Centers for Disease Control and Prevention. http://www.cdc.gov/. Last accessed: 11 June 2009.
2. Hibiclens & Hibistat. http://www.hibigeebies.com/. Last accessed: 11 June 2009.
3. Herrmann, M. 2003. Salicylic acid: an old dog, new tricks, and staphylococcal disease. Journal of Clinical Investigation. 112(2): 149-151.
4. Jeffrey, A. E., and C. M. Echazerreta. 1996. Medical uses of honey. Rev. Biomed. 7: 43-49.
5. Cooper, R. A., Molan, P. C., and K. G. Harding. 2002. The sensitivity to honey of Gram-positive cocci of clinical significance isolated from wounds. Journal of Applied Microbiology. 93:857-863

Factors affecting observer safety in the Gulf of Mexico

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Commercial fishing is an inherently dangerous profession, as repeatedly documented by the United States' Department of Labor[1]. While many recognize the dangers of working in northern temperate waters, such as the North Atlantic or the Bering Sea, there may be a complacency regarding safety in the Gulf of Mexico (GOM). Numerous factors typical of commercial fishing operations in the GOM can contribute to this complacency such as warmer waters[2], lack of survival suit requirements[3] and the predominantly smaller size of vessels that have no head facilities on board. In order to complete their duties and come home safely, fisheries observers must be prepared and knowledgeable about fishing fatalities. The objective of this study is to understand factors regarding fishing vessel loss, fatalities and how these are related to the GOM in regards to two other areas of fisheries importance, the North Atlantic and Bering Sea.

Methods

Historical data of occupational fatalities, from the Bureau of Labor Statistics, was reviewed in order to highlight the dangers of the three most dangerous occupations from 2002-2007. The number of fatal work injuries/employment* 100,000 was calculated to get a fatality rate. Fishing vessel losses and fatalities were also reviewed from United States Coast Guard[4] districts in the GOM versus the North Atlantic and Bering Sea from 1992-2007.

Results/Discussion

Over the course of 16 years, 1,903 American flagged fishing vessels were lost. 57% of the lost vessels occurred in the three areas of interest- the Bering Sea, GOM and North Atlantic. Over half of the total fishing vessel losses was reported to have occurred while in a non-fishing mode i.e. transiting, out/inbound and drifting. Observers must be aware of any dangers at all times, not just while fishing operations are being conducted. During this time period, the GOM ranked second highest in numbers of lost fishing vessels and fatalities. Of the 934 documented fatalities in all districts, 58% occurred in the three areas of concern. Water exposure was the highest cause of death overall, while 217 deaths were due to man-overboard incidents throughout all districts. The GOM has had the highest percentage of falls overboard throughout the stated time period, accounting for 35% of total falls overboard. The GOM is the only district to report falls overboard every year, which should cause concern for personal safety. Common situations in which an observer may find themselves, such as being alone on deck, losing balance, and working in inclement weather, are associated with falls overboard and safety in general[5]. High rates of man-overboard incidents, fishing vessel loss and the possibility of hypothermia in the GOM should raise concern. While the majority of water exposure fatalities were due to the vessel sinking, flooding or capsizing, an observer can control such events as man-overboard incidents by staying alert and prepared. In contrast to the Bering Sea or North Atlantic, an observer working in the GOM is usually on an exposed back deck more often to clean themselves and use the restroom "facilities". Staying away from gunwales when possible and keeping one hand for the boat along with proper use of standard issued safety equipment, such as wearing a personal flotation device (PFD) when alone on the deck[6], are essential in helping an observer complete their duties properly and safely. Observers can also create personal "man-overboard kits" including personal locator beacons, signal mirrors, and other visual/audio distress signals, which can be easily attached to a PFD. The need to be diligent and alert at all times is necessary for an observer during their deployment. One has to be aware of the potential for disaster and remember that this is a dangerous profession regardless of where they are working.

Notes:

1. U.S. Department of Labor, Bureau of Labor Statistics 2002-2007. National census of fatal occupational injuries. www.bls.gov/iif/.
2. National Oceanographic Data Center [NODC]. 2005. World Ocean Atlas.
3. U.S. Federal Register. 1992. Commercial fishing industry vessel regulations. 57:149, 34188-34190.
4. Dickey, H. David. 2008. Analysis of fishing vessel casualties: a review of lost fishing vessels and crew fatalities, 1992-2007. United States Coast Guard. Office of Investigations and Analysis, 51p.
5. Lucas, D.L. and, J.M. Lincoln. 2007. Fatal falls overboard on commercial fishing vessels in Alaska. American Journal of Industrial Medicine 50(12): 962-968.
6. Beerkircher, L., K. Keene, S.Cushner, and J. Barker. 2009. Pelagic observer program field manual. NOAA. NMFS-SEFSC.

Anger management much? Desensitizing observers to conflict and teaching them how to resolve it successfully

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Introduction

Conflict is a familiar occurrence in the interpersonal communications between observers and fishing vessel crew. Unresolved conflicts can lead to an uncomfortable or unsafe environment for observers. Handling both minor and major conflicts quickly and effectively is fundamental to maintain the important communication lines between observer and crew. It is important for programs to train observers how to recognize different levels of conflict and techniques on how to reach a resolution. Teaching observers how to read and recognize both verbal signals and body language will help them understand the premise of a potential conflict and allows the observer to choose a technique to best handle the dispute amicably. It is equally important for observers to practice various scenarios and to utilize roll playing in order to gain experience and build confidence. Practicing different scenarios will help observers avoid a conflict in the first place. Observers may be able to assess the principle reason for the conflict, clarify the concern and return the environment to a safe and acceptable workplace for the observer and crew. In the West Coast Groundfish Observer Program, training includes teaching the observers how to recognize conflict, showing different techniques to resolve conflicts and role-playing activities where the observers practice conflict resolution with fellow observers and staff. This presentation will focus on the variety of tools that can be used by observer programs to teach conflict resolution.

Methods

To prepare WCGOP observers for the possibility of a conflict the West Coast Groundfish Observer Program's Communication and Conflict Management lesson plan now included in-class lecture, video dramatization and role play activity.
The objectives of this three part lesson plan include:

- How to recognize a potential conflict
- Understanding the origin of conflict and how one can resolve the conflict with carefully considered responses
- Reading body language
- Identifying differences between passive, aggressive, and assertive communication
- Communicating assertively when presented with resistance and conflict
- Demonstrating effective communication strategies to de-escalate and resolve conflict
- Realizing that resolving, not winning, the conflict is the key
- Showing various methods to contemplate when considering the best way to diffuse a conflict
- Desensitizing observers to hostile circumstances
- Returning an observer's work environment to a safe and civil condition

Results/Discussion

The trainees were first introduced to an informational lecture by staff to describe all the elements to a conflict situation. The new video dramatization was then shown to present how these events could take place in an at-work scenario, addressing common conflict scenarios between observers and fishing crew, to show new observers how volatile and different a conflict with fishermen may be from their day-to-day relationships. The video's storyboard was written in an entertaining format including, cartoon characters as the videos' trainers, different observer personalities were acted out to show the results of aggressive, passive and assertive interactions and selected music was played during the point of information slides appropriate to the scenario. Finally the trainees had an opportunity to role play scenarios that are typically seen in an observer's line of duty. This allows the observers to practice different methods of communication and to help desensitize them from hostile interactions. At the conclusion of the training module current WCGOP observers were available to field questions from the trainees as well as share their experiences at sea in regard to conflict scenarios encountered and how they were able to resolve them successfully.

An anonymous questionnaire was returned by each of the fourteen trainees asking their opinions on this training module. More than 85% found they were better prepared to encounter and address conflict and now had the tools necessary to resolve a work-related conflict successfully. All trainees found the video opened their eyes to what they may experience in the field. 100% felt this conflict resolution training class is relevant to the job skills they will use as an observer. And more than 90% found the lesson plan ratio of lecture, video and role play activity appropriate to learning this subject.

The trainees also had an opportunity to express their thoughts on improving all aspects to the training materials used in this module. Their suggestions have inspired the trainers of this module to continue to adjust and improve the lesson plan to better coach future WCGOP observers.

Assisting observers in bridging the gap

Jennifer Lengares
A.I.S., Inc., New Bedford, Massachusetts, USA

Introduction

Observers are often fielding questions from the general public regarding seafood purchases. As an objective scientific source of information, the observer can seem an unbiased opinion compared to other resources. Not enough resources are available for observers to turn to when confronted with a question regarding seafood choices. Observers in the Northeast region of the United States undergo extensive training before taking their positions. None of that training focuses on, or addresses handling a confrontation with the public. Additionally, the resources available, such as the three websites examined in this paper, do not offer enough information to address all of the questions raised by the general public[1]. Additional resources and training need to be made available to resolve this issue, and offer observers a better resource.

Methods

A survey of the general public was conducted regarding the type of seafood people purchased and why. Survey participants were selected randomly with the only requirement being that the respondent purchased seafood "regularly" defined as having purchased seafood for consumption within the last two months, and having intention to purchase seafood in the future. Surveys were then compiled and the percentage of positive responses was calculated. Once determined, the data gathered was compared to the available information on three websites:

Fish Watch (http://www.nmfs.gov/fishwatch/)
Environmental Defense Fund Seafood Selector (http://www.edf.org/home.cfm), and
Monterey Bay Aquarium's Seafood Watch (http://www.montereybayaquarium.org).

Websites were chosen by performing an internet search for a site that would assist consumers in making educated decisions regarding seafood purchases. This helped determine if the needs of the people being surveyed were being properly addressed by the websites. Additionally, a survey was conducted with observers operating out of the Northeast Observer Program, U.S.A and employed by A.I.S., Inc. to determine if they felt their was a need for more accessible sources of information, and if they had experienced people turning to them as Fisheries Observers to assist in their seafood choices.

Results/Discussion

Results from the public surveys showed that; 91.16% of people listed taste as a reason for choosing a particular type of seafood, 64.02% listed price, 40.19% listed possible presence of mercury or other pollutants, 25.70% listed sustainability of the fishery, 22.90% listed a recommendation from someone else, and 6.07% listed unspecified other. Of the surveys returned 19.16% of the people responded that they had heard of the National Marine Fisheries Service Fisheries Observer Program, and 17.29% had heard of at least one of the three websites examined. When given the following description of the program, 78.04% of survey respondents indicated that they thought the program would provide them with information to assist them in their seafood choices.

> "The objectives of the Fisheries Observer Program are to collect operational fishing data, biological data, and economic data from the various fisheries. Additionally observers monitor interactions with protected and endangered species to ensure continued survival of these animals[2]"

Of observers surveyed, 90.91% would like to see more resources made available, and 72.73% responded that they had heard of at least one of the three websites examined. 59.10% of observers surveyed have been asked questions regarding seafood choices since becoming an observer. Of surveyed observers 54.55% responded that they felt being an observer gave them an added insight in to fishing industry, where 45.45% felt that they only see a small portion of the industry and the information that they collect was not extensive enough to use as a definitive source.

Based on the feed back from the surveys, the general public sees the observer program as a possible source of information for their seafood choices. Many of the topics addressed by the public surveys were available on the websites[3], but only a small percentage of the public had heard of the websites. Observers felt that on one hand, they had an insight to the fishing industry, but that it was a small part and did not necessarily reflect the status of the fishery as a whole. Considering that observers knew of the websites, but still felt that they would like to see more resources made available indicated that websites do not offer enough of a solution. During surveying, the general public often commented that they would not likely go to a website to look for information, and that it would be more useful if readily available.

Possible solutions to this problem include better training, and more resources readily available to observers. As part of the training course for the Northeast Observer Program, observers are trained in conflict resolution as it relates to captains and crew. There is no training however in dealing with the general public. Incorporating resources for observers during the training period may alleviate some of the issues that they confront once they enter their positions. The observer program has to maintain a level of neutrality to preserve objectivity making it difficult to recommend resources that may not be government approved. A newsletter to observers may provide a solution. If observers are given information supported by the program, they can feel confident passing this information along to others.

Notes:

1. Personal Observation. Jennifer Lengares. http://www.nmfs.gov/fishwatch/, http://www.edf.org/home.cf, http://www.montereybayaquarium.org
2. http://nefsc.noaa.gov/fsb/
3. Personal Observation. Jennifer Lengares. http://www.nmfs.gov/fishwatch/, http://www.edf.org/home.cf, http://www.montereybayaquarium.org

Observer support mechanisms

*Mike Orcutt[1], and Jen Paton[1]
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Introduction

Some key challenges faced by our At Sea Observers include; difficult lifestyle, difficult crew interactions, work and personal life stress, and the perceived lack of professional and/or personal growth. Archipelago Marine Research Ltd. has developed a variety of programs and services to help our staff overcome these challenges.

Methods

Effective communication and conflict resolution is part of our three-week training course. It is designed to help boost the Observers' confidence levels when they encounter difficult crew interactions. Other topics help the Observer identify their own stress triggers and ways to manage stress. Scenarios' based training provides an opportunity to prepare the Observers for some of the real-life situations they may encounter.

Health and wellness programs are offered by Archipelago to provide support to full-time equivalent staff and their families. Beyond standard benefits packages there are a number of wellness benefits that Observers are encouraged to utilize. Many of these benefits can be accessed while they are in port between assignments when it is often needed most. The package reimburses a number of what we call "good for the head" benefits, including massage treatments, acupuncture, and various alternative therapies. One of the more popular aspects is the annual reimbursement for healthy living activities such as gym memberships, fitness classes or personal interest courses.

Archipelago has had a Critical Incident Peer Support (CIS) program in place since 1998. The initial goal of the program was to provide timely support to employees who are involved in critical incidents at work. As the program evolved it was realized that work related incidents are only a part of our employees overall well being, and often support is provided for personal issues rather than work related issues. An external service provider is contracted to provide training to the volunteer peer support team, consisting of program staff, supervisors, and fellow observers. The peer support team is used to assist employees and their families with obtaining the professional counseling and support that they need. There are a number of different options that observers can use to access the professional counseling services including a 24-hour emergency phone line, in-person counseling and email counseling.

Archipelago recognizes the need to be flexible in how we schedule Observer staff deployment. The standard is a 24 day rotation in one of three main ports, followed by 7 days off at home. During the 24 day deployment Observers average three, 5-7 day assignments. Another option for observer staff is to relocate to one of the main deployment ports. Port residents have greater access to work, and are able to be at home in between assignments. Archipelago also employs several casual or part time staff. These individuals are called upon for special projects, and during peaks in activity. Archipelago's staff are employees rather than contractors, so Observers are free to change the model they work under as their needs change. Giving Observers the option of which model they work under provides them time they need for their personal lives. From a program management perspective, having Observers in all of these categories can be very beneficial for meeting fluctuations in activity caused by weather and market conditions.

Mike Orcutt
Archipelago Marine Research Ltd.
Canada

Keeping staff motivated and rested ensures quality data collection and high-levels of service to our clients. Allowing leaves of absence for attending school or other types of training has been effective at restoring staff. Archipelago also provides long-term time-off for either travel or family commitments, where the employee may return to work at the same rate of pay and seniority.

Archipelago also conducts dockside monitoring and electronic monitoring work. Providing training for at sea Observers to work within Archipelago's other programs promotes work diversity, and allows at sea observers to supplement their work at sea. The cross training helps with temporary staffing solutions when these other programs require staff.

Recognizing Observers for their service, hard work, and contributions is a key component to maintaining a long-term commitment from staff. We have one, five and ten year milestone recognition programs, the coveted 1000 sea day award, as well as a personal gift rewards program for exceptional performance.

Results/Discussion

Understanding the issues faced by observer staff is the first step to being able to provide effective support. Once the issues are identified, it is necessary to either create or find the appropriate support tools and resources required to help staff with their challenges.

Providing an effective and complete support system is key to ensuring a healthy and productive work environment.

The art and science of juggling the increasingly complex observer work load

Vanessa J. Tuttle *Presented by Cassandra Donovan
NOAA Fisheries Service, Northwest Fisheries Science Center, At-Sea Hake Observer Program, Seattle, Washington, USA

Introduction

Recent developments in the at-sea Pacific hake fishery have led to catch restrictions on several bycatch species which have changed the nature of the fishery and necessitated changes in the At-

Sea Hake Observer Program (A-SHOP). In addition, increased interest about the types and quantity of data being collected by the observers has driven changes as well.

The result is an increasingly complex work load, which now requires the observers to be more involved in making minute-by-minute decisions about their sampling, and to prioritize and manage their time. The increase in data collection has created new challenges for the observers and has required the A-SHOP to make changes in the sampling protocols, provide new sampling tools, and to modify aspects of the observer training.

Methods

Historically, observers have collected vessel and haul information, species composition samples, marine mammal and endangered species samples and sighting data, and biological data from the target species. Recent additions to the data collection include a significant increase in species composition sample sizes, biological data on an additional seven bycatch species, coded wire tag data and samples from salmonids, genetic samples on two different species, and occasional special projects for additional data.
In the past, the observers were generally able to complete all of their assigned duties for almost every haul. However, with increased sampling demands, this is no longer the case. Observers are a very hard working group of people, and most of them find it difficult to not attempt every task that is assigned, on every haul. Prioritizing data collections and emphasizing that not all tasks are going to be manageable on all hauls has proven to be a challenging idea for some observers.

Results/Discussion

The A-SHOP has tried to ease the sampling burden in six distinct ways.

1. Ensure all data collection is appropriate and useful. Yearly evaluations with the data users help confirm that the data collection is relevant and meets their needs.
2. Carefully consider new data collection requests for feasibility.
3. Teach observers to prioritize their sampling effort and collect at least the minimum data necessary from every haul. As time allows collect additional data on important bycatch species.
4. Modify sampling protocols in-season to ensure target biological data goals are met and not exceeded.
5. Highlight time management by using real-life sampling scenarios during training.
6. Develop tools and techniques to streamline observer sampling.

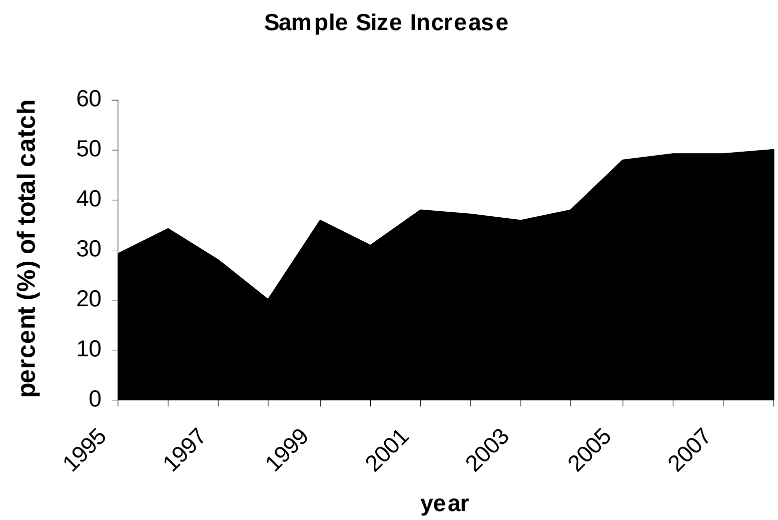

Figure 1. *Average species composition sample size by year*

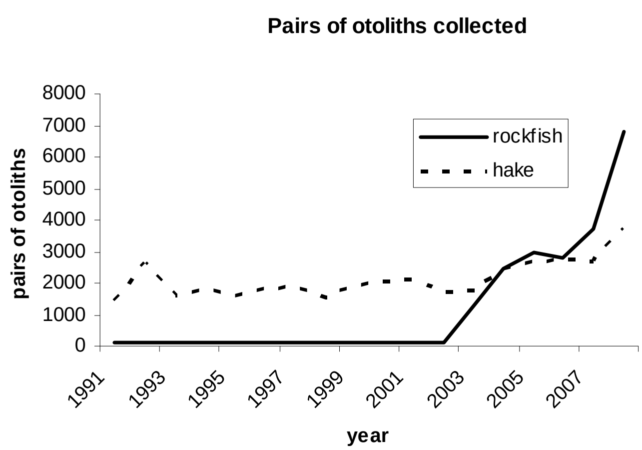

Figure 2. *Biological data collection for hake and rockfish bycatch by year*

The A-SHOP is continually evolving and changing to help the observers adapt to the increased sampling demand. The primary goal is to help ensure that the highest quality data is collected, along with a reasonable maximum amount of data, without causing observer fatigue.

Question and Answer

The question and answer session below captures the dynamic dialog between panelists and the audience. Each discussion is separated by a double line break

Comment/Question
Larry Beerkircher
NOAA Fisheries Service
USA

My question is for Sandra. It's a fantastic conflict resolution thing you all put together. You said you just implemented it relatively recently. I was wondering, I know your last slide had some feedback from the observers but I wonder if there's been any direct feedback from observers coming back from trips yet that have been in conflict situations where they've actually been able to give you feedback and say, "Yes, this absolutely helped me in this instance."

Response
Sandra Vieira
West Coast Groundfish Observer Program
USA

No, I haven't received direct information about that. I'm sure that they're using it or else they would probably knock me over my head and say none of that stuff has worked for me. People have a tendency to always complain about something just naturally rather than go back and take the time and thank someone or to commend them for what they gave to them.

Continuation of Question/Comment
Larry Beerkircher
NOAA Fisheries Service
USA

When you implement a new training regime like that do you try to ask in debriefings whether that training has been helpful when they come back from a trip?

Response
Janell Majewski
NOAA Fisheries Service
USA

We'll probably just include questions in the end of the year surveys that we give to the observers about conflict resolution training and how it worked for them on the boats.

Question/Comment
Joe Arceneaux
NOAA Fisheries Service
USA

I have somewhat of a statement for Ms. Lengares in her presentation about the concerns about health and seafood. I thought your topic was rather interesting because like you said, many people get those requests. With alot of fishery management agencies, NMFS, DFO, there are some very active and dedicated outreach groups. I did like your comment that was drifting towards just direct people to find the information themselves. Your point is well taken that just direct people to the places where they can find the information themselves and then just go from there. Let them make their own decisions. Hopefully as observers, you'll know which scientists you can best direct them to, because there are a lot of very dedicated, hardworking scientists that work on these issues.

Question/ Comment
Chris Heinecken
Capricorn Fisheries Monitoring
South Africa

My question is directed at Alec It's to do with safety at sea, and it evolves around what you always consider the observers right to refuse to board a vessel, and looking at different safety standards and especially on some of the foreign vessels, as Alex showed.

I wanted to know in New Zealand do you have a minimum safety requirement before an observer is allowed to board a vessel? We've set up some protocols along these lines, keeping in mind that observers are not surveyors. They can not be considered as a judge whether the vessel is safe or not. So we can give them minimum requirements. I'm wondering if those exist outside our program.

Response
Alec Woods
Nelson Marlborough Institute of Technology
New Zealand

Thanks for the question. Yes, it's a complicated area. We have a range of steps that are gone through as a result of this new standard being put in place. To start with there's an observer pre-departure checklist. There's a vessel safety induction that the observer goes through with a crew member, senior crew member usually or master and then the observer goes through a pre-departure checklist. If at the end of that they decide that they don't want to sail or that they have concerns, then they're told to raise those concerns with the vessel or with the observer program ashore. They will, in turn, raise the concern with Maritime New Zealand, which is our equivalent of the Coast Guard here, and they can refuse to sail on that vessel.

The vessel will then be told of the problem. They'll be given a chance to fix that or maybe take another observer onboard. But if it gets to the stage where the concern is still out there then it's going to be a fairly serious matter, and Maritime New Zealand will want to have that fixed before that vessel goes to sea. At the end of the trip there's another trip report that is done. The information that's gathered in all these forms are part of the briefing that future observers will receive when they go out on that particular vessel.

And I should also add that when a new vessel comes into New Zealand and wants to fish, there's a very rigorous inspection undertaken by a fisheries officer as to the suitability of that vessel. It gets a risk categorization of high, medium or low risk, and that vessel can move from its position on those tiers depending on how it performs and how it improves. So it's not a simple answer, I'm afraid. But there is a process.

Comment/Question
Chris Heinecken
Capricorn Fisheries Monitoring
South Africa

If I may, I'd like to comment a bit on that. We have a similar process for our South African licenses but the foreign vessels don't go through the same safety checks for the South African Maritime Safety Association. We also have a similar situation where we're flying observers to other countries where they are to board vessels. In some cases, they'll board a vessel by launch, and they don't have the opportunity or there's no opportunity prior for a formal authority to inspect those vessels. What we've set up is a memorandum of understanding with whomever the organization is who's requested the observer.

We've actually highlighted minimum safety requirements and these are pretty much black and white situations. They cover things like life rafts, life jackets, crew compliment, and the observer actually has a very strict instruction. If any of those criteria are not met he may not board the vessel. I'm wondering how other countries will follow this model, because observer safety is paramount. I think from somebody who employs observers, you don't want to have an observer's life on your conscious. These black and white situations or absolutes mean that the observer, the decision is taken away from him. If a life raft is not certified, if it's not in date, if there aren't sufficient life rafts or emergence seats onboard; he's actually got a very fixed instruction. He may not board that boat and he has to return to shore.

Response/Comment
Cassandra Donovan
NOAA Fisheries Service
USA

With the Hake program, we have a pre-boarding vessel safety checklist as well that's based on the Alaska program, and I know the west coast program has a similar checklist. It's actually black, white and blue. And the blue ones are highlighted, and those are the no go. So if anything that's a no go item does not meet those standards – and it's EPERBS, life rafts, that kind of thing – if they don't have that then the observer does not board the vessel period. In the Hake program, we don't have boarding at sea incidents. They always board at the dock, but they complete the safety checklist before the vessel can leave the dock. All of our vessels are Coast Guard inspected every two years, and they have to have that Coast Guard sticker. That's one of the criteria before they can actually go on the vessel.

Question/Comment
Floor Quirijns
Netherlands Fisheries Research Institute
Netherlands

Several of my colleagues go onboard fishing vessels to do all sorts of projects, and what they ask us researchers is, "Do you have some useful information we can have so that we know what's going on at the Research Institute"? Fishers ask a lot of questions about, the stocks, what kind of projects are you doing and what can we expect for the next TSE advice and all sorts of things. I'm sort of looking for the right thing to do with this because we're doing a lot of projects. It's impossible to put all the information into short paper pieces that they can bring with them. I would like to ask you if you have experience with this issue. I would direct this question to Jennifer since she touched upon this issue a bit, but welcome responses from others as well.

Response/Comment
Jennifer Lengares
A.I.S., Inc.
USA

I just wanted to clarify; you're speaking about information available to fishermen in regards to current stock assessments?

Question/Comment
Floor Quirijns
Netherlands Fisheries Research Institute
Netherlands

Yes. You talked about people around you, family, friends who are asking all kinds of questions about fisheries and fish. In my experience, it's also the other way around. Because you're onboard of a fishing vessel-in the Netherlands it's for one week or multiple weeks – you get a lot of questions by the fishermen and the crew.

Response
Jennifer Lengares
A.I.S., Inc.
USA

I think in the northeast United States, it appears that there is a lot of resources that the fishermen go to retrieve information regarding the stocks. I think it relates more to what was discussed on the last panel. Particularly to Amy who works up in the office had said, that there are ways to get certain types of observer data from that. So personally, most of the fishermen I run into think they know exactly how the stocks are doing because they experience it everyday. A lot of fishermen I run into are much more confident than I am, in terms of knowledge of the ocean.

Personally, I have only had experiences regarding the general public and the gap between the fishing industry and the public. I think that there are a lot of other resources that they turn to. I'm not entirely sure what they are but I think the data that comes from the observer program could maybe be put into a resource for fishermen. This way they are getting accurate stock assessments as opposed to the public, which usually looking for easier answers. I think that it would kind of depend on what they are looking for. It seems to me a better idea for fishermen to try to get more accurate information than what we could provide the public with.

Question/Comment
Ebol Rojas
Association for Professional Observers
USA

Besides many others in 2007, one observer died in Alaska, In 2008, another from Costa Rica and Nicaragua. His body was really never recovered. This year, one Spanish boat sank off of New Foundland, another in Argentina and another in South Georgia. My question is "What are the barriers for the implementation scheme for the investigation and monitoring of all these safety issues affecting observers, as a tool for learning from these lessons and improving training, and safety conditions?

Response
John Lafargue
NOAA Fisheries Service
USA

Most of the programs are starting to document a lot of this information on their own. We do not really have a lot of law enforcement. We have to rely on other agencies like the U.S Coast or NMFS Office of Law Enforcement to follow up on those issues. Most of us can document it and we have the option to be able to pull observers off of boats, but we do not really have too much authority to get them to change their boats.

Comment
Alec Woods
Nelson Marlborough Institute of Technology
New Zealand

With the observers in New Zealand, I use the example of the Artic Ranger. I find that these case studies are absolutely invaluable. The reason why I finished on the slide of the Hercules was that this was a major catastrophe, and none of us virtually know anything thing about it, so I take your point. There are some real gaps in the way we handle accidents that do occur at sea. I'm sure we all know there are areas of ocean out there were all sorts of things are going that we know very little about. You only have to look at who's involved the pirate fishery being a well known one, but it is by means not the only one. I think that it is a good point that you make, and if we can get good information back from those events and feed that back into the training then I think we really getting somewhere.

Comment
Keith Davis
Association for Professional Observers
USA

Ebol brought up a lot of good points. He's working on a continuing project through the Association for Professional Observers, where we are trying to catalog all causalities, injuries, and harassment event for observes. If you have any events that you know of that we don't have in our database up online we'd appreciate hearing of these events. Please check out the website at www.apo.-observers.org/join. Ebol is spearheading the safety area on the APO site. Contact him with that information to share those sorts of stories with him.

Comment
Alec Woods
Marlborough Institute of Technology
New Zealand

Keith, there's a magazine put out from the UK called Safety At Sea International. Have a look at that. It's of most interest to large vessels, but it has very good detail on accidents and mishaps at sea.

Question/Comment
Jason Vestre
West Coast Ground fish Observer Program
USA

My question is for Matt and for Jeff about the Gulf Coast. Matt, you made a strong recommendation for observers to wear PFDs and to keep somebody, knowing their on deck. Do you require observers there to wear PFDs and do they? Also, you showed some statistics about vessels sinking or fatalities with while steaming. You mentioned steaming but also on your slide it said drifting. Our program has taken a strong stance in that we will not board a vessel that does not keep a watch while drifting. Do you have an issue with that in the Gulf Coast? And also, do you have minimum safety requirements for the boats there? Do you sometimes not board vessels due to those requirements not being met?

Response
Matt Walia
IAP Worldwide Services
USA

Yes, I'll start off with the last point with the safety requirements. I'm sure everyone can vouch for their own programs, but we have pre-board safety forms we go over as far as making sure the EPERB is up to par, checking out the life raft, and ensuring their U.S. Coast Guard decal is concurrent, checking flares, etc. Maybe I used the improper word but PFDs are required. I was just trying to reiterate a fact to keep in the back of your mind, because a lot of the times when you're out there, the crew and the captain might not necessarily be wearing that. Especially, I'm sure with new observers, maybe they'll get jostled into getting made fun of or want to fit in, and try to take it off when its pretty calm weather.

However, you do need to keep it on, because you could easily hit your head and fall over. It could happen in a split second. As far as drifting goes, at least I can speak for boats that I have been on, maybe someone else here can elaborate. There are times when you sit down for the night. The captain may be a little alert and try to jump up if he hears the alarm go off. However, there are times, I've experienced where everyone is just laying down for a couple of hours. It can cause a situation. There's a lot of oil rigs out there in the Gulf, and sometimes you hear that horn come a little too close. I don't know what you could do to recommend, to try to make the crew do that or if there's some sort of form to enforce that, or when you get back- talking to the debriefer to address that issue. It may be something to look into.

Question/Comment
Jason Vestre
West Coast Ground fish Observer Program
USA

Are you aware of the maritime law of maintaining wheel watch at all times on a vessel?

Response
Matt Walia
IAP Worldwide Services
USA

Yes, maybe that could be something to be on the form. I've seen people break it, I guess. I don't know how to address that.

Comment/ Question
Evan Casey
Saltwater Inc.
USA

I'm an observer with the pelagic long line program in Hawaii, and my question is mainly to Simon. We run into a lot of the same conditions in Hawaii and Samoa that you mentioned with your slides of the mercer infections in the Gulf. The boats aren't small enough though. Out in Hawaii, we seem to have a doctor that is familiar with our program and familiar with the conditions that observers are exposed to. Have you or any other members of the panel looked into having a dedicated physician that can prescribe antibiotic preemptively to observers than they can then carry at sea?

Response
Simon Gulak
IAP Worldwide Services
USA

We do not have a dedicated physician. We have tried to look into this idea of being able to prescribe stronger antibiotics and maybe have them on hand, but, as of yet, our contractor hasn't resolved any of this. We're still at sort of a standpoint for the moment. But that's a good suggestion.

Question/Comment
Jennifer Hogan
NOAA Fisheries Service
USA

My name is Jennifer Hogan with NOAA Fisheries in Alaska, and I appreciate your presentations. I come away with a renewed appreciation for, not only what the observers face at sea but also the crew members who fish our resource. Some of those pictures were funny but also depicted some deplorable living conditions. I was just wondering if there is an agency or any type of oversight in (I know there is some oversight as far as life raft go and PFDs,) human health and sanitation reviews. Are there any types of at sea requirements for doing sanitation procedures at each off load?

Response
Alec Woods
Marlborough Institute of Technology
New Zealand

Yes, there are but no one wants to know about them. There's the Torremolinos protocol of 1993. There's SDCW in '95 which 13 states have signed. It leaves 15 to be ratified. It needs to go another 12 months before it comes into force. So we've had two states sign this year so far. Maybe we'll get 15 states signed up by the end of the year. And so the end of 2010 that may come into force and that has FAO ILO and IMO combined behind it. The answer is that there's something coming. Some countries will turn around and say, "Well, we're already way above that", and they probably are. Others are waiting for this to come into force so that they then turn around and say "Hey, look. We have to meet this standard". But there is something out there, it's just takes it that long to gain momentum. It will still be a year or two for this.

Panel Session 7:

How can self reported data by the fishing industry be improved for use in assessments and management?

Moderator: **Lisa Borges, European Commission, Belgium**

Speakers

Howard McElderry –Canada
Fishery Management by fishermen for fisherman: The area A crab association taking and leading role

Floor Quirijns – The Netherlands
Good Communication: The key to reliable results from self sampling

Flavia Chen – USA
Ensuring accurate reporting: Examining incentive structure in fisheries management

Andrew Fedoruk – Canada
Fisher- based audit system in the BC Groundfish Fishery

Sally Roman – USA
Validation of study fleet data collected through the SMAST study fleet program

Irene Huse – Norway
The representativeness of the reference fleet data and how it is biased by changes in the dynamics of the Norwegian Mackerel Purse Seine Fishery

Beverly Sauls – USA
Comparison of self- reported logbook data with at-sea observations in the recreational headboat fishery in Florida and Alabama

Prabhath Patapendi – Sri Lanka
Self Monitoring System: An indigenous system developed by Sri Lankan fishermen- a case study in Southern Sri Lanka

Introduction to the session

Self-sampling programs are an emergent issue in fisheries monitoring as observer's programs are expensive, and many countries around the world can only afford small percentage coverage of their fishing fleets. Self-sampling programs can be used to increase sampling intensity, data availability and data quality. At the same time, these programs have the advantage of increasing industry buy-in for scientific advice and associated management measures. In many countries, self-sampling schemes take the form of the so-called reference fleet, i.e. a group of volunteered vessels that are sampled systematically and extensively, and thus constitute the reference for the fishing activity/behavior of the whole fleet. Several panelists from different countries including Canada, The Netherlands, Norway, Sri Lanka and USA discussed the issues associated to self-sampling programs, namely: incentives for industry participation; programs funding; use of reference or study fleets; protocols for industry training; credibility, appropriate uses and audit methods for self-reported data.

Fishery management by fishermen for fishermen: The Area A Crab Association taking a leading role

Edwards, P.[1], Scherr, J. [2], Gould, G. [1], Rusch, B[3], *McElderry, H. [2]
Area A. Crab Association[1], Archipelago Marine Research[2], Victoria, BC, Canada
Department of Fisheries and Oceans, Canada[3]

The Area A Dungeness crab fishery on the north coast of British Columbia is a unique example of industry group taking a lead role in implementing intensive self-monitoring in order to improve management and provide effective enforcement in their fishery. With about 50 vessels, 2,500 fishing days and over 30,000 single buoyed traps, catches in this 10-month fishery may exceed $22CAD million per year. In 2000, the Department of Fisheries and Oceans (DFO) was seeking to reduce total effort with vessel-based trap limits and reducing gear loss with trap soak limits. Meanwhile, conflict was building among fishery participants because there were high levels of gear and catch loss from theft and vandalism by other Area A fishers. Factors contributing to the conflict included the remote unmonitored fishery location, areas of high gear congestion and tangled buoy lines, and the high catch value making it tempting to poach catch from other's traps. The conflict rose to crisis proportions with violence and industry was unable to find an acceptable remedy to their problems through DFO or the police.

The Area A Crab Association, representing the majority of Area A licence holders, began to work with Archipelago Marine Research Ltd. to seek a cost effective, technology based monitoring solution for the fishery. After pilot studies considering a number of alternatives a monitoring program was developed. All vessels were required to carry an electronic monitoring (EM) system, powered 24/7 during the fishing trip, recording continuous imagery of the fishing deck and sensor data from GPS and hydraulic pressure. All trap buoys were fitted with radio frequency identification (RFID) chips and every trap haul was scanned to fine scale temporal and spatial resolution of all active gear. Data sets from each EM system were retrieved and analysed, with results reported to the fisher, the Association and DFO.

The monitoring program, now in place for nearly 10 years, averages about 2% of the ex-vessel catch value and has brought about significant changes in the fishery. The level of compliance with the EM program is very high and incomplete data making up less than 0.02% of total fishing days in the fleet. With nearly complete monitoring, the objectives of DFO for trap limits and soak duration are effectively enforced, and more significantly, conflict has declined substantially with theft and vandalism being effectively controlled. The annual gear cost for fishers declined, in some cases by as much as 30%. Other unanticipated outcomes of the monitoring program included the implementation of a science-based approach to timing fishery openings. Selected vessels sample catch from a variety of stations to monitor moult stages and the EM system provides an audit check to ensure sampling is carried out properly. As well, the monitoring program created multiple years of fine scale temporal and spatial data that has been useful to establish a fishery 'footprint', enabling the Association to have meaningful engagement on issues such as wind farm and oil and gas development. The Association is also hopeful that the monitoring program will contribute to the successful application for certification by the Marine Stewardship Council.

Perhaps the most interesting question is: How did this happen? Unlike most fisheries where such a monitoring program is the result of 'top down' initiatives led by the fishery agency, this program was entirely 'bottom up' through industry initiative. Importantly, the Area A Association represented the majority of licence holders, among which were respected leaders. One such leader, Wayne Helgason, advocated that *"Fishermen need to take care of the fishery and be involved in the management. They have the most to gain but also the most to lose."* The Association's executive director, Geoff Gould, points out that *"The Association provides the organization, leadership, communication and motivation."* All licence holders recognized there were problems in their fishery that only they could solve. This 'ownership of the problem' fostered the recognition that 100% monitoring was necessary to effectively control the fishery. Self monitoring was accepted by most as a means to compel the rest of the fleet to be monitored. Monitoring reduced conflict and created a more orderly fishery, much in the same fashion as a referee provides to sporting events. Also contributing to the fishers becoming compliant was the widespread belief that EM provided a credible monitoring program, treating everyone across the fishery in an effective, unbiased fashion. The exclusive provision of the monitoring service by the Association enabled a range of both administrative and legal remedies for effective and timely resolution of compliance problems. In the words of the Association president Paul Edwards: *"The compliance monitoring aspect of the program brings forced honesty. Everything else falls into place."* Lastly, the monitoring program made economic sense; the overall cost of the monitoring program was less than the cost of gear and catch loss.

The Area A Crab monitoring program has been a great success but the Association still faces some challenges in controlling their fishery. The Association believes that standards are needed to ensure consistent application of EM across a range of fisheries.

Good communication: The key to reliable results from self sampling

Floor Quirijns[1]
Wageningen IMARES, The Netherlands[1]

Introduction

Self sampling by fishers can be a useful method for affordable research that is supported by many parties. It is most efficient to have fishers carry out sampling, as they are at sea for a large amount of time; they know exactly how to handle their gear and they are familiar with their fishing grounds and distribution of the species they catch. Scientists add their expertise on how to set up experiments, analyze data and report on results. When fishers and scientists cooperate, all available expertise is applied to carry out a research project as good as possible.

One question that is often being asked about these kind of experiments is: "Are the results of these experiments reliable?" The facts that fishers are not as experienced researchers as scientists and that fishers might have incentives to manipulate the outcome of a project, are plausible reasons to doubt whether the results are trustworthy. In the Netherlands a lot of experience is gained in cooperative research projects, leading to insight in how to get reliable results. The lessons learnt are described by means of a case study: the mesh size experiment in the Dutch beam trawl fishery.

A major problem in the Dutch beam trawl fishery is: “too many discards”. To tackle this problem the Dutch beam trawl fishers want to reduce their juvenile plaice discards. Other parties, i.e. managers, nature conservationists and fishers from other fleets, suggested increasing the minimum mesh size from 80 to 90 mm in order to reduce discards. In the fishing industry this suggestion raised the questions "Would that be a solution to the discard problem?" and "How would increasing the mesh size affect catch compositions?". Instead of a desk study or a scientist only approach, which had the potential to answer the questions, beam trawl fishers wanted to carry out an experiment that reflected their own experience and methods. By finding a fishers’ solution from the industry, there was the advantage that it was likely to be supported by other fishers as well.

Methods

A communication plan was designed based on the methods suggested by Johnson & Van Densen[1] In general, this resulted in thorough communication during all phases of the project. Researchers and fishers designed an experimental set-up and work plan; carried out the research; monitored quality and eventually drew up conclusions together.

A lot of attention was given to instruction of the skippers that were involved in the project. A protocol was set up based on the work plan. Before finalizing the protocol, its feasibility was checked with the skippers.

During the experiment, IMARES research secondaries went onboard to carry out extra measurements and check the methods applied by the crew. Afterwards, the data collected by the secondaries could be compared to data collected by fishers in order to check reliability of those data.

Results/Discussion

This joint fishers and researchers project has been considered a success. It resulted in reliable data, thanks to good instructions, methods and data checks. The joint research approach led to results that were supported by the industry as a whole. These results have been used in discussions about discards in the beam trawl fishery, with staff from the European Committee and with the North Sea RAC (Regional Advisory Council).

The factors leading to success were a good communication plan, thorough instruction of participating fishers and onboard checking methodology by observers.

Notes:

1. Johnson, T.R., Densen, W.L.T.v., 2007. Benefits and organization of cooperative research for fisheries management. ICES J. Mar. Sci. 64, 834-840

Ensuring accurate reporting: Examining incentive structure in fisheries management

Ben Martens and *Flavia Chen
Cape Cod Commercial Hook Fishermens Association, Massachusetts, USA

Introduction

The world of fisheries management is characterized by an asymmetry of information, uncertainty, and a multitude of management regimes. While it is widely recognized that accurate, truthful and complete self-reporting data is vital to successful fisheries management, this criterion alone cannot ensure consistency in management. In essence, best practices call for a regime of "trust self-reporting but verified through independent monitoring, while encouraging compliance through positive incentives." Assuming rational behavior among fishermen, negative incentives often exist for individuals to harvest beyond the social and/or biological optimal limit, as the opportunity costs of foregone future harvesting are undervalued. At-sea monitoring has been shown to be an effective deterrent against unwanted discarding and in favor of honest reporting. This paper addresses the need for an incentive structure in commercial fisheries that takes into account the negative externalities inherent in the exploitation of common property resources, while providing positive motivation for compliance with management. We will compare fisheries with successful frameworks for this approach with a contrasting fishery from New England which has largely failed due to its over-reliance on unverified self-reporting.

Methods

This paper analyzes a series of publications in fisheries management literature, economic theory, and social studies relating to the role of incentives in bycatch reduction. The vital role of at-sea monitoring for any management system is highlighted.

Results/Discussion

Danish Fisheries Policy: In November 2007, the Danish government began a new program for fisheries management that recognized the need for incentives in creating a sustainable industry. Under a TAC and quota system, fishing mortality resulted in over exploitation of stocks and underreporting of catch. The new program sought to make individual fishermen more accountable while also rewarding them for proper reporting. The scheme required all catches, both landed and discarded, to be reported. Furthermore, the data collected was of a high quality and could be used to assist in scientific stock modeling and policy creation. The project's reliance on volunteers resulted in greater cooperation between industry and scientists.

British Columbia. Groundfish From 1997-2005 the B.C. groundfish fishery used 10-20% observer coverage on hook and line fisheries to verify fishing reports. The accuracy and completeness was brought into question, and a Pacific Scientific Advice Review Committee (PSARC) report examined the effectiveness of such a monitoring scheme. The study found that observer reports and logbooks could not be solely relied on. The resulting management model combines at-sea observers and/or electronic monitoring systems for complete perceived coverage of the fleet. Data indicates that catches for all except one species are being maintained within conservation limits in the hook and line and trap fisheries after this change.

New England Atlantic Herring: Atlantic Herring are cooperatively managed as four distinct management areas with hard TACs. This management method requires accurate and timely reporting. The incentive to reallocate fishing effort clearly exists as TACs decrease. When TACs govern the length of a season, the incentive to discard is pervasive. Although there are area and season specific catch limits, the reliance on landings reports and the lack of actionable observer data on total catch – especially relating to at-sea discards – results in the enforcement of landings limits, a problematic discrepancy. Due to late, inaccurate, or incomplete reporting, catch and/or landing limits are regularly exceeded. Additionally, nearly all catch data (landings and discards) in the fishery are based on unverified, good-faith volumetric estimates by fishermen and dealers, as opposed to actual certified weights. This is especially true for high-volume target and incidental catch species such as Atlantic herring, Atlantic mackerel, and river herring.

Economics and Enforcement: Without thorough monitoring, the incentives for highgrading and discarding are substantial. Without the accountability that monitoring provides, measures such as full retention of quota species, though seemingly constructive in theory, provides incentives for illegal discarding at sea in practice. The necessity for at-sea coverage or EM system can also be seen in comparing the B.C. fishery with the West Coast fishery of the United States. In the U.S., the West Coast fishery is governed by TACs applicable to the whole fleet. As TACs for overfished species continue to decline, a strong incentive exists to concentrate effort on other species where there are less limitations and overages of TAC limited species could be discarded.

In addition to discards due to size and accidental bycatch, a far more insidious form of overages occurs yearly in the form of illegal transactions and harvesting for the black market. A February, 2009 press release from the Department of Justice reported the intentional overfishing of striped bass by five Maryland commercial fishermen valued at over $2.1 million. While this may be the exception, and not the rule, such events severely undermine the efforts of fishermen and managers working to sustain stocks and manage quotas. Despite examples of successful enforcement, many acts of illegal harvesting go unnoticed or are deemed too minor to warrant the costs associated with enforcement. If fisheries policy is to respond to inherent negative incentives as well as establish rewards, cost-effective methods of enforcement will need to be formulated.

Research Needs: Further emphasis must be placed on creating accountability among fishermen, policy makers, and scientists alike. Analysis along the lines of the B.C. Electronic Monitoring regime, or the Danish Full-Documentation scheme would most likely be of great benefit to U.S. fisheries management, particularly if it took into consideration fisher's incentives both to abide by regulations as well as eschew them.

Fisher-based audit system in the BC Groundfish Fishery

Andrew M. Fedoruk
Archipelago Marine Research Ltd., Victoria, BC, Canada

Introduction

Management of the several groundfish longline and trap sectors in British Columbia is based on the use of catch information from fisher-completed logs. Key to the use of these data is a system to monitor or Audit the data being provided.

After each trip, the weight of landed and discarded catch has to be deducted from the vessel's current quota holdings for each quota-managed species by Species Area Group (SAG). This information is summarized on a Quota Status Report (QSR) issued to the vessel. QSRs are generated using landed catch data which are allocated to quota areas using the catch area percentages. The default data source for the catch area percentages and any relevant released catch information is the fisher-completed Fishing Log. In order to assess whether or not the Fishing Log is complete and accurate enough to be used for catch management purposes, industry and Fisheries and Oceans have collaborated on the design and implementation of a number of tests of the fishing log data. This set of tests is what is referred to as the program Audit: a technical assessment of the data quality of the Fishing Log.

The Audit's primary purpose is to test the accuracy of the Fishing Log data against the catch data from the Dockside Monitoring Program and a percentage of the catch and spatio-temporal data from vessel-based electronic monitoring (EM) systems. If the data match within certain standards, the Fishing Log is used for the catch allocation and represents the at sea catch reporting for that trip.

If the Fishing Log does not meet the current standards, the Trip is sent to a review board which may chose to use the Fishing Log Data as is, require further testing, or require further processing of data. In some cases, the data from the EM System supplants those from the Fishing Log. The entire process including data entry, analysis and processing is completed within five days of the landing.

A review of the Audit process is provided, including descriptions of data sources, testing protocols, and results.

Methods

Catch data from vessels participating in the GHLCMP (commercially licenced hook and line and trap vessels fishing groundfish in British Columbia) were compiled for 2008 and 2009 and processed according to the current program audit rules[1]. The individual scores and overall audit results were summarized to assess performance. Analysis was done through simple tabulation of scores (frequencies) and comparisons of catch between the various data sources.

Results/Discussion

Data from the first two years of the program reveal a high degree of agreement between fisher data and that collected in the DMP and EM program for the majority of species and tests completed, confirming a high degree of reliability in the fisher log data.

For example, for 2,923 trips examined, 92% had a trip score value of 7 or higher, 85% had a score of 8 or higher and 57% had a score of 9 or higher (scores are out of a maximum of 10). For individual tests, summarizing all 6,850 DMP to Fishing Log comparisons performed, 91% scored 8 or higher, 83% scored 9 or higher, and 38% scored a perfect 10. Similar results are seen for the 25,444 EM to Fishing Log tests performed with 88% 8 or higher, 78% 9 or higher, and 30% 10s. Each trip is subject to a number of tests depending on the catch, with 71% of trips being subject to between 5 and 20 tests.

A study conducted by Fisheries and Oceans Canada looking at catch rates of Yelloweye Rockfish also confirmed that the program is producing reliable catch estimates, stating "the observations collected during the VF review (VF-data), although collected for the random fisher log audits, provide a virtually independent and unbiased estimate of total catch in pieces"[2].

Overall, results of the program confirm that data from self-reported Fishing Logs can yield high quality data for IVQ Management Purposes as well as estimating total removals for biological purposes.

Notes:

1. Archipelago Marine Research Ltd. 2009. Overview of the 2009-2010 Groundfish Hook and Line/Trap Catch Monitoring Program Audit. www.Archipelago.ca.
2. Stanley, R.D., N. Olsen, and A. Fedoruk. (in prep). Independent validation of the accuracy of yelloweye rockfish (*Sebastes ruberrimus*) catch estimates from the Canadian Groundfish Integration Pilot Project. Paper presented to the Managing Data Poor Fisheries Workshop, Berkeley, California, U.S.A. December 2-4, 2008.

Validation of study fleet data collected through the SMAST study fleet program

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Study fleet programs offer a complementary source of fisheries dependent data for use in fisheries management and stock assessments. The SMAST study fleet program collects environmental and catch data in collaboration with the New Bedford offshore groundfish fleet. The project objectives include: 1) obtaining fisheries data with high spatial and temporal resolution; 2) involving the fishing industry in the collection of fisheries data and management of the resources; 3) developing methods for training commercial fishermen to record scientifically acceptable data during normal fishing operations; and 4) characterizing the effects of environmental conditions and fishing operations on spatial and temporal patterns in catch statistics. Study fleet data were compared to vessel trip reports, dealer landings data and NMFS observer data for nine trips over a data collection period from April 2006 to April 2007. Data were evaluated on multiple levels: trip, effort, catch, and landings.

Despite the few observed trips, comparisons were generally favorable for most catch records, but also defined some minor systemic differences. Validation of self reported data is an important aspect of assessing the credibility of data before information can be incorporated into a scientific or management program.

The representativeness of the reference fleet data and how it may be biased by changes in the dynamics of the Norwegian mackerel (*Scomber scombrus*) purse seine fishery

*Irene Huse[1] and Cecilie Kvamme[1]
Institute of Marine Research, Norway

The peak period and the fishing areas of the Norwegian mackerel purse seine fishery have changed considerably due to market situations. The Norwegian reference fleet (17 high seas vessels, and 21 coastal vessels) was established to get better and continuous sampling, by training the crew to conduct sampling of the catches. Since 2003 the number of purse seine vessels in the reference fleet has increased from one to five. To investigate if the changes in the mackerel fishery can affect the representativeness of the data from the reference fleet we use data from the vessel monitoring system, and sale slips data. We compare landings per trip for the total fleet with the reference fleet, and look at the spatial and temporal overlap for the time period 2006–2008.

Materials and Methods

The study is based on Norwegian sale slips data and satellite data from the vessel monitoring system (vms). The sale slips data give information about each landing: vessel, date, gear, species, weight (round weight, kg), and fishing ground (cell in the strata system of the Norwegian Directorate of Fisheries[1]. Vms data are available for active fishing vessels with an overall length above 24 m. The time resolution is one hour and these data give information about vessel, time, date, and geographical position.
In this study, the mackerel purse seine fleet is defined as all vessels larger than 24 m (vms limit) landing mackerel (landings > 10 t) by purse seine in the mackerel season The vessels (5%) with the smallest annual mackerel purse seine landings were excluded.

Vessel name	Length, m	2006	2007	2008
Utflesa	21.3	*	*	*
Nybo	69.5	*	*	*
Hargun	68.1	*	*	
Libas	94.0	*	*	
Skagøysund	27.5		*	*
Eros	75.9			*
Brennholm	75.4			*

Table 1. Purse seiners in the Norwegian reference fleet 2006-2008

Results and discussion
Landings from both the total fleet and the reference fleet show the effect of the time limited embargos from buyers or sellers organizations in 2006-2008. A significant difference (GLM, $p<0.05$) in the first landing date and the total number of trips during the season was found between the reference fleet and the total fleet for 2006 and 2008 (Table 2). The landings per trip or amount of catch exceeding the vessels quota were not different between the groups for any of the years tested, and there was no difference in the last date for delivery either.

	2006	2007	2008
Fishing dates	**	NS	**
Landed catch exceeding quota	NS	NS	NS
Number of trips	**	NS	**

Table 2. Overall fishing strategy.(GLM, level p<0.01

In 2008, this pelagic part of the reference fleet shared an additional quota of 600 t mackerel and 600 t of herring. The total number of trips by the reference fleet is significantly larger compared to the total fleet in 2006 and 2008.Thus also the number of samples of the catches and possibly the precision increase, but the accuracy may still be biased because of the temporal and spatial nature of the data.

There seems to be a difference in the areas fished between the groups (Figure 1). This should be further studied.

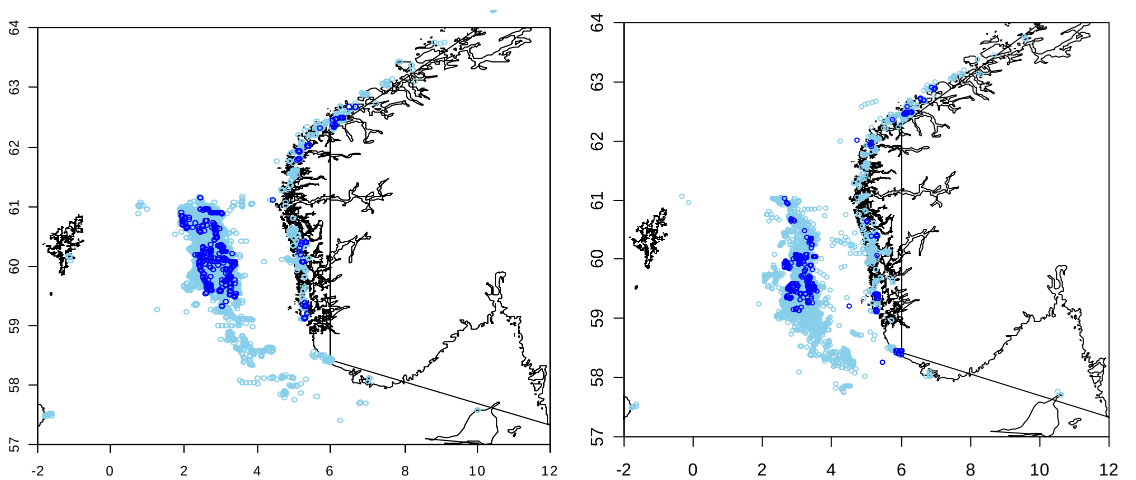

Figure 1. Fishing positions from vms in 2006 and 2007. Dark blue: reference fleet. Light blue: other vessels

Notes:

1. http://www.fiskeridir.no/fiskeridir/statistikk/fiskeri/kart/kart-lokasjon-og-omraade

Comparison of self-reported logbook data with at-sea observations in the recreational headboat fishery in Florida

*Beverly Sauls[1] and Kenneth Brennan[2]
Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, Saint Petersburg, FL[1] National Marine Fisheries Service Southeast Fisheries Science Center, Beaufort, NC[2]

Introduction

Approximately 100 large-capacity headboats (also called party boats) operate in Florida. These vessels carry greater than 10 passengers up to approximately 120 passengers (limited by vessel capacity) and accept walk-on recreational anglers for a per-person fee. The primary mode of fishing is hook-and-line fishing for reef-fish and other bottom-associated species, and a select number of vessels also drift fish for pelagic species, such as mackerel.

Headboats in Florida have been required to report their daily fishing trips and harvest by species to National Marine Fisheries Service since the early 1980's. In 2005, the state of Florida received funding on both the Atlantic and Gulf of Mexico coasts to pilot test an at-sea observer monitoring program on working headboats. The pilot was designed to collect detailed data on the numbers, size, and condition of harvested and released fish. For this analysis, we present a direct comparison of self-reported logbook data and at-sea observer data from recreational angling trips taken from headboats in Florida between 2005 and 2007.

Methods

During 2005, 2006, and 2007, vessels from each of five regions in Florida were selected for at-sea observer monitoring (Figure 1). Approximately 280 observer trips statewide were completed each year. During each sampled trip, one observer was stationed on the port side, and one observer was stationed on the starboard side of the vessel. If the vessel carried more than 30 passengers, observers were permitted to select a sub-sample of 15 or more anglers within their line of sight to observe for 100% of the fishing time. For each observed angler, we recorded the number of harvested and released fish by species.

Paper log sheets were provided to vessel operators by National Marine Fisheries Service, and vessel operators were required to fill out a separate log sheet for each trip the vessel made. Space was provided on the logsheet to report the numbers and pounds of harvested fish by species, numbers of fish released by species, and the numbers of paying passengers for each trip.

Figure 1. Five sample regions for at-sea headboat observer surveys.

For this analysis, we matched observer records for a given vessel on a given day and time-period with logbook reports filled out by the vessel operator. For vessel trips where all anglers were observed for 100% of the fishing time, we did a direct comparison of the total harvest and total released catch by species to what was reported for the trip on the logbook. For vessel trips where only a sub-sample of anglers could be directly observed, we calculated an expanded catch (harvest or released) for the trip (Equation 1). The expanded catches for the vessel trip from the observer data were directly compared to logbook reports for the same trip.

Equation 1:
Expanded catch $_{\text{trip x}}$ = (number of species a observed/number anglers observed) $_{\text{trip x}}$ * (total number of anglers) $_{\text{trip x}}$

To test for significant differences between observed and expanded catches and self-reported logbook catches, we used a paired t-test with a significance level of alpha=0.05. For this analysis, we chose the following reef fish species of significant importance for fisheries management: red snapper (Lutjanus campechanus), vermillion snapper (*Rhomboplites aurorubens*), yellowtail snapper (*Ocyurus chrysurus*), gag grouper (*Mycteroperca microlepis*), red grouper (*Epinephelus morio*), gray triggerfish (*Balistes capriscus*).

Results/Discussion

For observed trips where all of the anglers were observed 100% of the fishing time, the numbers of harvested fish counted by observers were not significantly different than trip log reports in all regions for all species. This indicates that operators are accurately self-reporting harvested fish on the trip logs. For observed trips where harvest rates were expanded for unobserved anglers, some comparisons were significantly different. Based on these results, we conclude that self reported logbook data for harvested fish is comparable to counts by at-sea observers for the five managed species; however, there may be differences in catch rates among anglers fishing from different areas on the vessel that have a significant impact on the average catch rates. It is preferable to observe 100% of the anglers on a sampled trip, or more effort should be made to sub-sample anglers from various areas around the vessel to eliminate any potential bias.

The numbers of discarded fish were consistently under-reported on logbooks in this study (significant at alpha=0.05 in almost every comparison). For red snapper, observers counted a mean of nearly 50 more discards per trip than were reported by vessel operators on log books (statewide). This may be due to the fact that vessel operators are more likely to keep track of harvested fish that are strictly managed with bag limits, but may be less able to accurately record fish that are discarded. The large volume and short handling time for live discards may make it difficult for vessel operators to count and track discards during the course of a fishing trip. For these highly regulated species, discards in the recreational fishery far exceed landings, and discard mortality has become a significant portion of total fishing mortality. The results of this study indicate that accurate estimates of discards are not provided by self-reported logbooks and at-sea surveys may be a better approach to collecting this information.

Self monitoring system: an indigenous system developed by Sri Lankan fishermen- A case study in Southern Sri Lanka

Prabhath Patapendi
Institute of Human Development and Training, Sri Lanka

Sri Lanka has a population of 18.5 million. To satisfy its fish protein requirements it needs 270,000 t of fish per year, 220,000 t of which is taken from its own waters, the rest is imported. The marine sector contributes 202,000 to the total fish catch; the balance comes from inland waters. Coastal waters contribute 80% of the marine catch; the balance comes from the deep sea and offshore areas. The deep and offshore catches are mostly tuna, tuna-like fish, bill fishes and sharks the majority of which spend their young days in coastal waters before they move out to the deep. Long before any scientific understanding of fish stocks, fishermen were aware of the reduction in abundance caused by over fishing. They knew that over fishing has to be dealt by collective action which later became the written fisheries law. They also aware of the value of protecting the females and young animals by means of non-fishing seasons such as the breeding seasons or prohibition of fishing for young fish, and later these traditions were added to their laws. But now this indigenous system collapsed with the introduction of the license to fish in the Sri Lankan waters by foreign fishing vessels. They harvest fish by using all sorts of techniques harmful and destructive to the sustainability of the fishing industry in Sri Lanka. There are lots of initiatives at the southern coastal belt to regenerate the indigenous system that leads to sustainable fishery.

Sustainable Fishery program has been working with the poor fishermen in Southern coastal belt whose income is below the poverty line to empower them to face this new challenge. This paper analyses the advantages of the indigenous system used for almost 2500 years and the difficulty to practice it with the foreign fishing vessels in the absence of formal monitoring mechanism by the government authorities.

Question and Answer

The question and answer session below captures the dynamic dialog between panelists and the audience. Each discussion is separated by a double line break

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Question/ Comment
Julie Bonney
Alaska Fish Data Bank
USA

My question relates to the audit system in Canada. I noticed that on slides that you used, you used counts, which I'm assuming are converted to weights based on the dockside landings. I was just curious if you've looked at biases because I would think that average weight would be potentially different for what you see at the dock versus what is discarded at sea, (that's one question). The other question deals with interaction with marine mammals and sea birds and whether you have some kind of information available since that's usually documented by observers versus EM.

Response
Andrew Fedoruk
Archipelago Marine Research Ltd.
Canada

For the weights, you're correct that the actual landed weights are used for IVQ and then it's allocated to the area by piece percentages. For the at sea discards, it's allocated typically by pieces. Then, those are basically allocated weights based on formula from the department. So they are set fixed weights. One of the real challenges is (obviously since you are from Alaska) something like a rockfish, the weight range is quite significant for all of the pieces. So, there is a bit of averaging with the at sea discards using an average weight per piece for IVQ, yes, absolutely.

Comment/ Question
Andrew Fedoruk
Archipelago Marine Research Ltd
Canada

For marine mammals and sea birds, are you talking about actual catch incidents or interactions at sea?

Response
Julie Bonney
Alaska Fish Data Bank
USA

Interactions.

Comment
Andrew Fedoruk
Archipelago Marine Research Ltd, Canada

We certainly see any interaction with the gear, but yes, its one of the limitations of EM- its not looking around the ocean to see what is going on.

Question/Comment
William Ward
Gulf Fishermen's Association
USA

Good job panelists, I enjoyed it. Beverly, I had a question for you primarily since I'm from the region. First and foremost was the issue of the 280 trips. I was curious to know what the relationships of those were with Gulf trips to the Atlantic trips. I believe you said you had five regions. Second question relates to your three year project that's coming up. What are you going to do in the project in terms to ensure that you get a cross section of depth considerations with the study in the recreational fishery?

The reason why I ask that is I currently am the principle investigator of a CRP for the commercial industry and we're getting a broad strata of depths. I just wanted to see what your study was going to do in terms of shallow water, mid-level waters and deeper water fishing effort in the Gulf region. Then of course, after the break if you need any help with identifying some possible participants, charter boats in our region I'm very well acclimated to the fishery. I used to be a charter boat captain for years also. So I'd be glad to help out anyway I could.

Response
Beverly Sauls
Florida Wildlife Conservation Commission
Fish and Wildlife Research Institute
USA

Your question for the Gulf versus the Atlantic is what was their distribution of sampled trips?

Continued Comment/ Question
William Ward
Gulf Fishermen's Association
USA

Yes. I believe it was 280 trips you mentioned in the presentation.
I was trying to get the relationship of Atlantic to Gulf.

Response
Beverly Sauls
Florida Wildlife Conservation Commission
Fish and Wildlife Research Institute
USA

I believe it was about half and half. I don't know the numbers off the top of my head, but what I did was I took the number of vessels in each region and proportionately allocated trips to those regions based on the number of vessels. As far as the cross section of depth, we're interested in recording whatever the fishery is doing. So our strategy is to conduct a random sample. Hopefully we'll have representative cooperation from vessels that operate both in state and federal waters so that we can get a good sample of each of those. Right now I'm still recruiting though for that so I haven't had a chance to look at the representativeness of the sample because I'm still trying to get vessels into the system, but for the previous study it was all head boat vessels were included and were randomly sampled. So whatever trip they were doing the week they were selected is what we sampled.

Question/ Comment
Craig Loveridge
Ministry of Fisheries
New Zealand

Sally, you mentioned during your talk that you removed identical weights, weights that were the same. I just wondered how many points that was or how much data that was that you removed and a bit of the rationale as to why they were removed.

Response
Sally Roman
University of Massachusetts
USA

I don't have the actual numbers. I'd have to go look it up on my computer. The rationale behind it was that if they were tending to work together and get the same exact weight then you would actually have more similarities. So that would actually bias the statistical tests that we were trying to do.

Question/Comment
Kelle Moreau
Institute of Fisheries Research
Belgium

I have a question for my Dutch colleague. You were talking about the problem of the plaice discards and showed that increasing the mesh size was not a problem because of the mixed fishery aspects and the sole relation. Recently I've attended a meeting where it was suggested that in the future we might want to work towards getting rid of the minimum landing size in place. To what extent do you think that would be a solution?

Response
Floor Quirijns
Wageningen Imares Institute for Marine Resources and Ecosystem Studies
Netherlands

We have been discussing this with fishermen too. It is not 27 centimeters, but the problem is that the market for the even smaller plaice under 27 centimeters will be very bad because there used to be a smaller size category for place, which is marketable, but didn't sell very well, so I don't really see that as a possibility

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Question/Comment
Lori Steele
New England Fisheries Management Council
USA

My question is for the representative from the Cape Cod Commercial Hook Fisherman's Association. Regarding your presentation I heard a lot of incentives discussed about why fishermen may not report accurately and I heard about the need for comprehensive monitoring, most of which seemed to be through some sort of a third party, like observers or electronic monitoring to check and confirm the self-reported data. However, I'm not clear on what the incentive structure may be within the management system that you referred to for accurate self-reporting

I guess my questions are all related -What are the incentives for the industry to report accurately and what is it that your group thinks can be established in the management system to provide those incentives? Maybe I have a different interpretation of what an incentive is, but is the incentive to report accurately simply the fact that the industry will be monitored closely presumably at an additional cost to them and will be reprimanded if they don't report accurately?

Response
Flavia Chen
Cape Cod Commercial Hook Fishermen's Association
USA

I approached this presentation from a more hypothetical standpoint-what are the incentives for fishermen to report accurately. I was not approaching it from a negative standpoint of are they going to get in trouble. Clearly, discards are a big problem in commercial fisheries in general. I think the incentive for complete monitoring exists on both sides for fishermen. As an example, if fishermen distressed science and say their tax is too low, they have a huge incentive to take on monitoring to say, "What are we actually seeing?" If you can establish a scientific baseline that's a huge incentive for them to potentially raise their tax. That has happened, and I think that there is an example of that. For management, I think the incentive for 100 percent monitoring is pretty clear. The less uncertainty you have in your management, the closer is can parallel what's actually going on. I was suggesting that the cost should be shared between industry and management, because from my readings it seems to be that there's incentive on both sides. This is clearly a hypothetical paper at the moment.

Question
Gordon Gislason
Gs Gislason Associates, Ltd., Canada
Canada

Would the BC Ground Fish monitoring program work if there wasn't 100 percent coverage of vessels and 100 percent coverage of trips? Also, I have a follow-up question for Beverley, who I believe indicated that on the charter boat observer program that she compared observed trips log books versus observer data and found some comfort in the fact that they aligned with each other, but that doesn't really address the question of whether behavior and log book completion on unobserved trips is different than on observed trips.

Response
Andrew Fedoruk
Archipelago Marine Research Ltd.
Canada

No

Comment/ Question
Gordon Gislason
Gs Gislason Associates, Ltd.
Canada

You said you had some comfort that there was the log book data and the observer data aligned with each other on observed trips, but that doesn't really address the observer bias issue and I was just wondering whether you had some thoughts or there's some other investigations you've done on that that weren't part of your presentation.

Response
Beverly Sauls
Florida Wildlife Conservation Commission
Fish and Wildlife Research Institute
USA

Well it didn't stop them in the southeast from not turning in a log book, which is not legal. I feel like they were quite comfortable with us on the vessel because we saw some things that shouldn't be happening, certain species being used for bait. I don't think that there was much intimidation for us being on the vessel versus what happens when we're not on the vessel.

The fact that the discards told a different story indicates that at least they are able to accurately report the harvested catch, but maybe not. Maybe we shouldn't expect the same results for discards. I can't guarantee that their behavior wasn't altered when we were on the vessel, but my sense is that we weren't too much of an intimidation for them.

Question/ Comment
Edwin Van Helmond
Wageningen Imares, Institute for Marine Resources and Ecosystem Studies
Netherlands

I work myself on a shell sampling program for discards. I have a question for all panelists. You all mentioned you test your data in one way or another way. I'm wondering what you do with the data that are not up to your satisfaction. So if they are more or less wrong are you deleting them or converting them?

My second question is if you delete them are you not afraid you're going to lose a lot of data this way?

Response
Andrew Fedoruk
Archipelago Marine Research Ltd.
Canada

In our program we don't actually discard any data at all. What we do is basically use the best quality data through that audit process. So for example, if the fishing log data doesn't meet the standards that we expect, we don't so much discard it, but we will replace it using the observed data through the imagery. So there's always a complete data set of everything, so in essence we don't ever discard data.

Response
Sally Roman
University of Massachusetts
USA

In terms of our data, we don't get rid of any data that we feel is poor quality, but I guess the only way that we do alter the data is in the toter ration if they record that incorrectly and then we verify it against the temperature sensor. If this occurs, then we do change that, but there's still documentation of what they originally had written down so we'd still keep all of our data as well.

Question/Comment
Greg Croft
Department of Fisheries and Oceans
Canada

From what the panel was saying I just wanted to make a comment of an example where we went from 100 percent monitoring on George's Bank (we had the problem that was mentioned on some other fisheries), where one species had a quota that was much, much higher than the quota for cod.

So we were sure there was quite a bit of dumping going on. So what we did was we went to 100 percent observer coverage and 100 percent eliminator trawls and then once we had some confidence that that was working and the log books were looking good because they were close to the observers, the next year we dropped to 50 percent.

Any of the fishers that didn't take an observer they got the average of their fleets observer coverage ratio of cod to haddock and they lost cod off their quota. So if they said they landed 500 kilograms and the observer coverage said the fleet landed 1,000 they lost 500 extra off their quota.

A very good fisherman then asked for an observer so he could prove that he was fishing at a better ratio than the regular fleet that had the observer. Now we're down to 20 percent and we're pretty confident they're keeping their logs pretty good. Otherwise they're going to get that ratio that might be a little less beneficial for them.

Question/Comment
Craig Loveridge
Ministry of Fisheries
New Zealand

Irene, In your talk you mentioned slippage and I don't know what the term means. So could you just give a quick explanation of what slippage is?

Response
Irene Huse
Institute of Marine Research
Norway

By slippage I mean often you have first your fish up to the side of the purse seiner. Then you may lower down the opening, the beginning of the net and slip out some fish before you start pumping, during your pumping or after the fish is dead. That's what we call slipping.

Question/Comment
Vicki Cornish
Ocean Conservancy
USA

I was just wondering if any of the panelists could speak to whether it's true that in rights based management systems that self-reporting tends to be more accurate.

Comment/ Clarification
Lisa Borges
European Commission
Belgium

The question was if in ITQ's if the data is more accurately reported or not.

Comment/ Clarification
Vicki Cornish
Ocean Conservancy
USA

Yes, when there's fishermen involvement in how the fishery is managed that the self-reporting tends to be more accurate.

Response
Floor Quirijns
Wageningen Imares, Institute for Marine Resources and Ecosystem Studies
Netherlands

In the Netherlands we do have an ITQ system and I don't have an idea whether that really helps in getting more accurate data by self-sampling, but I do have the feeling that there is quite a group of fishers that are really into how the fisheries should be managed. So I don't have the possibilities to compare it to systems where there is no ITQ's, but I do have the impression that they do want to put some effort in getting reliable data. But still there's always those difference between fishers. There's always one group of fishers that participate in every project and there's a group of fishers that we cannot really reach, so there's also a difference in that.

Comment
Howard McElderry
Archipelago Marine Research Ltd.
Canada

It might seem implicit that rights based management and the vested interest that the license holders have would orient them towards more accurate data through self-reporting, but I think there are so many competing issues there that I don't think it's necessarily true. I think what is true though is that in rights based fisheries, the license holders have a vested interest in making sure that the data in the fishery are more accurate, whatever means that is.

Panel Session 8:

What specific issues are important to the fishing industry regarding fishery monitoring?

Moderator: **Amy Sierra Van Atten, NEFOP, National Marine Fisheries Service, USA**

Speakers

David Boyes – Canada
After 4 years: A fisherman's experience with British Columbia Groundfish Integration Pilot Program.

Eric Brazer – USA
An inaugural case study in groundfish sector monitoring.

Vito Giacalone –USA
Development of Fishtrax, a reporting tool designed by fishermen for groundfish sectors

Rodney Avila – USA
Importance of safe and sound monitoring programs from a Fishery Management Council Member

John Gauvin – USA
New handling & accounting procedures to reduce halibut mortality rates while improving catch accounting.

Elio Neves – Azores, Portugal
Fishermen and the University of Azores working together to observe the tuna fishery.

Mary Beth Tooley – USA
Developing a monitoring program in the U.S. Atlantic Herring Fishery.

William Ward – USA
Benefits of cooperative research as seen by the Gulf Fishermen's Association in Florida.

Introduction to the session

Welcome to our 8th session that is comprised of fishing industry representation from around the world. Our speakers come to us from Portugal, British Columbia, and the U.S. They will address issues that are important to the fishing industry regarding fishery monitoring. Among the topics our panelists will cover are; the impact of new innovative fishery management strategies on data collection activities, real-time bycatch management strategies, sentinel fisheries or cooperative research as mechanisms to improve fishery monitoring, costs issues and risk-benefit analysis of industry-led fishery monitoring programs, and outreach processes for successful implementation of fishery monitoring.

All of us here agree that it is important that viable valid methods to sustain our marine resources are critical. Today we will hear from the primary users of that resource on the importance of working cooperatively with industry in developing monitoring programs and incorporating new technologies to ensure sound resource management. Are fishermen willing to take accountability and responsibility for their utilization of the resource? Are they concerned how the data is being collected and used? Do they want to have strong and open communications with the resource managers? I think we will hear the answer to these questions and more.

After four years: A fisherman's experience with the British Columbia Groundfish Integration Pilot Project

David Boyes
Arbegar Fishing Company, British Columbia, Canada

In 2006 BC groundfishermen began to fish under a new management system whereby vessels were individually responsible for all their catch, and any mortality associated with at-sea releases. All vessels were required to carry either observers (the large, trawl fleet) or video cameras (the smaller hook and line and trap fleet) and to fill out detailed logbooks. Fish quotas became transferrable between species license categories, under negotiated trading rules, so that vessels had access to the fish they needed. Since the beginning of this program, all species have been fished within annual TACs.

An inaugural case study in groundfish sector monitoring

Eric Brazer
Cape Cod Commercial Hook Fishermen's Association
Chatam, Massachusetts, USA

Eric Brazer
Cape Cod Commercial Hook Fishermen's Association, USA

Sectors offer communities of fishermen the opportunity to manage their own quotas of fish. Fishermen are given more control over their businesses, the chance to increase their profits, opportunities to rid themselves of trip limits, and the satisfaction of knowing that they won't be forced to discard fish. In return, they agree to operate more responsibly and to live within the rules. Further, they agree to stop overfishing and to develop a monitoring program that ensures this goal. The Cape Cod Commercial Hook Fishermen's Association (CCCHFA) has developed a monitoring program for one of the only two Sectors in New England: the Georges Bank Cod Fixed Gear Sector (Fixed Gear Sector). Through the use of innovative video monitoring systems, trained data collectors, and the Sector members themselves, CCCHFA and the Fixed Gear Sector have advanced a credible and viable program for their fishing community.
Additionally, this work is intended as a blueprint for the 17 additional Sectors, representing a majority of the ground-fishermen in New England, to use when they are approved in 2010. The key to an optimal and successful Sector program is the ability to accurately know how many fish

are being removed from the ocean; without it, guesswork, extrapolations, and assumptions will continue to drive fisheries and fishermen to extinction. Robust monitoring brings more accurate data; more accurate data leads to more effective management; and more effective management leads to more fish and more profit for fishermen. Only through a robust and accurate catch monitoring program will any catch share program, including Sectors, allow fishermen to achieve optimal yield while not exceeding the biological limits of our prized fish populations.

Development of Fishtrax, a reporting tool designed by fishermen for groundfish sectors

Vito Giacalone
Northeast Seafood Coalition, Gloucester, Massachusetts, USA

A monitoring system should be designed to provide real and measurable long-term benefits for a fishery. To be embraced by commercial fishermen, the effort put toward data collection should enhance fishing flexibility, eliminate reporting redundancies, reduce scientific uncertainty and improve the economic viability of the fishery. The Northeast Seafood Coalition in partnership with Geek Gene, Inc. developed a software system called Fishtrax to accomplish these objectives.

Vito Giacalone
Northeast Seafood Coalition, USA

Importance of safe and sound monitoring programs from a Fishery Management Council member

Rodney Avila
New England Fishery Management Council
New Bedford, Massachusetts
USA

Rodney is a member of the New England Fishery Management Council and serves on the Safety and Enforcement Committee among others. He is a career commercial fisherman out of New Bedford Massachusetts. Rodney also works with IMP as a safety drill instructor helping to improve the safety aboard commercial fishing vessels.

New handling and accounting procedures on deck to reduce halibut mortality rates while improving catch accounting

John Gauvin, Best Use Cooperative
Seattle, Washington State
USA

At the Electronic Monitoring Workshop sponsored by the Alaska Fisheries Science Center workshop last June, I stated that for larger scale fisheries in Alaska, Electronic Monitoring should be developed to replace human observer coverage for compliance monitoring applications wherever possible. My opinion is that the skills and training of human observers are better utilized for biological data collections and other resource management duties. EM systems are capable of being "on duty" 24/7 and with further development and some periodic spot checks by human observers, these systems would free up observers to expand biological data collections such as additional stomach contents sampling or gonad collections, or even some baseline ecosystem monitoring data collections. The crux of this matter turns on development of EM systems that are sufficiently robust and improvements in cost effectiveness of EM, particularly in the review of EM data. After I made this pronouncement I showed a short video of crew members crew members in Alaska sorting Pacific halibut from a net brought on board, prior to the prohibition on sorting catch on deck (sorting halibut from tow net that was not selected for observer sampling). The purpose of the clip was to illustrate a potentially challenging application for EM. Many who had agreed with my opening statement about using EM for purely monitoring tasks approached me after my talk. They wondered if EM could really be effective for monitoring based on conditions on deck in the video. To them I replied that if the industry's approach were simply "business as usual" then EM will probably not work or might be so expensive (particularly in the data review phase) that it would be cheaper to keep to the present system that results in very high halibut mortality rates and high observer coverage costs. So in my short talk in Portland, I'd like to describe progress since last June in the development of new handling and accounting procedures on deck to reduce halibut mortality rates while improving catch accounting. We are currently gearing up for a field study this summer under an EFP to assess potential for reducing halibut mortality rates on flatfish vessels through changes in fish handling procedures. These procedures are not "business as usual" in terms of how fish and handled on deck and in the processing area. The objective is to engage in a paradigm shift to use the industry's knowledge of how to sort and get accurate accounting of catches at sea in a collaboration that is working to facilitate monitoring and accounting of catches while reducing bycatch mortality rates for halibut. The first phase of our pilot study is primarily focused on estimating the potential for reduction of halibut bycatch mortality rates but will incorporate an EM system to evaluate potential for monitoring of the new catch handling procedures. In the next phase of this study, we hope to continue working with the Alaska Fisheries Science Center to evaluate how to strike an appropriate balance between human observer coverage and electronic monitoring. Preliminary results for the field work should be available in time for the International Observer Conference in Portland in late July.

Fishermen and the University of the Azores working together to observe the tuna fishery

* Elio Neves, and Miguel Machete
APASA, Azores, Portugal

Tuna Producers Association of the Azores (APASA) was created in 1985 in order to represent the professionals that harvest tuna and similar species in the Azorean waters. The association focused on fisheries related issues but also in trade questions since a considerable part of tuna was exported and consumed abroad. In the 1990's, it became clear for APASA and other parties, that there was an urgent need to be fulfilled in the tuna fishery – the dolphin safe certification. Tuna export was seriously conditioned by this fact, since the Azores had a strong traditional whaling history. In 1998, after some unsuccessful attempts, the regional administration, the Institute of Marine Research (IMAR), APASA, Industry Association and Earth Island Institute (certification body) agreed in the establishment of a Program that would be independent, managed by the University of the Azores (through IMAR), and that would be responsible to place observers onboard APASA tuna fishing vessels associates - the Azores Fisheries Observer Program (POPA). Since then, Dolphin Safe certification was assured every year, with collected data demonstrating that there was no mortality of dolphins or other cetacean in the Azorean tuna fishery. Besides that, a large amount of information regarding tuna fishery and associated species started to be systematically collected by the observers. As a consequence of the data collection program, the Friend of the Sea certification (a broader certification for sustainable fisheries) was granted to this fishery in 2001. After 11 years of cooperation between parties, POPA data is frequently requested by administration and researchers (eg: for management purposes) but also by fishermen that can beneficiate from information collected in previous years. Presently, APASA and IMAR/University of the Azores are trying to establish closer cooperation based on POPA and other projects data in order to provide more information about tuna abundance and their relation with environmental factors such as primary production and surface temperature.

Developing a monitoring program in the U.S. Atlantic Herring Fishery

Mary Beth Tooley
O"Hara Corporation, Rockport, Maine, USA

Mary Beth Tooley
O'Hara Corporation, USA

The Atlantic herring fishery in US territorial waters on the northeast continental shelf has come under tremendous scrutiny in recent years due the nature of this volume fishery that is not well understood by many stakeholders. Having recovered from a major decline in biomass in the late 1970s and early 1980s, the resource has fully recovered and fishing mortality remains low on a robust stock. However, a major criticism of the fishery by some stakeholders is the perception of an inadequate monitoring program for both catch and bycatch in the fishery. The industry is working with fisheries management agencies and advisory bodies to develop a more vigorous monitoring program. Industry has identified the need for development of a fisheries code of conduct and a cooperative relationship with the NMFS Northeast Observer Program. As proposals move forward on monitoring alternatives for the fishery the industry has been active in seeking funding for monitoring, establishing standards for sampling and catch estimates; and has conducted numerous education and outreach meeting for captains and the observer program to foster greater understanding of the goals of the monitoring program and the needs of the fishery.

Benefits of cooperative research as seen by the Gulf Fishermen's Association in Florida

William Ward
Gulf Fishermen's Association, Florida, USA

Will manages a Cooperative Research Project for the Gulf Fishermen's Association (GFA). GFA is a commercial fisherman's association promoting environmentally friendly and sustainable fisheries in the Gulf of Mexico. Will is a third generation grouper fisherman turned retail/wholesaler. He has been fishing for 25 years or so. He has seen a contribution of scientific data to the benefit of the industry and NMFS SEFSC. The project has made a big difference in the fishermen's attitude towards scientific data collection and allows the scientists to see how the fishermen work. I currently manage a Cooperative Research Project CRP for Gulf Fishermen's Association. I have seen the myriad of benefits our project has brought to the industry, NOAA'S Southeast Science Center and scientific data collection. It (the CRP) has made a big difference in our fisherman's attitude about scientific collections and given the scientist a hands-on view of how we operate.

Question and Answer

The question and answer session below captures the dynamic dialog between panelists and the audience. Each discussion is separated by a double line break

Question/Comment
Lisa Borges
European Commission
Belgium

My question is for all panelists, but directed to John Gauvin. The commission wants to incentivize collaborative research between fishermen and researchers. So we get innovative ideas for our policy on discards. Now I couldn't really understand what was your incentive to work for the Three vessels. I wanted you to explain, but I wanted to ask the panel. Incorporating any incentive is always a challenge. I want your opinion on what an incentive could be for fishermen to work together with scientists and managers.

Response
John Gauvin
Best Use Cooperative
USA

We benefit if we can reduce halibut mortality by being able to catch more target fish. That's the general incentive.

Specifically to do an exempted fishing permit, which is a research project where we could fish outside of the regulations in terms of how we handled halibut and potentially reduce halibut mortality rates, we needed a permit to fish in a mode different from what's allowable.

The incentive specially was (although fishermen were using their own groundfish allocations through the co-op and their halibut by-catch allocations) if they could reduce the mortality, they would be credited to savings in mortality and potentially be able to do more fishing. Not get closed down by halibut by-catches early. So that was a very direct incentive that we needed to have to make sure fishermen would sort all that fish and do what they had to.

Generally in Alaska we've got a number of different approaches to cooperative research that if it's an exempted fishing permit you might even ask for an additional allocation of groundfish or by-catch to be able to test something if it has benefit to the fishery, if you're willing to make the information that you bring about available to everyone.

That is available sometimes because we don't actually catch our entire allowable biological level of fishing, so extra fishing doesn't create an impact on the resource.

Question/ Comment
WIlliam Ward
Gulf Fishermen's Association
USA

That was a very good question about maybe a little different perspective regionally how you can build incentives.

In our area in the Gulf of Mexico there are two groups of fishermen. Well, there are lots of groups of fishermen, but let's break it into two groups if we will. Those that already have the incentives already, which are because of the lack of data, because we're data poor fisheries the incentive's already there. They're looking up at bottom. They're looking up at every time it's being taken from them.

So for them, the incentive's already built in. They know that they've got to get good data. So in essence that should be a selling point

The second group, for the other group that aren't willing to work with you on that we'll just keep working and educating them on the value of that if you will. Neanderthal comes along slow and long, but it will come along. That's a process that I have to fight with, we as industry representatives fight with all the time and we encourage all of you to do that because I think sooner or later they will come along if we keep on chipping away at it. Good question.

Question/ Comment
Bjorn Stockhausen
Joint Research Center of the European Commission
Italy

I have also a question for John regarding the halibut discard mortality. You had a huge decrease in handling time; down to 26 minutes. Maybe it's a bit too specific, but there are studies that suggest that even halibut needs less handling time to survive.

Also there is delayed mortality which suggests that after ten days there's still mortality happening when the fish is already released back. Is there a possibility for you to reduce this handling time even further and did you evaluate the delayed mortality?

Response
John Gauvin
Best Use Cooperative
USA

We're working in a very cold area in terms of ambient temperatures on deck. I think that could mean that the other study may not be relevant to what we're doing. I don't know where the other study came from.

The bottom line is we used the approved viability assessment techniques that are used generally to assess and those are based on science that's looked at, releases and holding them and looking at latent mortality, etc. So that should have been incorporated.

As to the bigger question, could we do it faster, that's a huge and actually interesting question because the fishermen could have swore we found out in ten minutes. Because we had to measure every fish and do viability on every fish, in some cases that backlog there was increasing the time before they got back in the water.

What we were measuring the entire time from the time we pulled up the net until the time they were back in the water. So I think why we're interested in doing a sub-sample is to speed that process up so we're not doing viability assessment and killing them at the same time with the added time.

Question/ Comment
Julie Bonney
Alaska Fish Data Bank
USA

We've been investigating using EM. I have a question for Eric. When you talked about the issue of confidentiality in terms of the data that you were going to be generating, were you struggling with the idea of confidentiality in terms of trade secrets, in terms of where fishermen fish or are you more concerned about legal ramifications in terms of injury to crew, the ability for an NGO to foil your data? I'm looking for; A: What kind of confidentiality issues you are struggling with and, B: What kind of solutions that you may have.

Response
Eric Brazer
Cape Cod Commercial Hook Fishermen's Association
USA

The short answer is all of the above. Who has access to that data, what is the pathway that that data flows through from the vessel through the analysis, and how is the data stored. I mentioned access to the data. There's a large concern from the fishing industry that this data could be taken out of context and I think it's a valid concern.

Once you have something on film, once you have an image or a video it exists in perpetuity until it's deleted. We're still trying to address "How do we extract the data we need from it while minimizing any sort of harmful implications to the fishermen" and it's an ongoing project.

Question/ Comments
Kim Dietrich
Consultant
USA

I have a multi-level question about the sector system. One is I'm wondering if there's a body that's going to review these monitoring plans and are there going to be some consistent elements that will be required in all of them.

I'm asking this because as a data user sometimes you perform an analysis and your data is in one format, but it seems like this sector system you're suddenly going to have varying degrees of data quality and when you have to extrapolate by-catch rates or something like that it gets way more complicated when you have multiple collection systems.

Then, I'm wondering how this sector system will address the loss of biological information that your current observer program is already collecting, so things like age structures and protected species interactions.

Response
Eric Brazer
Cape Cod Commercial Hook Fishermen's Association
USA

In terms of the review, each sector is required to submit an operations plan by September 1st of this year in order to operate on May 1st of next year. That operations plan is reviewed and finalized by the National Marine Fisheries Service. There's also opportunity for public input and review as well.

When we're dealing with a network of sectors, up to 19 potential sectors, there are going to be consistency issues. To an extent we're doing a good job of streamlining this within the industry. We may have 19 sectors, but in terms of the industry leaders there's really only a handful of us and we attempt to do our best to work very closely to ensure that we can streamline this as much as possible.
There will be varying degrees of data quality and we're very interested to ensure that we don't lower the bar inadvertently by failing to address this.

Finally, there won't be a loss of biological data in the context that you mentioned. Whatever catch monitoring program sectors have to implement will be over and above the Northeast Fisheries Observer Program, so that data collection will still occur, but this will be focused specifically on catch monitoring.

Comment
Vito Giacalone
Northeast Seafood Coalition
USA

We've been working closely with NMFS and they've been holding workshops. One of the key things we're looking for is to have format that is uniform. How ever the data streams end up going, Fisheries Statistics is going to have their way that they want the data to be received and that's probably going to rule I think as far as the data format.

All of the systems that are collecting the data are going to ultimately have to have it in that one format that goes to FSO.

Comment
Amy Van Atten
NOAA Fisheries Service
USA

My final comment on that since I'm involved with that program in developing the at sea monitoring program, we are working closely with the industry. We've held two workshops at our regional office in Gloucester to come up with some standard guidelines and a template that the fishermen will have to use in their operations plan.

We're standardizing the training as well as the data quality checks and ensuring that the multiple data collection systems can easily be integrated and be used real-time.
We have a third workshop coming up on August 5th for interested service providers in Woodshole to get more information.

Panel Session 8 question and answer

Question/Comment
Craig Faunce
NOAA Fisheries Service
USA

Just a personal thanks to all the participants. I found all the talks very informative and professionally presented.

David, but you did briefly mention that with the initial implementation of the EM component of the groundfish project there was concern in the fishery in adopting and acceptance and data quality.

I was wondering if you could just take a moment to comment or elaborate a little bit on that. Did you find acceptance and those issues resolved within a timeframe of weeks, months, years?

Response
David Boyes
Arbegar Fishing Co. Ltd.
Canada

To some extent the fishermen that elected to stay and fish under this new program were a self-selected subset of the industry because some people just baled. They said, "I'm not going to do that. I'm not going to take a camera and I'm going to sell out."

We have an old cohort of captains. I think the average age is 58. The younger guys though seem to accept this much more readily. It's interesting to note that people who were really very much opposed or very skeptical about it in the first year or two of the program are now some of the strongest supporters.

We’ve been using ITQ management for 19 years in the halibut and sable fish fisheries. I think came on in ’96. We didn’t finish ITQ-ing the other groundfisheries until 2006. So ling cod and dog fish came on then, as well as zeden, which is rock fish, but it’s complicated in that halibut did hold some rights to rock fish prior to that.

So it’s a mixed bag, but it took time. It took years for people to get used to it and there was lots of people who were and are still mad about it.

Question/ Comment
Melany Haggard
MRAG Americas
USA

I’ve worked in the Alaska Groundfish Program, as well as Hawaii Pelagic Long-lining. My question is for Mary Beth. I’ll start by admitting that I don’t really know much about the Atlantic herring fishery, but you mentioned many ways the industry is supportive of observer coverage and better estimates of catch volumes.

I’m curious to hear more about the obstacles preventing actual weights of the catch as opposed to estimates. Has the idea of incorporating flow scales into your fishery been suggested or researched?

Response
Mary Beth Tooley
O’Hara Corp
USA

It has been suggested, however, the industry thinks it’s really not very feasible. We are wet boats, in that the vessels are pumping fish aboard into RSW tanks. So you have a lot of water, lot of fish. Obviously we are trying to minimize the amount of water to a certain extent, but you’d have to have a flow scale on deck and with open sea conditions, we just don’t think that that’s very feasible.

Also a lot of the fishermen really feel that the volumetric measurement system they’ve used in the past is accurate. They want to get paid for all their fish. So they do want to have accurate estimates of that catch.

The people who buy the fish don’t want to pay for more than what they get. So from the fishermen’s perspective they have a comfort zone with the way they’ve been doing it.

I think we do need to make it better and just from the actual weighing, fish, they’re pumping aboard a vessel 100 ton of fish in half an hour, 40 minutes. It’s a lot of fish coming aboard fast. When the fish come off the boats it’s the same thing.

Question/ Comment
Allen Kramer
West Coast Groundfish Observer Program
USA

First I’d just like to show that I appreciate the proactive nature of all of your organizations. I find it rather refreshing

My question is for Eric. I’m not really familiar with New England management, but “Are your sectors exclusive to particular individuals or if you were successful in your management and perhaps your quotas were increased for that area could fishermen from other areas of the state or other states come in and fish in those areas?”

Response
Eric Brazer
Cape Cod Commercial Hook Fishermen’s Association
USA

Yes, the sectors are open to anybody who would agree to live within the standards of accountability that the sector sets. The sector is run by a board of directors and they set the contract and the harvesting rules. As long as fishermen agree to live within those rules then they're more than welcome to join the sector.

We've had our sectors up and running since 2004. Starting next year the sector concept is really going to take off and it's going to be a lot more comprehensive. So the addition of new members, new gear types, new fishing areas, new home ports is going to require additional analysis and additional justification in both the operations plan and the environmental assessment.

But the short answer is yes, they're open, they're self-selecting, they're voluntary

Panel Session 9:

What specific issues are important to non-governmental organizations (NGOs) regarding fishery monitoring?

Moderator: **Vicki Cornish, Ocean Conservancy**

Speakers

Keith Davis – USA
The Association of Professional Observers (APO): Strengthening fisheries monitoring through advocacy and education, since 1995.

Elizabeth Griffin – USA
The application of observer data by NGOs in advancing policies for protected species conservation.

Jay Lugar – Canada
Data requirements in Marine Stewardship Council Certification.

Chris Robbins – USA
Fisheries monitoring in the recreational sector: Challenges and opportunities in the Gulf of Mexico.

Peter Baker – USA
Slippage in the commercial fishing industry.

Introduction to the session

Among the concerns are providing a forum for addressing issues important to non-governmental organizations (NGOs) regarding fishery monitoring is such as providing research and scientific advice, assisting in the development of best fishing practices, provision of funding for fisheries resource issues, and influence through litigation and the political processes are among them. But the primary reason involves the idea and challenge of possibly affecting changes for resource management through an organization not in the Federal sector.

As a fellow member of the NGO community, I am pleased to present to you our speakers, Elizabeth Griffin from Oceana, Peter Baker from the Pew Environmental Group, Keith Davis form the Association of Professional Observers, Jay Lugar from the Marine Stewardship Council, and Chris Robbins from the Ocean Conservancy.

The Association for Professional Observers (APO): Strengthening fisheries monitoring through advocacy and education, since 1995

Keith G. Davis[1], Alicia Billings[2], Ebol Rojas[3]
Fisheries Observer/APO Board, USA[1], Lotus Web Design and Consulting/APO Board, USA[2]; Fisheries Observer/APO Board, Uruguay[3]

In May 1995, five Fisheries Observers waiting for vessel assignments out of Kodiak, Alaska - discussing the poor treatment of observers by observer providers in the region - decided to take action by founding the Association for Professional Observers (APO).

Founding Actions:

- Summer 1995: The first *Mail Buoy*, the APO's newsletter, published
- 1996 - 1997: the APO rallies for Observer representation at the Fisheries Council level and helps initiate representation by way of an employment union.

Founding Principles:

- Advocate for and increase awareness of Observers' rights
- Gain a voice in the political mechanism that drives Observer Programs
- Build an awareness that Fisheries Observers are an essential component to the sustainable management of resources

Prior APO Board Members[1]:

- Erika Acuna, Stock Assessments, NOAA; Steve Copps, Senior Policy Analyst; NOAA; Kim Dietrich, Natural Resources Consultant; Tracey Mayhew, Observer Union Representative; Mandy Merklin, Environmental Consultant; Suzanne Romain, Marine Biologist, Independent; Gillian Stoker, Graduate Studies Student; Teresa Turk, International Observer Program Coordinator; NOAA.

Historical Overview (Conference History):

The APO has traditionally worked many of its projects around the schedule of the Conferences in the IFOMC Series. The APO has been represented at all of the Conferences and has been a consistent influence to its success and outcomes.

1st (Seattle, 1998) Conference[2]; APO Representation: Teresa Turk:

- **North Pacific SDM**: "real and apparent conflicts…"
- **Retention**: "high turnover rate may indicate that observers feel discouraged and unmotivated by their working conditions."
- **Safety**: "observers in some programs could be fired and replaced for refusing to board a vessel they considered unsafe."

2nd (St. John's, 2000) Conference [3]; APO Representation - Kim Dietrich:

- Observer Bill of Rights (OBR): The idea to establish an OBR started with the APO in 1997, and the Observer Bill of Rights (OBR[4]) document was created as the outcome of a workshop and panel/discussion session led by Teresa Turk and Kim Dietrich at the 2nd Conference.

3rd (New Orleans, 2002) Conference[5]; APO Representation - Kim Dietrich, Suzanne Romain, Gillian Stoker, and Tracey Mayhew:

- National Observer Support Standards
- Safety issues and Incentives to improve safety
- Evaluating Contractor Performance
- Challenges of Effective Observer Training

Jerry Dzugan concluded a 3rd Conference session by paraphrasing Sir Walter Scott: “It’s not data you’re gathering, it’s risk.”

4th (Sydney, 2004) Conference[6]; APO Representation[7] - Mark Wormington, Dave Wagenheim, and Keith Davis:

- Conflict of Interest: “Explicitly define professional duties of all participants… ”
- ObserverNet: “online forum to discuss topics such as sampling techniques, data use, vessel safety and accommodations, and compensation.
- Heightened Observer Program Standardization and Communication

5th (Victoria, 2007) Conference[8]; APO Representation - Liz Mitchell, Brad Justin, and Keith Davis:

- Membership on Observer Professionalism and Observer Safety Working Groups
- Short-story Book project proposal
- Ecosystem-based Management
- APO poster presentation

Other APO Accomplishments:

- **Mail Buoy**: important avenue for disseminating fisheries information for 14 years
- **Letter Writing**: input into rule changes that influence the lives of Observers
- **Web Resources**: the APO website is an increasingly important resource for understanding the Observer profession
- **Observer Recruitment and Retention Study (2005)**: Contracted by the US National Observer Program (NOP) – Later formalized into NOP Report

The APO Today:

- **Mission Statement:** *the Association for Professional Observers (APO) is a non-profit, non-governmental organization whose mission is to strengthen observer programs through advocacy and education. Our goal is to facilitate the exchange of fisheries information while providing an important source of fisheries observer program and fisheries observer data-use information. It is our intention that the results of our activities may encourage the recruitment and retention of professional observers and foster the best quality observer data for the purposes of conservation and the responsible management of marine living resources.*

Current (2009) APO Board:

- Liz Mitchell: President; Dave Wagenheim: Vice President, ObserverNet; Keith Davis: Secretary, *Mail Buoy* Editor; Alicia Billings: Treasurer, Web Master; Ebol Rojas: APO Board, Associate *Mail Buoy* Editor; Mark Wormington: APO Board; Brad Justin: APO Board

APO Reconstruction (Focus Area) Objectives:

- Accommodate the APO’s Mission and visions in a more directed manner

- Optimize the utility of APO resources
- Help APO Members become more involved

Focus Areas:

- **Education and Outreach**[9]
    - Objectives
        - Support the dissemination of educational information
        - Increase and improve the utility of fisheries resources available to the public
        - Reach out internationally among stakeholders
    - Primary Projects:
        - *Mail Buoy* newsletter; 906 Subscribers
        - *Eyes on the Seas*, collection of observer stories

- **Observer Data**[10]
    - Objective:
        - Provide resources regarding issues and take action upon issues related to: public access to Observer data; collection protocols; training and data quality control standards; service delivery model structuring; and, rules that impact the independence and integrity programs
    - Projects:
        - *Public Access to Observer Data*
        - *North Pacific Groundfish Observer Program Overhaul*
        - *Implications and Trends of Electronic Monitoring*

- **Observer Health, Safety, and Welfare**[11]
    - Objective:
        - Address issues such as: working conditions and emergency procedures; safety training, rules, and standards; drills, inspections, compliance and enforcement; and, protection of observers' livelihood
    - Projects:
        - *Catalogue of Observer Casualties, Injuries, and Near Misses*
        - *Globally Outlawing Observer Harassment and Interference*
        - *Implementation of an Observer Bill of Rights*

- **Observer Labor and Professionalism**[12]
    - Objectives:
        - Identify initiatives associated with fostering heightened observer professionalism
        - Address issues that have bearing on the fair and equitable labor rights of Fisheries Observers.
    - Projects:
        - *North Pacific Groundfish Observer Union Negotiation Survey, For 2010 Contracts*
        - *Implementation of an Observer Bill of Rights*

Outlook, from Members (Feedback Survey Results):

- ***Observer Professionalism Central***: on-line location that acts as a job site where observers and contractors/providers from around the world can meet. Observers can post a profile with their education level and experience.

- ***Build Greater Overall Stability***: work towards building greater financial and administrative stability within the organization so that the APO can be more valuable for its members by tackling its mission objectives more effectively.

Outlook, from Board[13]:

- **Business Plan**: establish a business plan (2 year), designed with multiple options
- **Fund Raising**: membership recruitment, grant writing, source funding options.
- **Staff**: currently we are 100% volunteer run. We would like to have the funding to hire at least one part-time employee.

Closing:

- Fisheries Conservation Need Statement:
  - "Global fisheries are in crisis: marine fisheries provide 15% of the animal protein consumed by humans, yet 80% of the world's fish stocks are either fully exploited, overexploited or have collapsed." - Camillo Mora, *Management Effectiveness of the World's Marine Fisheries* (2009)[14].
- Professional Observer Need Statement:
  - The Food and Agriculture Organization (FAO) of the United Nations reports that "There is a direct relationship between the professionalism and morale of observers and the quality of the data they collect,"[15] and the integrity of an observer programme is directly linked to the professional ethics of its observers.

Notes:

1. This is not a complete list of all Prior APO Board Members. For more information on prior APO board members, please contact us: apo@apo-observers.org
2. McElderry, H., Karp, W.A., Twomey, J., Merklin, M., Cornish, V., & Saunders, M. 1999. Proceedings of the First Biennial Canada/U.S. Observer Program Workshop. U.S. Dep. Commer., NOAA Tech. Memo. NFS-AFSC-101. 113p. http://www.st.nmfs.noaa.gov/ifomc2009/1st%20IFOC%20Proceedings%20Seattle.pdf
3. Anon. 2000. Canada - U.S. Fisheries Observer Program Workshop - Proceedings. NMFS and DFO, St. John's, Newfoundland, Canada. 52p. http://www.st.nmfs.noaa.gov/ifomc2009/fisheriesprogramrev.pdf
4. Link directly to the OBR document at: www.apo-observers.org/docs/ObserverBillofRights.pdf
5. NMFS. 2004 Proceedings of the Third International Fisheries Observer Conference. U.S. Dep. Commerce, NOAA Tech. Memo. NMFS-F/SPO-64, 192p. http://www.st.nmfs.noaa.gov/ifomc2009/ThirdProceedings2002IFOC.pdf
6. Mcvea, T.A, Kennelly, S.J. 2005. Proceedings of the 4th International Fisheries Observer Conference. NSW Department of Primary Industries, Cronulla Fisheries Research Center of Excellence, Cronulla, Australia. ISBN 1 9209 12 20 2. 230pp. http://www.st.nmfs.noaa.gov/ifomc2009/4th%20IFOC%20Proceedings%20Sydney.pdf
7. Note: None of these APO members were APO Board members at the time, though all are now
8. McVea, T.A and Kennelly, S.J. (ed.), 2007. Proceedings of the 5th International Fisheries Observer Conference –15 – 18 May 2007, Victoria, British Columbia, Canada. NSW Department of Primary Industries, Cronulla. Fisheries Research Centre of Excellence, Cronulla, Australia, 412 pp. ISBN 978 0 7347 1861 7. http://www.st.nmfs.noaa.gov/ifomc2009/Proceedings_ALL_FINAL_170907.pdf
9. Link directly to the Education and Outreach Focus Area page: http://www.apo-observers.org/education
10. Link directly to the Observer Data Focus Area page: http://www.apo-observers.org/data
11. Link directly to the Observer Health, Safety, and Welfare Focus Area page: http://www.apo-observers.org/health
12. Link directly to the Observer Labor and Professionalism Focus Area page: http://www.apo-observers.org/labor

13. Check out the APO and Become an APO Member Today. www.apo-observers.org/join General Email: apo@apo-observers.org
14. Mora C, Myers RA, Coll M, Libralato S, Pitcher TJ, et al. (2009) Management Effectiveness of the World's Marine Fisheries. PLoS Biol 7(6): e1000131. doi:10.1371/journal.pbio.1000131
15. Davies, S. L.; J. E. Reynolds (ed.). 2002. Guidelines for developing an at-sea fishery observer programme. FAO Fisheries Technical Paper. No. 414. Rome, FAO. 116 pp.

The application of observer data by NGOs in advancing policies for protected species conservation

*Elizabeth Griffin[1], Beth Lowell[1], Michael Hirshfield[1], Courtney Sakai[1]
Oceana, Washington, D.C, USA[1]

In the United States, non-governmental organizations (NGOs) play a significant role in securing funding to support fisheries observer programs. Subsequent data is then used to hold the government accountable for its legal obligations to manage protected species and to develop bycatch reduction options.

In Oceana's work to reduce bycatch of non-target fish, sea turtles, marine mammals and other marine wildlife, a pattern has emerged. First, a suspected problem spurs the acquisition of money for a low level of observer coverage. Observer data is then used to produce a bycatch estimate for the fishery of concern, which results in the development and implementation of mitigation measures. A higher level of observer monitoring is then needed to ensure that bycatch reduction efforts are working, which requires more money. Finally, as new observer data is analyzed, bycatch mitigation measures are altered as needed based on the new information, thus continuing the cycle. As highlighted by the following case studies, NGOs can play an essential role in helping to drive this cycle.

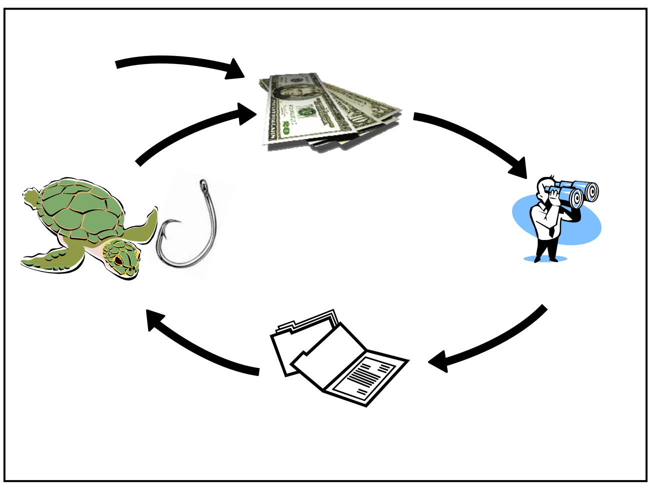

Figure 1: Figure 1: The Circle of Life. An illustration of the cyclical path of observer data-based management

In fiscal year 2005, no dedicated funding existed for fisheries observers in the bottom longline fisheries targeting reef fish and sharks in the Gulf of Mexico and South Atlantic. Based on concerns over fish and sea turtle bycatch, Oceana began lobbying Congress to include funding in the National Marine Fisheries Service (NMFS) budget to establish pilot observer programs in these fisheries. Over the next few years, observer coverage increased, albeit to a low level, in fisheries using bottom longline gear in the Gulf of Mexico. NMFS then used the observer data collected from July 2006 through 2007 to produce a bycatch estimate of nearly 1,000 sea turtles in the bottom longline fisheries targeting reef fish over the 18 month period[1]. These takes proved to be nearly 8 times the level authorized in the 2005 Biological Opinion, which was based on logbook reporting. Upon receipt of this new information, Oceana began working with other

NGOs, commercial fishermen, and the federal government to reduce turtle takes in the Gulf of Mexico reef fish fishery. Oceana and NGO partners asked the Gulf of Mexico Fishery Management Council to vote on an emergency closure of the fishery to allow for sea turtle protection during the development of a longer-term solution. The Council indeed voted in favor of the emergency closure and NMFS put the decision in place. Oceana is now in the process of developing long-term solutions, which the Council is expected to adopt in August, 2009. Close monitoring of the reef fish fleet will be necessary to ensure that sea turtle bycatch is being reduced to the expected level. In addition, a large portion of the bottom longline effort is expected to shift to vertical line fishing. Increased monitoring of this gear type will also be needed to ensure sea turtle bycatch only occurs at very low levels and that other unexpected consequences do not occur. Therefore, the cycle continues as Oceana returns to Congress to lobby for more money.

Oceana's role in marine mammal Take Reduction Teams (TRTs) illustrates another example of how this circular process can be used to enhance conservation of protected species. A TRT is a stakeholder team of representatives from the fishing industry, fishery management councils, state and Federal resource management agencies, the scientific community, and conservation organizations. Such a team convenes when necessary to reduce marine mammal bycatch in a particular fishery. Oceana and other conservation groups often advocate for additional funding to support observers in fisheries suspected to have marine mammal bycatch issues. If extrapolations of observer data show the level of interactions to be higher than biologically-based limits put into place by the Marine Mammal Protection Act, the Act calls for the formation of a TRT. The team develops a Take Reduction Plan, which is the bycatch mitigation plan for the fishery of concern. These plans often include monitoring to ensure that bycatch is being reduced to acceptable levels. If the data extrapolations show this to not be the case, the team meets again to revisit the plan and the cycle continues.

Fisheries observer programs collect invaluable information that can be used by conservation groups to identify fisheries that are likely to compromise the survival and recovery of protected species and to monitor bycatch mitigation efforts once they are put in place. While being successful in protected species conservation requires NGOs to be active in all steps of the cycle, the cycle starts with more eyes on the ocean. This vital first step is a time when NGOs can really make a difference. For example, from 2002 to 2008, Oceana's focus on observer funding helped lead to a 125% increase in federal funds for this program. This funding has allowed for the acquisition of additional data for Oceana and other NGOs to use in advocating for improved protected species conservation. However, for this data to be useful to NGOs it must be made available and the process must be transparent. This is an area where the U.S. continues to struggle, with the trend moving towards less available data and a less transparent process.

Notes:

1. National Marine Fisheries Service, SEFSC. Estimated Takes of Sea Turtles in the Bottom Longline Portion of the Gulf of Mexico Reef Fish Fishy July 2006 through 2007 Based on Observer Data. September, 2008.

Data requirements in Marine Stewardship Council certification

Jay Lugar
Fisheries Outreach – Americas, Marine Stewardship Council, Seattle, WA , USA

The Marine Stewardship Council (MSC) was created 10 years ago to empower market forces for the advancement of sustainable fishing practices. Fisheries voluntarily undergo assessment to the internationally developed MSC standard for environmentally sustainable fishing and, if successful, the fishery is then certified and products can be promoted through the use of the MSC label. MSC assessments review three main areas: target stock health, impact on the ecosystem and effectiveness of the fishery management system. Assessments are robust, data-driven and peer reviewed. The assessment process can identify specific areas of strength and weakness within the fishery. Weaknesses become conditions to a certification that are designed to improve performance or to develop and analyze additional data during the life of the certificate. Data quality is a key element in the process.

The MSC movement has developed substantially in its 10 year history. As of mid-2009 there are 47 fisheries certified to the MSC standard for a well-managed and sustainable fishery, 106 in full assessment and another 20-30 in confidential pre-assessment. Almost 2,500 products carry the MSC ecolabel in about 50 countries around the globe. Globally, nearly 400 million individual seafood items carrying the MSC logo were sold in the year preceding April 2009.

The MSC standard is based on three Principles that consider target stock health (P1), impact of the fishery on the ecosystem (P2) and effectiveness of the fishery management system (P3). A number of outcome and information based criteria under each Principle stipulate minimum acceptable practice. Within this rubric an MSC assessment employs 31 performance indicators to score a fishery. A successful fishery must demonstrate minimum acceptable practice for every indicator and must also pass a higher threshold for the average of all indicators within each Principle. An indicator that falls below the threshold becomes the subject of a condition that must be met within a span of one to four years.

The MSC assessment process uses independent third parties called certification bodies selected by the client fishery. Certifiers hire scientific experts and together make decisions according to the MSC standard. The certifier's team considers all available stock assessment, scientific research and other information provided by the fishery representatives, the regulator, government and university scientists and other stakeholders who declare an interest in the fishery. The MSC process is transparent and encourages stakeholder involvement at all stages so that all valid perspectives and information about a fishery's sustainability practices are considered. If successful, a fishery's MSC certificate is valid for five years with annual audits to check progress on conditions and continued performance under the three Principles.

Key elements in MSC assessments of interest to observation and monitoring organizations are requirements for information sources and their accuracy – independence being an obvious corollary. The assessment methodology includes the category "Information/Monitoring" in one of two P1 (stock health) components and in all five P2 (ecosystem) components. As an example, one P1 indicator states: "Relevant information is collected to support the harvest strategy." The acceptable practice score requires regular monitoring of stock abundance and fishery removals at a level of <u>accuracy and coverage</u> consistent with the rules that govern the harvest (which are evaluated under a separate indicator). If monitoring is not regular or lacking accuracy and coverage then a condition would be created to improve performance to the acceptable level.

In another instance, a P2 indicator states: "Information on the nature and amount of bycatch is adequate to determine the risk posed by the fishery and the effectiveness of the strategy to manage bycatch." The acceptable practice score includes a requirement for qualitative and some quantitative information on the by-catch and sufficient data for detecting any increase in risk to the main bycatch species. If these information standards exceed current practice a condition would be developed.

It is obvious that the range and nature of the current work by observer and monitoring programs to support fishery assessments are essential in MSC assessments. In fact, many MSC certified fisheries are successful because their information base is among the very best – transparent and independent. All MSC certified fisheries, however, have received conditions designed to increase the results of particular indicators through improved performance or better information. Two examples highlight the effectiveness of conditions and a role for IFOMC:

- The US North Pacific halibut fishery was required in increase observer coverage in order to improve information for multiple MSC indicators under P2 – ecosystem impacts. The Public Certification Report prepared by Scientific Certifications Systems Inc. included a requirement to "Establish a scientifically defensible and comprehensive monitoring and reporting system for bycatch and discards taken directly from the halibut fishery."

- In a certified South African hake fishery significant achievement occurred under a requirement to investigate the incidental take of seabirds. A new observer program identified a significant bycatch of an average of 18,000 seabirds per year and as a result a mitigation plan and new practices were developed to reduce the take. Now less than 200 seabirds are taken per year, over 98 percent improvement.

Where do IFOMC participants and the MSC program coincide? Two areas should be apparent: delivering solid, independent and transparent data to MSC assessments and helping certified fisheries meet conditions. Moreover, MSC certifications lead to a subtle shift in responsibility by placing onus on fisheries to demonstrate their sustainability practices. In this sense, MSC is a form of business development for many here today. MSC certified fisheries and those in assessment need independent observing and reporting mechanisms in order to meet our standard. You are there to assist. Together we can achieve the MSC objective – employing market forces to improve sustainability in the world's fishery.

Fisheries monitoring in the recreational sector: Challenges and opportunities in the Gulf of Mexico

*Christopher S. Robbins[1]
Ocean Conservancy, Austin, Texas[1]

In the United States the Magnuson Stevens Fishery Conservation and Management Act (MSA) – the country's primary fishery management law – mandates the use of Annual Catch Limits (ACLs) and Accountability Measures (AMs) to end or prevent overfishing in U.S. managed fisheries. To implement these new provisions as effectively as possible in the recreational sector, managers need complete, accurate and timely information on fishing mortality. Higher quality scientific information reported expeditiously reduces uncertainty and leads to more responsive and effective management. Managers benefit from a monitoring system that helps them meet the legal requirements of setting and monitoring ACLs while fishermen are less likely to exceed their quota and be penalized for overages when catch information (landings + discards) is reported and analyzed in a timely manner.

This issue of monitoring is important in Gulf of Mexico where millions of private anglers and more than 1,300 hundred federally permitted charter boat operators participate in the recreational fishery. ACL overages in this sector have the capacity to compromise the sustainability of popular species, such as red snapper, due to sustained high levels of effort delays in data transmission catch estimates reach managers weeks after the season ends.

Discussion

Data collection methods used in Gulf of Mexico commercial fisheries are typically not appropriate for the volume of recreational fishing participants, and other methodologies have been applied. Since 1979 the Marine Recreational Fisheries Survey and Statistics Program (MRFSS) administered by the National Marine Fisheries Service (NMFS) and similar but independent state surveys have been the main methods for collecting data on recreational fishing. MRFSS uses a combination of telephone surveys of coastal households and dockside angler-intercept interviews to estimate total effort and catch, respectively. In 2006 the National Research Council identified shortcomings with MRFSS that included unreliable methods of accounting for at-sea discards, angler recall bias associated with post-trip surveys and delays in the transfer of data to managers[1]. This review prompted NMFS to redesign the MRFSS program and establish the Marine Recreational Information Program (MRIP) in its place.

While the two-part catch and effort survey methodology remains the core of MRIP, new technologies and innovative research could greatly improve the timeliness, reliability and management value of self-reported data collected from recreational anglers in the Gulf of Mexico. Some examples of technological advances and promising research from around the US include the following: 1) electronic logbooks to be designed for and piloted in the Gulf of Mexico charter boat fleet; 2) mobile phone reporting via text messaging in North Carolina; 3) Web-based reporting in Maryland; 4) on-board video monitoring for verifying discards; and 5) cooperative research evaluating factors affecting the survivability of released fish in Florida. While these data collection and verification methods have limitations of their own, they offer a variety of uses and potential benefits (Table 1).

Implementing ACLs and AMs to end and prevent overfishing in the United States will depend in part on robust and effective fishery monitoring. The recreational sector accounts for a significant portion of fishing morality for many species in the Gulf of Mexico, but the sheer size and dispersed nature of the angling population complicates monitoring efforts. National changes to the recreational fishery data collection program and regional efforts to pilot new self-reporting technologies or engage anglers in applied research could help overcome these hurdles. Ultimately, improvements to recreational fishery monitoring programs in the Gulf and elsewhere must support the MSA’s new requirements for catch limits and accountability measures and strive to do so in a timely manner.

Data collection method	Uses and potential benefits
Charter boat electronic logbooks	Timely transfer of data to managers for responsive in-season management; avoids memory recall bias associated with post-trip surveys.
Mobile phone and text messaging	Widely available, relatively affordable method of reporting; significant potential for collecting key data from numerous anglers in near real-time.
Web-based reporting or surveys	Direct and timely submission of information to fishery managers; enables managers to determine length frequency for compliance reports, use sublegal fish for discard data, measure recreational effort with the fishery and obtain reports on all size classes of fish caught/released.
Video monitoring	Practical, unobtrusive method of validating at-sea fishing activity (discards) against logbooks; may reduce risk-averse behavior of clients/crew.
Tagging discards for monitoring survivability	Identify factors (depth) that contribute to higher mortality; may determine best practices to improve survivability of released fish.

Table 1. Promising technologies or approaches to recreational fishery data collection and management in the Gulf of Mexico

Notes:

1. NRC (National Research Council). 2006. Review of Recreational Fisheries Survey Methods. National Academy Press, Washington, D.C.

Uncertainty created through slippage

*****Peter Baker[1], John Crawford[1], Megan Mackey[2]
Pew Environment Group[1], Regional Marine Conservation Project[2]

Slippage, a variant on high grading, occurs in pump fisheries, both with and without observer coverage, when the contents of the net are partially or completely discharged without sampling the discarded catch. On otherwise observed trawl trips, this phenomenon forces observers to rely on either good-faith estimates from the captain regarding the size and species composition of the slipped catch, or on their own visual estimates of net contents, which are still largely underwater. Neither of these methods constitutes reliable sampling of the discarded catch. The problem of slippage is compounded by size-specific sorting grates, which function to pre-sort the fish at the fish pump before they are brought aboard, excluding larger marine life and debris. Because of this pre-sorting, the composition of the landed catch is different from the slipped catch, and cannot be used to estimate the composition of the slipped discards. Accurate catch monitoring data is critical to ensuring our nation’s fisheries are well managed. Slippage seriously undermines knowledge of catch composition in certain fisheries and represents a major challenge to observers and to the integrity of monitoring programs. This presentation examines the problem of slippage in mid-water pelagic fisheries and offers some solutions and suggestions for further research.

Methods

In this study we analyzed national and international fisheries to gain a better understanding of the prevalence of slippage events, and developed proposed conservation and management reforms to address this issue.

Results/Discussion

New England Atlantic Herring: Catch data for the Atlantic herring fishery is conducted by the Northeast Fisheries Observer Program (NEFOP). In 2007, the NEFOP reported that approximately 6% of observed tows were partially discarded or slipped at sea without systematic sampling, and nearly 11% of observed tows were completely discarded without sampling[1]. Because individual tows may contain well over 100 metric tons of marine life and cause substantial mortality to the catch, this degree of unsampled discarding is of great concern[2].

Mid-Atlantic Mackerel[3] The amount of discards of large pelagics in the Atlantic mackerel fishery is largely unknown due to the inability of observers to view such discards because of the pumping mechanism. Large bodied species are prevented from entering the pump by the sorting grate, and are discarded while the cod end is submerged.

Scotland[4]: In one short study of discards in pelagic fisheries in Scotland, 11% of the total catch of maatje herring, comprising three complete hauls of 25, 15 and 5 tons, respectively, was discarded with the third haul slipped. In the mackerel fishery, approximately 4% of the total catch was slipped.

United Kingdom[5] In the UK mackerel and pilchard trawl fisheries, the cod-end was emptied without being brought on-board, thereby compromising the ability of the observer to record all marine mammal bycatches.

England[6] Slippage has been recorded as an issue in one study when researchers were studying discards in an English pelagic trawl fishery for mackerel. Researchers noted that whole catches were sometimes slipped without ever being brought on board, forcing them to rely on the fishermen's estimates of catch size and composition.

Solutions: Conservation and management reforms to alleviate the problem of slippage involve improvements to monitoring and observer programs to ensure more reliable sampling of all catch. Reforms should include:

- Monitoring of every tow, all trips with an observer on each vessel.
- Ensure a complete sampling record of both pre-sorted catch and residual catch in the cod end after pumping, as was apparently done in one study of the Dutch pelagic trawl fishery off Mauritania, in which most discarded catch came on board[7].
- Use of electronic monitoring, including mesh pressure sensors on nets and video records of catch pre-sorted on deck, to augment standard observer data.

In addition, strong regulations and innovative solutions must be devised to minimize and account for slippage events that are unavoidable due to safety concerns. For instance, an overall cap on allowable slippage, combined with an assumed slippage event tonnage and a trip-termination requirement should be considered[8].

Research Needs: More extensive studies of catch, bycatch, and discards in mid-water pelagic trawl fisheries, based on high quality sampling data, are essential to gaining more reliable information about the actual impacts to target and non-target resources, and critical to ensuring sustainable fisheries management.

Notes:

1. Van Atten, Northeast Fisheries Observer Program, Presentation to Herring Oversight Committee, New England Fisheries Management Council, May 22, 2008. See http://www.nefmc.org/herring/index.html.
2. Davis, M.W. 2002. Key principles for understanding fish bycatch discard mortality. Canadian Journal of Fisheries and Aquatic Sciences. 59 (11): 1834-1843.
3. Appendix to Letter from D. Furlong, Exec. Dir. MAFMC, to J. O'Shea, ASMFC (May 11, 2009) (on file with Mid-Atlantic Fishery Management Council).
4. G. J. Pierce et al. 2002. Results of a short study on by-catches and discards in pelagic fisheries in Scotland (UK). Aquatic Living Resources. 15: 327-334, 332
5. Y. Morizur et al. 1999. Incidental catches of marine mammals in pelagic trawl fisheries of the northeast Atlantic. Fisheries Research 41: 297-307, 303.
6. Y. Morizur et al. 1996. By-catch and discarding in pelagic trawl fisheries. Final Study, Centre de Brest, France. 122p at 66.
7. R. ter Hofstede, M. Dickey-Collas. 2006. An investigation of seasonal and annual catches and discards of the Dutch pelagic freezer-trawlers in Mauritania, Northwest Africa. 77: 184-191, 185.
8. P. Baker et al. 2008. Herring Alliance Scoping Comments re: Amendment 4 to the Atlantic Herring Fishery Management Plan. p.8.

Question and Answer

The question and answer session below captures the dynamic dialog between panelists and the audience. Each discussion is separated by a double line break

Comment / Question
Mary Beth Tooley
O'Hara Corp
USA

I'm with the Small Pelagic Group. In terms of Peter Baker's animated movie, it's a little difficult to address all of the issues that came up in the movie. I think I had an issue with just about everything.

For one thing, the pumps are not attached to the nets. They're attached to a hose that comes off the deck of the vessel. It is then attached to the cod end for pumping. We use the same pumps whether we're seining or trawling. These are not pumps that are specific to trawling operations.

The statistics he used are different than the statistics that we've been recently using at the council for slippage events; 8.7 percent observed slip events. Of those, 48 percent are because the captain said there was not enough fish in the net to bother with. Over 50 percent of the pounds that are slipped are due to mechanical malfunctions. These are all things that people on the vessels are working 24/7 on. They like to keep things working and they're trying to catch fish.

So as I said, there's very little of the film that I agreed with, but it's the first time I've seen it. It would take me a little while to go through it in detail.

Question/Comment
Julie Bonney
Alaska Groundfish Data Bank
USA

I have a question for Keith. Observers in the US are required to have a four-year college, biological degree. I know in the Canadian model that they require a high school degree and in that model they have a higher retention and they've been able to incorporate fishermen that have experience on vessels and have experience on the ocean and are very much into sustainable resources and good monitoring.

Would the organization that you work for be willing to have a discussion about whether the four-year degree for observers is appropriate or could there be some other avenues in terms of people that might be qualified to enter the core?

Response
Keith Davis
Observer/APO Board Member
USA

This is a subject that's come up a lot over the years. Actually we're addressing it in the observer professionalism working group. In the workshop we're collecting information about employment standards committee as far as eligibility requirements on an international level.

As far as the APO is concerned, we haven't' been working on that specifically, but I would definitely be interested in starting some sort of discussion about it. Personally I feel that it doesn't need to be a requirement it depends on the objectives of the program and it depends on the resources that you have available, the employment resources you have in the area. You have to work with what you have, then try to build those standards up to a better level as time progresses and as you have better resources.

I think it comes down to the objectives of the observer program and what you're asking observers to do. In the North Pacific for example, they require that you have statistics background.

I think that's a good thing to require there because there's information that you're collecting in the random systematic sampling scheme that they have there in place that requires more of that background knowledge whereas other programs it might not require that.

Question/ Comment
Phil Bailey
Electric Edge Systems Group
Canada

My question is for Jay Lugar. I was just wondering how many fisheries have applied for certification and completed the process and of those how many actually fail to gain certification.

Response
Jay Lugar
Marine Stewardship Council
USA

The number of fisheries that have applied would be the total of what is certified, which is 52, and the number in assessment now which is 112. So give or take 170 or so, including the ones that are under trial assessment and those are the ones that have come forward for full assessment.

There's another range of fisheries that would have done a confidential pre-assessment, which we may not know about until they would come forward. Over time we hear about a number of pre-assessments, but we don't know until they formally come forward through a certifier who notifies us that this fishery has started a full assessment.

Heretofore there has been on fishery that has failed certification. The reason for that, (what you may think is a skewed number) is that fisheries use the pre-assessment tool to determine if they have a good opportunity or likelihood of passing our assessment.

So you'll see a number of fisheries that may undertake a pre-assessment and say- "not for us right now". There are a number of other examples where there's other conservation groups working with those fisheries, use the pre-assessment tool to identify specific elements that may require work or new methods and they go back, work with the fishermen and then come forward later on with, we would hope, for a full assessment. So I think that covers the gamut of your question.

Question/ Comment
Greg Williams
Halibut Commission
USA

I have a question for Chris. I was interested in your recreational fishery presentation there particularly where it comes to monitoring and documenting or observing total mortality or total harvest.

I've been gaining increased awareness and experience with the use of log books in recreational fishery for Halibut in Alaska and some of the difficulties in getting accurate, reliable data with that. I'd be really interested in some of your thoughts on verification of log book data, particularly in at least my case, we've got a quota limited fishery and the reliability of data reported through a log book.

Response
Christopher Robbins
Ocean Conservancy
USA

That's a good question. Well I think there are two issues associated with verification of catch from a for hire vessel. One is landings. I think you can get at that through dockside sampling, so you have existing port samplers checking the coolers of anglers getting off charter boats. There is an existing system in place in the Gulf for that.

I think that the MRIP- for hire working group is looking group is looking at viable verification mechanisms. That's one of them.

Now the tricky bit is the discarding. If you're going by or using a quota system, in theory those discards should apply to the catch limit. So, there are one of two ways. You can assign a person (independent observer) to document the discards or you can find some other passive means or mechanism, and cameras come to mind.

Question/ Comment
Bob Trumble
MRAG Americas
USA

As an observer/provider I'd like to follow-up on Julie's question and Keith's comments on high school degrees and four-year biological degrees.

When we ran the Hawaii observer program we had a number of observers who had only high school degrees. I'm not even sure all of them had that, but they were trained by Alulike. It was a wonderful program. Individuals went through a several week training in advance of the NMFS training. If they passed the Aloliki training, that qualified them to go into the NMFS training.

Then they had to pass the NMFS training like any other observer. So it was a multiple selection process that filtered out the very best observers. These guys from Alulike turned out to be some of our best observers. They've got the most sea days. They're the most dedicated. They're really great observers.

I would encourage anybody to at least think about how to develop this kind of a program because it does offer a widespread opportunity for people to come into the program and I think that that Alulike program demonstrates how you can do it, but I want to emphasize you've got to do it right because if you don't do it right you're going to end up with problems.

Comment/ Response
Keith Davis
Observer/ APO Board Member
USA

I know some of the Aluliki observers down there and there are some really good observers.

I didn't quite answer completely what Julie had asked about as far as retention of observers. I could see how eligibility is finding a fine line between how you want to retain your employees in the system because with a four-year degree you can make the argument that it's just a stepping stone to move up beyond the profession and that sort of thing.

So often times if you can find someone that is working well and it comes down to proper training and support and that sort of thing and retaining a professional work force. It doesn't necessarily have to be the eligibility standards.

Question/ Comment
Corrin Flora
NOAA Fisheries Service
USA

I have a question for Chris. You had mentioned one of your monitoring methods is telephone surveys. I was wondering if these are captain interviews or like telemarketer telephone surveys.

Response
Christopher Robbins
Ocean Conservancy
USA

That's a good question. I'm no expert on this. If there's someone here from the Marine Recreational Information Program, they'd be in a better position to get into the particulars, but yes, telephone surveys are conducted on a random digit dial basis. They typically target coastal households for effort information. Then the angler access point surveys get the CPUE information and there's an estimation procedure used to combine the two data sets to get at total catch and effort.

The telephone surveys, that's one of the issues that the NRC highlighted in its evaluation in that there are a fair number of anglers from non-coastal counties that come to the coast to fish. So how do you effectively capture those individuals in the sampling frame.

Comment/ Continued Response
Corrin Flora
NOAA Fisheries Service
USA

I was just wondering how much of a demographic do you feel you're losing there? Probably about 80 percent of the people hang up on telemarketers.

Response
Christopher Robbins
Ocean Conservancy
USA

I don't know if it's automated. It may be a live human on the other line.

Question/Comment
Georg Hinteregger
Observer
USA

Vicki, you mentioned how important it is to the NGOs to lobby for observer coverage of getting money for observer work. I'm wondering if you're also looking at the quality of the observer coverage that you're going to spend the money on.

Are you looking at service delivery models, like the Alaska system where you have multiple companies in competition with each other directly working for the industry.

the kinds of problems that creates for good data and observers lifestyle. Are the NGOs engaged in the how observer programs should be run in addition to just getting them more money?

Response
Elizabeth Griffin
Oceana
USA

Yes it is something that we've been kind of keeping an eye on. It's not something that we've actively engaged on across the board, but in key fisheries that we've looked at we have been paying attention to it.

I know there are a lot of questions. We do a lot of work on turtle by-catch and the scallop fishery in New England. There are questions about industry funding versus government funding and how those systems are set up, but I do agree. It's something that we need to be looking at on a broader level than just fishery by fishery.

Response
Vicki Cornish
Ocean Conservancy
USA

I've realized that there are a lot of nuances in how observer programs operate and that most folks in the NGO community aren't aware unless you are deeply entrenched in the process of how observer programs operate and are executed.

So it's a difficult process to insert yourself into. A lot of people say well, we need money for observer programs. Let's just get the industry to pay. Of course, all the folks from industry know that that's not always a viable option.

But we do want to have more ownership of the fishery management process and bringing fishermen into that process or the ownership of fisheries through their direct payment for the monitoring requirements is one way to do it, but we are very careful that we like to see programs set up that are effective and that do have the highest quality of data because every dollar that we lobby for on the Hill is precious dollars for monitoring.

We certainly want to see those dollars be used most effectively. So it's in forums like this that observer programs are able to share information about how to operate more effectively that I think the NGO community should be more involved in to make sure that those dollars are being spent in the best way possible.

Response/ Comment
Georg Hinteregger
Observer
USA

If you recall was it a couple days ago Kyle Baker gave his wonderful presentation about reforming the protected species observer program in the middle earlier. I'm wondering if the NGO's are aware of those efforts and are actively engaged in helping accomplish this.

Question/ Comment
Thuy Nguyen
WWF
Vietnam

I have question to Jay Lugar about the condition of the certification. In this developing country you have the observer as an independent party to monitor the fishery.

So in a developing country like our country, is the fishery certified with the condition of data monitoring? We don't have the observer or the third party. Does MSC have tools to measure the accuracy of the data monitoring by the fishery itself?

Response
Jay Lugar
Marine Stewardship Council
USA

I know for a fact that the application of our program in some fisheries that would otherwise be called data deficient is more difficult. Often times it is fishery, developed fishery dependent information, fishermen derived information directly from the fishery.

I think the answer is that we are definitely, the certifiers who would be reviewing the fishery according to our standard, would definitely take into account all the available sources of information and try to assess their accuracy and their applicability to the questions that are being asked about that fishery.

There's nothing to say that fishery dependent information or fishermen information fishermen themselves provide would not be considered. We don't require independent data, but it would certainly be an advantage for a fisher to come forward with a selection of independent data that would help the assessment team understand what was accurate and what was just anecdotal.

Finally the last thing I wish to mention is that we are, as of July of last year, we established a default assessment tree which we call the Fisheries Assessment Methodology. There are some data deficient fisheries or small scale fisheries that may have a hard time meeting the requirements in those indicators.

So we have recently in January developed and will have a version two coming out at the end of this month what we call a risk based framework which is based on an Australian model that uses more of a discussion, a consultative mechanism rather than specific published data sources to help certify, pick out and derive sufficient information in which to make their determination.

Those risk based frameworks are going to be essential to helping the situation in which you refer to help certifications in those examples.

Question/ Comment
Keith Davis
Observer /APO Board Member
USA

I have a question to Jay also as far the quality of data from observer programs and different professionalism standards for the monitoring in developing countries.

Is there anything in your certification process to ensure that the quality of data coming from those programs based on whether or not the observer has issues of severe harassment and that sort of stuff that could influence the outcome of the data and that sort of stuff in the fisheries that you certify?

Response
Jay Lugar
Marine Stewardship Council
USA

We don't have a specific rubric that would identify good versus bad data. It would be up to the certifier to understand the sources of that data and to assess from that scientific assessment team's perspective what the data means and then to interpret it according to our standard.

So it's possible that there could be slightly different approaches by different certifiers as to what data they would accept and what they wouldn't, but they all have to meet the same criteria and they would have to publicly announce and be peer reviewed against what standard they think that fishery has achieved and what the data means.

Response/Comment
Amy Van Atten
NOAA Fisheries Service
USA

I just wanted to thank the panel and thank the NGOs for your time that you do spend on the Hill lobbying for money to support observer programs and monitoring programs. It's very important, especially for the Herring Fishery since we're discussing that this morning and this afternoon where we don't have dedicated funds to direct towards that fishery in particular.

I'm a little bit disappointed at the debut of the movie. I just feel in this forum it's a little bit of a shame and a poor example of how NGOs can constructively work with observer programs towards a resolution to reduce discarding.

I actually agreed with your slides, Mr. Baker, in the beginning, but there are some serious flaws to consider in requiring the observer to sample the entire pumping process, especially if it exceeds the capacity of the observer workload. It can take more than 18 hours to retrieve some of those nets and to expect an observer to sample 600,000 pounds of fish over that period of time will be very difficult.

Just to let everybody know, for the pilot whales there really is a very rare event of incidentally taking pilot whales in this fishery.

Comment
Peter Baker
Pew Environmental Group
USA

As long as we continue to deny that slippage is an issue, we're not going to solve the problem. I think that's where I'd leave it.

Question/ Comment
Howard McElderry
Archipelago Marine Research Ltd.
Canada

I had a few comments to put out. I didn't actually intend to speak about observer training or experience and qualification level, but just listening to the few comments that were made I thought maybe it might be appropriate.

Because we wear the whole cycle of the program from initial investment and training and hiring to completion of the data and delivering it all the way through, I think that it's caused us to be a lot more thoughtful about the hiring of people. There's a tremendous amount of investment put in to just pre-screening people before they ever enter a training program and observer program. When I think about whether or not education, to the extent that's important, I would agree it is, but I also think about someone's understanding of the work environment well before they're considering being an observer and also motivation and trainability. You can accomplish an awful lot in a training program, but they have to be receptive of that. I think those are success factors in our program.

I also, being the person that was requesting that the M be added into what was the IFOC and looking at some of the mandate of the APO, I would encourage you to broaden your thinking about instead of looking at the pros and cons of electronic monitoring and how it fits and so on, I really think the real question is looking at the broad suite of monitoring tools that are needed in various fisheries and trying to figure out appropriate settings for where those might work together, independently and that sort of thing.

I don't think the observer community should feel threatened that there's a technology that's coming along that can offer vastly cheaper monitoring on certain fisheries. I see it as being a real opportunity to capture certain parts of the fishery where it really is indeed a hazard to be there. So just look at it in the whole perspective.

I stood up to ask Jay Lugar a question, which first I want to thank you for participating. In Victoria we tried very hard to get the MSC to come to the meeting because I think MSC has a really big part in just the monitoring community and I really hope that this is just the first of many times that we'll see MSC at this meeting.

My question though was when -- I am at a distance from MSC in the process, but it seems to me that the MSC process is almost about certifying the management framework around a fishery as opposed to the fishery itself. I'm just wondering what your thoughts were around that.

With certain fisheries, the interest from industry may be very high toward certification and there may be a lot that industry is interested in doing to try to achieve certification, but they might just be out of luck if their agency that's providing all of that framework just isn't up to the bar.

Response
Jay Lugar
Marine Stewardship Council
USA

It's a perfectly valid question. I think it highlights the fact that when a given fishery wishes to seek MSC certification that it alone cannot get there.

One of the essential elements in our process is that stakeholders can bring to bear information that they have a place, but it also puts a heavy burden on the management agency to bring and to provide the documentation and the process that they use to develop that documentation and information to the table so that the assessment team has a complete picture.

There have been a number of examples where the fishery has used MSC certification to put their management agency in a corner and say without you doing what we need to have done we won't get there and you and we can both benefit from the certification.

So there are many motivations behind why a fishery would come forward and of what you speak is just really not a bad example of a non-market motivation.

Response/Comment
Howard McElderry
Archipelago Marine Research Ltd.
Canada

I was just thinking that type of pressure, that sort of feedback loop would be really valuable in a lot of instances.

Response/Comment
Jay Lugar
Marine Stewardship Council
USA

Well it is in some countries in Europe and then some countries in North America the management regime has been quite resistant because they see it as something – a non-profit organization doing what they in essence do, but in actual fact it can be used by fisheries as method to test on an international standard basis the performance of sustainability and many jurisdictions and two of the prime ones I think that have come 180 degrees from being a little bit worried about the impact of MSC but have come 180 degrees and they're fully supportive(Norway and Canada**)**

A number of years ago in both countries the management authorities were quite reticent, but at least now in Canada, (I'm more familiar with that situation than in Norway where there are a number of fisheries under certification) but in Canada we had a distinct relationship with Fisheries and Oceans. They see the MSC as a tool to help them improve fisheries where they don't have the same level of measurement over sustainability.

So it's a very cooperative relationship and we're working quite hard with them because the other side of that relationship is that when certifications happen and conditions are developed it often puts an oneness on the management agency to do the kind of data collection that hasn't been done and is needed now to bring the fishery up to a status where it won't have any conditions (That's assuming it can be certified)
The time element and the person years it takes for a measurement agency to be able to address those issues is a factor. That was one of the factors why some governments were reticent in the beginning, but I think over the last couple of years there's been a large movement to accept these factors, as long as the certifier and the fishery can work with the measurement agency to structure the action plans, to meet the conditions over a period of time.

Comment
Keith Davis
Observer/ APO Board Member
USA

Yes. As far as electronic monitoring I think it's part of the future of observer programs. We're gearing towards that in a lot of aspects and I think it's a good thing as far as coupling electronic monitoring with on-board observers and that and for programs that are unmonitorable by human observers you can actually get some information from.

I know there are concerns in the observer community as far as thinking that it could take away jobs. So I would like to see this project with the APO develop and put forth some pros and cons on both sides and provide resources from all sides.

Howard, if you do have any links to resources that you think would be useful to link to, please send them to me and we can start to develop on this project and try to show many different facets of the electronic monitoring future in observer programs.

Comment
Howard McElderry
Archipelago Marine Research Ltd.
Canada

Yes, that's great. We'd be happy to. I think you can look at all these tools as trying to define what the ideal setting would be and then work from there, but it's a good approach.

Question/ Comment
Jennifer Lengares
A.I.S., Inc
USA

My question was actually in regards to the lobbying that's done. Obviously as an observer I have an appreciation for funding for observer programs, but my question was do you have certain criteria that you apply to where you get funding from?

I'm concern that funding from certain sources might reflect on the observer program and challenge their objectivity at least in the eyes of the public and in the eyes of the fishing community. So I'm curious if you have any criteria or standards that you look at.

I'm not very familiar with lobbying so I'm not sure exactly what sources you get the funding from, but obviously for me there would be some concern particularly that if we're being funded by a group or an individual that's very controversial we wouldn't want the observer program to be pulled into a political debate in that sense. We want to try to maintain objectivity. So I was just wondering how you decide the funding.

Response
Elizabeth Griffin
Oceana
USA

Right now all of our lobbying efforts are geared towards the U.S. Congress. So it's all about educating Congress on how important these programs are. Some of it's directed at key senators and congressmen from places where there's an issue that we need to solve and some of it's educating the entire Congress on the importance of good data for good management. So we have both of those categories of lobbying going on, but it really is all government money.

There are other circumstances where you might have a cooperative research program that's funded by a particular foundation or grant giving organization, but those wouldn't normally be the same pools of observers. They'd be small scale cooperative research projects.

Comment/ Question
Jørgen Dalskov
National Institute for Aquatic Resources
Denmark

I have a comment concerning the herring fishery. In European waters there is a total herring landing of around two million tons. I used to work landings and I know of course they are slipping. They are discarding, but the magnitude of that we don't know.
But then I saw the movie, and I saw all the marine mammals in the trawls. We're using double pair trawlers. We are using pelagic trawlers. We are using purse seiners in the European fisheries.

In 2004 the European council adopted a regulation which should reduce the incidences by-catches of marine mammals in the pelagic fisheries. All member states had to conduct a pilot study for a two-year period where at least in some fisheries it was five percent coverage and in other fisheries it should be ten percent coverage to see the magnitude of incidental by-catches of marine mammals.
I don't have the exact figures, but it was very, very few by-catches. I can say for the Danish fishery we didn't catch any.

Response/ Comment
Peter Baker
Pew Environmental Group
USA

Good, I'd be interested in seeing that. I don't personally see five percent observer coverage where you allow slippage as being a bona fide sample that I would trust the future of marine mammal populations to, but I'm glad that you conducted a set study.

Question/ Comment
Bob Trumble
MRAG Americas
USA

We're a certification body for the MSC. The risk based methodology of risk based framework that Jay mentioned is a very powerful tool for fisheries without much information, but I just want to point out that it's not without risk to use the risk based framework because if you don't have much data in a precautionary framework that the MSC requires you have to have a lot of supporting consensual agreement that the fishery works.

The process works on the situation of worst plausible scenario. So fisheries are way better off collecting information and using the regular assessment if practicable because you're in a much better situation of getting through.

But for some fisheries that are too small with not enough value that are very precautionarily managed, the risk based framework is a great way to go.

I don't want to discourage anybody from thinking about it, but I want you to think about it really carefully before you get into it because it may not get you there, but the pre-assessment as Jay mentioned, will give a really good idea of the pros and cons of the fishery and what kind of additional information you may need to move forward.

Question/ Comment
David Boyes
Fisherman
Canada

We've been pursuing MSC certification, since 2003 for the area 2B, the BC halibut fishery.

My question or the issue that I'd just like to bring forward, once again pertaining to the BC halibut fishery. We have an allocation framework between commercial and recreational, 88 commercial, 12 percent recreational. That was based on historical landings.

We also have an incipient transfer mechanism between the sectors. Right now the recreational sector can lease fish out of the commercial sector. The issue that I think this observers group might like to consider is that right now the fish is going from a regime that is very tightly monitored, as I tried to outline in my talk, to a regime that is very loosely monitored. I think that's an issue

I think the NGOs might like to comment on it. We don't know how far these transfers are going to go eventually, but we could be moving backwards in terms of good fisheries monitoring if the recreational sector isn't brought up to an acceptable standard at some point in the future.

Comment/ Response
Jay Lugar
Marine Stewardship Council
USA

I'd just like to make a brief comment to that, not directly to your question, but only to point out that the MSC does allow wild capture fisheries to volunteer to come forward and that would include recreational fisheries. You could very well work with other partners to convince the recreational component to come forward to have their gear type assessed in the same fishery and hopefully wouldn't take them seven years. In any event, it may be a methodology that you could use to have the same level of documentation and data requirements applied to them if you so chose.

Comment/ Response
Keith Davis
Observer /APO Board Member
USA

I'd like to comment as far as recreational fisheries and dockside monitoring. The APO hasn't really focused as much on different types of monitoring beyond fisheries observers out on commercial fishing boats, but I suppose a lot of it can be translated to other monitoring programs that are developed beyond the commercial fisheries. And dockside monitoring, that was brought up to me recently that we don't really pursue anything as far as the APO as far as dockside monitoring goes.

Comment/ Response
Vicki Cornish
Ocean Conservancy
USA

Have you looked at the at sea monitoring proposal that it's coming in under sector management and have you talked about this amongst the APO in terms of what that might mean for the observer program and the different responsibilities for at sea monitors versus observers? It's a program that's under development. I think it is Amendment 16 of the groundfish plan (looking at the use of at sea monitors with a little bit of a different requirement).

Response/ Comment
Vicki Cornish
Ocean Conservancy
USA

Perhaps I shouldn't get into this too much since I'm just learning about Amendment 16 myself, but I understand it has different requirements for eligibility and debriefing and responsibilities while at sea. It might be something to look into.

Comment
Chris Robbins
Ocean Conservancy
USA

Dave, in regards to your question about allowing the for hire sector into the IEVQ program and the potential for lowering the bar- I think we're seeing the opposite in the Gulf.

There is a segment of the for hire population that wants to establish its own sector within the larger recreational sector, but they realized that to do that they need to raise the bar of accountability and have in place the monitoring systems that will account for all their catch and they're looking to the commercial model, the ITQ model.

So in a sense the commercial ITQ model is raising the bar for that sector to be more accountable and to account for all catch, total mortality. So it's an interesting angle that you've touched on.

Question/ Comment
Steve Kennelly
New South Wales Department of Primary Industries, Cronulla Fisheries Research Centre of Excellence
Australia

This is a contribution to that current discussion about recreational fishing and the need for monitoring there. There is a whole science associated with monitoring recreational fishing. I guess it's something that's fallen out of this particular series of conferences and that we don't really consider that sort of thing too much in terms of all the work that's done in Krill surveys and omnibus surveys and all sorts of stuff that people do about recreational fishing.

Where I come from we have a lot of shared stocks between recreational and commercial fishing we often have to consider the management restrictions that are placed on the commercial sector and the effect that that has on what we call the recreational sponge, which means that yeah, you can be deciding on all these fish via restrictions you put on commercial fishermen, but it's absorbed by this massive number of people who go fishing with a hook and line and catch one or two fish a day, but there's millions of them so it has a big effect.

So you do need to monitor that and you do it using very different methods, but they're still out there and there's a whole other science associated with the work around Krill surveys and recreational fishing surveys.

I did have a question for Jay about the MSC certification process. You mentioned that it's all about the certifiers and I was just wondering, "who certifies the certifiers and who certifies those people who certify them". I mean in government we have a process where people called ministers do that and they get voted in or out according to their job, but I just wonder who's actually at the end of the line in the MSC.

Response
Jay Lugar
Americas Marine Stewardship Council
USA

Good question. We certainly don't know any MSC response or any population through elections, but certifiers must be accredited. There's an organization called Accreditation Services International which monitors if you will, certifies the certifiers.

A certifier would apply to be accredited. They would go through a year long process of training and their first efforts would be reviewed by ASI. They're constantly subject to being visited and reviewed, audited if you will by ASI as well.

So that's at arm's length from us and at arm's length from Bob Trumble as a certifier. Once they are accredited by ASI then they have full entitlement to proceed and offer their certification services around the world subject to audit once again.

Comment
Steve Kennelly
New South Wales Department of Primary Industries, Cronulla Fisheries Research Centre of Excellence
Australia

Who picks ASI people?

Response
Jay Lugar
Americas Marine Stewardship Council
USA

ASI has been hired by MSC and FSC, the Fisheries Stewardship Council, which pre-dated MSC by about ten years. It is wholly owned by FSC, but it is external to MSC, but there's no one overlooking ASI in a sense, except that of course our program meets UN FAO echo certification guidelines.

That's something that we're going to have tested independently. Part of that is to have the accreditation body that certifies certifiers outside of both them and us, certifiers and MSC.

You can go to the inth degree and not only arms length, but leg length and toe length or something if you wish.

Comment
Steve Kennelly
New South Wales Department of Primary Industries, Cronulla Fisheries Research Centre for Excellence
Australia

I just wondered where the public comes into that process at the end. That's the reason for asking.

Response
Jay Lugar
Americas Marine Stewardship Council
USA

I think one of the mechanisms that the public can use to support the overall program is to look for our logo on packages and on the fresh fish counter and support sustainable fisheries in that sense and therefore, make sure that what it is they're purchasing is sustainable, but if you're looking at another level of certification there isn't such, but we're a self-governing organization that has an independent board of trustees that makes sure that the program operates efficiently and effectively.
We also have an independent technical advisory board, which may be some people in this room or other people, scientific experts, both on the commercial side as well as on the scientific side, fisheries, biologists and stock assessment biologists to set up the technical aspects of our program.

We go through a rigorous program of standard development and standard maintenance.

Comment/ Question
Lisa Borges
European Commission
Belgium

I would like to make one comment from a scientist's perspective and one comment from a manger's perspective.

From a scientist's perspective, I published a paper last year with my colleagues from the Dutch Fisheries Institute where I estimated the percentage of discards, including slippage. The pelagic fishery trawler I think was 300,000 tons of landings and we estimated to be ten percent discards of which those discards I think was only 20 percent was caused by slippage.

From a manager's perspective, when we consider the high grading ban on law in the European community we did include slippage because I wrote that law and although I do not think there is a problem in this fishery, slippage was included.

Question/ Comment
John Gauvin
Best Use Cooperative
USA

I'm mostly involved with cooperative research and building alliances between industry and scientists and sometimes advocacy groups when it can happen.

This is a question for Miss Griffin. I listened with attention to your presentation and I particularly found interesting the circle of life. That somebody alleges something's going on in fishing and then we find money, go get data, do an analysis, etc.

I've been involved with this circular motion quite a bit over the years with different issues and I guess I'm wondering how can we do this better? Is there a way that industry can work better with NGOs to more directly address this and address it in ways that would be both more efficient and maybe more cost effective?

Response
Elizabeth Griffin
Oceana
USA

That's a great question. We have been very "emergency oriented" in fisheries in the past. There's a tendency to wait until there's a big problem and then try to solve it. You end up under the gun under a lot of pressure to come to a solution that might not be that good of a solution.

Whereas if we had consistently good levels of observer coverage across all fisheries it would give us a chance to be more proactive and take care of some of these issues before they become major problems.

So I think the first step really is getting a decent amount of observer coverage across all fisheries. I think that's a common goal that can benefit fishing industry, management and NGOs.

Comment
John Gauvin
Best Use Cooperative
USA

That's the first step. Then how do we work better together; that part of it.

Response
Elizabeth Griffin
Oceana
USA

Well I think meetings like this are a great start. Giving people a chance to get to know each other and start the dialogue. I definitely would be interested in catching up with you after this to start talking about where our common interests lie. I do apologize for leaving the fishing industry out of my lobbying efforts, as Vicki pointed out. We do occasionally go in with fishermen and ask for money for various fisheries.

Panel Session 10:

How can observer capacity be developed and/or expanded?

Moderator: **Andrew France, New Zealand Ministry of Fisheries, New Zealand**

Speakers

Teresa Turk – USA
Capacity building in West Africa.

Azure D. Westwood –USA
Utilizing observers to collect social data about fishermen's well-being.

Mike Orcutt – Canada
Fisheries observer program staffing strategies

Ryan Shama – USA
Should I stay or should I go? Observer retention and attrition in the WCGOP

Brian Belay – USA
Retention of observers in a global market

Introduction to the session

- Building observer capacity and retaining experienced observers
- Risks of increasing coverage levels too quickly
- Flexible employment arrangements
- Breadth of observer expertise/experience

Observers from around the world record a wide range of information and collect a vast amount of data. The information and data collected is often essential to better management and enforcement of the world's fisheries. There is an increasing need worldwide for more information and data to be collected to assist in the management of fisheries, and observers are often seen as the means to collect the required data and information.

As observer programs are tasked with increasing their capacity levels to meet higher levels of coverage, there are risks associated with attempting to do this too quickly. An observer program's greatest asset is in having high quality observers, and being able to retain high quality observers is a key factor in the success of an observer program.

In this session we learn how established people are able to use their experience and expertise to assist developing observer programs, and how important and beneficial retention of experienced observers is. We hear about a way to measure and manage happiness and hear some ways that established observer programs have tackled the issue of improving their retention of observers.

Capacity building in West Africa

Teresa A. Turk
NOAA's National Marine Fisheries Service, USA

Introduction

The passage of the Magnuson Stevens Reauthorization Act in 2006 requires the United States to assist other nations in eliminating illegal, unreported, and unregulated (IUU) fishing and to reduce protected species interactions. US assistance can be in the form of technology transfer and training or other areas of support. One such key topic to reduce and eliminate IUU is the collection of fishery catch and bycatch information and the development of monitoring, control and surveillance information.

Teresa Turk
NOAA Fisheries Service, USA

Robust and reliable observer programs are critical to solving IUU, reducing bycatch and providing sound and accurate catch statistics to domestic and international stock assessment scientists and managers. Observer programs can record a wide range of information at sea that is essential to better management and enforcement of the world's fisheries.

Methods

To further NOAA Fisheries Service efforts in Africa, we have been collaborating with the U.S. Navy's African Partnership Station (APS) to improve maritime safety, security, and resource stewardship. In early April 2008, NOAA Fisheries coordinated a 10 day observer training workshop on board APS vessel, HSV2 Swift, in Tema, Ghana.

Four scientists from NOAA and University of Alaska SeaGrant worked with the Ghanaian Ministry of Fisheries to offer a joint training program for 35 fishery observers. The program trained observers to improve the ways they collect data for scientific research and monitoring of fish stocks and bycatch within domestic and international fisheries. NOAA Fisheries also provided Ghana with safety and scientific equipment for use by observers while performing their duties. In February 2009, NOAA Fisheries in coordination with the Direction des Pêches Maritimes-Senegal and through the APS vessel, USS Nashville, provided a second observer training to 40 Senegalese observers and several interested NGO's and university students. During both training session, a fishery scientist from a different West African country attended. The intent was to "cross pollinate" the training concepts to other countries in the region and initiate a regional observer network.

Results and Discussion

NOAA Fisheries Service is scheduled to continue to provide observer training in Senegal in November or December 2009. Other countries requesting training are Sierra Leone, Sao Tome and Principe, and Cape Verde. Together with our West African colleagues we are developing a West African observer sampling manual that will be used for the training in Cameroon. If these activities are successful, future assistance will continue that may result in a regional West African database.

Utilizing observers to collect social data about fishermen's well-being

Azure Westwood
Massachusetts Marine Fisheries Institute, USA

Azure Westwood
Massachusetts Marine Fisheries Institute, USA

The Magnuson-Stevens Act requires that management measures shall "take into account the importance of fishery resources to fishing communities by utilizing economic and social data" (MSFCMA 2007, Sec.301.104-297 (8)). While social science data of various forms has been collected by observers and considered in fisheries management decisions in the Northeast USA, there have been no directed efforts to measure and understand a crucial social variable: subjective well-being. While often described as difficult to measure, well-being is an important variable with links to many aspects of life and includes satisfaction with one's job, health, opportunities, and access to necessary resources. Using past subjective well-being measures and models from across multiple disciplines, a survey-based method for collecting information about fishermen's well-being has been developed and tested in three prominent New England ports (New Bedford, MA; Point Judith, RI; and Chatham, MA). Observers are uniquely positioned within the fisheries paradigm to collect social data that can help managers, social scientists, and anthropologists to better understand fishermen and fishing community dynamics. The well-being survey can be incorporated into the observer data collection protocols at sea without compromising confidentiality priorities. On a broader scale, well-being measures collected by observers should be considered in policy-making as it lends insight into how management decisions affect fishermen's way of life, behaviors, attitudes, and their communities. This also helps fulfill the requirements under the Magnuson-Steven's Act to take into account social data variables. Exploring appropriate ways for observers to integrate social data collection like well-being should be a high priority for U.S. observer programs.

Fisheries observer program staffing strategies

Mike Orcutt
Archipelago Marine Research Ltd., Canada

Archipelago Marine Research Ltd., a private marine consulting company, has over 20 years of experience in the delivery of At Sea Observer Programs for a diverse array of fisheries and clients. Archipelago currently employs 40 to 60 at sea observers throughout the year in order to meet the at sea monitoring requirements of British Columbia's groundfish fishery and its dynamic fishing activity patterns. The experience of Archipelago's observer staff ranges from recent recruits to employees with over 10 years of experience in the profession. Archipelago employs a number of strategies to develop and sustain observer staff levels that meet the needs of its client fisheries and the development needs of its observer staff. These strategies include observer recruitment, professional development of existing staff and promotion of observer staff into new work areas either permanently or on a temporary basis. Archipelago uses a number of planning models that consider historic fishing activity patterns, staff availability and retention rates in to plan for recruitment in a proactive manner. This allows for the careful development of new observer staff without compromising the availability of work for existing staff. It also allows program staff to scale observer staff size to meet changes in fishery activity levels and to provide new work opportunities and professional development opportunities to observer staff.

Should I stay or should I go? Retention in the Westcoast Groundfish Observer Program WCGOP

*Ryan Shama and James Benante
Pacific States Marine Fisheries Commission
West Coast Groundfish Observer Program
USA

Since so much of the success of any observer program is dependent on the quality of its observers; and, since experience can play a major role in dealing appropriately with the multitude of sampling situations and issues that arise, it should follow that retention of quality, experienced observers leads to better data collection.

In addition to improved data quality, there are many other benefits to increasing observer retention, such as reduced training effort, time saved during the debriefing process, familiarity with the West Coast fleet, and the potential for recruitment of experienced individuals for lead observer and staff positions. In the WCGOP, we employ both seasonal and year round observers along the coasts of Washington, Oregon, and California and these observers are debriefed, face to face, every two months.

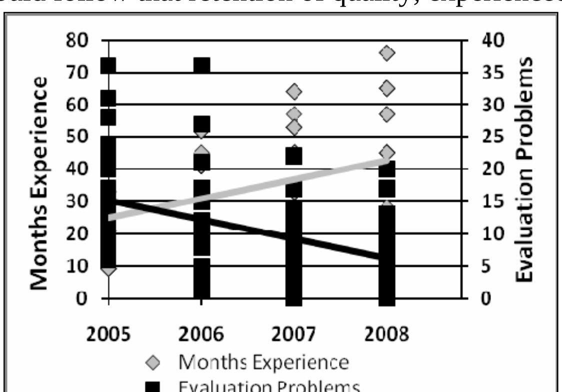

Figure 1: WCGOP Percent Retention by Year

In order to examine how retention affects the quality of sampling in the WCGOP, we have taken a look at observer evaluations over a four year period (from 2005-2008). Bi-monthly evaluation notes were used to quantify the number of "Problems" per debriefing period, and these "Problems" were used as a proxy of performance. However, keep in mind that these "Problems" could be anything from issues with sampling methodology, to issues with documentation or calculations. So, this data does not take into account the severity of the individual issues. Furthermore, within this 4 year span, we only used the eight month period when both year-round and seasonal observers were employed, as the workloads and fisheries observed were essentially the same for both groups during this time. By tracking the occurrence of "Problems" during these periods, we can measure the quality of data collection in relation to experience (Figs. 2 & 3).

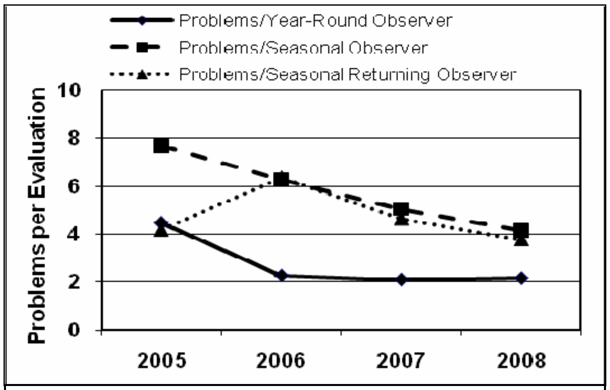

Figure 2: Experience vs. Problems by Group

In order to maintain an experienced observer core, the WCGOP has taken several steps to increase retention of both year-round and seasonal observers. These include: a competitive salary, the potential for year-round employment and other advancements, health insurance, optional retirement funds (401k), bonuses for months with high activity, an Annual meeting and Annual Safety Briefing which serve as forums for the discussion of issues important to WCGOP observers, and a dedication to the improvement and effectiveness of trainings.

Integrating observers into the fishing communities was a goal of the WCGOP and led to the creation of year-round positions. In an attempt to create job advancement opportunities and support for observers, the WCGOP also created lead observer positions in each port group.

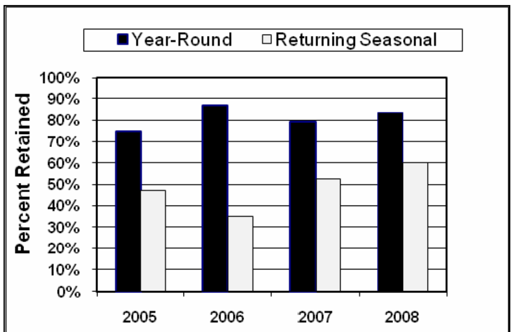

Figure 3: Experience vs. Problems by individual

This allows the program to offer observers three tiers of employment (seasonal, year-round, and lead observer positions). Furthermore, the WCGOP has filled nearly all debriefing openings with prior WCGOP observers.

Communication and a sense of ownership are considered essential for retaining observers in the WCGOP. Through staff surveys and open group discussions, WCGOP observers are given the opportunity to provide input; therefore, helping to shape the future of the program. One of the tools used to gauge our observers' satisfaction with the program is the annual Observer Survey. This anonymous survey is handed out yearly to all observers and covers a broad range of topics, providing staff with a great deal of useful information that can be used to improve staff/observer relations.

There are a number of both positive and negative responses which are consistently seen when looking at the Observer Survey over the past several years, each of which could be a factor affecting both retention and attrition. Some of the overriding themes over the past few years' surveys are:

- Positives: Staff and Contractor communication, support, and experience; quality of the training and debriefing process; quality and availability of WCGOP sampling gear; and the program's focus on safety awareness and training.
- Negatives: Short notice for trips; unequal workload between observers/port groups; inability to travel far from home port due to on-call status ("cell phone leash"); dissatisfaction with the evaluation process; and a poor understanding of how the data collected is being used.

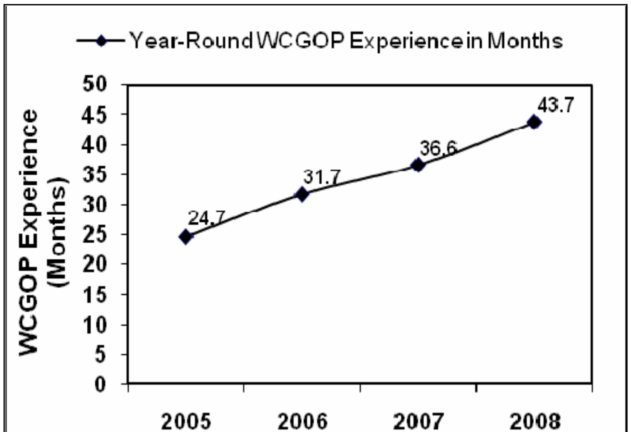

Figure 4: Year-Round Observer Experience Accumulation over the Years

Survey results are discussed at the WCGOP Annual Meeting, one of two yearly meetings which include both staff and year-round observers. These meetings provide opportunities for WCGOP observers to address issues, as a group, directly with program staff. In addition, observers are able to interact with their peers in a professional setting, as opposed to social settings.

A major portion of the Annual *Briefing* is dedicated to safety awareness and this has been met with an overwhelmingly positive response from our observers. Through lectures, hands-on activities, and drills the WCGOP strives to give every observer the tools and skills necessary to keep them safe, while performing their duties both on land and at sea.

As a result of these efforts, we have seen an increase in overall retention (Fig. 4), as shown earlier, and this has resulted in a steady increase in the level of experience of our year-round observers.

In closing, regardless of the steps taken to increase retention, there are other obvious and perhaps unavoidable factors, such as injury, burn-out, and performance issues, which will always contribute to attrition. So, while inexperienced observers are, and will always be an important part of the WCGOP, it appears that our experienced, year-round observers perform better and are more easily retained.

Retention of observers in a global market

Bryan Belay
MRAG Americas, USA

In the current age of limited resources and expanding demand for fishery products, there is an increasing need for fisheries monitoring and observer programs. Retention of quality observers is a key factor in achieving the goals of any observer program. All observer programs rely on quality data and effective monitoring. An experienced team of observers provides more accurate observations, can increase the confidence in the data, and minimizes the use of staff time and logistical costs. There is a diverse array of fisheries observer programs in the world today, which generally fall into four types:

1) Temporary programs require observers for specialized tasks on a one-time or pilot basis.
2) Seasonal programs that reoccur at particular times during the year and require observers for defined periods.
3) Full Time programs that occur year around and require observers continuously.
4) Complex programs that cover multiple fisheries or regions with fluctuating but full time demands.

Bryan Belay
MRAG Americas, USA

MRAG Americas will present guidelines for retention of observers in the four program types referenced above using examples from our experience working in a variety of fishery observer programs around the globe. MRAG has experience in Temporary programs such as the Alaska Marine Mammal and New South Wales Ocean Haul Observer Programs. MRAG places observer in Seasonal programs such as the Alaska Department of Fish and Game Shellfish Observer Program and seismic operation in the Arctic Ocean. MRAG has experience with Full Time programs in Hawaii Longline fisheries and the Tuna Transhipment programs. MRAG's experiences in the North Pacific Groundfish Observer Program will provide insight into the issues facing Complex programs.

Retention of observers starts with identifying and recruiting quality observers. There are traits most programs are looking for in a fisheries observer; and identifying and prioritizing these traits when recruiting observers increases the retention of observers. Some observers will not cope with the mental and physical demands of the potentially hostile environment we send them to, and long-term observers are a rare breed. Observer providers can boost observer retention by taking into account the following factors:

1) Adequate logistical support: observers are often reliant on program staff or contractors to provide logistics and contact with the outside world.
2) Timely and competitive pay: observers that are not paid promptly and fairly will often not return
3) Reasonable work responsibilities: data collection requirements and forms should be efficient and practical
4) Streamlined debriefing process: the submission of data should be organized and supportive, observers' input on data collection should be considered.
5) Variety of opportunities: providing diverse observer opportunities will lengthen the career of an observer and attract prior observers from other programs.

Question and Answer

The question and answer session below captures the dynamic dialog between panelists and the audience. Each discussion is separated by a double line break

Question/ Comment
Bob Stanley
Australian Fisheries Management Authority
Australia

Teresa, I'm quite impressed, this is vast, its huge, it can be something tremendous, but I didn't get the sense from what you suggested how you are going to measure your impact on IUU.

I'm cognizant of the fact that when we had IUU problems down in the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) area, a concerted effort in the Falklands and around Prince Edward and Marion simply transported a very significant problem to the east.

I can see the potential for a similar ripple effect in what you're attempting to do. Have you anticipated where you might displace this effort to and have you got some design or regime as to how you might measure that and assess that impact that you have, and the net worth that you get out of this effort?

Response
Teresa Turk
NOAA Fisheries Service
USA

Great question, we're just getting started. I think we're over there for a number of reasons. It's not just IUU. It's also to increase the scientific data collection and all sorts of other informational aspects.

There's quite a few things we're doing. We are developing a manual and forms so that the observers can try and look for other vessels that are on the water, things like that and provide that kind of information. We're also working with the MCS network and trying to raise the level of experience, awareness, competency to work with collecting that kind of information and also with the Navy. So it's a combined effort. It's in its infancy. It needs a whole lot of attention and nurturing and collaboration with all of our African partners to make it successful.

In terms of displacing another fleet, I hope the Navy and our African partner's Navy can work to combat that.

Question/ Comment
Lawrence Beerkircher
NOAA Fisheries Service
USA

Mike, you talked about targeted recruitment. I'm wondering if you could highlight a couple of the things you look for when you're targeting people that you think can stay in this system for a long time.

Part of that is also I'm interested in the issue of the age of observers you're recruiting and have you noticed a tendency for older observers or younger observers to be retained longer?

Response
Mike Orcutt
Archipelago Marine Research Ltd.
Canada

In terms of the targeted recruitment and kind of as I mentioned in the presentation there, it's not necessarily anything specific in terms of an observer's suitability for the job.

For me some of the things that I'm looking for in people: field experience in remote areas is one of the things that I particularly look for, whether it's been in fisheries really to me is irrelevant. If they've lived and worked in remote living conditions, whether it be in the forestry industry, mining industry, those sorts of things. I've found from my experience that that type of experience lends itself very well.

Any type of work in a camp environment where they've collected data in the field seems to work quite well for the most part. In terms of the education I think that perhaps our program might be a little bit different than others in that we don't require people to necessarily have a bachelor's degree.

We do look for people with some form of post-secondary education, but it's not essential. For me in my program it's more important that first of all, they have the skills because I can train them. Sometimes you have to work a little bit harder with people, but the level of education is not all that important, at least from my perspective provided they have some basic skills, which I actually test for during the interview process.

But it's their actual suitability; their ability to get along with resource based workers; if they've worked in any type of resource industry. That seems to work very well, in terms of the age we have everything. I think our youngest observer is maybe 20-21 and all the way up to potentially our oldest observer who's probably sitting here right now.

So there is a little bit of everything. Right now, previously the last couple of years has been a very hot job market in Canada. So recruitment has been difficult because there's been a lot of good, well paying jobs available to people. Right now things have turned around like they have everywhere and things have slowed down. So I'm seeing all kinds of people interested in doing observer work.

Question/ Comment
Lawrence Beerkircher
NOAA Fisheries Service

So you've noticed no difference in retention between a younger recruit and an older recruit?

Response
Mike Orcutt
Archipelago Marine Research Ltd.
Canada

That's a good question, too. Not that I can really put a finger on. I'd have to go back and look at some of the numbers. Not off hand I can't say that I have really.

Question/Comment
Reuben Beazley
Observer St. John's
Canada

Do any of your programs have any additional duties required of experienced observers that would not be expected of trainees or is the data set limited for all observers to what's lowest common denominator, i.e., what a trainee can handle. If that is the case do you have any suggestions to maximize the use of your experienced people?

Response
Ryan Shama
West Coast Groundfish Observer Program
USA

Well I mentioned that we have some year round observers and lead observers. The lead observers have some additional duties involving contacting the fleet and such, but not necessarily in data collection.

I think occasionally there's maybe a special project which we'll assign to more experienced observers, but generally the data collection is the same for everyone.

Response
Brian Belay
MRAG Americas
USA

We have several programs that require only experienced observers in the IATTC transshipment program. There is a 60-day requirement for tuna experience, fishery experience in a tuna fishery. In the marine mammal program it's only prior observers. It's not really a defined period at this point, but typically 90 days is what we've been looking for as far as experience in that program.

The shellfish, groundfish programs of course do not have a prior experience level, but we really strive to find observers that have been working in other programs when we hire. In the last several training classes that I've put together have only been prior observers from other fisheries that have been getting involved.

We do see a lot more productivity from those prior observers. If you've never been on a boat it's very difficult, you're learning the sampling techniques and learning how to live on a boat at the same time so something is going to suffer.

Response/ Comment
Andrew France
Ministry of Fisheries
New Zealand

When we take on our observers we give them a three and a half week training course. We only really train them in trawling. We teach them about other types of fishing, but we don't teach them the detail on how to fill out the work or do the work on other types of fishery methods.

So until they get experience they don't do those fisheries. Once they become experienced we'll move them into what we call long line and purse seine and other types of fisheries.

The other thing we do with them following our training course with our new observers, there's a requirement that we place in there that they will have to go to sea with an experienced observer for at least two trips. We pay the experienced observer a training allowance per day while they're doing that activity.

Also, we have a couple of extra specialized fisheries, like in the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) area. We won't send anyone down to the CCAMLR fishery which is quite a bit more complicated, until they've got quite a lot of experience under their belt.

Question/ Comment
Kelly Schmidt
A.I.S., Inc.
USA

My question is to Miss Westwood. Did you find differences in well being between the captain and the crew or look at the data by fishery?

Response
Azure Westwood
Massachusetts Institute of Fisheries Science
USA

I actually did. There was a difference between captains and crews. Captains generally had a higher level of well being, but I should preface that with the fact that the sample that I worked with was 72 people after having to weed out some of the surveys. That's a pretty small sample size, which is why I was hoping with an observer program well being sample you could certainly get a lot more.

I interviewed on a random sample basis, so whoever I happened to meet on the docks. I interviewed scallopers, trawlers, hook and line, gill net. I didn't do a lot of analyses. I found that the most majority of my sample was actually trawlers. So, from that I didn't want to go into a lot of detail comparing because my sample numbers were so dispread. They were quite different. I had a handful of hook and line fisherman, but that would be a very interesting question.
On the age question I was thinking a lot of the well being literature actually shows that well being levels off after around (depending on culture and a lot of other things, but) 40-50 years of age. I wonder if that would be an interesting thing to explore on the observer side of well being and see if that affected retention.

Comment
Charlie Pitts
A.I.S., Inc
USA

Very good presentations, have you ever asked observers, "how can we keep you?" I can tell you right now if you pay them they'll stay.

As far as being an observer do you realize how many sheets we bring on board and to bring one more, I don't know what I would do. We just got rid of a sheet, it was an economical sheet.

Response
Azure Westwood
Massachusetts Institute of Marine Fisheries
USA

That's a good point. I think that maybe one aspect that I should have talked about in a little more depth is social information. There's a dearth of social information out there and I think my point that I was trying to address was that I think observers already collect a lot of this information implicitly and to just formalize it in a way, even if it wasn't a direct one-on-one interview type situation where you can even through at the end of the trip quickly get a bit of information or summarize some things.

Comment
Charlie Pitts
A.I.S., Inc.
USA

Could you make it a mail in form?

Response
Azure Westwood
Massachusetts Institute of Marine Fisheries
USA

You could do that, too, but there's some research out there that indicates mail-in versus one-on-one personal interviews responses even from the exact same person are different because there's a different avenue in which you're trying to connect with that person. But sure, there could certainly be some easier ways to lighten your load, good point.

Comment
Cyril Forward
Teamsters Union/ Seawatch
Canada

I agree with Charlie what he just said there. If you let the observers make a decent living, get their days, they will stay. There is no use to pay an observer $1,000.00 a day if you're only going to give him 9 days a year. He's not going to stay. Give him X number of dollars, not X plus 25. X number of dollars. Let him make a decent living and he'll stay.

Question/ Comment
Keith Davis
Observer/APO Board Member
USA

I also want to compliment the entire panel. I think you guys are all doing great work

I guess I wanted to follow-up on what Bob Stanley had brought up with you Teresa. Are you going to produce some sort of report on how you're going about these outreach efforts in Africa and emerging observer programs and set up some sort of guideline of how you're doing that and provide a resource so that other agencies and organizations can look to that as some sort of guiding light for helping out fellow emerging observer programs and if you do that sort of thing can we link to it on the APO site?

I guess as far as assessing I would like to see that as well in the future, and the progress that these programs are making due to your efforts.

Response
Teresa Turk
NOAA Fisheries Service
USA

I think we're so early on that assessment is really hard to figure out performance indicators, but it's something on our horizon that we're thinking about because, "how do you really measure effectiveness?"

There are a lot of variables. In developed countries we have a lot of safeguards, with the Coast Guard a lot of regulations, a lot of enforcement activity that support all of our efforts. In developing countries that's kind of a challenge at times.

You can do the best training in the world, but if you don't have enough funding to send people out to sea or you don't have enough enforcement to really support all the efforts that you're doing, then you're not going to be very effective.

So, we're going to try and look at some holistic approaches and work together with our African colleagues to figure out some of those solutions.
In terms of a report, we have a report to Congress that we mention some of our activities every year, but I think once we get a little bit more experience under our belt and have made a lot of mistakes and maybe have had a few successes, we'll probably try and generate a report with some lessons learned and also a summary by both our partners and ourselves and maybe some NGOs or FOA to make sure that we're not missing anything and really trying to be successful.

Sure, I don't think there's any problem with the link to the APO web site. It's early and I hope it's going to get better and better because we're going to all work together and our partners in Africa are going to drive all this. We're just there to help and support and fill in any gaps where needed or where requested.

Question/ Comment
Jann Martinsohn
European Commission
Italy

My question is directed towards Teresa. I'm very impressed by this program which is certainly urgently needed. Talking to colleagues from the FAO coming from west African countries, they told me that there is certainly also needs to build an infrastructure, be it laboratories, be it the capacity to host and manage data, which is actually quiet important also to give to these countries a certain degree of independence. Now, I acknowledge that your program is just starting, but are there any plans to build this kind of infrastructure and will there be funding available for this or is this still completely open?

Response
Teresa Turk
NOAA Fisheries Service
USA

I think once we get some kind of agreement if that's the way we want to go, which I think in spirit and concept we're in agreement on that. Then after a manual is agreed to or blessed, then we can start working to build a database.

So we have had discussions like that, I think that if we have agreement, we continue to carry on in partnership with everybody and also continue perhaps to work with the Navy if their assistance is required and everything keeps going well, then I think funding will follow.

I think we build upon success and funding is always hard to get, but I think that we'll have support for that.

Question/ Comment
Nathan Lagerway
NOAA Fisheries Service
USA

I wondered if any of the panel members on the left would comment on the effect of experience on compliance monitoring and conflict resolution on board the vessels.

Response
Mike Orcutt
Archipelago Marine Research Ltd.
Canada

Really good question. In terms of compliance monitoring, I'm not sure whether I've noticed any difference between experience and new observers. It's really an individual thing that has, in my mind, not a lot to do with experience.

Response/Comment
Ryan Shama
West Coast Ground Fish Program
USA

I think getting to know the fleet in the West Coast Program, living in the communities, and the boats you begin to recognize issues faster than you might if you were just new to the program.

Response
Mike Orcutt
Archipelago Marine Research Ltd.
Canada

One other thing I might note, too, with the experienced observers sometimes we do see a decrease in the level of compliance issues that they document. The reason for that primarily is their ability to change the behavior of the boat such that there is no compliance issue because they're able to actually get the vessels to change or alter their procedures so that there is no longer a compliance issue. They've actually adapted their methods, whereas newer people are often not as comfortable approaching the vessel when they do run into an issue discussing it, asking or requesting that they change the way they do things so that there is no longer any compliance issues.

Response
Brian Belay
MRAG Americas
USA

Yes, we definitely see a correlation with experience and compliance issues. We had an issue this year, it was a case of harassment and we put a much more experienced observer on board and he was able to deal with the situation and got through the trip. It wasn't his most favorite vessel that he was ever on, but he was able to deal with the situation in a much more professional manner.

I agree that experienced observers tend to recognize when problems are arising and can go to that crew member or the captain and say "hey, captain, your guy is gaffing halibut". If this continues to happen it's going to be a real problem, where an inexperienced observer may just let that go on and continue to be a problem and not say anything to the captain.

One of the things we do in our interview process is I set the observer up with a conflict situation and ask, "how would you resolve it". You learn real quick that there are certain people that you can't put out there. Other people will handle those situations much better.

Question/ Comment
Georg Hinteregger
Observer
USA

When I started as an observer in 1983 I was hired by the government. I started as a GS-5. After time spent at sea and doing the job adequately I became a GS-7. Sometime then after became a GS-9. I wonder if any of these programs recognize the value of experience by higher pay for longevity.

Response
Bryan Belay
MRAG Americas
USA

Yes, we have an extensive pay scale that starts out with 60-90 days in the early steps. Then once you get up over 500 sea days the steps get a little larger, but we have pay scales all the way up to over 1,000 sea days. I have many observers that are in that top pay scale.

Yes, we value those prior observers. There's no way to replace those sea days experience. We definitely reward that sea time.

Comment
Georg Hinteregger
Observer
USA

Is experience transferrable from one program to another?

Response
Bryan Belay
MRAG Americas
USA

Yes, with MRAG, we recognize sea days from other observer programs, even if it's with another contractor we will recognize those sea days. In special situations, if somebody is coming in, say for example from the southeast, from marine mammal programs etc, we'll credit those days even if we haven't been involved in those programs. This is just because we want that experience within our core.

Response
Mike Orcutt
Archipelago Marine Research Ltd.
Canada

Yes, we use a similar system where observers advance through four different pay levels based on the number of sea days that they accumulate. So it's definitely experience based pay.

We also do a number of recognition or rewards that we provide to observers for reaching certain milestones. A thousand sea days, things like that where it isn't necessarily a step in pay, but it's a gift if you like or a bonus that we provide to them.

Response
Bryan Belay
MRAG Americas
USA

I was going to add that in our program it's based on experience by year in the program. So I'm not sure exactly on when it caps off, but around three years. There's still an annual raise after that, but it's based on living costs.

Comment
Georg Hinteregger
Observer
USA

Could I just quickly ask what the top rate is or is that confidential?

Response
Bryan Belay
MRAG Americas
USA

I'm not sure off hand. I think it's around 60K but I'm not exactly certain.

Question/ Comment
Matthew Grinnell
Simon Fraser University
Canada

There's a poster downstairs and a talk today looking at the number of errors with regard to experience. I realized that those are sort of probably transcription errors or data form errors. I'm wondering if there's a difference that you've noticed in the ability to have more accurate estimates with observer experience.

The reason why I'm interested is as someone who uses observer data the analyst might not necessarily know where that data's coming from, someone who's newer versus more experienced.

Response
Mike Orcutt
Archipelago Marine Research Ltd.
Canada

Well it's definitely been my experience for the most part that experienced observers are definitely more accurate with their estimates. That's not always the case. I often see new observers going out on their first few trips that do a remarkable job, unbelievable actually for their first few trips, but overall I'd say that definitely observers with more experience certainly have the ability to provide more accurate estimates.

Panel Session 11:

What are the monitoring issues with right-based managed fisheries?

Moderator: **Teresa Turk, National Marine Fisheries Service, USA**

Speakers

Melissa Sanderson –USA
Robust and accurate monitoring is the key to successful catch share management.

Gordon Gislason – Canada
No data, no fishery- the crucial role of catch monitoring in providing access to fish resources.

Janell Majewski –USA
Observers' role in monitoring multi-species individual quota (IQ) programs.

Craig Faunce – USA
How new quota systems aimed at stopping overfishing impact observer programs.

Gib Brogan – USA
Cap and control-a comprehensive approach to managing fisheries mortality.

Graeme Parkes – UK
Rights based management of European Fisheries.

Alicia Billings – USA
Using fishery observer data in community-based fisheries management.

Introduction to the session

Rights Based Management(RBM) is a relatively new idea and is gaining traction as a way to change the standard method of fisheries management that typically restricts harvest opportunities, processing capacity, and gear types. This session features speakers from the USA, Canada and the United Kingdom. It focuses on monitoring methods, observer relations and issues specific to rights-based managed fisheries. There are several rights-based management fisheries operating throughout the world, but are quite diverse with respect to their requirements, structure and implementation. The speakers discussed many of these right based management programs, and will explore new developments and the complexity of challenges and issues specific to rights based management. The session features talks that address the observer collected data, the crucial role of observers in these management setups, data accessibility, and monitoring methods. The session aims to discuss developments of rights-based management programs across several world programs.

Robust & accurate monitoring is the key to successful catch share management

Melissa Sanderson
Cape Cod Commercial Hook Fishermen's Association, USA

Limiting annual fishing mortality through hard TACs and quotas is central to ending overfishing. The Cape Cod Commercial Hook Fishermen's Association (CCCHFA) has been the regional leader in bringing community-based quota management to New England, in the form of Sectors. However, catch shares and quotas are ineffective at ending overfishing if the catch is not accurately quantified. The more uncertainty in the catch numbers, the greater chance there is that quotas will be exceeded and overfishing will continue. None of the past observer data, collected under days-at-sea and trip limits, will be able to estimate discards or catch rates under Sectors. High levels of fishery monitoring create the most accurate, precise, and reliable data. High levels of monitoring prevent necessary assumptions and best-guesses from over- OR under-estimating at sea discards. High levels of coverage protect a fisherman's investment in quota (none is assumed to be discarded before fishing even occurs) and protect the fish from overfishing (all fishing mortality is accounted for in stock assessments). CCHFA has piloted an at-sea sector monitoring program to provide a starting point in developing catch monitoring protocols. If the goal is minimal uncertainty, a sector monitoring program would initially have to contain 100% at-sea monitoring to create a baseline for future discard and catch rate estimates, as well 100% dockside monitoring to ensure accurate landings data. Coverage levels could be scaled back significantly after a baseline of accurate, precise, and reliable data is collected. CCCHFA recognizes the significant cost of high levels of monitoring and believes the fishing industry should not shoulder the entire cost. Until fish stocks are rebuilt, the fishing industry can't afford to pay for a robust monitoring program. Ending overfishing of a public resource benefits everyone and there should be significant financial assistance from the government.

Melissa Sanderson
Cape Cod Commercial Hook Fishermen's Association, USA

No data, no fishery - The crucial role of catch monitoring in providing access to fish resources

Gordon S. Gislason
GSGislason & Associates Ltd., Vancouver, Canada

Introduction

Sustainability and the precautionary approach are fundamental tenets of current fisheries management. Meeting the sustainability test requires that reliable estimates of total removals or catch - landings plus discards - be available for use in stock assessment and setting TACs. Without third party catch monitoring, fisheries can not prove that they are sustainable and run the risk of having access to fish resources reduced or eliminated. Simply put, strong catch monitoring is a necessary condition to sustainable fisheries management.

This paper outlines for Pacific Canada the evolution of fisheries management philosophy over the past 25 years, how catch monitoring is now an integral component of current management practice, and how third party monitoring has increased TACs and fishing opportunities.

The Change in Fisheries Management Philosophy in Canada

In Canada the federal Department of Fisheries and Oceans (DFO) has lead responsibility for managing ocean commercial fisheries. Over the past 25 years conservation and environmental issues increasingly have taken centre stage in DFO decisions as to Total Allowable Catch (TAC) levels for commercial fisheries. This movement has been spurred by worldwide trends such as the setting of sustainable fisheries criteria by the Marine Stewardship Council (MSC) and the growing influence of Environmental Non-Government Organizations (ENGOs). The shift also has been spurred by Canadian events such as the collapse of the Atlantic cod fishery in Eastern Canada and the problems in managing mixed stock fisheries in Pacific Canada.

At one time, fisheries automatically occurred each year unless there was compelling evidence that so doing would result in significant harm. TACs were set based on mortality estimates from landings data alone for broad stock groupings, as well as economic and social considerations. And even if there were significant data deficiencies, inaccuracies or gaps the fishery was still allowed to operate in a “business as usual” sense.

Today the burden of proof has shifted. The onus is on scientists to provide science advice, including total mortality figures with an allowance for discards, to justify having a commercial fishery at a particular TAC level. As well, there is a finer definition of individual stocks. Scientists still provide, as before, a range of potential catch scenarios or TACs to fisheries managers, and there still is uncertainty around the scenarios. However, under the precautionary approach, the chosen TAC is lower than in the past without a substantial upgrade in the quality of supporting data, specifically catch data on both landings and at-sea discards. This at-sea data must be derived from independent third party systems, as opposed to self-reporting systems, in order to provide reliable and credible data.

Figure 1 displays key differences in fisheries management practices between the past and the present. The previous practice essentially was “No Data, No Problem” - the lack of data was not a sufficient reason to close or significantly curtail a fishery. The current practice is “No Data, No Fishery” - a fishery at a significant scale will not be allowed without a firm information base.

BEFORE / THE PAST	NOW / THE FUTURE
Circumstances & Philosophy	Circumstances & Philosophy
• fishery open unless closed • science one of many considerations • a business approach • nascent ENGOs, no MSC • TACs - landings only - broad species groups	• fishery closed unless open • science the main consideration • a precautionary approach • strong ENGOs, MSC • TACs - landings plus discard mortality - individual stocks
+	+
Catch Monitoring Practices	Catch Monitoring Practices
• self-reporting systems - landings only covered • no at-sea monitoring • post-season reporting acceptable	• third party systems - landings plus discards • at-sea monitoring • in-season reporting required
=	=
“NO DATA, NO PROBLEM”	“NO DATA, NO FISHERY”

Figure: 1 Commercial Fisheries Management

Stronger Catch Monitoring, Higher Catch

Many groundfish, herring and shellfish commercial fisheries in Pacific Canada have moved to Individual Transferable Quota (ITQ) management over the past 20 years. A 100% Dockside Monitoring Program for landings conducted by independent third parties was a requirement in the move to ITQ management. And in the case of groundfish fisheries, where there are significant bycatch issues, there is 100% at-sea monitoring of discards either through observers or video electronic monitoring (bycatch in herring net and shellfish dive fisheries is minimal).

It is estimated that, without the move to ITQs and attendant improved monitoring, TACs would be 5 to 50% lower over a variety of fisheries[1] . The 100% monitoring of discards under the 2006 Groundfish Integration Program has allowed the retention of certain bycatch, such as rockfish, that by regulation had to be discarded previously. And rigid third party catch monitoring provides transparency in fishing operations and this, in turn, instills public confidence that fisheries are being conducted in a sustainable manner[2].

The evidence is clear. Third party 100% monitoring of catch - dockside landings plus discards - has increased TACs and fishing opportunities.

Notes:

1. GSGislason & Associates Ltd. 2008. Employment impacts of ITQ fisheries in Pacific Canada. Prepared for Canada Department of Fisheries and Oceans, p.71.
2. Gislason, G. 2007. Commercial catch monitoring: gatekeeper to sustainability and public confidence in Pacific Canada, Presented to 5th International Observer Conference, Victoria, Canada. p.6.

Catch Shares: The U.S. West Coast Groundfish Trawl Fisheries move to individual quota management and the effects on the observer program

Jannell Majewski
NOAA Fisheries Service, USA

The U.S. west coast groundfish trawl fleet operates out of small coastal communities in California, Oregon, and Washington. It is currently managed by a complex set of two-month cumulative landing limits, which constrain the amount of fish landed but not the amount of fish caught (discarding at-sea allowed when cumulative landing limit reached). Despite numerous management measures enacted since 2001, including a fleet buyback and the closure of the majority of the eastern Pacific Ocean continental shelf along the US west coast, the fishery is still marked by serious biological, social, and economic concerns. It is currently viewed as economically unsustainable due to the number of participating vessels, a regulatory approach that constrains efficiencies, and the status of certain groundfish stocks along with the measures in place to protect those stocks. Due to these concerns, in June 2009, the Pacific Fisheries Management Council finalized plans to implement a trawl Individual Quota (IQ) fishery, with an anticipated start date of January 2011.

Approximately 170 vessels (permits), which range in size from 13 to 24 meters, will be eligible for IQ quota shares. A quota share is an amount, as a percentage, of a species/complex allocated to a permit based on historical catch. Although fleet consolidation is anticipated, it's unclear how quickly and how much will occur, especially considering that the selling of IQ shares will not be allowed in the first two years. The trawl IQ program will include approximately 67 species, some of which will be managed as complexes (minor shelf rockfish) (See Figure 1). The species list includes 48 rockfish (*Sebastes spp.*) species, 7 of which are overfished. The overfished status of so many rockfish stocks adds greater complexity to the IQ program, as very low optimum yields (OY's) will result in very small quotas to individual participants. One stock, Yelloweye rockfish, is expected to have an OY of less than 14mt in 2011. This has implications to both the fleet (will vessels have less opportunity because of the high cost to purchase Yelloweye quota) and the observers (ensuring accurate weights and counts of overfished species with extremely low OY's).

Roundfish/Other	**Rockfish**	**Rockfish**	**Flatfish**
Lingcod N 42˚N	**Pacific Ocean Perch**	**Shortspine THDS S of 34˚27'N**	**Dover sole**
Lingcod S 42˚N	**Widow rockfish**	**Longspine THDS N of 34˚27'N**	**English sole**
Pacific cod	**Canary rockfish**	**Cowcod rockfish**	**Petrale sole**
Pacific hake	**Chilipepper rockfish**	**Yelloweye rockfish**	**Arrowtooth flounder**
Sablefish N of 36˚N	**Bocaccio rockfish**	**Minor Shelf Rockfish North**	**Starry flounder**
Sablefish S of 36˚N	**Splitnose rockfish**	**Minor Shelf Rockfish South**	**Other Flatfish[1]**
Longnose Skate	**Yellowtail rockfish**	**Minor Slope Rockfish North**	
	Darkblotched rockfish	**Minor Slope Rockfish South**	
	Shortspine THDS N of 34˚27'N		

Figure 1: West Coast Groundfish Trawl IQ Species/Complex List

One unique feature of the west coast trawl IQ program is a gear switching provision that will allow trawl vessels to use hook-and-line or pot gear to catch some or their entire IQ quota. It's unclear how this provision will change the practices of the trawl fleet, although in some ports there is already concerted effort to move to a small vessel, hook-and-line/pot fishery with little or no trawl activity. In other areas, trawl vessels may decide to catch some species with non-trawl gear, such as sablefish, while continuing to use trawl gear to harvest flatfish and other species. The west coast groundfish observer program (WCGOP) has observed the west coast groundfish trawl fishery since 2001 and will be responsible for observer coverage in the IQ fishery. One significant change will be coverage rates increasing from the current 17% to 25% to 100% at-sea observer coverage under IQ's. While still in the planning phase, the WCGOP has identified numerous areas that need to be revised with the implementation of IQ's. These areas include:

- Observer sampling methodology –Of particular concern will be designing a sampling methodology that:
  - Ensures accurate accounting for up to 67 IQ species on different gear types
  - Considers the enhanced accounting needs for the overfished species with very low OY's
  - Accounts for other non-IQ species with OY's (i.e. sharks, skates)
  - Monitors the catch of protected and/or endangered species (marine mammals, seabirds, salmon)
  - Estimates the impacts to unmarketable species and invertebrates
- Training – Planning for a three to four fold increase in training classes offered.
- Data Quality – Designing a "real-time" data quality system that's built into an electronic on-deck data collection system and a follow-up data quality process that allows for the update of observer data weeks or months after collection.
- Data Delivery – Ensuring a system is in place that allows for the timely turn-around of observer data that relates to other data sources, including landing receipts and the permit/quota pound monitoring system.

How new quota systems aimed at stopping overfishing impact observer programs

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Introduction

A fundamental shift in fisheries management is from developing fisheries (open access) to controlling harvest. Long-standing methods to control harvest include restrictions on vessel fishing power, gears and season. Newer economically-based methods to control catch include catch-share programs. Catch share programs dedicate a share of the allowable quota to an individual or a group of individuals. These catch-share programs include individual transferable quotas (ITQ), community development quotas (CDQ) and cooperative quotas (CQ). Catch-share programs have been prominently touted as the management solution to "end the race for fish" and prevent fisheries collapse[1], however their implementation has not universally achieved that result[2].

Since 1990 the North Pacific Groundfish Observer Program (NPGOP) has been responsible for independent third-party reporting of observable directed and incidental mortality of groundfish, birds, and marine mammals in the Economic Exclusive Zone off Alaska. The NPGOP is currently managed by the National Marine Fisheries Service's Alaska Fisheries Science Center. Because a large portion of the at-sea observer program is industry funded under a "pay-as-you-go" system, initial coverage rates on vessels essentially derived from decisions as to what was considered a fair financial burden for fishery participants to bear. Consequently the current coverage system is complex, owing to various pressures exerted on the program since its inception, yet basic coverage rates are determined by combination of vessel length, gear type, target fishery, and type of quota management. Observers are currently trained and subsequently debriefed after 90 day deployments.

The National Marine Fisheries Service's Alaska Regional Office (AKRO) manages over 600 quotas for an industry whose ex-vessel value in 2007 was in excess of $1 billion. Components of the AKRO's Catch Accounting System include at-sea estimates of catch from observers and reports from industry. Fisheries management in Alaska deducts both retained and discarded catch from allocated quota. Thus there exists economic incentive to underreport discarded catch at-sea, and this incentive may be increased under catch-share programs[3].

A variety of catch share programs have been initiated in Alaska, with varying consideration made towards observer coverage requirements. In 1995 Sablefish and Halibut longline fisheries began to be managed under IFQ- the first program of its kind in the U.S. No changes in observer coverage requirements were enacted under the new program. During the period of 1995-1999, CDQ program allocations were increased through various fishery plan amendments and in 1999 a limited licensing program was initiated. The American Fisheries Act of 1998 mandated flow scales, motion-compensated platform scales, certified observer stations and increased observer coverage within newly created pollock fishery cooperatives by the 2000 fishing season.

The timeline of the aforementioned catch share programs are used to make comparisons between the realized workload of observer programs before and after their implementation. The period from 1995-1999 is considered as the IFQ period, and the period from 2001-2005 is considered the CQ period. Differences in the observer program workload between periods were used to predict the workload associated with a new CQ program initiated in 2008.

Methods

Observer workload was determined by the total number of at-sea days realized each year and the total number of debriefings realized by NPGOP each month each year. Data were examined between periods through the use of a two-sample t-test. Realized workload before and after enactment of the CQ in 2000 was compared to data realized in 2008 after the establishment of a new CQ to examine stability in the results.

Results and Discussion

The period from 1995-1999 was marked by a reduction in the total number of sea-days that mimicked the reduction in the number of vessels fishing sablefish IFQ. During the IFQ period total sea-days were reduced by ~ 11% to around 27,400. From 1999 to 2000, with the onset of new coverage requirements associated with CQ, total sea-days increased to pre-1995 levels by the largest inter-year increase of the period (~10%). During the CQ period, total observer coverage increased only modestly (~1%). Differences in total sea-days between periods were not significant. Total debriefings declined during 1995-1997 but increased during 1998-2001 after which it remained stable. In contrast to total sea-days, there was a highly significant difference in total debriefings between the two periods ($p<0.01$). Although seasonal workload peaks were realized earlier and were of longer duration during the CQ period than during the IFQ period, the timing of peak debriefings between the two periods remained largely unchanged. Comparison between the workload realized during the CQ period and that in 2008 show that increases in observer coverage with CQ consistently resulted in an immediate increase in both total debriefings and total sea-days. When combined, these results demonstrate that NPGOP workloads increased in years immediately prior to initiation of new catch-share programs and remained high for at least one year post-implementation. The duration of peak workload is likely dependent on the interplay between: (1) the magnitude of newly regulated changes in observer coverage per vessel, and (2) the number of vessels that choose to opt-out of the fishery in subsequent years by trading or selling quota.

Notes:

1. Costello, C., S. D. Gaines and J. Lynham. 2008. Can catch shares prevent fisheries collapse? Science 321, 1678-1681.
2. Chu, C. 2009. Thirty years later: the global growth of ITQs and their influence on stock status in marine fisheries. Fish and Fisheries 10, 217-230.
3. Branch, T. A., R. Hilborn, A. C. Haynie and eight co-authors. 2006. Fleet dynamics and fishermen behavior: lessons for fisheries managers. Canadian Journal of Fisheries and Aquatic Sciences 63, 1647-1668.

Count, cap, and control- A comprehensive approach to managing fisheries mortality

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Introduction

The success of fisheries management in the United States and around the world has suffered because most management programs fail to identify, quantify and manage both landings and discard mortality.

Oceana has developed an analytical management tool to assess the catch (landings plus discards) of fisheries, establish limits on these catches and enforce these limits as a means to effectively limit overall mortality to biologically acceptable levels.

Limiting mortality will increase targeted catch, limit waste and improve the probability of achieving management objectives, common goals for all management programs.

Methods

The analytical process for setting mortality limits is elegantly broken into three phases which lead to an improved management program for each fishery: Count, Cap, and Control.

Count- In this phase fisheries managers and their technical advisors use available data on landings, discards and fishing activity to conduct a matrix-based catch analysis for the fisheries and stocks for which they are responsible as well as the catch of "Threatened and Endangered" species. This analysis will provide a robust assessment of fishery/stock interactions and catch composition of these fisheries.

A generic sample of this matrix:

	Fishery 1	**Fishery 2**	**Fishery 3**
Regional/Federally-managed Stocks			
State Managed Stocks			
Federally-Managed Stocks (Highly Migratory Species, etc.)			
Threatened and Endangered Species			
Other Species			

Figure 1: Generic Sample Matrix

Cap- For those fishery/stock interactions with interactions deemed to be *significant*, the relevant fishery managers will allocate available catch (as determined by stock assessments) to those fisheries as they see fit.

Control- These allocations will serve as 'hard caps' or total allowable catch levels (TACs). The hard quota assigned to each fishery will serve as an absolute backstop limit on catch (landings plus discards) in that fishery. Management success is ensured by requiring the cumulative catch of all allocations to never exceed 100 percent of the biologically supportable catch.

The Role of Fisheries Monitoring- Because of incentives to misreport or underreport catch to avoid exceeding a quota allocation, self-reporting of catch is an unacceptable option. Monitoring and enforcement of these limits will rely on a robust at-sea observer program that provides accurate and precise estimates of catch coupled with timely reporting of catch.

<u>Results-</u>

The Count, Cap, and Control approach has been used in a range of individual fisheries in the United States to address specific interactions between dissimilar fisheries. In these limited applications this approach has mitigated bycatch and increased opportunity to catch target species.

Oceana believes that a complete catch analysis and allocation of available catch to a system of smaller limits is an essential element of modern management of fisheries and the interactions of fisheries with Threatened and Endangered Species.

The implementation of this tool as a programmatic approach for all fisheries fully satisfies the 2006 US Magnuson-Stevens Reauthorization Act which requires Annual Catch Limits and Accountability Measures for all US fisheries by 2011.

Rights based management of European Fisheries

*Graeme Parkes [1], Suzannah Walmsley [1], Sean Savage[1], Steve Cunningham [2], Martin Aranda [3], Sten Sverdrup-Jensen [4], John Cotter [5], Alyson Little [5], Graeme Macfadyen[6], Steve Hodgson [1], Ragnar Arnason[7]

A broad range of rights-based management approaches exist in European fisheries, but until now there has been no systematic review or assessment of their characteristics and performance. To inform the debate on the role of rights-based management (RBM) in the implementation of a reformed Common Fisheries Policy (CFP), the European Commission has recently published a new study that explores rights-based management (RBM) and its contribution to achieving CFP objectives. The study, carried out by an international consortium led by MRAG Ltd, presents a detailed catalogue of European fisheries management and a cross-cutting analysis of the drivers for RBM, its implementation in a variety of national contexts, the development of national and international markets for rights and the impacts on participation in EU fisheries. Key issues discussed include the concentration of fishing rights, protection of small-scale fisheries, access of newcomers, access of nationals of other Member States, and potential effects on discarding practices. The report also explores future options for national authorities to develop stronger and higher quality rights in support of more effective implementation of the Common Fisheries Policy and the potential role of the Commission in supporting national and regional rights-based management initiatives.

The study used a deliberately broad definition of RBM, including 'any system of allocating fishing rights to fishermen, fishing vessels, enterprises, cooperatives or fishing communities'. Within this, the study categorised existing management approaches into catch-based quota systems (ITQs, IQs), effort-based quota systems, licensing systems and territorial use rights in fisheries (TURFs).

The study involved extensive consultation with government officials, industry and academics to gather information on the RBM systems and to score them for four quality attributes: Exclusivity, Validity, Security and Transferability. This enabled calculation of an overall measure of the theoretical 'quality' of the fishing right.

A key output of the study was the identification of lessons learned that could be useful for the development of future RBM approaches and particularly their alignment with achievement of CFP objectives: sustainable exploitation of stocks, balancing fishing capacity with fishing opportunities, and economic viability. However, there were also difficulties in analysing key indicators such as profitability and sustainability. For example, participants in the same EU fishery often operate under different national RBM systems, making it hard to tease out cause and effect.

The principal driver for many RBM systems in the EU has been the requirement to implement EU regulations that establish TACs for a number of species, and that limit fishing capacity. The study showed that RBM approaches are often not sufficient in themselves to meet the objectives of the CFP – this requires a range of fisheries management measures at different levels, from Commission level down to hands-on monitoring and control – but they play an important role in a successful management system.

The report concludes that although there are clear examples of success in rights-based fisheries management, the transfer of this success to other fisheries is not straightforward; RBM systems should be designed with stakeholder input for specific fisheries and implemented in an incremental manner. Best practice is difficult to define, especially given the enormous diversity of fleets and fisheries in the EU and the need to address national as well as EU-level objectives. Nonetheless, this study compiles detailed information on current RBM practices, highlights lessons learned from specific case studies and provides a solid basis for further discussion on the reform of fisheries management in the EU.

Notes:

1. MRAG Ltd. UK.
2. IDDRA, France
3. AZTI, Spain
4. IFM, Denmark
5. CEFAS, UK
6. Poseidon, UK
7. University of Iceland

The Potential Use of Observer Data in Community Based Fisheries Management

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Lotus Web Design and Consulting[1], USA

Introduction

The marine environment is complex, with webs of interdependency between and among species that are just beginning to be examined. With every research project and new technology, this statement is confirmed. Along with investigating these complex relationships, traditional methods of defining stocks must take into account the effect that these relationships have on the future of sustaining both the resource and the fisheries.
Community Based Fisheries Management (CBFM) is an alternative approach to the traditional "top down" management practiced in the United States. Where these traditional methods examine populations based on more jurisdictional boundaries than biological restrictions, CBFM seeks to empower local fishers to become stewards of their local fisheries resource by using a more ecosystem-based management (EBM) approach[1].

The Port Orford Ocean Resource Team (POORT) is a nonprofit organization based in the small (1200 population), rural community of Port Orford, Oregon. Their mission is to engage local fishers and other members of the community to ensure the long-term sustainability of the nearby marine ecosystem and the social system dependent on it. Several programs, including establishing a Community Stewardship Area, have energized much of the fleet to take care of the fish and habitat that provide their livelihood. As such, the POORT office is a hotbed of useful local knowledge and viewpoints on fisheries management.

Methods

During the last 3 years, the author was employed as a West Coast Groundfish Observer in Port Orford and with POORT as the project director. Through both talking with the fishers and learning the inner workings of how fisheries are managed on the West Coast, it became apparent that these fishers sincerely want what is best for the resource to sustain their livelihood. It was also apparent that the ability to manage local stocks is hindered by the traditional management practices because of confidentiality restrictions and lack of confidence in small datasets.

This is a preliminary report based solely on these experiential knowledge interviews to shed light on the need for further examination of the use of observer data in CBFM. The information regarding policies and management is the viewpoint of these fishers, right or wrong, and is used because it is important examine the perception alongside the reality when discussing CBFM to determine how best to use local knowledge in the management of our oceans.

Results/Discussion

Marine organisms are true citizens of the world. They don't abide by state, federal, or international boundaries because they are bound by their own biology and ability to live and move in favorable habitats. Management lines on the west coast are created on maps with latitudinal lines bisecting habitats and creating a potential for two different regulation structures upon the same fishing grounds[2].

A striking example of this is seen when looking at the Rockfish Conservation Area (RCA), a large-scale closed area extending the length of the entire west coast, with different boundaries for different gear types[3]. Observer data is used to determine the rates of discard for several key species, including the Yelloweye rockfish. Yelloweye is the most restraining species in management plans for the nontrawl fisheries around Port Orford. Because of its rebuilding status, its capture as bycatch is restricted to near nothing.

If the data collected by observers show the bycatch rates of Yelloweye are higher than optimal, managers have the option to flex the RCA through east-west boundaries based on fathom curves. In an attempt to better serve regional differences in the both bycatch rates and habitat, several large blocks delimitated by arbitrary latitudinal lines are available to segment the boundary changes.

For the 2009-2010 management cycle, the Pacific Fishery Management Council (PFMC) looked at bycatch rates for the Yelloweye rockfish in the limited entry nontrawl sablefish fleet. From this, it was decided to move the RCA western boundary out to 120 fathoms in the management block that bisected a key traditional fishing ground north of Port Orford. Experiential knowledge from several limited entry sablefish fishers pointed to the lack of Yelloweye capture in that area. Because of restrictions in obtaining place-based observer records, there was no way for the fleet to gather bycatch rates for their grounds, and the Oregon Department of Fish and Wildlife (ODFW) does not have the directive to go after such small scale information. Without this evidence, however, the fleet could not make it's case to the PFMC.

There are two main reasons for this lack of place-based examination and use of observer data: confidentiality restrictions and the lack of large datasets. The Magnuson-Stevens Fishery Conservation and Management Act[4] is the leading authority governing fisheries management in the United States. It restricts how the data is binned based on the number of observed trips and observed vessels in a given area to preserve fisher confidentiality and increase the size of the datasets. Because of this, data is binned into large areas, long time periods, or both. Unfortunately, small communities caught in the middle can be unduly restricted.

With half of this vital sablefish ground lost and the loss of the salmon fishery for the second consecutive season, fishers in Port Orford who were unable to move into other fisheries began to struggle. The willingness to trust management authorities has been decreased because of this, and is talked about regularly over morning coffee and down at the dock.

Ensuring confidentiality of fishing vessels is important. The observer program would not be tolerated by fishers if the data collected was open to the public. But the devastating socioeconomic effects of large-area restrictions that are not appropriate should be avoided to preserve both the social structure of fishing communities and their economic strength. By figuring out how to preserve fisher confidentiality and confidence in the observer program, as well as finding innovative ways to use small datasets, observer data can be a step closer to its full potential as the leading collection method for fishery-based information.

Notes:

1. Port Orford Ocean Resource Team website (http://www.oceanresourceteam.org)
2. Pacific Fishery Management Council's Council Guide (http://www.pcouncil.org/guide/Guide-intropage.html)
3. NMFS Groundfish Closed Areas Website (http://www.nwr.noaa.gov/Groundfish-Halibut/Groundfish-Fishery-Management/Groundfish-Closed-Areas/)
4. Magnuson-Stevens Fishery Conservation and Management Act (http://www.nmfs.noaa.gov/sfa/magact/)

Question and Answer

The question and answer session below captures the dynamic dialog between panelists and the audience. Each discussion is separated by a double line break

Question/ Comment
Leigh Featherston
Ocean Conservancy, USA

This question is for Melissa and Craig. If I understand what has happened here in New England, we now have 17 sectors that will design there own monitoring programs. Melissa talked about the importance of monitoring to catch account, which I can appreciate – we work real hard on that in the Gulf of Mexico. I see a lot of potential problems with 17 fishery monitoring programs delivering data to NOAA Fisheries Service without any standardization. By way of example, the recreational fishery monitoring programs in the Gulf of Mexico collect and deliver data very differently. Data from Texas is not brought in with data from the other states until quite late; it's collected differently; and it's really hard to add together. It has created a lot of headaches for us in terms of managing those fisheries in any kind of real time. So, Melissa, I was hoping you could speak about the importance of standardization.

Craig, I know the Alaskan fisheries do a very good job of collecting data from a number of fisheries while providing output in real time. If you could offer other regions advice on how to set up such a program, it would be very helpful. Thank you for your talks. This was a very interesting panel.

Response
Melissa Sanderson
CCCFHA, USA

You are correct that standardization is very important, and each of the sectors will be shaping their own monitoring program. What I didn't mention is that they will be standardized. There are minimum monitoring requirements set by NMFS that must be met. I mentioned the one's that are in place right now. Even within that, the industry and the NMFS regional office and science center have had a lot of discussion and a lot of work has gone into the data protocols and what the data will look like and in what format it will be transferred. So even though a sector has the discretion to decide whether they will use EM or specifically how they will do their monitoring and distribute it among their vessels, the data that is output should all look the same across those sectors.

Response
Craig Loveridge
Ministry of Fisheries, New Zealand

I don't think I can describe how to set up a program like Alaska's in one answer. What we have seen as the basic elements of such a program are: in season transmission of data. I saw innovative transmission systems described in this conference, such as palm pilots and cell phones. We use a system called Atlas that we deploy on vessels. Our boats are very large, up to 600 feet. We have computers through which the observer can enter the data, and it gets transmitted and decoded in our database. We have system staff of 10 people who manage that database. We also have 15 or more people who that debrief, and it's been an evolving process. So the first thing for in-season management is that you have to have a system for getting the data out there. Once it's collected there's no way to debrief that data in real time, obviously. Our observers are deployed for up to 90 days. So that data is posted for in-season management every week. The idea of weekly, rather than daily, is that the variance is reduced by aggregation, so you don't have so much bouncing around. I guess I would say that observer programs around the country have standardized ways of collecting data by vessel/gear type, and we're no different from that. We have our manuals and everything, which may be downloaded on-line.

This problem it is a challenge for observer programs. Our offices are commonly in crisis mode. The NMFS regional office will call and say this number exploded and this number didn't or "What's going on with this data?" Fortunately, in Alaska, we are protected from a lot of major data problems because we have so much data. We have full observer coverage on a lot of our fisheries sectors. By "full coverage" I don't just mean every vessel, but every single haul; and not just every single haul, but also large sample fractions within that haul. So for targeted species we're actually doing quite well. For a frame of reference, the yellow eye rockfish TAC for the west coast would equal one-tenth of one Pollock tow (for scale).

Key elements are: In season transmission, rapid turnaround of observers, and ensuring the quality of the data through thorough debriefing.

Question/ Comment
Dennis Hansford
NOAA Fisheries Service, USA

Very good presentations! Janelle, you talked about your example of the ability for switching gear, and your example of the division of the 5 metric tones and the fisher's can switch gear to a gear that will hasten the catch of a species in your example. I wonder what is the impact of that. Does that hasten the closure of the fishery?

Response
Janelle Majewski
NOAA Fisheries Service, USA

That's a good question. I'm not totally sure if, I don't think it's clear if that allocation to that sector is reached, if that whole sector will be closed or not. That's the biggest concern I have with this gear switching provision. It's not only yellow-eye, but cod also are more likely to be caught also with line gear, rather than trawl gear. So like I said, it's not real clear what'll happen if vessels go over their quotas so much that it exceeds their TACs.

Question
Susan Wigley
NOAA Fisheries Service, USA

My question is for Janelle and it relates to the cost. As you begin your work on sector and 100% monitoring, who do you anticipate bearing the costs?, and would there be a transition period between government and industry, if the monitoring will be industry based for and by the industry?

Response
Janell Majewski
NOAA Fisheries Service, USA

That's a great question, and a question we also have. As of today, we have received no additional funding for the transition. That includes for designing and implementing the program. There is an expectation that we will receive some funds from the next budget cycle, but I'm going to mention a couple problems that I have with that. The earliest we would receive the funds would be October 2010, and the ITQ fishery is slated to begin in January 2011. That means we have two months to prepare, purchase all of the observer gear, and hire additional staff before the first observer training takes place. When it comes to funding of the actual observers on the vessels, we have not had any indication from NMFS whether it will be industry or government funded. I guess I would advocate very strongly that during the transition period, at least for the first two years of an individual quota managed fishery, it's pretty important that we get it right by having federal funding that will allow us the flexibility we need in this kind of dynamic period of the fishery. But we have no indication that will be coming.

Question/ Comment
Julie Bonney
Alaska Groundfish Data Bank, USA

In terms of the sectors here in the NE where you are talking about 100% observer coverage at sea over a period of time, during which you'd create a baseline, and then from that point forward you'd have reduction in the coverage. In my experience from Alaska, once you have such a high level, going to something at a lower level typically doesn't happen. So have you had that dialogue to define that baseline and what they are going to be looking for in terms of what level of observer coverage you might have in the future?

Response
Melissa Sanderson
CCCHFA, USA

I don't have a complete answer for you. We haven't had a lot of dialogue on that. And I hope you didn't misunderstand me. We won't have 100% coverage, unless some things are changed before next May. There looking at implementing low observer coverage or applying an assumed discard rate to calculate discards. So what I was putting the argument out was that we should be having 100% coverage, at least for a couple years so we can build a baseline to actually have data so we can know what those rates look like under sector management. But in terms of backing of from 100% coverage, we haven't had those dialogues.

Question/ Comment
Dennis Hansford
NOAA Fisheries Service, USA

Graham, in your presentation you outlined so many rights based management schemes In your review of those rights-based schemes, did you assess the quality of the science that's being conducted as the fishers are taking on the responsibility of the management?

Response
Graeme Parkes
MRAG Ltd., United Kingdom

That really wasn't part of our brief. The project was not specifically looking at monitoring issues. It was more of a cataloguing exercise to sort of put Europe on the map with respect to rights-based management and to see what's really going on across the EU and particularly how members states respond to limits and constraints put on them by the Commission and the EU particularly the overlapping and shared stocks sort of issues. We did clearly see that some systems are more complex than others. There is no one size that fits all sort of answer. We saw some limiting licensing systems which are relatively straight-forward with less management burden working perfectly well in certain situations.

Question/ Comment
Dennis Hansford
NOAA Fisheries Service, USA

Have any of the other panelists looked at rights-based management systems and seen any kind of deficiency or efficiency in the science?

Response
David Boyes
Arbegar Fishing Co. Ltd., Canada

In British Columbia there has been a big difference. The science is much better. In fact, industry is actually paying for science. There is research being conducted that would not be conducted if not for the ITQ system, because they see it themselves as being the client and not just the government or the resource. So there's a commonality of interests that has been brought together through stronger rights-based systems. So I would say definitely in Pacific Canada the science is much better, not just through the catch monitoring programs, but there is a adjunct of a whole bunch of other research investigations that just would not happen without the stronger rights and the fishing communities realizing that they are the beneficiaries of the better science.

Question
Lisa Borges
European Commission, Belgium

My question for Graeme associated with Dennis's earlier questions. My sense of the talks here is that a lot of the ITQ programs will need a high curve example monitoring. And I wondering if when you did your analysis you checked how many countries actually have a monitoring program? More importantly, what was the percentage of sampling coverage?

Response
Graeme Parkes
MRAG Ltd., United Kingdom

I'm afraid it's the same answer. We didn't really look at that specifically, we were more occupied in trying to categorize and characterize the different systems in terms of how they were managed, particularly the interplay of the different kinds of rights. As I mentioned before, the licensing overlaid with individual quotas and with effort, perhaps, on top of that, and the effects that has on the efficiency in the way in which the fleets operate. I think, though, that what you are talking about is important and if we were able to do that the study would have been more relevant to this forum. I think we did identify a number of follow-on projects and research that would be very useful, and I think that topic is one. We look forward to the request for proposals on that.

Question/ Comment
Bob Trumble
MRAG Americas, USA

We've heard quite a bit this morning from Gordon and Alicia about the benefits of 100 percent monitoring. We know in the US that we're not to get 100 percent coverage for a lot of our fisheries. In Alaska, Paul has experience with 100 percent and 200 percent coverage on factory trawlers. I'm curious whether anyone has done a study looking at the increasing risk as the coverage level goes down. When it goes to zero, obviously, there's very high risk of inappropriate fishing and inaccurate, inadequate records of landings and discards. But how do we look at some balance where we cannot afford 100 percent coverage in some of these smaller fisheries, against the risk of getting inappropriate data. If anyone has done such a study or put out an RFP for such a study, I'd like to know your thoughts on that.

Response
Julie Bonney
Alaska Groundfish Databank, USA

It would be a difficult study to do just because I think those fisheries where you have really constrained stocks adds another complicating factor. You'd have to look at it on a fishery by fishery level.

Response
Craig Loveridge
Ministry of Fisheries, New Zealand

I'd also like to comment on that. One of the things that in addition to observer coverage level to consider is how fast that data gets transmitted and in chunks data is being loaded into the system relative to the TAC. If you have relatively small TACs and the data coming in small chunks then you might be okay. If the data all come in at once, you could seriously over blow that TAC very seriously. So I think it's a matter of scale, rather than observer coverage, which is related to scale

Response
Gib Brogan
Oceana, USA

Over the course the conference you've heard reference to the Northeast Standardized bycatch reporting methodology, which is a project of the National Marine Fisheries Service here in the NE region, and they looked issue of how many observers do we need to get adequate information about the fisheries. They worked with Oceana; this process was actually the result of some of our litigation. And unfortunately, that long study looked only at precision. We heard reference to a 20 and 30 percent CV associated with observer coverage as the goal, but there was no discussion of accuracy. The key to design for all of this observer coverage for these programs is the accuracy issue. That needs to be factored into this and the uncertainty that's associated with accuracy needs to come in. At least in the United States, we're looking right now as we implement annual catch limits that "scientific uncertainty" is going to be a buffer in all of our management. So that accuracy, that bias in all of our observer data, I'm really hopeful that that is going to be factored into our data.

Question/Comment
Mike Lindley
West Coast Observer Program, USA

The question is directed mainly to Alicia about the Port Orford community-based program. Do the fishers feel that – what's the best incentive for them? Is it to fish in areas or depths that they ordinarily wouldn't be able to? Or is it to get more pounds of fish? Or is even that within the realm of possibility that they would be able to get more pounds of fish than they would ordinarily be able to?

Response
Alicia Billings
Consultant, USA

Are you talking about the RCA change?

Comment
Mike Lindley
West Coast Observer Program, USA

Exactly correct. Is there a provision to allow them to fish between the 75 and 150 fathom limit that they wouldn't ordinarily be able to?

Response
Alicia Billings
Consultant, USA

The only time that they can fish above 125 fathoms in depth is during the halibut openers, which is only one day and rather infrequent. But as far as that particular area the eastern boundary is still at 30 fathoms. That whole area is closed off. They were really concerned about the loss of that whole area because there is really good sablefish habitat. The contour line curves and the fishermen say that the black cod like to hang out in those curves. And the fishermen lost those grounds. That was a huge issue for them.

Comment
Howard McElderry
Archipelago Marine Research Ltd., Canada

I'd like to add another dimension to this discussion. Just from our experience in British Columbia, a lot of the talks are on coverage levels and data quality and so on – sort of focus on the need for quota management and improved science but in the mixed species fishery that we have in BC, in particular for those species in which the large need for quota is centered around addressing discard requirements, there's a trade-ability element in the fishery that's really important. The fishermen need to be able to lease quota from one another in order to acquire the species portfolios that are needed. My sense, I guess my prediction is that as this program evolves, the precision level requirements around data quality will really focus in order to make the currency of this transaction work in a better way. I guess an example – if you need to lease 1000 pounds of halibut, but that 1000 pounds could be anything from 500 to 1500 pounds, then your sell or lease that quota will have a very different value than if the precision requirements are a lot narrower. So I think that's going to be a driver in some of the programs that we develop.

Response/ Comment
Gordon Gilasion
Economist, Canada

I think it's fair to say that the business of trading is still in an evolutionary stage. Some of these so called "rare species" that you need some semblance of in ordinary to go out and prosecute a fishery in a boat on a fishing trip, are very valuable, and are actually trading at more than the market price. So if the price of fish you bring to the dock is $5.00 per pound, to lease a pound of that to go on a fishing trip, you might have to pay more than $5.00. So a lot of these things are still evolving on that. It will be interesting as this evolves, and given what I know about fishermen, they will come to a solution on this; they will deal with it in time.

Question/Comment
Kimberly Murray
NOAA Fisheries Service, USA

My question is for Gib regarding the cap of endangered species across multiple fisheries. For those of you who don't know, in the US, under each fishery management plan, if a fishery is likely to affect endangered species, then the amount of endangered species is assessed, and if that amount is not going to jeopardize the species, then that fishery is granted an allowable take of that species. This is done on a fishery-by-fishery basis. My question is, what are your thoughts on how a cap allocated across the different fishery management plans would be assessed and implemented.

Response
Gib Brogan
Oceana, USA

I think the cap – We would look for your guidance. As the turtle experts from the government, you (NEFSC) do the stock assessment, so biologically we'd look for guidance from the experts on what a particular stock, say, loggerhead turtles, and the mortality that the stock could withstand. And then from that cap, apply that across the fisheries. And they may be aggregated. There be an aggregated cap for, say, trawl fisheries in New England – or something along those lines. So when implemented that cap, whatever it is that is dictated by the biology of the species, when that's hit the fishing will change. And as far as it's implemented, I think it's going to take a robust observer and at-sea monitoring program to look at these rare occurrences. Sampling for these rare events is a different beast than sampling for common events. So it's going to take some work to put together and observer and monitoring program that's going to account for all of takes and count them against that cap.

Comment
Kimberly Murray
NOAA Fisheries Service, USA

I think it's tricky how that one single allocation can be divided among the fisheries; that is, whether it's divided equally or by effort or just how you would divvy it up.

Response/ Comment
Gib Brogan
Oceana, USA

Absolutely, I think that fight is best left to the fishery managers with the understanding that all of that mortality will stay under an acceptable cap number. And that's our goal – to stay under whatever that acceptable cap number is. Allocation is best left to the managers. In our belief, that's what Magnuson was meant to do, to let the managers allocate initially available catch, but we're looking more at the issue of protected species as well.

Comment
Craig Loveridge
Ministry of Fisheries, New Zealand

I'd just like to make a comment on that last point about how the shares are allocated among individual fishers. In Alaska, the AKRO has traditionally used historical catch (whatever your historical catch was). This introduces an interesting incentive, because fishers would increase their fishing for a particular species if they thought a closed system was going to go into place. So then what the region did was they used as their basis landings data from six years ago. It introduces an interesting problem. They are using years that may not be representative of true fishing efforts, but they are trying to eliminate this incentive to fish a particular species that you may not have fished before because you think it's going to be closed. It's an added wrinkle.

Comment
Kjell Needreas
Institute of Marine Research, Norway

Following up on Bob Trumble's question - What are the consequences of reducing the coverage in our sampling? I will use the opportunity to make some "PR" for two important ICES workshops. Last year there was a workshop on bias. This year in September there will be a workshop on precision. And you know, together, this is about accuracy. I think in those cases where you have today 100% coverage, that is very good opportunity to do simulations. You can reduce by random the data to a lower coverage and you can see what consequences this has for various purposes. As far as key words, I mentioned the variance component analyzers, and effective sampling size – I think we should do more of that in order to document our sampling, our needs for sampling, and the precision that is necessary.

Comment
Susan Wigley
NOAA Fisheries Service, USA

I have a comment as a follow-up to Gib's reply about SBRM and accuracy. The analytic component to the SBRM Omnibus Amendment did include a spectrum of analyses, including precision, but it did include accuracy, looking at the spatial and temporal patterns of our observer program, as well as trip length and total trip pounds kept by observed and unobserved trips. I'd be happy to discuss those analyses with anyone who has any questions regarding them.

Question
Jann Martinsohn
European Commission, Italy

Graeme, did you look beyond the European Union to places such as Iceland and their rights-based management systems. Are there any lessons, be it positive or negative, to be learned?

Response
Graeme Parkes
MRAG Ltd., United Kingdom

Well, actually, we wanted to, but we were told specifically not to. This study was very focused on Europe. We felt that we had to get information out there, so that people like Rebecca Lent could remember about Europe, for example. We did actually have an Icelandic member of our team, Rigra Anderson, who is a well known economist and who has done a lot of work on rights-based management. He was actually very helpful and very instrumental in our study of the attributes of the systems and the Q-value and so on. That was a concern to some of the people on the Commission, because they didn't want some sort of theoretical treatment of rights and that sort of thing. What they really wanted was information about the situation of rights-based management with the EU. The only component that we did look at in Iceland was with respect to the allocation of rights. There is a legal procedure going on at the time about initial allocation that had happened in Iceland, so we presented a piece in the report on that and the implications that might have on the different ways of allocating rights within Europe. That was really as far as we went.

Panel Session 12:

How can electronic monitoring be used to improve data collection activities?

Moderator: **Howard McElderry, Archipelago Marine Research Ltd., Canada**

Speakers

Julie Bonney – USA
Electronic monitoring in the Central Gulf of Alaska Rockfish Fishery

Melissa Sanderson – USA
Electronic Catch Monitoring in New England's Groundfish Fishery

Morgan Dyas – Canada
Using Electric Monitoring to estimate reef fish catch on bottom longline vessels in the Gulf of Mexico: a pilot study.

Andrew France – New Zealand
Assessing protected species interactions using electronic monitoring technology- a pilot study in New Zealand Longline Fisheries

Stephanie Rowe – New Zealand
A new approach to monitoring protected species interactions with inshore trawl vessels

Martin Loefflad – USA
Summary of the North Pacific Electronic Fisheries Monitoring Workshop, July 2008

Introduction to the session

Electronic monitoring technology typically consists of multiple closed circuit television cameras, a GPS receiver, a hydraulic pressure sensor, a winch sensor, and a system control box. EM has been deployed on variety of fishing vessels to monitor a range of fisheries issues including fishing location, catch, catch handling, fishing methods, protected species interactions, and mitigation measures. There are six presentations within this session, crossing broad geographies, fisheries and fisheries monitoring issues. In addition to these, the use of EM technology has infused the conference in several previous presentations speaking to its applicability in various other applications.

Electronic monitoring in the central Gulf of Alaska rockfish fishery

*Julie A. Bonney[1], Alan Kinsolving[2], Jennifer Watson[2], Kathleen McGauley[1]
Alaska Groundfish Data Bank, Inc.[1], Kodiak, Alaska, Sustainable Fisheries, Alaska Regional Office, NOAA Fisheries, Juneau, Alaska[2]

Introduction

In 2007, the Central Gulf of Alaska rockfish fishery shifted to a quota share system. Under the new program, each catcher vessel cooperative is allocated a share of various rockfish species, sablefish and Pacific cod. Additionally, the cooperatives are allocated halibut prohibited species catch (PSC) to allow the prosecution of the fishery. Halibut PSC must be discarded at-sea and, at this time, can only be effectively accounted against the cooperative's PSC quota if there is an observer onboard to estimate the halibut catch in each haul. However, North Pacific Groundfish Observer Program sampling methods were not designed for haul specific catch accounting on individual vessels. In 2005, a pilot study was conducted to evaluate the use of electronic monitoring (EM) to monitor discards in the CGOA rockfish fishery[1]. The final report stressed that if discard was restricted to a single location and discard species were limited to only halibut PSC, the effectiveness of EM would increase. If effective and feasible, EM in the CGOA rockfish pilot program may improve estimation of halibut bycatch, instill vessel-level accountability for all hauls, reduce the need for at-sea observer coverage and prove to be a more cost effective option for the inshore rockfish co-op fleet. In 2007 and 2008, an exempted fishery permit study was conducted to determine whether EM could quantify halibut discard if the 2005 study recommendations were followed. Phase I was designed to evaluate the accuracy and precision of EM by comparing the at-sea estimates of halibut PSC generated by EM versus the census values and to compare both to observer-derived estimates; Phase II examined qualitative issues such as industry self-reporting, data management, cost structure, timeliness and shoreside support that need to be considered before fleet-wide implementation.

Methods

In 2007, one catcher vessel made six trips targeting rockfish, sablefish or Pacific cod. All catch other than halibut was retained and halibut were discarded through a single discard chute pre-marked with a measurement grid. All halibut were measured by project staff prior to being discarded. The EM system was designed to monitor for 100% retention and collect video and sensor data at sea that would allow a shoreside reviewer to enumerate the number of halibut discarded at sea and to estimate their lengths. In addition, each tow was sampled for species composition according to the current observer program protocols. In 2008, the study was broadened to explore the use of EM on more than one vessel in a co-op over the course of the entire season. EM was installed on four vessels and, in addition to following the Phase I protocol, the operators were also requested to tally discarded halibut by size category (small, medium and large) and to submit this tally sheet to the Co-op manager after each trip. The skipper-derived average weights were compared to those generated by EM. Project staff recorded dates and times for vessel arrival, hard drive retrieval, data submission to the EM provider, and arrival of the final EM weight estimates of discarded halibut by tow per trip per vessel.

Results/Discussion

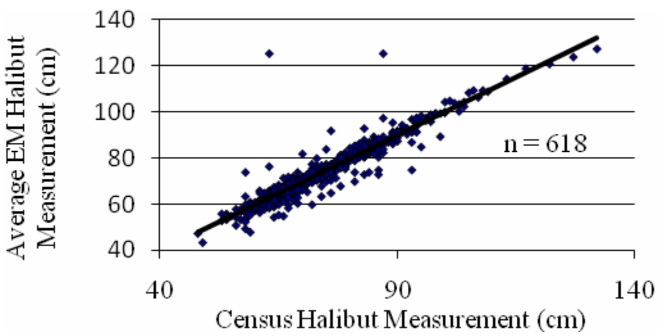

Figure 1. Census v. avg. EM halibut length for the 618 Phase I hauls.

The results of Phase I in 2007 showed that the video-based length estimates of discarded halibut had a high level of precision and were not biased relative to the at-sea census of halibut[2,3] (figure 1). Compared to the census values, observer sampling underestimated the overall halibut weight and halibut numbers. The study supported the use of EM to obtain estimates of halibut PSC catch at the haul level.

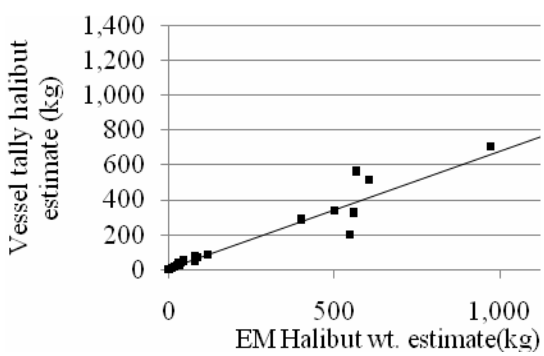

Figure 2. Phase II: EM v. operator halibut weight estimates by trip for the four participating vessels (n=30).

The trip tallies taken by crew and skippers during Phase II corresponded close enough to the EM estimates to allow for interim and immediate Co-op PSC management needs (figure 2) given the relatively long time lag between vessel arrival and receipt of the final EM data (ranging from 15-37 days, average of 26.4 days) when no local EM technician/reviewer was in town. Whereas Phase II of the project encountered some technical difficulties, losing about 16% of the EM haul data, these computer glitches would probably be alleviated by using updated software and electronics. The results indicate that local, shoreside support is essential for cost-effective and timely collection and receipt of EM raw and finalized data. Vessel EM costs would likely lessen with increased participation in fisheries requiring EM systems.

Notes:

1. McElderry, H., R. Reidy, J. Illingworth, and M. Buckley. 2005. Electronic Monitoring for the Kodiak Rockfish Fishery – A Pilot Study. Unpublished Report Prepared for the Pacific States Marine Fisheries Commission, Portland, OR, USA by Archipelago Marine Research Ltd., Victoria BC Canada, and Digital Observer Inc., Kodiak, Alaska, USA. 43 pp.
2. McElderry, H., J. Schraeder, T. Wallin, S. Oh. 2008. Trials on F/V *Sea Mac* To Evaluate the Use of Electronic Monitoring for the Kodiak, AK Rockfish Pilot Program. Unpublished report prepared for Marine Conservation Alliance Foundation, Juneau, AK. 17 pp.
3. Haist, V. 2008. Alaska Groundfish Data Bank study to evaluate an electric monitoring program for estimating halibut discards: Statistical analysis of study data. Unpublished report prepared for Marine Conservation Alliance Foundation, Juneau, AK. 28 pp.

Electronic catch monitoring in New England's groundfish fishery

Melissa Sanderson
Cape Cod Commercial Hook Fishermen's Association, USA

Catch share management, in the form of community-based Sectors, will be implemented in New England's groundfish fishery in 2010, with the intent to end overfishing on many stocks. Accurately accounting for annual quotas will require a regional change in monitoring intensity and has spurred the exploration of alternative monitoring techniques. The Cape Cod Commercial Hook Fishermen's Association (CCCHFA) contracted Archipelago Marine Research on two pilot projects to test the feasibility of using electronic monitoring to quantify catch (landings and discards) on the benthic longline and gillnet dayboat fleets fishing under quota-based management. The pilot studies field-tested EM systems consisting of up to three closed circuit television cameras, a GPS receiver, hydraulic pressure and rotational gear sensors, and a data storage device. At sea observers were deployed on nearly all trips in order to evaluate the quality of EM catch data. Fishing event imagery was examined for species identification, enumeration of catch and verification of fishing times. Participating vessels belonged to the Georges Bank Cod Hook Sector or the Georges Bank Fixed Gear Sector. They began fishing under community quotas for cod in 2004 and 2006, respectively, and will be required to have a robust monitoring plan approved by the National Marine Fisheries Service by 2011. The EM pilots have led the way in exposing New England to the possibility of supplementing human observers with electronic monitoring. In this monitoring application, EM offers a number of advantages over observer programs including lower cost, labor savings, logistical efficiency, fleet suitability, and increased industry acceptance. Issues hindering the implementation of an EM-based monitoring program include expanding fleet awareness of EM program requirements, local infrastructure to support such a program, and solidifying data sharing agreements that specify what information would be collected and how it would be used.

Using electronic monitoring to estimate reef fish catch on bottom longline vessels in the Gulf of Mexico: A pilot study

Maria Jose Pria, Howard McElderry, *Morgan Dyas, Paul Wesley
Archipelago Marine Research Ltd.

The need to provide better bycatch estimates in the Gulf of Mexico commercial longline reef fish fishery is the third action item priority for FY07-FY08 in the Southeast Region's Bycatch Implementation Plan. Consequently, NOAA Fisheries is interested in exploring cost effective methods of monitoring bycatch aboard bottom longline vessels operating in the Gulf of Mexico. In the spring of 2008, a feasibility study on the use of video-based electronic monitoring technology (EM) was cooperatively conducted between industry, MRAG Americas Inc., NOAA Fisheries Service Southeast Fisheries Science Center, the Southeast Regional Office and Archipelago Marine Research Ltd. EM technology was selected because of its demonstrated effectiveness in collecting the time and location of fishing events and in monitoring bycatch, catch handling and other shipboard practices[1].

The study was designed to trial EM installations on vessels actively engaged in fishing operations targeting Grouper in both shallow and deep water. The two main objectives were, first to determine if the imagery collected by EM systems is of sufficient resolution and clarity to allow a video analyst to accurately record the number of hooks and to count and identify species, and second to test how well fishing data collected by EM systems compared with data collected by on-board observers from NOAA Fisheries' Gulf of Mexico Reef Fishery Observer Program.

Each EM system consisted of three closed circuit television cameras, a GPS receiver, a hydraulic pressure transducer, a rotation sensor, a system control box and a monitor and keyboard. EM system software was configured to log data from sensors every 10 seconds and to capture

Species (Common Name; *Latin Name*) And Species Groups	Percent Occurrence	Average Pieces per Set	Total Observer Pieces	Total EM Pieces	Total Piece Difference	Percent Difference
Red Grouper; *Epinephelus morio*	96.3%	40.7	8598	8428	170	2.0%
Gag; *Mycteroperca microlepis*	18.7%	1.5	61	62	-1	-1.6%
Yellowedge Grouper; *Epinephelus flavolimbatus*	2.3%	12.2	61	52	9	14.8%
All other groupers	16.0%	1.3	56	24	32	57.1%
Total for Groupers			**8776**	**8566**	**210**	**2.4%**
Atlantic Sharpnose Shark; *Rhizoprionodon terraenovae*	46.1%	4.5	457	898	-441	-96.5%
General Sharks (Family); Carcharhinidae	21.0%	6.0	275	26	249	90.5%
Blacknose Shark; *Carcharhinus acronotus*	36.5%	3.1	244	66	178	73.0%
Nurse Shark; *Ginglymostoma cirratum*	9.6%	1.3	28	19	9	
Silky Shark; *Carcharhinus falciformis*	7.8%	1.4	24	7	17	
All other sharks	19.7%	1.2	59	38	21	35.6%
Total for Sharks			**1087**	**1054**	**33**	**3.0%**
Red Snapper; *Lutjanus campechanus*	28.8%	2.0	124	119	5	4.0%
All other snappers	39.7%	1.7	52	40	12	23.1%
Total for Snappers			**176**	**159**	**17**	**9.7%**
Total for Porgies	14.2%	1.5	48	42	6	
Total for Lizardfishes	13.2%	1.4	42	44	-2	
Total for Morays	11.4%	1.3	35	27	8	
Total for Tilefishes	1.8%	3.8	23	22	1	
Total for Toadfishes	8.2%	1.1	19	19	0	
Total for Rays and Skates	3.7%	1.3	10	10	0	
Total for Tunas, Bonitos, and Mackerels	3.2%	1.0	7	6	1	
Total for Eels	1.8%	1.3	5	4	1	
Total for Jacks	10.0%	1.7	37	37	0	
Total for Drums	1.4%	1.0	3	4	-1	
Total for Seabasses	0.9%	1.0	2	1	1	
Unknown Fish	0.9%	1.0	2	22	-20	
Total for Other Fish	32.0%	1.3	113	91	22	19.5%
Loggerhead Turtle; *Caretta caretta*	0.9%	1.0	2	2	0	
General Turtle	0.5%	1.0	1	0	1	
Total for Turtles			**3**	**2**	**1**	
Overall Catch Totals		**47.3**	**10388**	**10110**	**278**	**2.7%**

Table 1: Summary of total catch by species or species group

imagery during hauling and setting events. Video recording was triggered by the rotation of the groundline drum or an increase in hydraulic pressure above a pre-determined threshold and was set to run on for ten minutes after fishing activity had ceased.

EM sensor data and imagery were interpreted sequentially. Initially, sensor data were used to resolve trip and fishing event information and to evaluate each sensors functionality. Then, during imagery review, the quality of the imagery was assessed, catch was counted and identified to its lowest taxonomical grouping, and each catch item's disposition was recorded. 100% of the sensor data collected during the study were interpreted; while imagery review was conducted only for hauls where both the imagery and the observer data were complete. Data from observers and EM were compared at the project, haul and hook level and were only combined after all of the selected imagery was reviewed.

Six vessels ranging in length from 40 ft to 50 ft carried EM systems during the study. Data collection spanned a two-month period, capturing two fishing trips for each vessel totaling 148 days at sea. Every vessel carried an observer at least once, resulting in seven trips with data collected by both observers and EM. In total, EM systems collected over 2,000 hours of sensor data, and 645 hours of haul imagery associated with 325 fishing events. Sensor data capture success was 65%, where 92% of the data loss was associated with vessel operators manually powering down the EM system. Imagery capture was complete for 218 hauls of the 245 observed; 22 of those included hook level catch data. Overall, more than 10,000 catch items were available for comparison (Table 1).

High levels of agreement were found between EM and observer data at each level of the comparison. At the project level, the set start and haul end dates and times in the EM sensor data were on average, within one minute of those recorded by observers. As well, imagery viewers recorded counts for the total number of pieces caught (Table 1) within 2.7% of those recorded by observers and identified two out of the three protected species interactions. At the haul level, total piece counts were on average within 2.5% of each other and counts by both data sources for all major species were within one piece for 73% of the hauls in which they occurred. In general, species groups (e.g. sharks, amberjacks, toadfishes, etc) compared better than individual species. A much lower level of agreement occurred when catch disposition was compared, with piece differences averaging about 14 per haul for retained and 16 per haul for non-retained catch. At the hook level, Red Grouper were positively identified on 948 of 953 hooks or with a 92% success rate and EM was within 15% of the observers when counts of more than 19,000 blank hooks were compared.

Results of this study indicate that EM systems can collect data that compare well with data collected by on-board observers in the Gulf of Mexico longline fishery. EM systems were successful in collecting haul level sensor and imagery data but failed to consistently collect complete trip level data primarily because vessel operators were turning systems off to conserve power. EM sensor data gave accurate times and locations of fishing trip activities and imagery viewers provided similar counts of hooks and target and non-target species to those of observers. However, the identification of some catch to the species level, the ability to identify all protected species interactions and determining catch disposition proved more difficult. Discrepancies in species identification and EM failing to recognize one night time sea turtle interaction were mainly due to the temporary nature of the study since less than optimum camera angles and poor lighting went uncorrected. As well, the unsuccessful determination of catch disposition was due to catch being handled in an inconsistent manner and often discarded from multiple locations.

Future work with EM on this fishery would benefit from a strong outreach process educating vessel operators on EM system operation and thorough feedback loops aimed at finding optimum camera views and lighting. Similarly, more work on encouraging consistent catch handling procedures is necessary if EM is to track catch disposition on this fleet.

Notes:

1. McElderry, H. 2008. At Sea Observing Using Video-Based Electronic Monitoring. Background paper prepared for the Electronic Monitoring Workshop, Seattle WA.

Assessing protected species interactions using EM technology - a pilot study in new zealand longline fisheries

Andrew France[1]
Observer Services, Ministry of Fisheries, New Zealand[1]

Introduction

At-sea observers are currently the primary method for monitoring protected species interactions in longline fisheries in New Zealand. Due to observer costs and a number of vessels not being suitable for observer coverage, the Ministry of Fisheries (MFish) wanted to examine alternative monitoring methods. MFish initiated a pilot project to investigate the use of electronic monitoring (EM) technology on longline vessels, and contracted Archipelago Marine Research Ltd. to carry out the project. Archipelago worked in collaboration with Lat 37 Ltd., a New Zealand based company that specialises in applied technology for the fishing industry.
The specific objectives of the project were to:

- Trial the deployment of electronic monitoring (EM) systems in selected longline fisheries, monitoring incidental take of protected species;
- Evaluate the efficacy of electronic monitoring in allowing enumeration and identification of protected species captures; and,
- Recommend options for data management and information transfer arising from the deployment of electronic monitoring in selected fisheries.

Methods

The project used at-sea observers for comparison with data collected by an EM system. It spanned a nine-month period during which EM systems and MFish observers were simultaneously in place on two pelagic and two demersal longline vessels for a total of 8 trips and 198 fishing events, and about 100 days of vessel time at sea. Each vessel was provided with a standard EM system. The two demersal longline vessels collectively logged about half the sea time and 80% of the fishing events, and the two pelagic longline vessels recorded slightly more time at sea and only 20% of the fishing events. Vessel 1 was a 46m large factory demersal auto-longline vessel; Vessel 2 was a 14m coastal demersal longline vessel; Vessel 3 was a 24m pelagic longline vessel; and Vessel 4 was a 19m pelagic longline vessel.

Results

As the project was comparing EM and observer estimates, it was important to match the two data sets. This was difficult due to incomplete sensor data on significant portions of fishing trips for all but one vessel. Unsuccessful sensor data capture from the EM deployments was primarily caused by:

- the EM system being manually shut off
- a poor GPS signal caused by interference from one vessel's radar
- the EM system being powered down when fishing operations were not occurring
- a problem with one vessel's electrical system

There were different numbers of fishing events recorded by observers and EM systems, but 172 fishing events were able to be matched. Image capture rate was generally high across the four vessels, probably due to the efforts made by observers to ensure that EM systems were operating when retrieval operations were underway. As it was not expected that many protected species encounters would occur, some fishing events were also viewed to identify all catch. This provided an assessment of how well catch items could be identified from EM imagery. Imagery from 39 fishing events was assessed for all catch items and imagery from 122 fishing events was assessed for protected species.

The camera placements were opportunistic due to their temporary nature, and in nearly all instances were not ideal. This impacted on the quality of catch information that could be obtained. The shorter branch lines with demersal longline gear made camera placements easier as the field of view was smaller. The longer branch lines with pelagic longline gear made it more demanding for cameras to successfully capture catch information.
Observers recorded nine protected species interactions, eight seabird incidents and one sea turtle; and only two of the incidents were within view of the cameras. Four of the eight seabird encounters were deck landings, and two involved seabirds colliding with the mainline and becoming entangled during hauling, but not coming aboard at the roller. The other two incidents were seabirds hooked at the hauler, with one seabird released before the roller, out of camera view. The other seabird came aboard at the hauler, and was detected by EM. The other encounter involved a Leatherback Turtle becoming entangled in the mainline. During the initial review of the EM imagery, viewers did not detect this encounter due to the camera being viewed. When imagery was re-examined after comparing with observer data, the imagery from another camera view clearly showed the interaction, and positive identification was able to be made.

The percent difference between EM and observer catch counts varied across vessels, but there were about 60% of the sets which had a difference of less than 20%. The EM counts were lower that observer counts in all but 10 fishing events, suggesting that not all recorded catch was viewable by EM. There were issues with observer data that influenced the comparison, with some observer data taken from vessel records.

Imagery was successfully recorded from all vessels during longline setting, and although seabirds and streamer lines were evident in the field of view, performance and behaviour was difficult to assess from the camera perspectives.

The ratio of image analysis time relative to real time was computed for all imagery examined. Image viewing for protected species only, could be accomplished at about 50% of real time. Interpretation for all catch was almost the same as real time. The following conclusions were reached:

- The issues which affected 100% sensor data capture are resolvable.
- There were no instances of malfunctioning equipment resulting in data failure.
- The EM systems were suitable for all vessels covered, and should also be suitable for the component of the fleet not suitable for observer placement.
- The camera placement issues should be resolvable.
- With regard to the pelagic longline vessels, results from this project are inconclusive. Further testing of EM is needed in this fishery.
- With regard to the demersal longline fishery, EM shows promise.

However, the level of industry co-operation will strongly affect the success of an EM-based monitoring program. In this project, it was difficult to find vessels interested in participating. Of the four vessels covered, there were both willing and reluctant participants.

EM will likely depend on several issues, the main ones being cost and convenience (as compared with observers), opportunities for value-adding EM by addressing data needs of industry, and policies governing the use and ownership of data.

A New Approach to Monitoring Protected Species Interactions with Inshore Trawl Vessels

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Introduction

Over the last ten years, the Conservation Services Programme (CSP) of the New Zealand Department of Conservation has monitored interactions between large trawl vessels (> 28 m in length) and protected species, by placement of government observers on vessels. The data gathered has been key to developing an understanding of the significant risk posed to protected seabirds and marine mammals, and has enabled the development of a number of successful methods to reduce protected species bycatch. However, very little is known on the extent of interactions between smaller inshore vessels and protected species. The use of fisheries observers to perform this monitoring has been limited by the small size of inshore vessels which may not have room to accommodate extra personnel, the less predictable fishing schedules and lack of governance structure to liaise with over placements. Since January 2007 CSP has placed a limited number of observers on these small vessels for the first time and early results show the potentially large impact they may have on protected species, including albatrosses, shearwaters and marine mammals.

In 2008 CSP started investigating novel ways of increasing monitoring coverage and understanding of the interactions between small inshore trawl vessels and protected species in New Zealand fisheries. This included a six month trial of electronic monitoring (EM) on two small inshore trawl vessels. The key objective of the trial was to evaluate the use of EM for protected species interactions with fishing vessels, and use of associated mitigation methods and other related fishing practices, in inshore trawl fisheries in New Zealand.

Specific fishery monitoring objectives for the analysis included:

1. Providing detailed recommendations for improvements to field operations.
2. For a representative sample of fishing events, determine the feasibility of using the EM data to record the protected species retrieved from the gear; rate of occurrence and number of protected species around the stern of the vessel; number of seabird interactions with warp(s); lowest level of identification possible for protected species; deployment of mitigation devices and presence/absence and quantification of discard and offal discharge.
3. Develop a standard methodology that can be used on future EM data sets from inshore trawl fisheries.
4. For EM-monitored fishing events where a government observer was present, provide a comparison between the two methods.
5. Provide detailed recommendations on optimal storage/archiving of EM sensor and image data and any other recommendations relevant to future deployment of EM systems in New Zealand fisheries.

Methods

In early 2008, trials were performed to evaluate the potential use of EM in capturing PS interactions within the NZ inshore trawl fishery. EM systems consisted of four closed circuit television cameras, a GPS receiver, a hydraulic pressure sensor, winch sensor, and system control box. EM sensor data were recorded continuously while the EM system was powered, and was intended to be recording for the entire duration of the fishing trip. Sensor data were recorded every 10 seconds with a data storage requirement of 0.5 MB per day. Image capture occurred only during fishing operations.

EM image data were sent to Archipelago Marine Research Ltd in Canada for processing. As part of image data analysis, every tow was rated for image quality and usability. Image data quality was assessed as an average across all four-camera views while usability was determined based on individual fishery monitoring objectives.

Results/Discussion

EM systems were deployed on two inshore vessels fishing off the NE coast of New Zealand's North Island, recording a collective total of 14 months, 65 fishing trips, over 260 vessel days at sea, and 1,022 fishing events. Overall sensor data capture success averaged 84% with considerable variability between trips due to the EM system being manually powered off during the trip. Image recording was complete for 85% of fishing events. Detailed image analysis was conducted for six protected species monitoring objectives on a sample of 150 fishing events, plus 60 additional events where an observer was also aboard. Image quality was medium to high for virtually all (99%) of the image data but usability for specific monitoring objectives varied from 0% for warp interactions and 80%-95% for the remaining objectives.

The results from this study show EM to have a range of efficacy for the monitoring objectives examined and observer data were superior in most cases. EM has tremendous potential for monitoring protected species catch occurrences, providing general index of seabird abundance, and routine monitoring for mitigation practices such as offal discharge and deployment of gear avoidance devices.

The use of EM for detailed observations of warp strikes, or providing a detailed census of seabirds astern of the vessel would likely be ineffective. This study demonstrated the difficulty of achieving all monitoring issues equally well and improvements to the usability of imagery would be a process of prioritizing the specific monitoring issues and determining camera placements that best meet these needs. Working with the crew to develop more standardized catch-handling operations will also improve the ability to accurately document events from image data. A possible next step, if more widespread deployment is desired for management, is for the Department of Conservation to seek industry involvement in the design and development of an EM programme.

The successful deployment of EM in this trial was made possible by the active cooperation of the fishing company involved. Early results have shown the EM systems to be capable of capturing protected species interactions with the vessels and further analysis is underway at the time of writing.

Summary of the North Pacific electronic fisheries monitoring workshop, July 2008

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Chris Oliver[2;] Bob Trumble[4]
National Marine Fisheries Service[1], North Pacific Fisheries Management Council[2], North Pacific Fisheries Research Board[3], MRAG Americas, Inc[4].

The National Marine Fisheries Service, North Pacific Fisheries Management Council, and North Pacific Fisheries Research Board collaborated on a workshop in the summer of 2008 which focused on video and other electronic monitoring (EM) of commercial fisheries. The goals of the workshop were to: 1) review past and in-progress work using video technology, 2) identify legal and management implementation concerns, 3) evaluate video's applicability to management of the North Pacific Fisheries, and 4) assess future research and development needs and opportunities. While the focus of the workshop was on the applicability of video to Alaskan groundfish and halibut fisheries, there was national and international interest and participation. Within the Alaskan fisheries community, participants included government agencies, the fishing industry, North Pacific Fisheries Management Council members, and the environmental community. Key points include:

- The methodology is well established with proven technology and successful applications, but that EM is not applicable for all cases.
- EM has many potential applications for North Pacific fisheries. Incorporating EM into a monitoring program will depend heavily on the objectives of the particular program; two programs that rely on EM to various extents demonstrate the future potential for EM in the US North Pacific.
- Developers of monitoring programs that use EM should consider the full sampling needs of the program, and combine technology and observers in a way that takes advantage of what EM and observers do best.
- A substantial amount of research and evaluation is needed before managers and scientists can take full advantage of the benefits of EM.

A report is available at: http://www.fakr.noaa.gov/npfmc/current_issues/observer/observer.htm

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Question and Answer

The question and answer session below captures the dynamic dialog between panelists and the audience. Each discussion is separated by a double line break

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Question/ Comment
Lori Steele
New England Fishery
Management Council
USA

One of the points that I've certainly taken from pretty much every conversation I've had about electronic monitoring is how important it is to have industry support and industry buy-in to really ensure the success of the project.

One of the alternatives that we're considering for the Atlantic Herring Monitoring Program that we're developing simply mandates that electronic monitoring be used across the entire fishery with what I would consider to be somewhat limited testing. I believe its Melissa's group that has expressed support and stood behind that proposal. This would essentially require electronic monitoring on potentially 40 to 100 fishing vessels depending on whom it applied to, which hasn't fully been determined yet. We haven't done a lot of testing and I've heard a lot today about pilot projects and research and testing.

Is there support for a top down approach to implementing electronic monitoring and does anybody have any experience with that? Are there fisheries out there where it's just simply been required without a lot of testing specific to that fishery? And related to that, how important do you feel it is to have industry buy-in and support for this kind of an approach to be successful?

Response
Julie Bonney
Alaska Groundfish Databank
USA

I guess from my perspective in Kodiak there's about 30 vessels that are involved in the rock fish pilot program. There's a lot of discussion in-house about whether or not the vessels would be willing to put on cameras. You have two segments of the fleet – one group that's more progressive and others that are the old school. So our vision has always been that there are two options. You can choose the EM path or you can continue to go with the 100 percent human observer requirement.

I really think the issue of buy-in is going to be mostly about costs. So if there's a cost savings with EM I think more will go for that door and as you allow people to migrate, it will happen over time. I would be concerned that if you did a top down approach, you may not get the desired result. Fishers can defeat EM by getting in front of the camera to avoid views, unplug the system, and turn it off. So if you force them you may not get what you're hoping for.

Response
Stephanie Rowe
Ministry of Fisheries
New Zealand

I just wanted to say in terms of industry involvement, for us it was a little odd in that Sanford, New Zealand owned the vessels and the crew are hired, so the crew didn't actually have a choice. That can create quite a few difficulties for the technicians who are actually trying to put the gear on those vessels because the crew can be quite resistant to that. So, certainly for us we had that high level industry engagement, but we need to make sure in the future that we do a bit more groundwork with the guys who are actually living with it every day.

Response
Andrew France
Ministry of Fisheries
New Zealand

In the New Zealand context we have an added complication. Since we are part of the Ministry and if we want to collect the data we have a strong compliance component with the observer program. So the whole issue about the use and the ownership of the data and what it can and can't be used for, is an added complication to the industry perspective.

If they are really reluctant that what might be on the video could end up in our compliance team's hands it makes the task even harder. If we don't get their support and them almost wanting to drive EM being implemented, it's not going to work. As everyone's already said, EM can be tampered with and even on our trawls with the participants we had constant issues of power being turned off, and no data captured. If it hadn't been for the observers on the boats ensuring that those systems were powered on and operating at retrieval time we would have got even less data.

Comment
Martin Loefflad
NOAA Fisheries Service
USA

I have a fairly strong opinion on this issue relative to the comment about top down approaches and some of the buy-in you may get. If you take a top down approach, I ask the question does anybody like a top down approach?"

With top down approaches you can get compliance, but you can also generate a fair amount of resentment. In the workshop we held, we heard in a very large way that buy-in and working with the industry was essential to the success of these projects. I think you see that demonstrated in the work that we're doing with Julie today.

From my own perspective we work with the industry. The industry is smart in ways that I am not, and that is a very valuable perspective in trying to make these things work together.

Comment
Howard McElderry
Archipelago Marine Research Ltd.
Canada

We did work with Bob Stanley a few years ago on a fishery in Tasmania that had some similar issues as the herring fishery indicated here. So, there is some information about that, which might help you. The other comment I really wanted to make was, even the most idealized bottom up approach like I described with the Area A, Crab Fishery, you are still dealing with this 80/20 element where most of the people are moving in the direction of monitoring and you have a few people that really don't want to, and it is being forced upon them. The program has to be set up in a manner to apply equally to the whole group. There will be a transitional implementation period to achieve this.

Question/ Comment
Greg Croft
Department of Fisheries and Oceans
Canada

I have an observation and a question. My observation is I'm quite impressed with the correlation between observed data on a trip that also has EM data. It's amazing how accurate the EM can be. I wouldn't have thought it was so good. So, I really hand it to Archipelago for developing a functional system.

Now my question is (I assume for these pilot studies all the video was looked at) once you move into a production system how do you balance how much video you need to see and the cost of viewing it with getting the data and the accuracy you need?

Response
Julie Bonney
Alaska Groundfish Databank
USA

That is something that we've been discussing in-house as we look at implementation potential for monitoring using EM in a rockfish trawl fishery. You approach the question of how good of data do you want. For instance, the tally sheets that we had indicated the crew did a very good job of counting, but their binning was slightly off. Is this good enough?

It all comes back to cost trade off. If you can be 80 or 85 percent correct and it costs you \$80 versus 100 percent and it costs you \$1,000, that's something that I struggle with and I think that's where the agency and industry are bouncing back and forth. We are all about cost. They are all about precision. So, I don't know what the right amount of data review is, but I think everybody needs to think about yes, 100 percent is great, but the cost structure really goes up.

Response
Andrew France
Ministry of Fisheries
New Zealand

I think that it depends on why you put the EM onboard and what you are trying to achieve. In our case it was protected species interactions. They are rare events and you've got to have 100 percent monitoring. There's no two ways about it, they are rare events and you can't really extrapolate.

It also depends if you're able to compare with a data set that you've got some confidence in, like observer data. If you're looking at discard rates (e.g., watching discard chutes) and you're monitoring a percentage of the fleet (or fishery) or and you have a baseline that you can then start looking at percentages of what you need to examine, but otherwise you've got to do 100 percent on some of these things.

It really comes down to how you're going to use it as a tool to do what in particular and whether it's an adjunct or as a replacement for observers.

Response
Howard McElderry
Archipelago Marine Research Ltd.
Canada

Andrew Fedoruk talked yesterday about the audit method used in the BC groundfish longline fishery and the whole way of trying to get fisher log data incorporated into the system. The hammer that goes along with failing an audit I think that goes a long way towards answering your question. Greg Workman also talked about a different methodology from the same fishery where the 10% sample of image data are boot strapped to determine confidence intervals for different species or areas in question. I think there are some really good methodologies have been worked out that would address sampling levels based on your question.

Response
Stephanie Rowe
Ministry of Fisheries,
New Zealand

I think New Zealand is certainly a long way from figuring out how we might implement EM in the future. We didn't look at all the imagery, that was more related to cost than anything else, but one thing for us is when those protected species captures happened we knew exactly which imagery to look at because the hired crew was running around, they knew it had been picked up on the camera. They probably wouldn't have done that otherwise.

Response
Martin Loefflad
NOAA Fisheries Service
USA

The answer to your question came up earlier I believe. I believe Kjell Nedreaas from Norway touched on it a little in that with the video imagery, at least in some of the hook and line operations we see, you have a census. It's your choice as to whether you want to look at every image. You could potentially sub-sample that depending on your precision needs and the costs that you can deal with.

So, you have a gold mine of information, but how much of that information you extract really depends on what you want to achieve with it. So consider potentially sub-sampling to save money.

Question/ Comment
Will Ward
Gulf Fishermen's Association
USA

I have three questions:

First: Are there resolution or identification issues regarding protected species? I believe someone from New Zealand alluded to a 50 percent identification rate. In the Gulf of Mexico we had three turtles through the observer and two through the video So, I don't know if that would be a good case in essence, but the other may be.

Second: If you could, elaborate on the accuracy of gear sensors, in essence, from hydraulic sensors for long line length determination, in our fishery for example. In terms of the accuracy, in recent Amendment 31 discussions gear length modifications were being considered as a possible remedy for turtle mitigation, law enforcement spoke strongly against it because they didn't' think it was enforceable.

Third: So the third question kind of morphs into more of a legal question. Have there been any cases involving EM in terms of litigation and in terms of proof testing? If so I'd like to know what they were and what were the findings.

Response
Andrew France
Ministry of Fisheries
New Zealand

As far as identification is concerned, image resolution in our project was pretty good. The issue with the missed turtle was primarily viewer experience in that type of fishery. Image viewers have a monitor that could have one, two or three, camera images displayed, and there is usually one main image where most of the viewing interpretations are made. In this particular case where the turtle wasn't detected, the secondary camera provided a clear view of the turtle capture while there was no activity in the main camera.
With knowledge of a fishery and associated deck activities, an experienced viewer would have immediately recognized this kind of event and would have easily detected the turtle capture event.

The sensor issue with long lining, we found from the pilot and Howard will elaborate more on this probably, some of the vessels had quite different hydraulic and winch patterns to they've experienced previously. One of the vessels had a multitude of hydraulic lines and it was difficult to know what was going on with some of the sensor information. So with a lot of these issues, it's about getting the right set up and it's just going to take time. Each vessel is slightly different. We were doing a pilot. We were doing opportunistic camera placements. We weren't majorly impacting on the vessels, having to put up structures and things to put the cameras in exactly the right places. There were only one or two deployments; not long periods.

You get what you put into some of these things. We were happy with their pilot, but if we take it further we're going to have to do a lot more work in terms of looking at each individual vessel and setting them up specifically for those vessels.

The third one on litigation, I can't really answer that. It would be completely different here as to what we've got in New Zealand.

Response
Stephanie Rowe
Ministry of Fisheries
New Zealand

In relation to your first question, in our trial it was pretty easy to identify the species that were by caught because the bottle nose dolphin, it's pretty bloody huge and obvious and the gannet is also quite different to a lot of the other species.

New Zealand has over 80 taxa of seabird species. Even observers struggle with identifying a lot of our petrels and shearwaters. New Zealand observers recover all seabird mortalities and return them to a shore lab for necropsy. So that's something that EM can't do, but under special permit theoretically you could get fishermen to do it.

What we didn't get to test is whether EM could pick up water soaked petrol in the catch. So that's something that we'll want to figure out if we can do in the future.

Response
Howard McElderry
Archipelago Marine Research Ltd.
Canada

In terms of the enforcement cases, the Area A crab fishery has been in place for ten years or so and there's a bit of history there. Most of the issues that have occurred in that fishery have been settled through just administrative penalties, fines, compliance bonds and so on. There was one case that elevated from the Area A Crab Association to the Department of Fisheries for prosecution in court. After a couple of years the case was eventually settled out of court to the satisfaction of the association.

With the implementation of the BC groundfish hook and line EM program, like crab fishery, most issues are resolved through feedback and administrative penalties. There were two cases involving fishing in closed areas and the Department of Fisheries was successful in both.

Question/ Comment
Jerry Cygler
East West Technical Services
USA

Melissa, in regards to your pilot study, was the observer a certified observer.

Response
Melissa Sanderson
Cape Cod Commercial Hook Fishermen's Association, USA

The majority of the observers on both pilots were certified federal observers. I can get the numbers for you later. There were a handful of trips where we had some of our data technicians for our cooperative research programs doing some of that.

I didn't mention it in the presentation here, but we were doing some hook by hook species identification. So the observer literally was standing there with a tape recorder saying what they were seeing coming over the rail and that was all they were looking at. Those were some of our in-house data collectors.

Comment
Jerry Cygler
East West Technical Services
USA

Also, was your pilot study accepted by the science community?

Comment
Melissa Sanderson
Cape Cod Commercial Hook Fishermen's Association
USA

The original pilot with the hook vessels was a collaborative effort with the science center and the observer program. I would leave that to Amy Van Atten to answer whether or not they've found value in our pilots.

Question/Comment
Jerry Cygler
East West Technical Services
USA

Currently, electronic monitoring and electronic data processing is in its early development stages. This is what we had with computers 20 years ago, then we had hackers and those kinds of associated problems. Tampering is not only cutting wires on a monitoring camera, but could be more serious. This same issue could apply in EM.

So here if we're going to widely use that type of equipment, is there a possibility of some kind of a really bigger problem with the viruses, hackers and problems with the data?

Comment
Howard McElderry
Archipelago Marine Research Ltd.
Canada

I really think that the discussion about electronic monitoring often gets overly focused on just the technical aspects (e.g., can the cameras see this? can the sensors detect that?).

I see this in a slightly broader perspective. It's really the operational context that the technology is being employed. I think that that speaks to some of the detail in terms of the application of the technology. Issues include: service delivery - How are these programs are actually made available?; and standards - What are the standards for the technology and program delivery. These operational issues are really important and we only have a small number of live operational projects that we can look at to start to think about how this needs to work.

Question/ Comment
Dennis Hansford
NOAA Fisheries Service
USA

This question is for Martin. I attended your EM workshop in Seattle and it was very well presented. I read Howard's report and you're right. That is very good reading outlining the use of EM in some U.S. fisheries and Canadian fisheries, but one of the sections in your workshop you highlighted it relating to regulatory efforts, I'm wondering are there any regulatory efforts underway to manage EM system use and where?

Response
Martin Loefflad
NOAA Fisheries Service
USA

I can only speak to within Alaska though because I'm not familiar with the rest of the country. Within Alaska we do have one operational video system that is regulated and that is a system that is in place for a compliance function. It's operating on several vessels right now. There are regulations which established that mechanism. That was the first regulatory effort that was taken in our region to deal with video and EM.

Now we're looking to the future of that. So we're really wrestling and working with the industry as we're looking at the project that Julie reported on as to where do we go from here with it. The initial framework that we outlined in regulations I think was a first stab at it. Now we need to evolve and look a little bit more to the future as this has potential to expand.

So the regulations we have out there we would say are good, but they're not fully fine tuned yet. So we have some work to do.

Comment
Dennis Hansford
NOAA Fisheries Service
USA

Are those regulations specific for a fishery and do you see this being a template for other regions to follow on?

Response
Martin Loefflad
NOAA Fisheries Service
USA

At this juncture I'd say we need a little bit more experience. So we're really in the discussion phase right now. How do we structure regulations in the future? I wouldn't say that we have a template for others to follow at this point in time.

Question/ Comment
Graeme Parkes
MRAG Ltd.
United Kingdom

I have a technical question, to anybody on the panel. It was about the number of frames per second that are recorded. I believe, I saw it was ten frames per second. I don't know if that's a standard, whether that's been determined as what's necessary to see what you need to see or whether there is actually a hardware constraint on that as a limit and whether if there were more frames per second it would be beneficial or if it's other sorts of issues like camera placement and so on that really control how effective the image analysis is.

Response
Morgan Dyas
Archipelago Marine Research Ltd.
Canada

Regarding the frames per second, we typically use five frames per second because we found that best for long line. It's a balance that you have to find between what kind of detail you need and how much space you're going to use on hard drives by collecting more frames per second.

Response
Julie Bonney
Alaska Groundfish Databank
USA

Just to follow on, I know for our project we used I think it was either two or four frames per second for the discard monitoring application for full retention, but then in terms of the discard sheet where you're actually trying to measure each halibut, it was up to eight. It comes down to what you're trying to accomplish. We were fortunate in terms of the data storage because we switched out the hard drives at the end of each trip so we didn't have a storage problem.

Comment
Graeme Parkes
MRAG Ltd.
United Kingdom

So is it fair to say that then it's essentially not a constraint? You would just set it to whatever you need it to be in order to achieve your aims?

Response
Howard McElderry
Archipelago Marine Research Ltd.
Canada

Technology is moving quite a bit and how I'd answer that three or four years ago is different than now. The cost of hard drives – the cost per gigabyte - is a lot less than it was and is going to continue so data storage will become continually more and more affordable and, at the same time, processing capabilities will also improve, yielding higher frame rates.

Right now we distribute about 30 frames per second across 4 cameras. So that's the balancing act that you're playing, using higher frame rates on cameras with more activity and lower rates on other cameras. Internet Protocol (IP) streaming cameras are coming into the marketplace and when the prices become affordable, the image processing bottleneck will not exist (all cameras could deliver 30 fps). It then comes back to the simple question of how much data storage do you want to use for the cameras that you're using.

Comment
Bob Stanley
Australian Fisheries Management Authority
Australia

It's not so much a question directed to the panel, but more a comment and observation aimed at some of the questions that were raised earlier.

Firstly, someone mentioned rare events and threatened and endangered species. We played in this space back in '05. We found that we were looking at an exercise of a camera replacing an observer. When there was a rare event it really was a behavior modifier of the crew and they immediately notified us that an event had happened.

The end equation is the amount of video we had to review to see and understand these events became much smaller. So the actual costs are quite significant in the video analysis area. If you've got a behavior modifier you're immediately reducing that cost if you have a significant element of faith that the people are compliant. We had that faith.

The other thing is that we found that having given people a taste of an alternative to observers; we found our industry very, very supportive to the point where they're twisting our arms – we want it now! We're rather reluctant and we want to be very careful in our data streams and how we assemble them and how we integrate them. I think with time you'll see changes in the attitude of industry and they can be positive.

Lastly, some people went to the area of costs of these things for various types of fishing operations. We commissioned a cost benefit study over seven different fishery types and tried to project what our costs for EM systems would be. That study's available online at our web site. One of my observations from that study is if you have a fleet that's working year round in their fishing operations you will very possibly see benefits in EM supplementing observer work. If however you have a very short window of fleet operation we found that there were no significant differences in the costs. That was particularly drawn out in our shark gill net fleet where half of the fleet works all year and then the other half of the fleet moved out of the rock lobster industry and did some short term sharking. No advantages for the second sector; big advantages for the first.

Question/ Comment
Kelle Moreau
Institute of Fisheries Research
Belgium

We heard a lot about technical and practical restrictions or things that need fine tuning in the future in terms of EM. Suppose in some future we would live in an ideal EM world where all these problems have been solved, do you think that it's worth investing or investing more in species identification software?

Response
Martin Loefflad
NOAA Fisheries Service
USA

I'm certainly not an expert in the area, but at the workshop we held there was a presentation by a European gentleman from Scantrol, a company that has been developing species identification software. From my perspective, I think a couple years ago it was not so good, but it has continued to develop and I think it has great potential for the future as a tool worth watching and worth putting some time and effort into developing.

Comment
Howard McElderry
Archipelago Marine Research Ltd.
Canada

I would just say to that question that often when you're implementing the technology you're looking at trying to do it in a way that minimally interrupts the normal operations of fishing vessels. So if you happen to notice the imagery that was given in presentations, you don't get the ideal classic view that an analytical software tool might need. So moving in the direction that you're suggesting I think is also moving in the direction of industry finding a way to accommodate that more and more. I think it's definitely possible, but there are a number of issues to resolve to make the technology suitable.

Comment
Martin Loefflad
NOAA Fisheries Service
USA

Howard, if I could just clarify my points I believe Scantrol, was looking at individual fish going across a device on a conveyor belt where they're laid out flat as opposed to a hook and line vessel, where you have a wiggling fish.

Question/ Comment
Eric Brazer
Cape Cod Commercial Hook Fishermen's Association
USA

As a manager of the two existing sectors in New England, I first wanted to thank the panel. This was a very, very informative session and it's very interesting and exciting to hear about the other EM work that's happening throughout the world.

My question is directed towards Martin. As my colleague on the panel had mentioned, we've moved forward with a couple of pilot projects in the groundfish fishery in New England that have been viewed as successful. There have been some other pilot projects in New England that have been completely unsuccessful. However, it seems like this tool is gaining a foothold in the region as a viable option for managing an output controlled fishery.

You had alluded to a couple of fisheries that are actually using electronic monitoring and I was hoping you could briefly address any hurdles, either federal or regional obstacles that have come up in that discussion and how those were overcome to turn a pilot project into a fully operational tool.

Response
Martin Loefflad
NOAA Fisheries Service
USA

The major operational implementation of this I believe is in the British Columbia long line fishery. The operational program in Alaska is one which is for a specific objective. It is one which is more of a compliance function where we have videos installed on some vessels which are acting as another set of eyes for an observer looking at an area that they cannot see when they're taking samples. So that's a fairly simple application in the sense that we are not actually taking that video imagery and then analyzing it later. We are using it as another set of eyes and we have the ability to obtain that video if a problem is reported and detected, of which case we've had none so far.

So kind of a simple operation to start with, but we have found operationally that a couple of growing pains as we've started a couple of failures that occurred, but now we're seeing it pretty darn stable. It's out there. It's running today. It's working. We have people on boats today as we speak looking at video imagery of areas that they cannot see.

Comment/ Response
Howard McElderry
Archipelago Marine Research Ltd.
Canada

Another example that's probably worth mentioning is the shore based Hake fishery in Washington and Oregon. Janelle Majewski can probably speak more about it, but this is an EFP regulated fishery.

So I think what you talked about was a fishery that is under regulations where it's stipulated in the regulations. The Oregon shore based fishery is stipulated through an EFP process. So in the U.S., those are the examples to look at and think about in terms of trying to go from here to there.

Question/ Comment
Gordon Gislason
GS Gislason Associates, Ltd.
Canada

I just have a comment follow-up to what Bob Stanley's comment. I was the person who did the cost benefit analysis in Australia. What was interesting from my point of view is we put together cost drivers for both observer programs and EM programs. So the actual costs are very fishery specific and monitoring objective specific.

Some of the cost drivers are days at sea, days fishing, number of hours per day that a fishing event occurs, the costs of EM if you only have the gear in the water six hours a day versus 16 hours a day vary. Also in terms of the monitoring objective, it's true that if you're interested in threatened endangered protected species you have to review more of the film, but you can review that film at a much faster speed, especially if you're worried about interactions of say large marine mammals only.

So this part of the process is actually getting a snapshot of what your fishery looks like, what your main monitoring objectives are like and what the key cost drivers are. That's what was done in the Australia context. As Bob said, I would encourage people interested in the actual costing exercise to review the AFMA document which is online.

Question/ Comment
Craig Faunce
NOAA Fisheries Service
USA

I wanted to comment that most EM utility seems to be conducted during the daylight hours. EM certainly has the great potential for 24 hour utilization because unlike and observer id doesn't have to sleep. I was wondering if the panel could just comment on if anyone knows of any comparisons between day or night utility of EM, what it's good for in those two different scenarios because it's not really a day/night in northern latitudes. Darkness in winter occurs most hours unlike most of the studies that have been conducted primarily during light.

Response
Morgan Dyas
Archipelago Marine Research Ltd.
USA

Day/night usually come down to lighting issues. Typically, if we have good lighting we can see the activity. I don't know of any comparison between day and night EM analysis, but we do analyze night time hook and line fishing. As long as the lighting's good it's comparable to the daytime.

Response
Julie Bonney
Alaska Groundfish Databank
USA

I'd just note that that was something we looked at in phase one and there's actually an analysis that looks at the difference between day and night video and there was no difference.

Question/ Comment
Oscar Guzman
Institute for Fisheries Development
Chile

Most presentations were related to long line monitoring. How efficient could it be the EM to monitor discards on bottom trawlers?

Response
Julie Bonney
Alaska Groundfish Databank
USA

The trawl industry that I work for participates in four different target fisheries. One is flat fish bottom trawling, trawling for rockfish (bottom and pelagic), cod trawling and Pollock trawling. The only application that I see for trawling for EM is full retention requirements. Except for in the one example that I gave where you're monitoring one species and you can quantify that species as it's discarded, in a multi-species environment I don't think there's any way that you could come up with any kind of metric for what was discarded at sea.

Closing Session

Moderator: Dennis Hansford, National Marine Fisheries Service, USA

Featured Closing Remarks

***Dennis Hansford* – NOAA Fisheries Service, USA**

***Keith Davis* – APO member and Observer, USA**

***Lisa Borges* – European Commission, Belgium**

***Steve Kennelly* – NSW Department of Primary Industries, Australia**

***Ernesto Altamirano* –Inter-American Tropical Tuna Commission, USA**

Closing Remarks
Dennis Hansford
NOAA Fisheries Service

Good afternoon, and welcome to our concluding session. Wow. What a week. You should be proud of all you've accomplished this week. We had four full days of interacting with each other, sharing information, realizing our shared interests, respectfully disagreeing, agreeing to disagree, and meeting colleagues from the 37 countries represented here. It's been quite a week.

One of my tasks is to pass along the chairmanship and duties of host. I am pleased to announce that we have more than one option for host of the next IFOMC. Your attendance here has signaled your willingness to come again to the 7th IFOMC. By that time, we'll know whether it's going to be in Africa, Europe or South America. We'll work closely with the countries that are looking to host the next conference as they prepare proposals.

Dennis Hansford
6th IFOMC Chair Closing Remarks
USA

This week we've gone from data extrapolation to safety training to Moving Sushi. I look forward to seeing the final Moving Sushi video documentary. Thanks to Michael Markovina and Linda Schoenkecht for their wonderful presentation.

We heard and discussed different approaches to data use, accessibility, and enforcement. We saw how the importance of support for observers as they are on the front lines collecting fisheries information, how important it is to make sure there are incentives for them to continue doing what they're doing, and how important it is to insure that they are adequately trained for the rigors of sea life and for situations that can be life threatening – can be life taking.

We are all on the same sheet of music when it comes to collaboration, inclusiveness. We heard time and time again how important it is to have input from the managers, from the stakeholders, industry, how everyone brings something important to the table. It cannot be stated enough how coming together in forums like this play a critical role in effecting change.

The communication and interactions initiated here will continue, even after the conference wraps up and we've headed our separate ways. I look forward to seeing many of you at the next conference. Right now, we're going to hear summaries from some of our pre-conference events and concurrent session.

We'll start with Keith Davis, who chaired our Observer Professionalism Working Group (OPWG). I can't say enough about Keith and the boundless energy and dedication to his working group, as well as his affiliation with the Association of Professional Observers. He exemplifies all of what I admire and try to promote in my role working with the National Observer Program in trying to ensure observers that we share their best interests. We're told that observers are not our employees and are not really our concern, but I disagree with that. I will continue to support Keith and what he does.

An Observer's Perspective

Keith Davis
Observer and Association for Professional Observers Board Member

Thanks a lot, Dennis. I just want to say right off, I think this has been a great conference. I don't know the numbers of observers in attendance here as comparison to last conference, but I think the observer involvement and activities for observers have increased, and I really applaud Dennis's efforts in this and his leadership.

Regarding my role in this conference, I just want to talk about the working groups in general and the utility that they serve in this conference system. We started them back right before the last conference in 2006 and got the safety training and the professionalism working groups going. Working groups can provide outputs beyond what the conference can do as far as working beyond the conference and continuing these international cooperative and harmonization efforts.

I think they serve a great utility, and I would like to see other working groups come from this conference, for example, observer data and maybe tuna transshipment observer program working group, as well. As far as the OPWG is concerned, I would like to introduce those members in attendance: Sara Wetmore, Bob Stanley, Reuben Beazley, Amy Van Atten, Dawn Golden, Larry Beerkircher and Ebol Rojas. Also, we had Chris Heinecken and Jon McVeigh here as well, and we have a total of twenty in our group. Many were unable to attend, but they still are an integral part of what we do.

Our workshop at this conference was very successful as far as what we set out to do. We tried to build off of what we had started at the last conference, which was founded in the principles of the

Observer Bill of Rights started in 2000. We highlighted key topics and conducted focused interviews off on those issues. Now we are building some detail into those topics through further interviews.

Thirty five people signed up to our workshop (concurrent session held Wednesday morning), though around 50 came into the session. We completed about 40 interviews, yesterday, and they have continued after the workshop. I have a couple to complete later on today, and other OPWG members are also trying to complete some more, too. If you would like to contribute, get in touch with us, and check out our webview on the APO website, www.apo-observers.org/ifomc/opwg , and you can find more information about the project there. We're going to summarize the workshop and kind of just detail our outlook for the products that can come from this conference. The major products that we'd like to see come from the workshop are a full report on the details of over 80 interviews we've conducted – we conducted 40 interviews last February and another 40 here – and a summation with our recommendations stemming from what we've learned.

Keith Davis
Observer and Association for Professional Observers Board Member
USA

That's probably going to be a pretty bulky document, but we'd also like to produce a short pamphlet, as well. Our vision for the pamphlet is to print up a hardcopy form – maybe like a tri-fold pamphlet translated into several languages – that's sent out to every known observer program internationally. I hope we can get all of this accomplished in a year, but that's very ambitious. One reason it's so ambitious is because the interviews are recorded and we have to work at transcribing all these interviews, which is going to take quite a deal of time and effort.

The working group would really like to thank the IFOMC steering committee and conference organizers for all their work. Also, we thank Rebecca Lent and Azure Westwood whom also helped with French translations for two interviews (delegates from Senegal and Morocco.) Also, thanks to two observer volunteers who helped with the workshop – Mary Powers and Andy Ashley. They helped with orienting people, signing them in, and scheduling interviews. Thank you for your great help.

One other thing I've been involved in recently is the Tuna Transshipment Observer Program (TTOP) meeting. The main goals of the meetings (held before the conference sessions on Wednesday and Thursday) were to cooperate and organize a collective working knowledge between interested stakeholders amongst the different tuna transshipment programs worldwide. We could have used a half-day session to cover all that.

There are five regional fisheries management organizations (RFMOs) that manage the worldwide high sea stocks of tuna. We're trying to at least to start working with all the stakeholders, including observers, contractors and the RFMO representatives and working on harmonizing practices.

Primarily, we have the same or similar objectives in each region, and pretty much it's just one observer program – the first worldwide observer program. Attending these meetings were Brian Belay; USA's Joe Arceneaux, of Pacific Islands; Dawn Golden; John Kelly, Pacific Islands; Chris Heinecken, Capfish, South Africa; Bob Trumble, MRAG Americas; and Ebol Rojas, observer for ICCAT and the newly formed Indian Ocean Tuna Commission (IOTC); and Mary Powers who's recently trained for IATTC in the Pacific. She has not yet gone out, but she's going out soon hopefully. Also attending were Teresa Turk, Kim Blankenbecker, the US ICCAT representatives; Rebecca Lent; Tom Nishida, IOTC representative in Japan; Evan Casey, observer; Graham Parkes, MRAG; and Ernesto Altamirano, IATTC; and myself.

The discussions were very good. We just started to outline some principles that we can actually harmonize on across programs like species identification (ID), and at least getting the frozen fish – the popsicles ID views for that, and principles like that. We're trying to get together a single observer training manual, though we'll have to have addendums for each of the RFMOs.

We began to identify best practices for things such as estimating weights from length to weight relationship, formula and all that. So I want to move on from this. Well, I mean, it's hard to summarize everything. But I think it's just a start right now. We have some work to do. I'd like to see the TTOP working group established, so we can continue working after the conference and cooperate internationally on this.

So I'm going to show a short little video here of tuna transshipment. This video shows a Taiwanese vessel with 65 people on board, though accommodations were for only 25. They were transporting other crew members on there way to fishing vessels, long line fishing vessels that are out there. These vessels stay out at sea for one and a half to two years. The transshipment vessels are providing them with crew members, food, fuel, everything – magazines, whatever.

You can see, it can be pretty difficult to ID those frozen fish when they're swinging by like that, and especially hard to estimate their weight. So you've got some swordfish in there and big yellowfin. The video shows them packing the fish. This shows the vessel near the end of the trip. The hold's just about full. If you would like a copy of this movie, just contact me – lblegend@yahoo.com.

Comment

Dennis Hansford
NOAA Fisheries Service
USA

Thank you, Keith. That's just an example of his dedication and why I fully support what he does, not only regarding observers, but also the resource and the management and monitoring side of things. Next, Lisa Borges will report on the Data Extrapolation Workshop.

Data Extrapolation Workshop Summary and Closing remarks

Lisa Borges
European Commission

I should say that I am expressing my opinions, and they may not represent the opinions and the positions of the European Commission.

The workshop was initiated, I suppose, because there was a need. There was a lot of interest from the people at the conference to talk about data. I came forward to say, “Okay, I can do that,” because I chaired the ICES workshop on the same issues.

Vicki Cornish of the Ocean Conservancy was my co-chair for the workshop. I thought we should kind of divide the discussion to address two types of data – common occurrences or rare occurrences.

A common occurrence would involve the species that are usually discarded, those you see a lot on common haul – on every haul – and are usually fish and crustaceans. And then there’s the rare occurrence which are species that are accidentally caught in a haul. They are rare so they don’t show up as much. In fact, the data includes a lot of zeroes. These are usually protected species – bycaught species.

I divided the workshop on those two subjects. I gave a presentation on the first part of it about the common occurrence. I asked Kimberly (Murray, NOAA, NEFSC; Woods Hole, MA, USA) to do one about protected species and the issues associated to estimating those.

My talk was about what the ICES Discard Raising Procedures Workshop that we did. By “raising,” we mean extrapolation, although apparently statistically that is not the same.

ICES met for a week in San Sebastian, in Spain. We talked about methods and our problems of estimating. We put our data together and we analyzed our data together. We concluded (the report is available through ICES) that there’s a systematic method to assess, compare, and choose a raising method. We called it the raising procedure key.

I don’t want to go into the discussion of what the raising procedure key, but there is a way of actually going from the data you have to actually having results and data extrapolated to the population.

Kimberly talked about protected species estimation (bycatch estimation in the USA). She talked about the data and the problems associated with the data. Usually for rare occurrence, of course, you have a lot of zeroes in the data. You need to talk about nested data because the sampling is nested and it gives problems within estimation methods. You need to think about where you’re sampling and what unit of sampling you are using.

She also talked about estimation techniques, different models that she used, and she compared the results of those models. She talked about the problems, what she calls analytical issues, which are the assumptions of the models and how sometimes the data does not allow you to follow those assumptions. Finally, she talked about the quality of the data and the quality of the data at a population level.

At the end of the workshop we realized that regardless if you have a rare occurrence or a common occurrence, the issues in your data are the same. This is my take of what the workshop discussed or concluded – that there are definitely data quality issues, and those can be associated with bias so you are not sampling what you want to sample or what you want to discover. Precision is the other variable.

These data quality bias/precision issues are associated to representatives of your sample. What I mean by this, for example is a voluntary program may not result in random data. Many of the methods you use have an assumption of random sampling, which creates a problem.

You also have a problem with enforcement. You can have an observer onboard, and the vessel operators change their behavior, so you have a sample that is biased to the population you are sampling. You can also have problems, for example, if you sample vessels that are a lot bigger than your fleet, and, therefore, you're extrapolating for a behavior or a representative of your sample that is not what you actually want to sample.

Of course, quality comes up again and again, right? Much of the commercial data given by industry can be misreported. It can be under-, over-reported, or misreported by vessels, by area, by species. All these issues exist in the data itself. Also, you may not have the data that you need to raise your data to the fishery itself.

You can imagine that if you have, for example, a pelagic fishery and you don't have the landings, you don't have a good estimator of your landings, you can't use effort because there is no relationship between the variables, and you are stuck. You have all this sampling and you can't actually get the results you wanted as your initial objective was to get an estimation of discard.

Of course there's a common issue to all of this, which is associated to sampling. Your sampling unit could be anything. You could consider it as being on a trip level or a haul level. There are issues about being random or not, and how you estimate your data associated to that choice. Sometimes you might not have that choice if in every haul or set the fisherman changes the gear. It's a very different discard pattern and I would consider that a different fishery.

So we talked about all these issues. Then we realized that there are a lot of models you can use, both in rare occurrence and common occurrence. Now the first model, of course, to raise your data is a ratio estimator. You have a regression. You say that the landings of this species are compared to the discard. If you have the landings of the population, you just multiply and that's it – very simple.

Now, there are problems associated with that, particularly when your sampling is biased. You can use a lot of the statistical models available there. GLMs, GAMs, mixed- models – all of them have assumptions about data being nested, being independent. Zero-inflated models which you heard about – but all these models have basically to us two really big assumptions. One, which is independence and if you're sampling – you might actually have data that's not independent because it's nested.

Discard data is always over dispersed, and those assumptions are violated much of the time, and you need to account for that. I can say this now because I'm now a manager and I'm no longer a statistician or a biologist: you can actually break the assumptions of your model, no problem, but you have to check. There are levels of violation of assumptions and the results will either be bias or not. However, you can test for bias in a small violation.

We concluded also that models are time consuming. They're time intensive. It takes a lot of work to estimate the data, and you take a lot of time to get your model to put your data together, to your variables. And you might not have time for that if you're doing stock assessment annually and you need to produce your data.

Like Kimberly pointed out, if you spend your time once, you have all these complicated models, and then you can actually use it, and you don't need to do this model every year. This gives you the opportunity to estimate data outside your area, so you might not have a one year and you might use the model to estimate that, so that's the potential of it.

I'm using ICES and the work we did for this raising – discard raising procedure key. I wanted to highlight not the key itself and the questions it makes, but the process or where it goes. This is one of the conclusions of the workshop – check your data. Check if your log books are misreported. Check if you are sampling what you should be sampling. Check if your observers are only choosing the best boats, or if your fishermen are actually changing their behavior.

It is important to check these things and you need to check your data. Then use a lot of methods and compare the results. You need to compare the results because some of the models might not be okay. Much of our experience at least of swapping around with models is that you learn a lot about your data and about issues you might not realize. As an example, when I worked with the data it was obvious if you have misreporting in one of your data. If you extrapolate with effort and you extrapolate with landings and you end up with something that is very different, someone is misreporting.

You can actually then discover the quality of the data by comparing results. So, again, compare your results. Finally, it's important to improve your sampling scheme by analyzing your data. Now I know everybody says how to put together a sampling program – how do you build a sampling program to get your best data? And I'm not saying here how to put together your sampling program.

What I'm saying is when you analyze your data, you have very useful information in how you can improve your sampling to improve the data quality. When I talk about this, it's about targeting your sampling to where your variability is that what you might not have realized before you start your program.

For example, there is variability in your hauls. I have a colleague who published a paper saying that you should sample more times in one haul and not sample a lot of hauls because– there's not a lot of variability in hauls. There's a variability in the sampling itself.

Issues like this you should target. You need to go back and say, "Okay, I have a different fishery than I thought I was sampling." So go back and try to sample the boats. The three messages really are check your data, compare the results, and improve your sampling.

I just want to thank two people whom I couldn't do it without. Vicki Cornish took the notes for the workshop. I want to thank Kimberly Murray for coming up and being able to give the talk when I gave her very short notice.

In regards to the workshop report, one of the things we want to include is a bibliographic search of all the papers identifying the issues and answers related to the data problems. Thank you.

Comment

Dennis Hansford
NOAA Fisheries Service
USA

Thank you, Lisa. All right, now what I would like to do is get an overview from one of our moderators and one of our past hosts. Steve Kennelly hosted our conference in Sydney, Australia. Much of what he's done I've incorporated, as well as what Howard did during the 5th conference in Victoria. I've asked him to give us his take-away points from our week of presentations.

A Conference Overview

Steve Kennelly
NSW Department of Primary Industries

This "wrap-up" of this week's conference is focused around three overall themes: "Where we were"; Where we are"; and "Where to next".

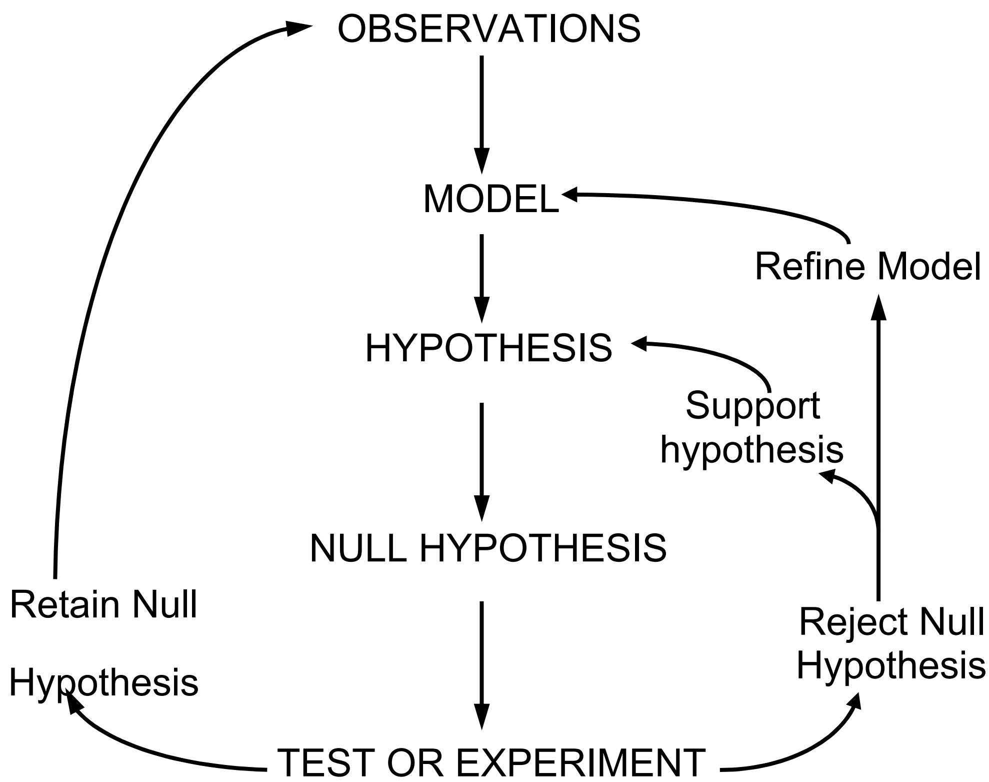
Where we were

We live on a blue planet, dominated by water. Our ancestors came from this water hundreds of millions of years ago and, for the past 90,000 years, we have exploited the world's oceans, seas, rivers and lakes for its seafood. From very humble beginnings, using harpoons and spears to catch fish, we have developed our fishing technologies into extremely efficient forms, culminating in factory trawlers, capable of harvesting huge quantities of fish in relatively short periods of time. In recent centuries we have identified that the seas of the world are not inexhaustible but are able to be over-fished using our new technologies; this has led to major developments in how we manage our exploitation of the oceans' resources.

Crucial to this management is our ability to observe, identify and monitor what occurs in the oceans and our exploitation of them. These factors shape the goals of our observer and monitoring programs. The latest developments in these programs are what we've discussed and learned about this week.

Our Scientific Basis

A man named William Whewell, the master of Trinity College in Cambridge University about 180 years ago, is credited with developing the concept of the Hypothetico-Deductivo, or the Scientific Method (see below). This method describes how good science should proceed. It starts with observations, from which we develop explanatory models, and then hypotheses are generated from these models. These hypotheses are next turned into null hypotheses which can be tested unambiguously. From these tests, we obtain more observations which inform us about whether we should retain or reject the null hypothesis (and so reject or retain, respectively, the original hypothesis and model). If the latter case occurs (and we reject the null hypothesis) then we confirm that our original hypothesis and model were correct and we have established a new scientific conclusion. If the former case occurs (and our test shows that the null hypothesis was correct), we reject the original hypothesis and its model, but we do so armed with new observations which allows us to begin the whole process again. Observations clearly form a critical part of this Scientific Method, which underpins all good scientific endeavors. So, whenever anyone says that observer programs or fisheries monitoring programs are not necessarily scientific, they are absolutely, totally wrong. Observer programs are actually at the crux of sound, empirical, scientific investigation.



<u>This Conference Series</u>

In fisheries science, these observations that are critical to the Scientific Method are what we do and what we meet to discuss every 2 years. That is, our scientific field has reached a point where we regularly gather to examine what we are doing and learn from each other so we can improve our work. This series of conferences began in Seattle 11 years ago. Nine years ago, we went to St. John's, Newfoundland. Seven years ago we went to New Orleans. Then we went to Sydney, Australia, and then to Victoria, British Columbia. And now we are here in Portland.

Over the last six conferences and 11 years, our field of fisheries observer and monitoring work has expanded and grown enormously throughout the world, and in each of the sequential periods between conferences, there has clearly been an increase in the quality, diversity, scale and sophistication of such programs. This week we saw evidence of these expansions to a greater extent than we have seen at previous conferences.

Where we are

At this conference, we have seen that the field of observer and monitoring programs has grown substantially in the number of countries involved. From South America to Sierra Leone to Sri Lanka; from Namibia to Norway to New Zealand; from Alaska to Africa to Australia; from Canada to Cameroon; from the largest fisheries in the world (we heard about the Peruvian anchovy fishery) to some of the smallest artisanal fisheries in Africa; we have discussed all sorts of programs from all over the planet.

We have also looked at some of the world's richest fisheries (with some of the world's richest fishers) to some of the poorest fisheries whose fishers go fishing every day just to catch enough to eat. And we also heard about statistics that 50 percent of the seafood harvested in the world is consumed that day by the people who caught it, and that 50 percent of people involved in the industry are women – a surprise to many.

This week we learned about the major increases over the last few years in the sophistication of the programs occurring in many places. For example, we heard about the very staged and scientific approach being used in some African countries like Namibia and Cameroon as they begin to roll out their observer programs.

We also heard about the development of truly global observer programs, like programs to quantify tuna trans-shipments at sea, and methods to try to increase the capacity of observers via observer exchanges between programs and even between vessels at sea.

We also heard about the devastating effects that war and tsunamis can have on the operation of monitoring programs - for example, the incredible challenges facing Sri Lanka whose entire fishing sector was ruined by a tsunami, and how they are trying to monitor their fisheries in the face of such devastation.

We also had several fishermen at this conference. At any fisheries conference in the world, the smallest group of people represented are often the fishermen. This week we were able to harness the talents of quite a few fishermen to the point where we were able to have a full session devoted to observer and monitoring programs from the perspective of fishermen – a very significant achievement for the organizers.

But the key to this series of observer conferences are the observers. They are, as we heard in the opening keynote speech of the conference, the eyes and the ears of fisheries management and fisheries science. We heard about life as an observer. We heard about the toilets and we heard about sleeping and working in terrible conditions. This allowed many to get a feel for what it is really like to be an observer.

As in previous conferences, we had a very significant focus on observer safety at this conference. The catchphrase was "Go Safe or Go Home". As was the case at the previous conference, John LaFargue, Mike Tork, and the people who did all the safety presentations and drills, saved lives this week. Whilst we can't actually quantify how many people they saved between the last conference and this one, I guarantee that people will not die as a result of the fantastic work these people did here this week. People will be safer for the experience of having come to this conference, and we all should appreciate just how important their contribution has been. We also heard about the importance of staying clean – and we learned about many tips on how to achieve this to stop infections etc. – especially on problematic vessels. And we heard about some amazing statistics on sunken vessels which showed that many fatalities actually occur when one is actually off watch – a very sobering point to bear in mind.

We had significant sessions on how one uses the information obtained from observer programs. This was a significant and key focus of this conference, and we learned about how one's program design is absolutely critical. But another thought came from a Louis Pasteur quote, "that if you hit the target every time then the target is too close". That is, it is important and somewhat sobering to remember that, when we're designing programs, not to be overly critical about achieving 100 percent coverage and making precision limits miniscule. If one's precision is that small, you should probably alter your focus to increase the value you get for the money and resources expended.

We discussed the traditional uses of observer and monitoring data – ie their use in quantifying charismatic and not-so-charismatic bycatch and discards, and their use in stock assessments. But we also talked about more intricate ways of using observer data - and covered many things in Lisa Borges' and Kimberly Murray's work in the Data Extrapolation workshop. A key item to arise from such discussions was how vital standardization and extrapolation are. But we also learned about another "-ation" - "inspiration" with a key example coming on the first day when Michael Zeljan Markovina and Linda Schonknecht provided an inspiring and passionate description of their expedition around the planet describing a variety of success stories in fisheries sustainability – many from developing countries. One of the key messages this week came from them: "Being inspired about the positive allows us to tackle the negative with inspired minds".

The use of observer data in fisheries compliance has been discussed at previous conferences, but here this discussion took on a level of sophistication that we hadn't seen before. We also looked at how observer data and its discard information can be used to contribute to the process of developing share managed fisheries. We touched upon eco-labeling, and had a presentation from the Marine Stewardship Council. This is an important area for practitioners of observer programs so we can see how the various eco-labeling organizations around the world operate and how observer data can be used by those groups.

We also had a very significant section on the law and the many ways that legislation interacts with observer and monitoring programs and observers. The lawyers we heard from were very senior people in their field who provided some of the clearest and most easy-to-understand presentations about this subject, allowing many of us to really appreciate, for the first time, this very complex but crucial area.

We heard a lot about the latest technological developments in observer and monitoring programs, including new work on self-reporting by fishers and how we can use that information to supplement and improve observer data and monitoring information. A very significant series of developments were discussed this week concerning electronic monitoring. Six conferences ago, the thought of putting cameras on boats to monitor fisheries would not have even been mentioned - yet now we are discussing very sophisticated ways of using such technology as a mainstream tool in several fisheries.

We also heard from Environmental Non-Government Organizations. We had an entire panel session devoted to this area who described their issues and how they can use observer data and contribute to the success of observer and monitoring programs through their lobbying efforts throughout the world.

Where to next?

One of the features of this conference series is the final session where we encourage a self-flagellation exercise and discuss what we did, how we did better, what we did worse and how we might improve things for the next conference. There has been six conferences now and, I believe we are at a point where we can use this number of experiences to provide a reasonably objective measure of the utility and value of these conferences. That is, let us consider our 6 conferences as a data set of six replicates through a time series.

In the past six conferences, we've seen a progressive increase in the quality and sophistication of observer programs in more and more countries, in more and more fisheries, by more and more people, with better and better safety features, using better and more sophisticated techniques to analyse and interpret the data gathered. And such progressive improvements have been discussed and described in the proceedings from the previous conferences. The question is, would all these improvements have occurred without this particular conference series? Now, there is no strictly empirical way of answering this question because we lack a directly comparable situation in which we did not have our conferences. But we do, however, have what is termed a mensurative comparison, where our time series of conferences shows that, by any interpretation, this conference series has, in itself, contributed significantly to the improvements and increases we have seen.

So my conclusion from this is simply, "if it isn't broke, don't fix it". It is clear, I believe, that what we have done in the past, what we achieved here and what we will continue to achieve in these conferences adheres to a very good and sound model that continues to lead to significant improvements in the way these monitoring programs occur throughout the world.

Finally, a few take-home messages. Firstly, it is important for people to realize that going to these sorts of conferences, and meeting with people like those that attend these conferences leads to all sorts of exchanges and developments that have ramifications far beyond our field and lead to planet-wide changes in how our fisheries operate. Secondly, we heard from Amy van Atten that Helen Keller said, "I am one. But I am still one. I cannot do everything. But I can still do something and I will not refuse to do the something that I can do". This is an important message to remember as we head home. And finally, please remember, "that the world is run by those who show up". So I encourage you all to keep showing up at these conferences because by doing so you are improving our world's fisheries and the way they are conducted.

Comment
Dennis Hansford
NOAA Fisheries Service
USA

That hit on all of the points we covered and then some. We've been talking to you and giving you our take and summarization and next steps. What I want to do is open up the floor so that you can tell us what your take aways are and what you think the conference's next steps should be. But what we're going to do is start it off with Ernesto Altamirano. Ernesto has done a lot of observing of tuna in the South American areas – Inter-American Tropical Tuna Commission.

An International & Management Perspective

Ernesto Altamirano
IATTC

I want to say that although I do come here representing the IATTC – one of the few RFMOs on tuna that actually has staff committed to work with observers and fisheries and science – I am going to comment as an ex-observer and now manager of observers.

I'd like to convey to the conference organizers and steering committee the greetings and gratitude of the director of the IATTC – the International American Tropical Tuna Commission -, Dr. Guillermo Compeán and the head of our program, Dr. Martin Hall. These kind of meetings have given the IATTC staff invaluable amount of information and knowledge, not only from the fishery science but from the experience of observers that have been really fortunate to meet in these meetings.

The scope of this particular meeting from training observers to defuse and resolve conflicts, monitoring vessels with electronic system, to identifying the needs for distribution and release of observer data, to extrapolation of data, observer professionalism – you name it. It's a lot of information.

My comment to the IATTC is that without that kind of information that we get from you guys, we would have spent a lot of years making a lot of mistakes. So that is something that we have gotten from you guys all over these five meetings that the IATTC staff has been able to attend.

On the personal level, it has been my pleasure to meet new and old friends, and to learn from the experience of work being done in other oceans. The enthusiasm and the level of professionalism that people from Africa or from Asia show – it really rejuvenates the excitement for me to work in this line of work.

I think that observers allow us focus not only on identifying the problems, but on finding ways to solve the problems. So although I do believe that eventually we'll use electronic ways to see things, in order to look beyond that, we will always need observers.

My final point – I have messages for three types of stakeholders here. First, and most importantly to observers, thank you – thank you very much for all the work you do, for your professionalism, for the kind of moral standards you put out there every time you go out in a boat, by yourself without supervision, sometimes feeling that everybody's against you. "The kind of work you do –I don't know how you do it, but I got to take my hat off to you".

My second message is to the observers' managers and those scientists that use the data of observers, Embrace your observers, and treat them well, and pay them well (or as much as you can.) Most importantly, don't you ever use the phrase that I've heard many, many times, "They are out there anyway." Gathering all the information that observers gather takes a lot of work and the kind of information observers bring is invaluable. I can think of a lot of things that I would like to do and like to get out there from observers, but I also view it in the human aspect of this observer doing as much work as she or he can with the little amount of time that he has. So that's my message to them.

My final message would be to the fishers- I would say thank you, too, for taking the observers. Think of observers not as a supervising and monitoring police force. Think of observers as the people that will allow us to work together so my six year old son can have tuna, salmon, etc. when he gets to be my age.

Closing Comments from the Floor of the 6th International Fisheries Observer and Monitoring Conference

Andrew Ashley
East West Technical Services
USA

I'm an observer in the northeast USA and I work through East-West Technical Services. It's absolutely inspiring to get a much more deep vision into how the data is used and where it's possibly going to take us in the future.

Vicki Cornish
Ocean Conservancy
USA

It's been a very long and interesting evolution to see these conferences take the shape that they have, and I'm really just very excited to be able to be here. I used to work for the National Marine Fisheries Service and for the National Observer Program. I left the government a couple of years ago and I joined the NGO community. It's been a very interesting transition for me. It's been an eye opening journey to take a step back and look at what we're doing in the oceans and to the oceans and for the oceans.

I think we take a lot out of the ocean that we definitely need to keep track of. We put a lot into the ocean that I'm concerned about. We also do a lot for the ocean, and that's really what you guys are here about in terms of the Observer Program is making sure that we are creating the sustainable resource for the future. I really like the mission of this conference and the focus on sustainability and the observer data as the key for us to get there.

I want to focus on our common goals because I think that's what brought us together even before Seattle to the very first conference in Galveston, Texas where we came together as a NMFS community – the National Marine Fishery Service community for the first time to really talk about observer programs and how to share information. All the programs were operating independently, and I don't think that that's a very efficient way and a certainly not very fun way to operate. So bringing people together is really key and core to the effectiveness of observer programs over time.

I just encourage us (even though there is going to be a lot of interesting new angles brought into these conferences every time) to remember what brings us together and these common goals that we have around expanding observer coverage to more and more fisheries around the world so that we have a better accounting of what comes out of the ocean.

I also encourage us to improve the quality of the data that we collect in observer programs so that we are all working with good information and not just bits and pieces of information that don't tell the whole picture. I have to make a plug – because I stand on the outside and I don't have the access to the data anymore, but I do go to the council meetings and I do go to the fishery management sessions – "We need good access to data."

That doesn't mean I need his data or her data, we just need the data, and we need it to be shared. It's a public resource. We pay a lot of money for this data. We need all of the users of the data to have access to it, including NGOs, including fishermen, including managers, including people from around the world.

It's key, we need to figure this out. I know there's a lot of controversy around the use of data and public access. We've got to figure that out because that is key to keeping people involved in fisheries management and restoring the oceans to sustainability.

Reuben Beazley
Teamsters/ Seawatch
Canada

What we do as observers is basically we shine lights in dark corners. We get managers to ask questions about things that they didn't know existed. I work alone all of the time when I'm on the water. These conferences are as much a part of my support group as anything that I have at home, from the company to the Coast Guard.

Many times when I'm at the end of an 18 hour shift or I'm putting on that damn rubber gear at 4:30 in the morning to go on deck and measure a few crabs, I ask myself, "Why the hell am I doing this?" I come here and I understand why, and it gives me a little bit of courage to go back out again. I thank you all for that.

Pierre Meke
Ministry of Livestocks, Fisheries and Animal Industries
Cameroon

I would like to take this opportunity to thank the USA and Canada, the forefathers of this conference which started eleven years ago.

First, I would like to say that it was a very fruitful conference in terms of knowledge and exchanges. In terms of scientific observer programs, I would like to say that the USA, Canada, Europe, Australia, South America and Asia have well established programs while Africa is a standstill.

My concern here is that the few delegates from Africa who attended to this conference may not be enough to spread and share the knowledge and to show how relevant are scientific observers in the management of fish resources. This is why I would like to advocate and convey that the 7th IFOMC should be held in Africa – and why not in Cameroon? This will surely contribute to raise awareness on the importance of scientific observers and their relevance to successful management of fish resources in the world. Thank you very much.

Vladimir Puentes
on behalf of the Minister of Environment
Columbia

During this week I have learned much. I would like to thank all the people who made this possible. We are just trying now in Colombia to establish a national observers program with a continuous observer program.

We already have research projects. The Minister of Environment is involved in this because discarding of noncommercial species of any fishery is our responsibility. The target fishers and bycatch commercial fishers are in charge of the fisheries authorities, so that means we have to work together to see what we are going to do with the whole thing.

First of all, I just want to point out very few things about the whole conference. The data extrapolation workshop was really, really interesting to us. We won't be able to have 100% coverage. We haven't built our program, but I already know we won't be able to be 100% coverage of that. So we need to know how to raise data.

The other thing was it's really nice to see that there are many other countries – especially the African countries and Latin American countries – in similar situations. Even if they already have an observer programs established, we have similar situations. Other countries, such as the United States, Canada or New Zealand, have established programs. That is a really good point of reference for us in order to build our own program.

I didn't see any presentation about observers programs in fresh water fisheries. We are thinking in Colombia we do need an observer program of fresh water fisheries because we do have huge river basins like the Amazon or the Orinoco River. We need to think about small scale fisheries or artisanal fisheries observers program as well, because it's a huge part of our fisheries.

It was a kind of funny to see pictures one or two days ago of vessels and facilities were difficult for many of the observers to work in. I just would say that those pictures appear for us as a really nice luxury transatlantic touristic thing. As I just began as an observer in Colombia, we didn't have any toilet. The electronic monitoring was so nice to see, but I would say that is not an option for our country, because there would not be any camera when we come back to the port.

So the other thing that's really interesting is that we can use observer program, not only for monitoring, but also to make some assessment and also to enforce research and make decisions based on observers programs. That's just really important for us, and that's one of the things we're struggling to make our government to see that it is important that scientific and technical data are used to make decisions about fisheries.

Kjell Nedreaas
Institute of Marine Research
Norway

Chairman, organizers and steering committee, thank you very much for hosting an important, interesting, and good conference. The conference has covered a lot of important issues. Especially, I would like to mention the broad and worldwide participation. I have participated in this conference one time before, in Sydney, and I see the development both in that respect and in others. As Steven said in his summary, if it's something that is functioning, don't change it. I think this conference has been the broadest in promises from a concerning topic and issues and participation ever. I also appreciate very much the observers' participation as presenters and in the discussions.

Participation by the fishing industry and environmental groups has also been very good. I encourage you to come back next time even stronger.

Being at an observer conference is very motivating for us scientists. We are completely dependent on the sampling you are doing out there. You are among many things [data collection systems/programs] we've heard about, but we are dependent on you. You are our – if I can say that – our ambassadors out there.

People have been asking me questions about how we are doing assessments, how we are estimating this, how we are estimating that. The workshop run by Lisa at this conference was an example of saying a little bit more about our methods and how we are doing it.

In some countries, like in Norway, the observers are employed by the institute, so it is more or less incorporated. In other parts, it is by outside institutes, private companies that provide observers. This could be something that should be thought of for the coming workshops to do a little bit more of – not too sophisticated. Not too deep. But these simple procedures we are doing when we are giving advice about the resources.

When I'm talking about the observers and I would just underline and appreciate and motivate you to go back and continue this important work. You are – as it was said here by others – you are securing the sustainability in our oceans for the future. We have to rely on you and we need you – we need people out there, even if we now have seen more about electronic monitoring.

So towards the next conference, electronic monitoring will be more on the table. It will be important, as you think of the next conference, when you are preparing your electronic monitoring projects to ensure there are comparative studies. I suggest making comparative projects with other means and measures we have there.

Next year, there will – we will maybe hear more about that. There will be a conference in Ireland run by International Council of the Exploration of the Sea. I am among those who will welcome the next conference to Europe, so that we can bring a little bit more of ICES and European fishery into the conference. I regret a little bit that we didn't prepare more presentations maybe as a kind of short summary from ICES work at this conference, but we'll come stronger back on that.

So finally, thank you very much. It has been a great pleasure for me and I have a lot of things that I bring with me home and will motivate others at home as well, so thank you very much.

Steve Kennelly
NSW Department of Primary Industries
USA

Kjell getting up reminded me that we put a pamphlet out on the tables the other day that's not really about an observer monitoring-type converse. But it's about using fishery dependent data better and more and expanding on all of that. The conference will be in Galway, which is a pretty cool place, and it's just a bit of a plug for that conference because it's important to try to maximize the use of that sort of data. It's a much more analytical type of conference than what we're used to here.

The other thing – and I'd like to say to Norway is that we've sort of lacked in this conference series of hearing about the sophisticated stuff that happens in Norwegian fisheries. Like I said, one of the most advanced – probably the most advanced country in the world in terms of fisheries management. Some of us have had the pleasure of seeing it firsthand.

It would be good to get more – especially the bycatch production work that they've done, which has led the world for the last two or three decades, and all the observer work they do.

Georg Hinteregger
Observer
USA

I've been going to these since the one in Newfoundland in 2000 and it's just fabulous to see old faces again. A suggestion of what I want to encourage us to consider for the next meeting. In the USA, we increasingly have industry funded observer programs to pose as an answer to the high cost of observer coverage. Often this is not accompanied by the realization that when industry pays, they must also be allowed to go into the marketplace to purchase the service from multiple providers.

Back in 1999 during the IFOC in Seattle, the problem with this model in terms of data integrity and quality of life for observers was analyzed and identified. Recommendations were put in place to discourage the use of this service delivery model. Nonetheless, the system continues to in the North Pacific and has now been authorized in the northeast USA.

On a positive note, when the multi-provider system was proposed by various interests in Canada, observers, fisheries, scientists and managers worked together to prevent this from happening. Unlike in the USA, it appears that in Canada, it is legal to have an industry funded observer program such as the highly successful British Columbia program we've heard so much about without having the industry cherry pick among provider companies.

From my casual contact with some of our international delegates, it seems much of the world treats the observer workforce as regular civil servants. At the same time, there is also great variability in how the job is structured in countries around the world. With so much of the world now represented at this conference, it would be a valuable as a minimum to inventory the structuring of the various observer programs and perhaps also to take the opportunity to identify the strengths and weaknesses of the various services and delivery models.

Oscar Guzman
Institute for Fisheries Development
Chile

Thank you very much steering committee. Dennis, it has been a great conference. I enjoyed it a lot and learned even more.

I must say that I feel a little bit shamed. The Chilean participation in this conference has been very poor. It should be greater, because we started our data collection system and observer program very early, in 1964, being an initiative of the Chilean government, the fishing industry and FAO. We started with 20 scientific observers, and today we have 154. All of them are part of the staff of our institution.

During these days, we hear a lot about the increasing importance of electronic data collection systems and other data quality management systems. I think in this regard, we must join effort in order to avoid duplications. To get budgeted for these purposes is not easy. The observer and technician time investment for this purpose is very vital.

I would like to encourage the steering committee to organize an international working group on this subject; I think it is very important.

Keith Davis
Association for Professional Observers
USA

I support and agree with everything Georg stated in his account of the service delivery model. I think it would be good to at least do a comparison or consider having a panel of service delivery model comparison study.

Bob Trumble
MRAG Americas
USA

As we've wrapped up, discussed, looked at the diversity, looked at the expansion of countries and kinds of programs, I started thinking how this diversity fits in with the earlier discussion we had on observer qualifications.

Many of the countries we're dealing with who are now coming into our conference and are giving us their experiences and hopefully gathering something from ours won't have the capacity to require four year degrees in their observers. I think that it makes a lot of sense to look at an observer qualification component in the next conference.

To look at what we can get from non-four year degrees, what it takes to train them, what kind of drawbacks we may face. We're going to have lack of capacity to have four year degrees in all of our observer programs. I would really encourage you to think about having this kind of a component in your next program. I'd really like to see how observer programs in other regions have used high school degrees, or maybe even less. What do they try to do? What are they paying? What kind of problems do they have? How can we help them with that?

Maybe over the course of that kind of discussion, we may rethink our stand here in the USA. But barring that, I think we could help programs to develop the most efficient kind of training and development of observers for the particular situation they're in. Thanks.

Joe Arceneaux
NOAA Fisheries Service
USA

I'm not sure what the structure of the next conference will be, but I would like to see a panel discussion or a workshop on the training tools the more established, mature programs have and those tools that are easily transportable that could be given as somewhat of a turnkey operation to new and developing programs.

That's one need that I see that comes up a lot. And I know that it happens. We have a lot of informal contact after these conferences. But I'd hate to think that somebody that needed something like that walked away without bumping in to the right person. So that's a subject I'd like to see addressed. Thanks.

Graeme Parkes
MRAG Ltd.
United Kingdom

Regarding Steve Kennelly's comment about Norway, I think we should be encouraging more participation from Europe, particularly more information about observer programs in Europe at the next conference.

Paul MacGregor
At-Sea Processors Association
USA

I am one of the industry representatives here. I was one of the three people who stood on the first day when Rebecca asked various sectors to stand up and there were only three industry representatives who were willing or honest enough to stand up and be identified here.

I've been checking under my bed before I went to sleep each night, locking my door and everything else. And nothing bad has happened, so I decided I'd stand up and sort of come clean in front of you all here about who I am and what I'm up to here.

I'm a lawyer, and I've been in the fishing business for 30 years. I am the general counsel of the At Sea Processors Association. It's the pollock catcher processor fleet that operates in the Bering Sea. We're the people who invented harvesting co-ops in the ground fish fisheries. We're quite proud of that. Our boats are large scale vessels, anywhere from 280 to 350 feet in length. And we carry a complement of up to125 people on our boats, and we fish for pollock. We carry two observers at all times. We've began carrying one observer in 1990 at all times. And since 1998 we've been carrying two, and we pay for them, every penny for twenty years.

I've also got a confession to make, and that is that we are the ones who invented the service delivery model that you've heard some complaints about. If I had a recommendation for you today, it's to have a panel discussion at the next IFOMC, and let's talk about it.

It may not be a perfect system, but it's the only one we had at the beginning, and we were the ones who stood up and said, "We're willing to pay for observers. We need them. We want them and we want 'them now." They said to us, "There's no mechanism for funding an observer program in the North Pacific." We got our wallets out and we've been paying for them ever since. And if there's a better way of doing business, and you can show us that you can deliver high quality observer coverage on a cost effective basis for a fishery of our size, I'd be willing to listen to you.

But until then, we're going to keep doing business the way we have because it works and as of now – twenty years into this – nobody's ever been able to point out an instance – not a single instant where that service delivery model has affected the delivery of quality data. The only thing that's ever happened is that somebody looked at this and said, "Oh, there's a perception of impropriety here because the industry is paying to an observer contractor the money for the observers to come to the boat." That's what we've been blamed with.

Like I say, there's never been a single instance in all that time of anybody showing that that has affected the quality of the data that's been delivered. Now there could be better ways of doing it. One way might go to congress and ask them to provide the $10 million a year that we pay for observer coverage through the federal government, but so far that hasn't ever happened. As long as we're paying for it, I think we have a say in what the structure of the program ought to be. But that doesn't mean we're not willing to listen to alternative ways of doing business. I'm quite proud of what we've done over the years, and I'm quite proud of the role that the observers have played in our fishery, because we probably have one of the cleanest, most successful fisheries anywhere in the world.

I'd like to close with a little anecdote – some facetious testimony I gave to the North Pacific Council a number of years ago when everybody had been sitting around for five or six days complaining about halibut bycatch. We had all the gear groups and all the fishing people in the room pointing at each other and blaming each other with halibut bycatch rates.

And I was sitting back there thinking – and I was one of the ones being accused of representing people who had too high of a halibut bycatch. And I came up with a solution to halibut bycatch. It was clear to me after listening that the solution was to get rid of the damn observers. Because only the boats that had observers seemed to have halibut bycatch.

Well, as they thought about that, everybody started leaving the room. There were people in the room who'd been blaming us, because we had an X percent of halibut bycatch. We'd been carrying observers every time we went fishing. But everybody was pointing the fingers at people who had never carried an observer to sea. So it's pretty clear to me that the observers were the root of this problem, and that's one way of solving bycatch for the world.

Keith Davis
Observer and APO Board Member
USA

I would like to address the perception issue that you're talking, to just outline what that perception can be as far as the conflict of interest arising from having such a direct relationship between contractors and industry.

I think as an observer going out there, you can be kind of influenced by a contractor, or you may just have the perception that your contractor may not want to hire you back if you complain about a certain thing on your boat, for example, an unsafe condition, because that industry is the one that's paying for the observers to be on board. It's in a direct relationship with the contractor, and there are four other contractors in the region that they could go to. So the industry could say to the contractor, “Do not put an observer like that on our boat again or we’ll go to another contractor in the region.” I just wanted to outline that perception that you talked about.

Paul MacGregor
At-Sea Processors Association
USA

Well, I acknowledge that there is a perception that might be a possibility. We’ve been doing this for twenty years and nobody’s ever shown us where that has actually happened.
And like I say, we’re the only people that have ever said we’ll pay for our observer program.

Now I don’t hear anybody else around the country standing up here and saying they’re willing to pay for their observer program. They look to the government to do it. It costs twice as much for the government to deliver an observer per day to the systems that they operate.

Now we’ve put to sea each year 36,000 observer days in the North Pacific. It’s more than the entire rest of the country put together, and we pay for it. And so the cost effectiveness of the program is real important to us. And if there’s a better way of getting that cost effective observer coverage to our fleet, we want it and we’re willing to sit down and talk about it.

We came up with this program twenty years ago. There wasn’t a single observer program in the country at the time when we did that. If it’s time to redo it, let’s sit down and talk about it. But the dollars that we pay for that program each year are not going to come out of the federal government. I can guarantee you that.

If we get anything from the feds, we’re going to end up with a lot less coverage. To us, comprehensive coverage is an advantage. It’s a benefit to our fishery, and we appreciate the work that the observers play in our fishery. And we don’t want to see it diminish – diminution of either the quality of the observers themselves or the data that they generate for us.
I would make one recommendation-I think it’s a good idea to have industry come to these conferences. I would recommend that you do a little bit of outreach between now and the next session. I’ll certainly be here. I learned a lot and I met a lot of very interesting people and I really appreciate the opportunity to be here. Thank you.

Dennis Hansford’s Closing Remarks
NOAA Fisheries Service
USA

Dennis Hansford
NOAA Fisheries Service
USA

I want to thank all the delegates for your comments and we are at a point where we will have to adjourn this session. I wish you speedy and safe travels home, and we look forward to seeing you at the Seventh International Fisheries Observer and Monitoring Conference.

Reports from Extra-Plenary Sessions

6th INTERNATIONAL FISHERIES OBSERVER & MONITORING CONFERENCE

Portland, Maine, USA *July 20 - 24, 2009*

Report of the Data Extrapolation Workshop

Lisa Borges [1]
European Commission, Directorate General for Maritime Affairs and Fisheries
Vicki Cornish [2]
Ocean Conservancy

1. Introduction

The IFOMC Steering Committee proposed a pre-conference workshop on data extrapolation for the 2009 Conference, to be held on Monday the 20th of July. The data extrapolation workshop was organized to meet a concurrent request for an extensive discussion of the issues involved in analyzing discard data coming from monitoring programmes around the world. While most countries collect data at-sea, few programmes have the resources or the management requirement to sample a fishery at 100% observer coverage. This results in the need for robust methodologies to be used in data extrapolation, an area where presently there is little guidance, but where common approaches are fundamental to ensure comparability between program results.

2. Objectives

The objective of the workshop was to establish a set of common best practice in data extrapolation. The specific objectives of the workshop were to:

a) identify and summarize the concerns countries have in relation to extrapolation procedures;

b) review extrapolation methods used around the world by comparing the results between raising methods and fisheries, identifying the advantages and limitations of each procedure;

c) and provide simple summary guidelines for data extrapolation.

3. Organization

The workshop programme was initially divided in two groups: rare and common occurrences of discarded species. This division was based on the different data characteristics (dominance of zero values in the data set), discard estimates objectives (ex: fishing impact on endangered species, fishing mortality estimates from stock assessment), knowledge of the population (availability and quality of raising variables), bias and precision estimates, and finally models assumptions and applicability (considering zero values and overdispersion). The morning session was therefore divided into commonly and rarely discarded species, each with a general presentation followed by a panel discussion led by invited scientists with experience in analyzing each type of data. The afternoon discussion was divided into four major aspects: issues associated with raising variables (haul/trip, landings, effort); analytical techniques for common occurrences; analytical techniques for rare occurrences; and considerations for sampling to facilitate analysis. In practice however, the afternoon discussion focused on all four aspects without a clear division.

4. Abstracts of the talks

Commonly discarded species – Lisa Borges

The ICES workshop on discard raising procedures was held in 2007 in San Sebastian, Spain[1]. In this workshop a common raising procedure was applied to a set of data covering a maximum of different European fisheries, sampling programmes and regions. The objective was to establish, if not a common methods for raising, at least a set of common best practice to be used to raise discard data. The auxiliary variables considered were: number of fishing trips, landings of target species, and fishing hours. Two additional variables (total landings – all species summed, and fishing days) were also examine when the previous ones were not available/applicable. The results show that particular methods under- or overestimate discard estimates systematically. Specifically, there is an ascending tendency to overestimate discards from trips to landings to effort variables used in the raising procedure. Regarding the precision of the raised discard estimates, there is a descending order of precision from fishing hours to trips to landings variables, i.e. fishing hours providing the most precise raised discard estimates. Finally, the workshop concluded that there is a systematic method to assess, compare and finally choose a procedure to raise discards. This procedure was compiled as a key (Discard Raising Procedure Key), where two major issues/characteristics (representativeness and quality) have to be assessed, followed by a subset of decisions that lead to a final choice of procedure. It is essential to apply different raising procedures and compare the resulting discards estimates, as unforeseen problems with the data may only appear through the comparison of different procedures. Ideally the chosen raising procedure should be unbiased, precise, and simple.

Rarely discarded species – Kimberly Murray

Different analytical approaches from those used to estimate discards of common species are often needed to estimate discards of protected species due to the rare occurrence of protected species discards (or bycatch). This talk reviews several analytical approaches used by staff at the Northeast Fisheries Science Center (NEFSC; Woods Hole, MA, USA) to estimate total bycatch of sea turtles, marine mammals, and sea birds, using fisheries observer data and total commercial fishing effort (i.e. from logbooks or dealer transactions). Prior to estimating total bycatch, data need to be evaluated with respect to the choice of sampling unit (i.e. hauls or trips), and the choice of the raising variable (i.e. hours fished or total landings). The choice will likely affect the amount of total estimated bycatch and uncertainty around the estimates. Ideally the response, or bycatch event, should have a statistical relationship with the raising variable, though often this relationship is hard to detect because there are so few bycatch events. The choice of raising variable may also be constrained by the quality or quantity of data in the commercial datasets. Protected species bycatch is an extremely rare event (for instance there may be 1 bycatch event in 3,000 hauls), causing datasets to have an excessive amount of zeros. Ignoring this feature of the data and applying standard error models may cause inferences to be incorrect and parameter estimates biased. There is also low power to detect significant effects when evaluating factors that

affect bycatch rates. As a result, techniques to estimate bycatch need to be carefully chosen and evaluated. Multiple approaches should ideally be compared to ensure an estimate is not sensitive to a particular model or technique. Some methods used by the NEFSC have been: 1) Ratio Estimators, stratified to increase precision of the bycatch estimates, 2) Generalized Additive Models, and 3) Generalized Linear Models. Uncertainty around the bycatch estimates (coefficient of variations and confidence intervals) are computed via bootstrapping routines. Overdispersion is a common problem in datasets with excess zeros, and occurs when the observed variance of the response is larger than the predicted variance from the model. Overdispersion can be evaluated via the dispersion parameter, and if present can be remedied by including important explanatory variables in the model, or assigning a different error distribution to the model.
After a model from the fisheries observer data is developed to estimate bycatch, the model is applied to commercial fisheries data to estimate total bycatch. Prior to applying the model, commercial data should be evaluated for comprehensiveness (i.e. does the data represent a complete census of all commercial effort?) and representativeness (if the data are not comprehensive, do they represent the general spatial and temporal distribution of all commercial effort?).

In summary, when estimating total discards of a rare species, one needs to proceed cautiously with inference from observer data, which often represent low levels of sampling (i.e. <5%). Results from multiple analytical approaches and units of analyses should be compared. If this is not possible, uncertainty should be incorporated throughout the analytical process to ensure that the final total bycatch estimates are robust.

5. Discussion

5.1. Raising variable

The questions and discussion that followed the presentations in the workshop were mainly related to the variables used for extrapolating data, its associated issues and fisheries applicability. Types of raising variables with examples from fisheries around the world are:

- Trips – The number of trips made by a fishery is usually relatively easy to obtain. Trips are also generally considered less sensitive to misreporting than other raising variables. Furthermore, if the sampling unit is considered at trip level (see section 5.2) then total number of trips is considered an unbiased estimator. However, defining a fishing trip requires careful examination when multiple areas/gears are used (see sections 5.2 and 5.3). Fishing trips is used to estimate discards from many demersal European fisheries.

- Species landings – this variable can give biased discard estimates, particularly in low sampling levels[2]. It is also more likely to be misreported in many European fisheries.

- Target species landings – In the Dutch pelagic trawler fishery target species varies with seasons thus it can not be used as raising variable for annual estimations. It is also not a good raising variable in the USA shrimp trawl fishery and the reef fish fishery in the Gulf of Mexico, as it is highly dependent on fishing ground. However, if there is a clear, common and constant group of target species in a fishery, then target species is as good as raising variable as total landings, provided there is no landing misreporting. Examples of fisheries where target species may be used as raising variable include: the North Sea beam trawl fisheries and gadoid trawl fisheries, Columbian demersal trawl fishery, and Norwegian shrimp trawl fishery.

- Total landings – used in many European fisheries as it is available, has a linear relationship with discards so is less likely to be biased, although provides somewhat variable results (high coefficient of variation; CV's). Total retained species is also used in the USA northeastern fisheries for both common and rare occurrences (i.e. sink gillnet fisheries) of discarded species.

- Effort – Time spent fishing (i.e. hours fished for mobile gear or soak time for fixed gear) is used in some fisheries to estimate total discards. Hours fished is a good estimator for the USA shrimp trawl fishery in the Gulf of Mexico. Time fishing has also been used to estimate total bycatch of turtles and marine mammal bycatch from USA northeastern bottom otter trawl and scallop dredge fisheries. Soak time has been used to estimate marine mammal bycatch in the French gillnet fisheries[3]. Effort data can also be evaluated by other sources of data such as electronic monitoring (video cameras and sensors), vessels monitoring systems (VMS), or interviews.

- VMS – Vessel Monitoring System data has been used in Norway to ultimately estimate landings of a fishery with high levels of IUU (Illegal, Unreported and Unregulated fishing). VMS data was used to estimate the number of vessels in operation in the fishery and its levels of activity, which was then used as a raising variable to estimate retained catch. VMS data can also be used to refine effort between steaming and fishing days.

- Interviews – In small scale fisheries usually there are no logbooks or VMS requirements so there may be little information regarding catch and fishing activity. Interviews and direct sightings surveys are used (under a mark-recapture logic) to estimate number of vessels in the Frasier River salmon fishery, BC, Canada. Other sources of information such as bait sales or fuel sales, may give an indication of fishing effort.

5.2. Sampling unit

One topic that was also discussed was at what sampling level is the sampling unit considered in data extrapolation analysis. This is because discard monitoring programmes are multistage sampling schemes, where sampling can be considered at different stages, but the decision may have implication in the final estimation[4] . Ideally a multistage estimator should be used to extrapolate data, but requires specific data at each sampling level that is often unavailable. In most trawl fisheries the sampling unit is considered at trip level. On the other hand, there are many fisheries where a different fishing method is used in each set/haul. An example is the tuna purse seine fishery (difference between fish aggregating device - FAD or school sets), the Portuguese polyvalent fishery (swaps between gillnets, longline and traps) or the Columbian lobster fishery (uses traps and snorkel). In these fisheries, the sampling unit is either considered at the haul level or a trip is considered to be composed by a group of similar sets/hauls (i.e. a subtrip). In any case, for extrapolation purposes it requires information regarding the population at the same level (landings/effort by haul/set).

When estimating total discards of rare species in USA northeastern fisheries, the sampling unit analyzed is usually the haul. Analyzing at the haul level provides more information about bycatch rates than at the trip level. However, when analyzing at the haul level some common model assumptions need to be evaluated, such as whether hauls represent independent sampling events. If not, then it may be more appropriate to analyze at the trip level.

When the sampling unit is chosen at trip level a decision needs to be taken regarding the non-observed hauls since most observers are unable to sample all hauls within a trip. The non-observed hauls are either ignored in the analysis or the sampled hauls are extrapolated to the non-observed hauls. The later is usually applied, using one of the raising variables described above (in Europe). In the USA northeastern fisheries, non-sampled hauls are excluded from the sample used to estimate fish discards and bycatch of turtles.

5. 3 .Representativeness

One of the issues discussed further was related to the decision of representativeness. Quantitative and qualitative methods can be used to determine if a sample is representative of the population. The choice of method may depend on the sampling coverage and the data available, i.e. from visual comparison of the data distribution, to t-test to a modeling approach. Several variables should be compared between what was sampled in the monitoring programme and the whole fishery: gear type, mesh size, vessel length, trip duration, total species landings. Temporal and spatial characteristics (where and when fishing occurred) should also be compared. In the USA northeastern fisheries, the distribution of differences between observed trips and non-observed trips were examined for the average trip duration and average total kept pounds of all species to see whether the distribution of data is centered around zero[5].

The definition of a "fishery" may also impact the raising variable available for extrapolation. For example, if logbook data is not sufficiently detailed to allow for a finer fishery distinction, the data at population level cannot be rightly attributed to the sampled fishery, which may led to biased results. Fishery definition issues can also be detected from data analyse which can be used to further improve sampling. Target species is used to define a fishery in the tuna purse seine fishery and in British Columbia, Canada where fishermen are asked to fill the logbook with the target species by haul. In USA northeastern fisheries, target species often defines how fisheries are defined and managed (i.e. by Fishery Management Plan (FMP) group), though for analytical purposes a fishery is often defined by gear type. Sampling is also allocated by gear type (versus by a fishery defined by the target species) so in some cases there is a lack of data available to help manage a particular target species or species group.

5.4 Improving sampling

Sampling schemes should target their sampling effort where there is higher data variability. In many fisheries there is higher catch variability between vessels/skipper and trips than between hauls within a trip. In this case, there is a gain in sampling more trips than hauls[6]. There is also an advantage in sampling less hauls within a trip but spend more time and sampling extensively each haul[7]. This may be of particular importance when there is high species diversity in the catch (e.g. the Columbia demersal trawl fishery), when there is a conflict between primary and secondary sampling objectives (e.g. between commercial and non-commercial species), or limitations in an observer's workload. To avoid loosing information, the solution may be to focus the sampling effort by sampling less hauls but more extensively. Another example is the monitoring programme for turtle bycatch in the USA northeastern demersal fisheries, where limited sampling resources are focused on the geographical area of turtle occurrence, or times and areas whit historically high bycatch rates.

A further aspect is the need in most programmes to sample several species or fisheries simultaneously, but where each requires different sampling levels, due to different abundance level, biology, conservation risk, catch composition, trip duration, etc. In this case, a compromise needs to be reached between each sampling requirement and the programme resources limitation. In practice, the different sampling objectives are prioritized and sampling is targeted accordingly. Although at the end of the process some species or fisheries may not be sampled, data quality for the ones that are sampled is ensured. This is the approach taken in many European observers programmes.

An issue interlinked to this discussion is the precision level that the final estimate needs to achieve. Precision levels depend on the type of data and objectives of each sampling programme. The journal *Ecology* published a special feature on Statistics of Rarity[8] that addressed the phenomena of rareness in ecology and the unique challenges faced by biologists when quantifying different biological processes that involve rare species in nature. In this special issue [9] addresses how to potentially improve precision from rare events.

Target precision levels for USA northeastern fisheries bycatch estimates a 30% coefficient of variation (CV) annually for finfish discard, while marine mammal requirements are based on a 5-year average[10]. In the European Union the requirement is a 12.5% CV of annual estimations. However, the main concern for a sampling scheme is to avoid being biased (check for representativeness of the samples collected; [11] provides methods to estimate and evaluate bias in monitoring programmes).

Rare species are not usually sub-sampled within the sample trips, i.e. all catch of rare species is recorded, particularly if sampling levels are low. This is the case in the USA shrimp trawl fishery in the Gulf of Mexico, USA northeastern demersal fisheries and Canadian offshore scallop fishery. The question that several programmes face is if it is worth the effort and money spent for very rare occurrences. This question may be replied in a legal context, if there is a legal obligation to do so (i.e. USA Marine Mammal Protection Act), or in a cost-benefit analysis (impact on the species versus the investment made[12].

6. Conclusions

The workshop concluded that although there are specific issues unique to rare and common occurrences of discarded species, both data types require the same general data analysis procedure, which can be summarized in three simple steps: **check data, compare results, improve sampling**. The first step includes checking and comparing the data (sampled and of the population) for its representativeness and quality. The second step includes estimating global discards or protected species bycatch using different methods and/or variables and comparing the results. Subsequently, an extrapolation method can be chosen. If, however, significant differences arise from the second step then there might be scope for fine tuning the sampling programme, which comprises the third step.

Comparing results is an extremely important step in extrapolation data and estimating discards. It can show different fisheries definition, changes in fishing patterns, issues related to the sampled data representativeness, but also (and more commonly) identifies quality issues with the reported data (misreporting). Data from different monitoring programmes should be compared and used to verify each others sampled data and also official reported data. A further important point to highlight is that fishing behavior changes over time and thus representativeness and quality should be checked periodically.

Finally, if extra funding is available it should be used to collect more data, instead of developing modeling approaches. Although models are a useful tool to estimate missing data, to provide predictions, to evaluate stratification and estimators, data is simply fundamental to monitor a changing activity such as fisheries. Furthermore, while a modeling approach to estimate discard may provide valuable additional information, it may be unpractical to be used in routine stock assessment. In this case, a simple estimator may be better to estimate discards, while a model may be better used to answer other fundamental questions. In any case, other methodologies should be considered to further collect data from at-sea monitoring programmes, such as electronic monitoring (video cameras and sensors), interviews, reference fleets, self-reporting and alternative platforms[13]. This is of particular importance for rare species sampling programmes.

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6th IFOMC Observer Professionalism Working Group (OPWG) Update

Edited by: Keith G. Davis[1]
Fisheries Observer/ Association for Professional Observers (APO)
USA [1]

OPWG Terms of Reference[1]**:**

<u>OPWG Mission:</u>

The mission of the Observer Professionalism Working Group (OPWG) is to investigate, categorize, and prioritize the international working knowledge of observer employment practices in order to outline principles that foster the proficient professional development of fisheries observers; whilst working to ensure and strengthen the technical integrity of the profession and fisheries observer and monitoring programs.

<u>OPWG Membership:</u>

<u>Steering Committee Liaison:</u>		
Amy Van Atten	NE Observer Program Branch Chief	Woods Hole, MA USA
<u>Chair:</u>		
Keith Davis	Fisheries Observer; APO	USA
<u>Members:</u>		
Ave Eddie Agae[2]	Native Fisheries Observer Program Manager	Honolulu, Hawaii USA
Shikami Kennedy Akweyu	Chief Fisheries Officer	Mombasa, Kenya
Rueben Beazley	Fisheries Observer; Union Shop Steward	St. John’s, N.F. Canada

Larry Beerkircher	SE Observer Program Operations Manager	Miami, Florida USA
Anik Clemens	NOAA Fisheries Technical Writer	St. Petersburg, Florida, USA
Dawn Golden	PIRO Observer Trainer/ Debriefer	Honolulu, Hawaii USA
Chris Heineken	Observer Training/ Deployment Director	Cape Town, South Africa
Patricia Mancini	Observer Program Representative	Itajai, Brazil
Tracey Mayhew	Observer Union Representative	Anchorage, Alaska USA
Jon McVeigh	West Coast Observer Lead Debriefer	Eureka, California USA
Sara Monteiro	EC Fisheries Adviser/ Technical Writer	Brussels, Belgium
Tom Nishida	International Fisheries Research Officer	Shizuoka, Japan
Mike Orcutt	Observer Operations Coordinator	Victoria, B.C. Canada
Ebol Rojas	Fisheries Observer; APO	Ozumba, Mexico
Bob Stanley	Technical Manager, Boat Information Systems	Canberra, Australia
Teresa Turk[3]	International Observer Program Coordinator	Silver Spring, M.D. USA
Elaine Ward	WFT Social Equity Specialist	Victoria, B.C. Canada
Sara Wetmore	NE Observer Program Area Lead	Woods Hole, MA USA
Prior Members [4]		
Elwin Kruger	Operations Manager	Lüderitz, Namibia
Glenn Quelch [5]	ICCAT Chief Fisheries Officer	Malta
Courtney Sakai	Oceana Campaign Director/ International	Washington D.C., USA

OPWG Committee Structure:

The OPWG is comprised of four standing committees (generally made up of five members each) that focus on each of the four general observer professionalism areas of study. With the primary objectives of the working group in mind, many OPWG activities and initiatives progress in this committee structure and are later brought back together to produce cohesive working group outputs. The four OPWG Committees are:

- **Wages and Benefits**:
  - Committee Members: Rueben Beazley, Anik Clemens, Keith Davis, Tracey Mayhew, and Ebol Rojas

  - Primary Focus: remuneration policies, reimbursable items, and initiatives set to foster the health and general welfare of observers.
- **Support and Opportunities**:
  - Committee Members: Larry Beerkircher, Dawn Golden, Jon McVeigh, Mike Orcutt, and Patricia Mancini.
  - Primary Focus: conflict resolution instruction, grievances procedures, counseling options, awarding credit where due, inclusion in professional fora, and assistance for observers' professional advancement.
- **Employment Standards**:
  - Committee Members: Chris Heineken, Tom Nishida, Bob Stanley, Teresa Turk, and Amy Van Atten.
  - Primary Focus: observer training, codes of conduct, hiring eligibility and competency standards, database and data collection standards, employee retention, and rules concerning the observer/fisher working relationships.
- **Social Equity**:
  - Committee Members: Ave Eddie Agae, Shikami Kennedy Akweyu, Sara Monteiro, Elaine Ward, and Sara Wetmore
  - Primary Focus: identify the factors which may bring about discriminatory practices and social barriers in the observer workplace (based upon sex, age, ethnicity, or class) and recognize and promote the initiatives which foster equitable employment practices in the profession.

Historical Overview:

During the Closing Session of the 4th Conference (Sydney, 2004)[6] in the IFOMC series, a general consensus arose in regards to taking action to change a portion of the structure of future Conferences to accommodate working groups that would dig deeper among some of the "issues that we all wrestle with" and produce "more firm outputs" that would build upon Conference proceedings. In May 2006, during the off year between the 4th and the 5th (Victoria, 2007) Conferences, the three standing IFOMC Working Groups - Observer Safety Working Group (OSWG), Observer Training Working Group (OTWG), and Observer Professionalism Working Group (OPWG) - were established by the IFOMC Steering Committee to begin to gather together the international working knowledge of these important reoccurring topical areas and to help construct the mechanism needed for producing more focused and robust outputs.

Throughout IFOMC history various driving themes and extended discussions have centered about "Observer Professionalism" topics. Many of these topics were first gathered together and categorized at the 2nd Conference (St. John's, 2000), with the creation of the *Observer Bill of Rights* (OBR[7] document, formulated by way of an observer-led breakout session coupled with a panel session and ensuing lengthy discussion session in front of the main delegation. While the OBR document has never held much clout in regards to guiding policy, it has been considered by many to be a sort of "light on the hill" for outlining some of the basic principles that foster the professional development of observers, and the OPWG referenced the OBR when shaping its founding goals. The two Conferences that followed (New Orleans, 2002; Sydney, 2004) brought to light several additional observer professionalism issues that the OPWG also considered when charting its initial path.

By November 2006, the OPWG was fully founded (with 16 original members) and had set a course for developing upon the observer professionalism information gathered at Conferences by establishing the means to not only continue gathering information but to further categorize and begin to prioritize topics and to frame recommendations in order to improve the utility of this information for the purposes of implementation.

In order to accommodate these goals, the OPWG initiated a survey in January 2007, primarily targeting 5th Conference (Victoria, 2007) delegates of various stakeholder perspectives[8]. The primary objectives of this survey were to clarify certain common observer professionalism terminology and to build a more solid basis for what observer employment initiatives (organized by three general categories: *Wages and Benefits, Support and Opportunities,* and *Employment Standards*) worked well and/or were desirable for fostering the professional development of observers. Along with this survey, the OPWG, in cooperation with World Fisheries Trust (WFT), hosted an *Equity in Fisheries Observer Programs Questonnaire*[9] in order to gather more-specific information in regards to the *Social Equity* issues concerning fisheries observers' employment practices. At the 5th Conference (Victoria, 2007), the OPWG hosted a break-out workshop where preliminary survey findings were presented and further information was gathered by way of discussions with workshop participants, and the OPWG also participated in the Closing Session at that Conference. In July 2008, the OPWG produced a comprehensive report[10] detailing a complete analysis of 2007/2008 OPWG findings, a list of recommendations, and an outlook into the Group's future proceedings.

"Focused Interviews" Plan:

In November 2008, after some membership and committee restructuring, the OPWG regrouped for a conference call and began to set its sights for the approaching 6th IFOMC by initiating a new plan of action. Working off the advice offered up by Joachim (Yogi) Carolsfeld during the Closing Session of the 5th Conference[11] and building upon internal Group discussions, the OPWG decided to utilize a series of "focused interviews" for its next phase of information gathering.

The main objective with initiating these focused interviews was to dig deeper among certain priority[12] observer professionalism topics highlighted by the Group's 2007/2008 investigations (arranged by the four OPWG study areas) in order to frame more detailed, broaden-scoped outputs that would prove to be valuable educational references to the international fisheries observer and monitoring community. The overall theme for this stage of OPWG investigations was:

Outlining Avenues that Foster the Recruitment and Retention of a Professional, Equitably Employed, Workforce of Observers

<u>Interview Target Topics:</u>

- **Wages and Benefits:**
  - Experience-based compensation - detail observer compensation systems in order to gain some insight into the systems that may work well for retaining professional experience within the profession.
  - Paid trainings, briefings, and debriefings - see what affect the presence or absence of "Paid trainings and debriefings" has on the livelihood of Observers and the retention of a professional Observer workforce.
  - Observer Benefits (i.e. Health Insurance) - exhibit various observer benefits systems, from a variety of programs, to see how each system affects the livelihood and retention of Observers.

- Experience transferability - see if and how Observer experience transfers from one region to another or within a region and to further understand why some experience may transfer while other experience may not.
- Year-round employment - see how various observer programs may foster the retention of a professional Observer workforce in finding a balance of availability of employment to their observers on a year-round basis. An important aspect of this topic would be to dig out how some programs may cooperate with other regions and fisheries to accommodate this.

- **Support and Opportunities:**
  - Career Advancement - detail the types of advancement opportunities (within and beyond the observer profession) that exist as well as identifying desired forms of advancement that do not currently exist.
  - Support to attend professional fora - gauge how support (assumed as monetary support) to attend professional meetings (such as the IFOMC) has influence on the livelihood and retention of Observers.
  - Movement between observer programs - examine if the ability to easily move between programs is considered a major benefit to observers, and how such movement could be fostered.
  - Life counseling and training - see how the availability of life counseling (e.g. post-cruise interviews, substance abuse, relationship, financial) and life training (e.g. conflict resolution, sexual harassment, preparation for the isolation of sea life) impacts the livelihood and retention of observers.
  - Observer evaluations - see how various observer programs use observer evaluations; both as a means to help the observer improve his/her performance or to allow the observer to provide feedback to a program.
- **Employment Standards:**
  - Observer/Fisher Working Relationship Standards - showcase how rules regarding Observer/Fisher Working Relationships are standardized among various observer programs.
  - Observer Code of Conduct Standards - showcase how Codes of Conduct are standardized among various observer programs.
  - Eligibility and Competency Standards - showcase how the Eligibility and Competency of recruited observers is standardized among various observer programs.
  - Employee Retention Standards - showcase how the retention of professional observer employees is evaluated and standardized among various observer programs.
  - Training Standards - showcase how observer trainings are standardized among various observer programs.
  - Debriefing Standards - showcase how debriefings (data accountability processes) are standardized among various observer programs.

- **Social Equity:**

  - Determine how Social Equity concerns affect Observer Professionalism – to determine what social equity concerns specifically affect each of the three other OPWG areas of study.
  - Identify ways to overcome external barriers to equal employment
  - Gender-related issues
  - Ethnicity-related issues

- Identify initiatives that foster equitable employment practices among observer programs

Scope of Interviewees:

The primary focus group for OPWG Focused interviews were active and prior Fisheries Observers, though other stakeholders (i.e. management-agency personnel, observer provider/contractor personnel, Observer data end-users, Observer Union personnel, fishers, industry personnel, NGO's) were also encouraged to participate.

Interview Technique:

Interviewees were asked to:

1. Review committee focused interview plans (with interview questions listed) and to complete a series of *Identification Questions*[13] prior to conducting an interview
2. Only answer questions:
    a. That are fully comprehended;
    b. That are applicable to them and their experience; and,
    c. They are fully comfortable with answering.
3. Consider interview questions to be open-ended and to share any information that may be relevant to the interview subject matter.
4. Take notes during the interview and to fill in written responses if they felt they could express themselves better that way.
5. Ask if they did not understand a particular question.

Pre-Conference Interview Participation:

- Focused Interview Plans were finalized by January 2008 and the first interviews began soon thereafter.
- By March 2008, plans were made available by way of the IFOMC website[14] (or by linking directly to the OPWG web view[15] so that they could be referenced and considered prior to interviews.
- In order to locate interview participants, OPWG members reached out among their networks and an announcement was made in the *Spring 2008 Mail Buoy*[16.]
- Pre-conference interviews were conducted by utilizing the following techniques: in person, on-line correspondence, telephone, or post. Some interviews were digitally recorded and some were conducted over multiple correspondences.
- Approximately 45 total (amongst all four committees) interviews[17] were completed prior to commencement of the 6th IFOMC.

6th IFOMC Observer Professionalism Workshop:

The Observer Professionalism Working Group continued its focused interviews process with delegates at the 6th IFOMC by hosting a ½ day break-out session called the Observer Professionalism Workshop on the third day of the Conference - Thursday July 23rd, 2009:

Observer Professionalism Workshop Logistics:

- The workshop ran currently with the plenary session and was held in a separate location than the main conference room.

- 08:30am to 09:00am: consisted of a brief orientation of the workshop and an audience-participant discussion.
- 09:30am to 12:00: The workshop room was arranged with separate stations for each of the four OPWG study area - Wages and Benefits, Support and Opportunities, Employment Standards, and Social Equity.
- Each station was set up with recording equipment so that 2 interviews could take place at each station simultaneously, and each station was equipped with a poster describing the interview target topics for that particular area of study.

Observer Professionalism Workshop Interview Participation:

- Delegates who attended the workshop were provided with literature describing the interview process and had access to each of the four committee interview plans.
- Participants were invited to take part in each of the four interviews though were instructed to begin with the OPWG study area of most interest first in case there was not enough time to complete all interviews they had an interest in.
- All workshop interviews were digitally recorded.
- As soon as the orientation part of the workshop was over, interviews began. From that point on, generally there were two interviews taking place at each of the stations throughout the remainder of the workshop, and several interviews continued (with permission) beyond the set end-time of the workshop.
- As the demand for interview participation was high, the two volunteer workshop facilitators (Mary Powers and Andy Ashley) were very busy scheduling interviews. Scheduling was based around a standard ½-hour time allotment and delegates could leave and return back at their scheduled time.
- Some delegates did not get a chance to participate or complete their interview at the workshop, and we made arrangements with all of those who expressed interest to us in still participating to complete their interviews either during the remainder of the Conference or soon thereafter.
- 35 individuals signed the Observer Professionalism Workshop sign-up sheet though we feel that we may have missed some and that a better estimate of workshop attendance was approximately 50.
- 35 separate Conference delegates - hailing from 10 different countries (including five regions in the USA and three regions in Canada) - completed 45 interviews during the workshop or during the remainder of the Conference. The majority of interviews were completed in English, however 2 interviews were completed in French with the help of volunteer translators Rebecca Lent and Azure Westwood, and several interviews were completed in Spanish by OPWG member Ebol Rojas.

Workshop Evaluation:

There was a broad sense of enthusiasm from participants and OPWG members alike at the Observer Professionalism Workshop that seemed to grow throughout the ½ day session and beyond. This workshop not only offered an opportunity for delegates to directly contribute to the workings of an international project that aims to produce some intriguing outputs, but it gave participants a chance to have one-on-one conversation with other delegates from around the world regarding issues that were important to them.

With consideration for the set goals, the OPWG considers the 6th IFOMC Observer Professionalism Workshop to be a great success. In order to allow workshop participants an opportunity to voice their likes and dislikes of the workshop and to rate the Group on accomplishing the set directives of the workshop, we asked all workshop attendees to complete an evaluation form. Though we did not receive feedback from all, a great deal of the workshop participants did share with us their thoughts and suggestions. The following are select comments[18] received back from workshop participants:

"Questions that were posed were very relevant in addressing challenges faced by observer programs globally."

- Elwin Kruger: Operations Manager; Lüderitz, Namibia

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"This workshop allows observers to discuss problems and resolutions individually based on their experiences. I think that gathering this information from individuals from various fisheries working for various programs gives us all the opportunity to view some of the concerns on a broader scale and see how some of these concerns are similar from region to region.

- Chris Stoehr: Fisheries Observer, Pacific Islands, USA

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"Enough time, space and commitment was not allocated to this workshop/objective…"

- Ken Barabash: Fisheries Observer, West Coast, Canada

Focused Interviews Outputs:

The OPWG Focused Interview process is now officially over[19], however there is a great deal of work to be done before any output or findings will be published from this phase of the Group's information gathering. Collectively, amongst all of the four OPWG study areas, we have collected approximately 90 interviews. These interviews have been compiled in many different formats, ranging from email correspondences and hand-written remarks to digitally recorded vocal tracks.

Though we aim to preserve all interviews in their original formats, our primary task in the coming months will be to generate digital transcripts of all interviews so that we may consider and utilize them equitably in regards to producing final outputs from this project. Some interviews (primarily pre-conference interviews) are already in a digital transcript format. However, there are approximately 30 hours of recorded interviews that need to be digitally transcribed, and we are presently unsure as to how long this process will take. To not only expedite the transcription process but to also preserve a reliable quality of all interviews, we are presently considering several options and sources of funding in order to have a professional service conduct transcriptions of the recorded interviews.

After we have compiled all interviews into a complimentary digital transcript format, the OPWG will need to spend several months exploring this wealth of information and begin making considerations for molding the outputs from this phase. The OPWG focused interview questions will help us with the preliminary steps to framing the outputs, though we imagine that there may be information brought about in the interviews that reaches beyond the questions asked. Consequently, we aim to mainly frame outputs as an exhibition of the interview responses rather than by the interview questions that had been asked. We will also utilize responses to the

Identification Questions for helping us to categorize particular interview responses by such general classifications as: Fisheries Observer stakeholder perspective, gender, ethnicity, experience, region/country/program, etc.

The Group's vision for producing final outputs to this project is two fold:

1. **2010 OPWG Report**: a complete report, arranged into chapters centered about general groupings of the collected information from the interviews, arranged in such a fashion as to serve as a useful educational reference. This Report will comprehensively detail all findings from the Group's Focused Interview stage and will include associated resources and recommendations.

2. **Observer Professionalism Outreach Pamphlet**: this pamphlet will be a concise synopsis of the 2010 OPWG Report. Our idea for this is to generate a quick-guide to Observer Professionalism (laminated, visually stimulating, pamphlet) that can be sent out to all know observer programs around the world and be widely used as an educational device.

Our outlook for completing both of these outputs is mid/late 2010. We will keep the 6th IFOMC delegation and all other interview participants apprised of all outputs that are produced from this phase of the OPWG's work.

In the meantime, here is a selection of excerpts from OPWG Focused Interviews to give you a taste of what is to come:

"You have to train them (Observers) to be assertive."

- Joost Pompert: Observer Program Staff; Falkland Islands

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"Once you prove yourself (as an observer) that you can handle it mentally and physically, there are plenty of opportunities."

- Steve Todd: Fisheries Observer; West Coast, USA

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"As observers, we like to jump around and keep our options open, and the biggest issue is cooperation among the programs (to foster this movement/transferability)."

- Brooks Doughtie: Fisheries Observer; Southeast, USA

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"Each observer program (in the USA) has developed their own system for promotion, so there is no standardization in that regard…"

- Dennis Hansford; National Observer Program; USA

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"I was lucky enough to get my Hawaii and Alaska (Observer) experience consolidated, though I know that some people have had trouble with transferring their experience."

- Melanie Haggard: Fisheries Observer; Alaska and Pacific Islands, USA

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"It is practical and reasonable for training staff to bring up the fact that minorities exist in the class and every class. Perhaps a short handbook or information would help…"

- Anonymous

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"Debriefing is probably the most critical part of my job… I believe 100% that debriefing should be mandatory for any program."

- Wayne DeGruchy: Fisheries Observer; Newfoundland, Canada

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"I feel that any type of benefits, especially health insurance, would be incentive to continue."

- Brant O'Dell; Marine Mammal Fisheries Observer; Gulf of Mexico, USA

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"Sexual harassment can happen both ways, even if a married, masculine man…"

- Anonymous

Working Group Outlook:

Vision for the 7th IFOMC:

Though we are currently (and will still be for quite some time) primarily concerned with completing the outlined outputs, we have had a chance to briefly discuss some of our thoughts for how we may progress in respect to the next IFOMC. Some members consider that our efforts may be best suited by hosting a plenary panel session centered about presenting topics associated with Observer Professionalism (not necessarily direct findings of the OPWG, but associated topics). This is simply a proposed idea at this point and will be discussed in further detail in our published outputs next year.

New OPWG Member Recruitment:

The OPWG is made up of 20 members. While we expect that the majority of OPWG members will chose to retain their roles with the Group, with the transition from completing the 6th IFOMC and beginning to set sites for the 7th IFOMC, we anticipate a certain amount of attrition in our membership. Over the next couple of months, we will ask all of the OPWG to confirm their membership with the Group and at the same time begin actively recruiting for new membership.

We are looking for new members from the international community who have a keen interest in working towards initiatives that, as our mission states, "fosters the proficient professional development of fisheries observers." We are always looking to expand upon our perspective and geographic representation, though enthusiasm (for the subject-matter) and time devotion are both important factors to us in recruiting new members. Our members' experience ranges from someone with 30 years of experience in a well-developed observer program to a member from an area of the world where their observer program is still just on the drawing board. We are proud of the diverse group of folks we currently have on the OPWG and look at this transition as an opportunity to expand upon that diversity.

If you have any interest in joining the Observer Professionalism Working Group please feel free to send us your resume/ C.V. and a Letter of Intent, telling us how you can add to the OPWG.

Important Information:

The OPWG on-line Resources:

To review all public OPWG resources or to provide feedback in regards to the continued work of the OPWG (via Public Forums) please navigate to the OPWG web view: http://www.apo-observers.org/ifomc/opwg.php

OPWG Point of Contact: Keith Davis: lblegend@yahoo.com

Acknowledgments:

We'd like to thank Dennis Hansford, Dan Morris, and all of the 6th IFOMC organizers for making the Observer Professionalism Workshop possible and for assisting with many other OPWG needs. Many thanks go to Rebecca Lent and Azure Westwood for acting as French translators during the workshop so that delegates from Senegal and Morocco could complete interviews in their native tongue. We would also like to acknowledge the help of two Fisheries Observer volunteers - Mary Powers and Andy Ashley. Mary and Andy acted as Workshop Facilitators, helping us with orienting folks as they entered into the workshop and with the scheduling of interviews. Last but far from least, we would like to acknowledge all of those who have taken the time to participate in OPWG Focused Interviews. We hope that you all will be pleased with the eventual outputs that your gracious efforts have contributed to. Thank you all very much for helping make the OPWG Focused Interview process a success!

Notes:

1. For a complete listing of all OPWG Terms of Reference, outputs, project updates, and to share any Public Input please navigate to the following web link: http://www.apo-observers.org/ifomc/opwg.php
2 Ave Eddie Agae retired from the Group just before the 6th Conference in July 2009.
3. Teresa Turk co-founded the OPWG in October 2006 with Keith Davis and served as the OPWG Steering Committee Liaison (SCL) from then until the close of the 5th Conference (Victoria, 2007). Thereafter, she has served as an OPWG member.
4. All "prior members" were members of the OPWG for the 5th IFOMC in Victoria, May 2007.
5. Glenn Quelch co-Chaired with Keith Davis from May 2008 till August 2008, when he retired from the Group.
6. Mcvea, T.A, Kennelly, S.J. 2005. Proceedings of the 4th International Fisheries Observer Conference. NSW Department of Primary Industries, Cronulla Fisheries Research Center of Excellence, Cronulla, Australia. ISBN 1 9209 12 20 2. 230pp. http://www.st.nmfs.noaa.gov/ifomc2009/4th%20IFOC%20Proceedings%20Sydney.pdf
7. Link to the Observer Bill of Rights document at: www.apo-observers.org/docs/ObserverBillofRights.pdf

8. Of the 45 respondents to the OPWG Survey (http://apo-observers.org/docs/2007_OPWG_Survey.pdf): 12 different countries were represented; 61% were Observers; 30% were agency Staff members; 7% were Data Analyst/end users; and 2% were from a source Other than these options.
9. Link to the Equity in Fisheries Observer Programs Questionnaire at: http://apo- observers.org/docs/WFT5thIFOMCQuestionnaire.pdf
10. Link to the 2008 Observer Professionalism Working Group Report: http://apo-observers.org/docs/IFOC_OPWG_Report_2008.pdf
11.McVea, T.A and Kennelly, S.J. (ed.), 2007. Proceedings of the 5th International Fisheries Observer Conference –15 – 18 May 2007, Victoria, British Columbia, Canada. NSW Department of Primary Industries, Cronulla. Fisheries Research Centre of Excellence, Cronulla, Australia, 412 pp. ISBN 978 0 7347 1861 7. http://www.st.nmfs.noaa.gov/ifomc2009/Proceedings_ALL_FINAL_170907.pdf
12.Priority topics for this stage were carefully selected from the "Analysis Highlights" of 2007/2008 OPWG Investigations (See the 2008 OPWG Report) based on two criteria: 1. the need for further investigations into a topic in order to make more-detailed recommendations, and 2. to limit selection of topics to a manageable amount to ensure a high quality of outputs to theses investigations. With this is mind, some "Analysis Highlights" from the 2008 OPWG Report were not selected for this stage.
13. Identification Questions were in regards to gender, ethnicity, stakeholder perspective, and experience (sea days, gear types, region(s), country(s), program(s)). Interviewees were encouraged to only answer questions they felt comfortable with answering and were instructed that they could remain anonymous if they so desired.
14. www.ifomc.com
15.http://www.apo-observers.org/ifomc/opwg.php
16.APO. 200. Mail Buoy. Spring 2009; 12(1). A quarterly newsletter of the Association for Professional Observers (APO). Link: http://www.apo-observers.org/mailbuoy/Spring09MB.pdf
17. This is an approximate estimation being that some interviews that were initiated prior to the Conference were completed after the Conference or are still in the process of being completed.
18. A more-complete synopsis of Observer Professionalism Workshop evaluations will be reported in the final output of this stage of the Group's work.
19. Though the OPWG Focused Interview process is officially over, some interviews (either initiated prior to the Conference or by way of contacts made at the 6th IFOMC) are still in the process of completion (as of September 2009).

6th INTERNATIONAL FISHERIES OBSERVER & MONITORING CONFERENCE

Portland, Maine, USA July 20 - 24, 2009

Moving Sushi: A Marine Resource Expedition

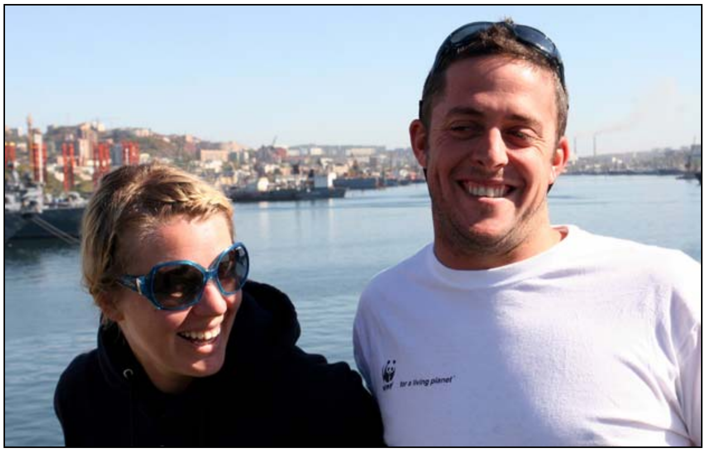
Mike@marine-expedition.co.na
Linda@marine-expedition.co.na

The 6th International Fisheries Observer and Monitoring Conference was very fortunate to have two passionate and inspiring individuals present a video documentary of their expedition through Africa, Europe, and Asia. Moving Sushi team leaders Mike Markovina and Linda Schonknecht are trekking across three continents and through over 40 countries. Mike and Linda presented to the conference attendants a look at their impressive journey on Monday (7/20/09) and Thursday (7/23/09). The movie focused on the management, monitoring, and enforcement of marine fisheries they discovered in the countries they have visited. The documentary captures the state of marine resources and communities which are affected by marine resource management decisions and how we as a people can sustain healthy fisheries around the globe. At the time of their video presentation at the conference, their journey had not yet brought them through Asia and East Africa. Once their global tour is completed, a final film version will be shown on television. Stay tuned! The conference video was a partial glimpse at their amazing trip**.** Their expedition concentrates “at contributing to marine conservation by gathering information and filming a holistic and objective documentary aimed at the following [1].

- Revealing the positive side of marine resource use through conservation, with major focus on marine protected areas, their successes or failures and their impacts on society.
- Gathering information from all stakeholders in the resource, i.e. fishermen, government, conservation NGO’S, industry and other to understand holistically the state of the resource and to document positive conservation initiatives associated with the resource.
- Gauging potential biodiversity by underwater observation of different habitats in and outside marine protected areas in the immediate and or surrounding areas of filming.
- The development of potential aquaculture, and its associated impacts on economies and society[1] .

Core Leaders Mike (Expedition Leader) and Linda (expedition photographer and filming coordinator) both from South Africa and graduates of Rhodes University in South Africa will televise the 13 part documentary series of their expedition in 2011. In their own words, “The

Marine Resource Expedition hopes to create awareness to marine resource conservation on a global scale by inspiring people through the ambitious nature of the project. Through our monthly magazine publications we have generated a global following of the expedition. We are currently in discussion with a PR company to increase our international media coverage through adverts, seminars and media launches[1].”



Team Leaders Linda and Mike in Norway
Photo Credit: Moving Sushi Website

The Steering Committee would like to thank Teresa Turk for coordinating Mike and Linda’s appearance at the conference, and would like to extend a warm and sincere thanks to Mike and Linda for putting their expedition on hold and flying half way around the world to attend the 6th International Fisheries Observer and Monitoring Conference. Their passion for marine resource conservation certainly inspired all that had a chance to view the video presentation or meet them in person. A quote from Mike and Linda’s presentation and noted by Steve Kennelly revealed a positive view on facing and overcoming difficulties and challenges, and reaching goals.

“Being inspired about the positive allows us to tackle the negative with inspired minds.” Mike and Linda’s travels can be followed on their website: http://www.marine-expedition.co.za/

Thank you to Mike Markovina and Linda Schonknecht for your inspirational presentation and we wish you safe travels.

Notes:

1. Moving Sushi Website http://www.marine-expedition.co.za/

Safety Room IFOMC 2009

The 2009 International Fisheries Observer and Monitoring Conference (IFOMC) Safety Room was a joint effort between ***National Oceanic and Atmospheric Administration*** **(*NOAA*)**, United States Coast Guard (USCG), West Coast Groundfish Observer Program (WCGOP), NE Fisheries Observer Program (NEFOP), Observer Training Center, McMillian Offshore Survival Training, Rodney Avila, and fisheries observers from around the world

The goals of the safety room were to highlight the importance of observer safety, foster a stronger safety culture, and to educate observers & program staff. As in the past the space was filled with safety equipment, safety related posters, and volunteers to answer questions. New this year were safety videos being screened at breaks and a workshop on training vessel drills and flooding damage control techniques.

Everything from EPIRBs (emergency position indicating radio beacon) and immersion suits to liferafts and PFDs (personal flotation device) were available to touch, test and inspect. The poster topics ranged from conflict resolution and hearing/eye damage to helicopter rescue and the importance of ‘hands on’ safety training. The room itself became a meeting place for observers, safety trainers and staff from both established and developing observer programs. Trainers and observers from different programs were able to network and share experiences. These connections have already led to multiple cross training opportunities and the sharing of training materials between programs.

The Safety Workshop was conducted to offer support and encourage the use of onboard drills during observer safety training. It brought observers and trainers together to learn from each other and share ideas. The workshop started off with lectures and discussion on training emergency procedures, station bills and the logistics of setting up vessel drills. After the discussion, the group participated in “mock” drills, damage control training, and ultimately in onboard vessel drills.

This year the safety room was a great resource for observer program staff and observers. Some participants were introduced to new materials and teaching techniques while others were able to foster new and existing connections. Having the safety equipment available for ‘hands on’ learning and the extensive collective knowledge in one place is invaluable. We would like to continue to advance the IFOMC Safety Room at future conference. Please send any suggestions to John.LaFargue@noaa.gov.

6th IFOMC Tuna Transshipment Observer Program (TTOP) Meetings

Edited by: Bryan Belay[1] and Keith G. Davis[2]
MRAG Americas, Alaska
U.S.A.[1]
Fisheries Observer/ Association for Professional Observers (APO)
USA [2]

Abstract:

The goal of the Tuna Transhipment Observer Program (TTOP) meetings at the 6th IFOMC were to begin to assemble the collective working knowledge and resources of a variety of interested stakeholders in the worldwide network of tuna transshipment fisheries observer programs and to set the stage for the creation of a standing working group that could outline some common practices that may be harmonized across programs and help pave the way for heightened communications and information sharing.

Meeting Participants:

TTOP Meeting Facilitator:		
Bryan Belay	Observer Provider, MRAG Americas	Anchorage, AK USA
Attendees:		
Ernesto Altamirano	Inter-American Tropical Tuna Commission (IATTC)	La Jolla, CA USA
Joe Arceneaux	Observer Training Coordinator, PIROP	Honolulu, Hawaii USA
Kim Blankenbeker	NMFS/OAA, Foreign Affairs (ICCAT representative)	Silver Springs, MD USA
Evan Casey	Fisheries Observer	Honolulu, Hawaii USA
Keith Davis	Fisheries Observer (IATTC); APO	USA
Dawn Golden	Observer Trainer/ Debriefer, PIROP	Honolulu, Hawaii USA

Chris Heinecken	Observer Provider, Capricorn Fisheries Monitoring	Cape Town, South Africa
John Kelly	Observer Program Director, PIROP	Honolulu, Hawaii USA
Rebecca Lent	NMFS/OAA, Director, Foreign Affairs	Silver Springs, MD USA
Tsutomu Nishida	International Fisheries Research (IOTC Rep.)	Shizuoka, Japan
Graeme Parkes	Observer Provider, MRAG Ltd.	London, United Kingdom
Mary Powers	Fisheries Observer (IATTC)	Anchorage, Alaska USA
Ebol Rojas	Fisheries Observer (ICCAT, IOTC); APO	Eureka, California USA
Bob Trumble	Observer Provider, MRAG Americas	St. Petersburg, FL USA
Teresa Turk	USA International Observer Program Coordinator	Silver Spring, MD, USA

Background:

Illegal, Unreported and Unregulated (IUU) fishing contributes to overfishing and "undermines efforts to conserve and manage fish stocks in all capture fisheries"[2]. In 2001, the Food and Agriculture Organization (FAO) of the United Nations initiated the *International Plan of Action to Prevent, Deter and Eliminate, Illegal Unreported and Unregulated Fishing* (IPOA-IUU).

A major component of the supporting infrastructure for distant water fishing fleets (i.e. large-scale longline and purse seine vessels) on the high seas consists of at-sea transhipment activities. Transhipment operations allow fishing vessels on the high-seas to continue to fish without needing to return to a seaport when their holds are full (APO, 2007)[3]. Vessels can stay at sea for extended periods of time: off-loading their catches, refueling, rotating crews, and re-supplying bait, food, and water - all facilitated via at-sea transshipment operations. It is generally accepted that a common means of conducting IUU fishing is by way of unreported or misreported transhipment operations.

In direct regards to the role played by at-sea transhipment and resupply ("support") vessels to the operation of IUU fleets, the IPOA-IUU states the following:

"48. Flag States should ensure that their fishing, transport and support vessels do not support or engage in IUU fishing. To this end, flag States should ensure that none of their vessels re-supply fishing vessels engaged in such activities or tranship fish to or from these vessels. This paragraph is without prejudice to the taking of appropriate action, as necessary, for humanitarian purposes, including the safety of crew members.

49. Flag States should ensure that, to the greatest extent possible, all of their fishing, transport and support vessels involved in transhipment at sea have a prior authorization to tranship issued by the flag State…"

The importance of regulating at-sea transhipment operations, via establishing Monitoring Control and Surveillance (MCS) measures (i.e. Vessel Monitoring Systems and on-board observers) implemented by the relevant Regional Fisheries Management Organizations (RFMO)s, was further detailed by a 2004 UN General Assembly resolution[4]. The UN:

"Recognizes that common means of conducting illegal, unreported and unregulated fishing involves the unreported or misreported transhipments of fish at sea and urges States, either directly or through relevant sub-regional and regional fisheries management organizations and arrangements, to establish comprehensive systems, where appropriate, for monitoring and control of transshipments on the high seas."

The five RFMOs responsible for the management of tuna transshipment operations in their respective management areas around the world are: International Commission for the Conservation of Atlantic Tunas (ICCAT) - Atlantic Ocean, Mediterranean Sea; Inter-American Tropical Tuna Commission (IATTC) - Eastern Pacific Ocean; Western-Central Pacific Fisheries Commission (WCPFC) - Western and Central Pacific Ocean; Indian Ocean Tuna Commission (IOTC) - the Indian Ocean; and, Commission for the Conservation of Southern Bluefin Tuna (CCSBT) – Southern Ocean.

According to the report on the 21st Meeting of the Parties (MOP) [1], June 5th 2009, "All the tuna RFMOs except WCPFC have on-board observer programs for transshipments at sea," and "the CCSBT program will begin operations this year." In the spring of 2009, a few months following the inception of the Inter-American Tropical Tuna Commission (IATTC) Tuna Transhipment Observer Program (TTOP) in the Pacific[2], several people of various stakeholder perspectives began discussing some ideas for how this young program could be strengthened and most effective at reaching its management objectives.

Because carrier/transhipment vessels (and operators/companies) work on a largely international inter-RFMO basis, there is an important need for conservation and management measures to at least harmonize TTOP initiatives on an international inter-RFMO basis. Being that the tuna RFMOs generally have many of the "same objectives and purposes"[3] concerning the monitoring of at-sea transshipments, especially in regards to Large Scale Tuna Longline Vessels LSTLVs trading with tuna carrier vessels, some see this essentially as a "worldwide observer program". Our discussions in the spring led to the realization that many interested TTOP stakeholders were scheduled to be in attendance at the 6th IFOMC and that we should take advantage of this great opportunity to meet, share ideas, expand upon prior discussions, and begin an iterative process for harmonizing certain basic TTOP implementation principles.

TTOP Meeting Results:

We had initially scheduled one 1-hour meeting for the morning of the second day of the Conference, though discussions carried over and we had another 1-hour meeting the following morning. Meeting participants were of a variety of stakeholder vantages (Observers, contractors, debriefer/trainers, RFMO representatives, and other international interests), and three of the five tuna RFMOs had representation at this meeting.

In this first step, we (TTOP Meeting participants) have identified some useful program tools and desirable program-implementation practices that could be further considered:

- TTOP Working Group- Create a working group made up of a variety of TTOP stakeholders around the world to: further discussions, share findings, analyze observer program implementation commonalities, and to reach out to and help guide all Tuna Transhipment Observer Programs to successful ends.
- TTOP Training Manual- Establish a single manual and include addendums that outline specific requirements for each of the tuna RFMOs.
- TTOP Frozen Fish Identification Guide- building on the ID deck sheet produced by James Clark (MRAG Ltd.) for the ICCAT program, construct a comprehensive frozen fish identification guide to help observers identify frozen fish products.
- Standardize TTOP sampling priorities and protocols and outline basic TTOP training, briefing, and debriefing standards
- Standardize TTOP data Forms and Reports and data-reporting methodology
- Establish a single TTOP observer certification process so that a TTOP Observer certified by one tuna RFMO would be certified to work as a TTOP Observer in another tuna RFMO.
    - Develop a list of certified TTOP observers with easy access for contractors through a secure web location. This would facilitate the transit of TTOP observers from one region to another (as many trips occur in multiple RFMOs), and would save contractors money (as far as training and logistics are concerned).
- Develop a standard set of conversions for estimating product weight from measured lengths and for converting dressed/product weight.
- Test Electronic Monitoring (video/photo) as an aide for observers to later verify their direct observations. A mounted system that can be left unattended during the transhipment operations would be most desirable, so as to not distract from other TTOP observer duties.
- Develop an inter-RFMO photo database of all LSTLVs as a resource that all RFMOs can build upon and utilize for tracking vessels more effectively.
- Investigate further the use of genetic sampling for positive identification of species and possibly the geographic area caught.
- Establish protocols for sharing information from one program to another.
- Expose the various end-uses of TTOP observer data, outlining limitations as well as potential new uses.
- Provide recommendations to the RFMO's:
    - Standardize Transhipment declaration forms
    - Look into standardizing LSTLV logbooks
    - Standardize fish labeling requirements and protocols
    - Eliminate nationality restrictions in regards to hiring fisheries observers.

TTOP Meeting Conclusions:

Discussions were very good and the largest gripe was that we did not allot more time at the Conference to develop further upon these discussions. Nevertheless, we see these meetings as a beginning to what could prove to be a very productive long-term cooperation. We plan to work towards establishing a TTOP Working Group, building off of the results from these 6th IFOM TTOP Meetings.

<u>TTOP Meeting Contacts:</u>

Bryan Belay (Primary Contact) bryan.belay@mragamericas.com; Keith Davis lblegend@yahoo.com; and Joe Arceneaux stuart.arceneaux@noaa.gov

Notes:

1. There were two TTOP meetings during the 6th IFOMC. The majority of attendees were at both meetings, however two who were at the 1st were not at the 2nd and there was one additional attendee at the 2nd.
2. FAO. 2001. International Plan of Action to Prevent, Deter and Eliminate, Illegal Unreported and Unregulated Fishing. Rome, FAO. 27p. Link: http://www.fao.org/DOCREP/003/y1224e/y1224e00.HTM
3. APO. 2007. "MCS Observers on board at-sea Transshipment Vessels", Ebol Rojas. Article in the Fall 2007 edition of the *Mail Buoy*, a publication of the Association for Professional Observers (APO). Volume 10(3). October 2007. Link: www.apo-observers.org/mailbuoy/2007-fall.pdf
4. WCPFC. 2005. First Meeting of the Technical and Compliance Committee of the Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean.WCPFC/TCC1/17. December 2005. 3p. Link: www.wcpfc.inc

Appendices

Appendix 1

Detailed Paper Submitted by Meke Soung Pierre Nolasque

The scientific observers programme as a tool for sustainable management of the marine trawl fishing in Cameroon

Dr Meke Soung Pierre Nolasque, Veterinary, Economist (MA)1
Head of the Brigade of Control and Surveillance of Fishing Activities
Ministry of Livestocks, Fisheries and Animal Industries
Cameroon

Cameroon with almost 17,476,497 inhabitants, presents a costal length of 402 Km which is the core of intense fishing activities. It is a multi-species fishing, contributing to 1.7 percent to GDP, (2003). The various stocks assessments surveys conducted since 1982 to 2007, show an overexploitation of the costal resource (Jens Otto et al., 2004, 2005, 2006, 2007). Due the business environment (poor national investment) and the decrease of the resource base, most of the vessels in the region and from abroad buy fishing licenses in two or three countries since the early 1990s. This situation, combined with Cameroon self ban on exports of shrimp products to Europe Union countries, has led to fraudulent exports, contributing to heavy losses in terms of *export taxes* estimated at 2 billion CFAF/annum since 2002. The losses from poor landing and declaration of catches (IUU fishing) were estimated at 15 billion CFAF per annum for around 1044 m.tons of shrimps and 4 billion CFAF for fish 10067 m. tons (Meke, 2007). Meanwhile a study on economic and financial performances of the trawl marine fishery demonstrated that the industry was operating at lost, while the fish price (1265 cfaF/kg), is above the poverty line (1 US$/ day) and thus high for the society (Meke and Njifondjou, 2007).

The Ministry of Livestocks, Fisheries and Animal industries is responsible of the fishery policy through licensing. However, there have been an increasing number of vessels. No closed season has been decided yet. Economic objectives of the fisheries have never been considered. Law enforcement, one of the weaknesses of the management has gone through important changes with the creation of Monitoring, Control and Surveillance of fishing Activities Brigade; launching a vessel monitoring system (VMS), with satellite Argos and a plan against illegal and unreported fishing (IUU) has been validated. Within the framework of the GEF/UNEP/ 201/project, Cameroon experienced two years scientific observations on some shrimpers. In 2009, three scientific observers, embarked also on board of trawlers. This contributed in building a knowledge base on by- catches and discards from shrimp trawlers and Chinese pair trawlers.

The objective of the study was to evaluate the current management tools in use or expected in the fishery and the consistency with the fishery policy. For that purpose, an estimate of the costs and benefits/advantages of each management instrument strategy is conducted separately and projected for a ten year period. While cost of the Control and VMS are based on actual facts, estimates for running an observer programme are based on the two experiences mentioned.

Findings of the study indicate that benefits from the management tools do not compensate the cost of their implementation neither on a yearly basis nor in the long run, a situation lasting since many decades, and that the management tools are yet to protect fish resources on a sustainable basis. In management strategies, the government should investment on VMS, and a full observer programme, associated with a light sea patrols along the three mile area.

Key words: Scientific observers programme; sustainable management; fishing effort, biological and socio-economic data.

I. INTRODUCTION AND BACKGROUNG SITUATION

THE PROBLEM

Cameroon's population in 2008 was estimated at 17476497 inhabitants (population growth rate of 2.8 % in 2003). The costal length of 402 Km is the core of intense fishing activities. It is a marine multi-species fishing with shrimp trawls, fish trawls in the industrial fishing; purse seining in the semi-industrial fishing with almost 100 wooden or plank canoes; gill nets in the artisanal sector, 24 635 fishermen using 7335 canoes (surface, and bottom and cast nets...). Marine fishing production is estimated at 65 000 m. tons and fishing activities as a whole contribute at 1.7 percent to GDP, (2003) and per Capita fish product consumption is estimated at 17.9 Kg. GDP was estimated at 9077.7 billion CFAF, with a real growth rate of 3.5 % in 2006. The demand was estimated at 298.000 tons and fish imports represent 52.9 percent of total supply (126 000 tons) leading to a deficit of 24.4 CFAF billion on the trade balance.

The fish catch is dominated by the scianid community of Longhurst, in which eight species contribute to 80 % of the main demersal landings of the Cameroon continental shelf and belong to the following families: Ariideas, Cynoglossidae, Polynemidea, and Scianids. Almost 81.3 % of catches are made at depths less than 20 meters with 98.2 % of species from swampy/muddy and sandy bottoms[17]. The catch composition was almost the same base on landings data with croakers **(**45 %); Arius sp (15%) *Pentaneamus quinquarius* (16%) Sphyraena sp (17 %) Trichurus sp (2%) in 2004[14].Using the analytical model of Ricker, Njock, 1990, demonstrated that any increase of long term production may only result from an increase of the mesh size with or not any change on fishing effort, and that the MSY was 17600 tons for an optimal fishing effort Fopt of 5200 fishing days and that the demersal resources were overfished since 1978. Since the 1970's to date, there has been a constant change in the fishing effort strategy with shrimp vessels dominant (38) on average against (11) trawlers and where trawlers were converted into shrimpers using small 33 cm mesh sizes.

During the 2004 third session of the scientific sub-committee of the Fishery committee for the eastern central Atlantic held in Togo, the working group conducted stock assessment based on a variety of methods including analysis of long-term trends in fishery data (landings, effort, catch per unit of effort (CPUE); fishery-independent surveys. The group came up with the following results with regard to some main fishes in Cameroon: for *Pseudotolithus spp*; *Galeoides decadactylus*, Cynoglossus spp, there was uncertainty in the assessment and the main recommendation was that fishing effort should not be increased until new assessment is carried out. In the case of *Penaeus notialis*, the main export product was overexploited and that current fishing effort should be reduced[2]. Other stocks assessments surveys conducted since 1982 and from 2004 to 2007 using the oceanographic vessel Fridtjoff Nansen show an overexploitation of the costal resource [9,10,11]. The only way of increasing fish production will rely on the exploitation of deep sea demersal resources where Sparids (Dentex sp), Ariommatideas (Ariomma.sp) are abundant but not included on actual landings statistics[14,15].

The Ministry of Livestocks, Fisheries and Animal industries is responsible for the fishery policy through licensing. However, there have been an increasing number of vessels. No closed season has been decided yet. Economic objectives of the fisheries have never been considered. No notable economic regulation such as buy-back programme, tax regulation, restriction of fishing capital or fishing effort in trawl fishery has been put in place. Since the early nineties (1920), the management technique include mesh size regulation and licensing. The fishery law has been reviewed to replace the 1982 law in 1994, which has also been reviewed to include additional management tools such as BRDs and TEDs (By catch reducing devices) and Turtle excludes Devices in the shrimp trawl fishery.

For law enforcement, the creation of Monitoring Control and Surveillance body in the Department of fisheries and Aquaculture is very recent and effective since 2005 and the equipment is coming gradually. Since 1920, the data collection system is the same. Formerly, landings data from vessels were collected at Douala, and very recently at Tiko or Kribi ports, based only on the declaration of captains, which is not enough monitor fishing operations and thus stock assessment using catch and effort data. Declared statistics have shown a sharp drop on landings from 10 000 tons to less than 3200 t when actually the number of vessels is almost the same. This situation contrasts with the results of an investigation conducted in 2007 on board of time-charter vessels at Limbe, where estimates with the 64 boats give 87 tons of shrimps/month and 1044 tons of shrimps per year and 10067 tons of fish (mainly, croakers, and soles) based on 839 tons of fish/month.

Even though, there have been some scarce sea patrols at Douala, it is under the South West Development Authority (SOWEDA) project in 2007 that there has been a regular scheme of sea patrols to control and protect the three mile area allocated to small scale fishermen. Cameroon also experienced scientific observers from 2004 to 2006 within the framework of a FAO project, *"Reduction of the environmental impact of shrimp trawl fishing through the introduction of by-catch reducing devices and change of management strategies"*, limited to shrimp trawlers. In 2009, a trial of scientific observers was also conducted on trawlers during one month; three scientific observers monitored 3 couple of Chinese boats. 45 hauls over 22 fishing days were registered; 4hours for a haul and 4 hours for fish selection, out of 125 tons of fish selected for trade, 46 tons were juveniles of by-catches.

A study under the REBYC project was conducted in 2007 to evaluate economic and financial performances of the trawl fishery came up with the following results: the fuel and lubricant represent 69 % of total costs. This dramatic situation is confirmed by the *ROI, -0. 2%* and the NP/TE ratio, *– 0. 09* showing that the local industry is operating at loss, since the returns for each 100 CFAF invested are negative. This situation has led to the increase of the fish price 1 270 CFAF on average, ie 2.54 US $, when actually, the poverty line is *1 US $ per day*, meaning that the cost of the industrial fishing is too high for the society, the middleman[16]. As a result, in 2006, the President of the Republic signed an ordinance to cancel VAT on imported fish products among others and due to economic importance and high value of the target species, depressed catch rates and economic returns are experienced which necessitates the need for effective management. A study to establish a plan against illegal and unreported fishing (IUU) has been conducted in 2008 and not yet fully implemented.

In the rationale for the efficient and cost effective management objective, it is explained that if a fishery is to be exploited in an economically efficient manner, then the administration of fisheries management must also be undertaken in a cost effective manner. For all the administrative functions that are undertaken- licensing, surveillance, logbook collections or general administration- the amounts spent should provide, at the margin, benefits which at least match the costs of undertaking the activity. Furthermore, an equivalent amount spent on a different management function should not yield a greater benefit. These are general principles which underlie the efficient allocation of inputs to any economic activity[6].

Objectives of the study:
The overall objective of this paper is to contribute to sustainable management of fish resources in Cameroon. Specifically, the aim of this paper is: to evaluate the current management tools in use or expected in the fishery and the consistency with the fishery policy.

Methodology
To achieve the objective of the study, we examine the industrial fishing sector, the actual strengths, weaknesses, opportunities and constraints of the fishery policy and current management strategies and instruments. An estimate of the costs and benefits/advantages of each management instrument strategy separately is conducted. While cost of the Control and VMS are based on actual facts, estimates for running an observer programme are based on the two experiences mentioned. All the costs are projected on a ten years period.

II Description of the marine industrial fishery sector;
The coast line of 402 km length is the core of intense fishing activities for a production estimated at 72 200 m tons, 9700 mt for the industrial fishery and 63 000 mt for the small scale fishery in the early 2000. Both industrial and artisanal fisheries exploit almost the same fishing grounds, where the dominant species are the sciaenid community of Longhurst. These common fishing grounds are at the center of conflicts between the two groups. Even though, Cameroon fish production comes from the marine artisanal and industrial fishery; the continental or inland water bodies (lakes and rivers), this paper will focus on the marine industrial sector only.

II.1Type of vessels, fishing gears and techniques:
Two kinds of vessels are encountered: the shrimpers targeting shrimps and trawlers for fishes. All of them are bottom trawlers. Even though the law makes a difference according to the cod end mesh size (56mm for shrimpers and 70mm for trawlers), fishing grounds are the same, which contributes in the catch of juveniles and a huge amount of by-catch and discards. Most of the vessels are 10 to 20 years old. Three kinds of nets or techniques are encountered: a single trawl is pulled by a vessel; beam trawler with one or pair trawl by side, mainly for shrimpers and trawlers[18]. The pair trawling, where two boats pull one net, introduced in the late 1995'by Chinese operators. From the 1970s to date, the fishery operates through constant change of strategy with an average of 38 shrimpers for a production of 882 mt of shrimps; 11 trawlers and a production of 11 291 m.tons.

II.2 Landings:
From the sixties to the early 2000's all landings were registered at Douala port. According to the fishery law, three days ahead, the manager of the company declares arrival of the boat at the port to enable fish quality inspection and size control during the landing by the veterinary and fishery services. Whole sellers bring their isotherm trucks to load the fish to their stores. A control of the captain logbook is organized to check the fishing grounds, the coordinates and the duration of the sea trip. Most of vessels operate in the so called *bare boat charter system* where landings are barely declared, which contributes to a bias on statistical data and a lost in foreign earnings. In 2007, during the installation of 35 beacons on those vessels at limbe, for the VMS, the control of captain logbooks for 32 fishing days resulted on a catch of 15.4t of *Penaeus Monodon* (7700 two kg boxes); 11238 boxes of *Penaeus notialis* (224.t) and 4829 boxes of *Parapenoepsis longirostris* (10 tons). When it comes to the 64 boats operating on bare boat charter, it gives 87 tons of shrimps/month and 1044 tons of shrimps per year and 10067 tons of fish (mainly, croakers, and soles) based on 839 tons of fish/month. The losses well known as Illegal, Unreported and Unregulated, (IUU) fishing in terms of production and export taxes are estimated at 6,2 billion

per year for shrimps and 20 million CFAF for fish approximately 12 400 000 U$ for shrimps and 40000 U$ for fish.

II.3 Fishing grounds and operations

Seven fishing grounds along the coast are established: in the north part, the Rio del Rey; Bibundi bay; Ambas bay. In the South, is the campo river mouth and in between, three rivers are encountered the river Cameroon, Sanaga and Nyong. (Fig1). The average number of fishing days is 30 for shrimpers and 22 for trawlers. The hauling time is 3 hours average and one hour for deck operations for selection and fish processing. On average, shrimpers and trawlers operate 5 to 6 hauls per day while the Chinese boats operate two to three hauls a day. Fishing vessels operate mostly along the shallow waters which result in a huge amount of by-catches and juveniles which contribute to impoverish the productivity of fish stocks. Due to poor Control and surveillance system, these vessels can cross the three miles area settled as border with the small scale fishery leading to the destruction of fishing gears of the latter. All the vessels are equipped with freezing tunnels.

III. CURRENT MANAGEMENT STRATEGIES OF THE FISHERY IN CAMEROON

Management strategies depend on one or many regulations which should be enforced to be effective. Measures for Management and conservation of fish resources are included in the fishery law. The broad objectives of fisheries management may include the conservation of fisheries resources and their environment, the maximization of economic returns from the fishery, and payment of fees to the community from profits made by the exploitation of a public resource. As fisheries management must often address social, political, legal, economic and biological factors, the overall objectives of fisheries management will almost always involve compromise. In Wallis and Flaaten (2000) and Arnason, Hannesson and Schrank (2000), there are three main categories of fisheries management services identified: *Research* (surveys, data analysis, and stock assessment); *management services* involved in adjusting management settings within an existing management system; recommending amendments or additions to the existing management system and administering the management system (monitoring fishing licenses and catch returns); - *enforcement services* involve surveillance of compliance with fisheries law, both at sea or on land (checking of catch, by-catch, licenses, fishing gears), prosecution of those not complying with fisheries laws[6]. The outcome of fisheries research and stock assessment should be to provide advice to fisheries managers in the form of probable biological, economical and environmental outcomes for a range of possible management strategies. The Ministry of livestocks is in charge of fisheries management, law enforcement while the research is broadly handled at the ministry of Scientific research and Innovation (MINRESI).

III.1 Fishery law and regulations:

Fisheries regulations are imposed on a fishery to support a strategy designed to achieve predefined objectives since any single management strategy measure will produce the desired results and a combination of several regulations may be needed. In Cameroon, the laws are specified into decrees and regulations to define the access conditions to the fishery**.** The *law n° 94/01 of 20th January 1994 to lay down forest, fauna and fishery regime* is the main law. Any applicant, national or foreigner should get the approval from the office of Prime Minister, before any license application. The other conditions are: - setting a transceiver on board the vessel; setting a By-catch reducing device (BRD) and TED (Turtle Excluder Device) or *escape windows* for shrimp trawlers, introduced in the new law and yet to be promulgated. The payment of License fee (= GRT x 10 000 CFAF for shrimp trawlers and GRT x 5000 CFAF for fish trawler) is compulsory for the vessels. The small scale fishery permit is 3000 CFAF/year and 50 000 CFAF for semi-industrial fishery. Vessels more than 250 GRT are not allowed in the fishery (Limitation of efficiency and type of fishing gears).

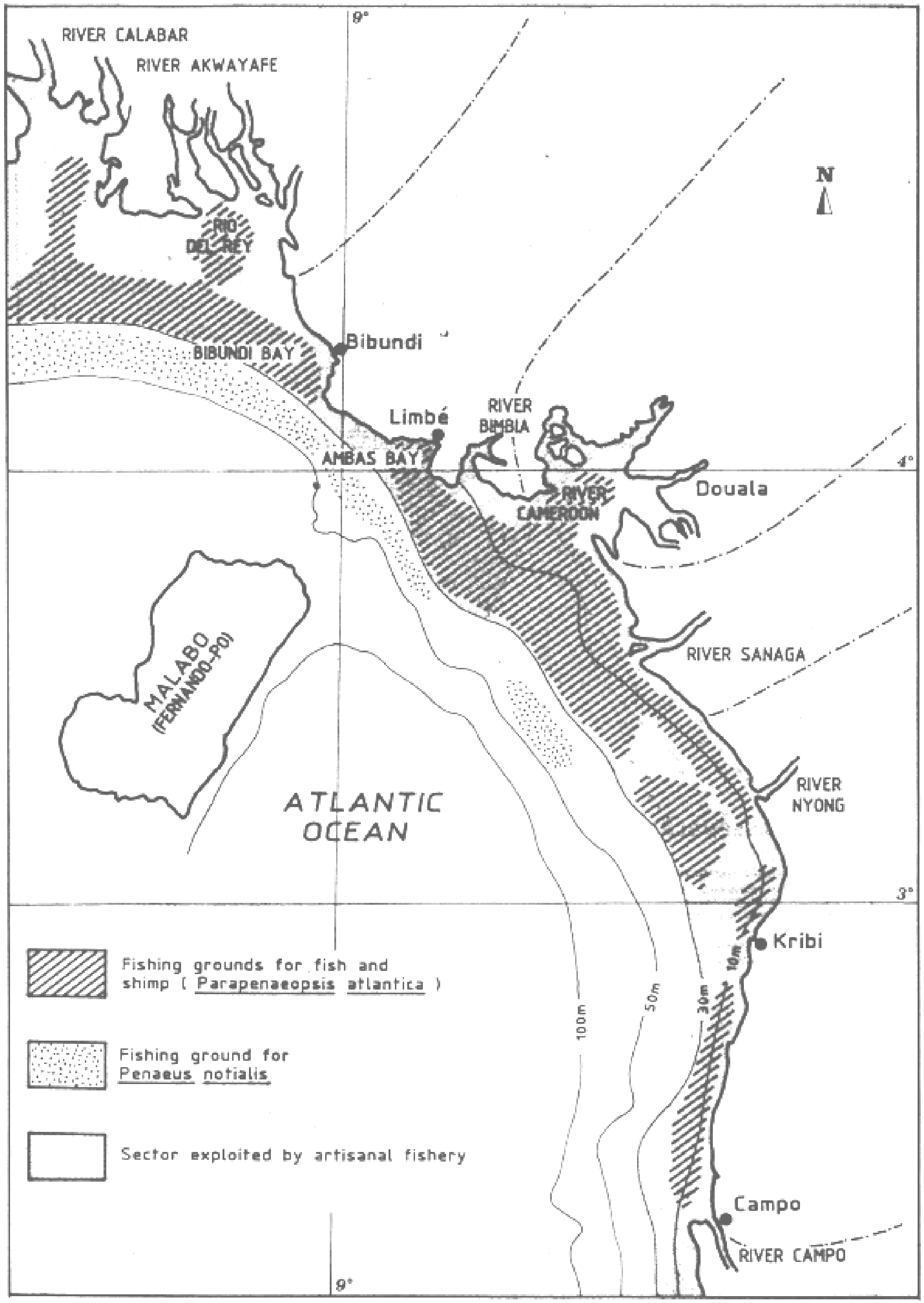


Figure 1: Map of marine main fishing grounds in Cameroon

Present state of development and exploitation of the fishery

III.1.1 Limitations on catches or output controls (restrictions to total catch**)**
Only one regulation has focused on total catch: *Arretee n 0002/MINEPIA of 01 August 2001 to set up protection of fish resources*. This regulation has five main chapters: chapter I relates to the

protection of sensitive habitats (nurseries and refuges for fishes) protection spawning females; chapter two introduces a biological rest, but in fortunately the period and the areas have not been defined. Chapter five of this regulation gives minimal size and weight for some target species *(Sardinella sp; Pseudoolithus sp; Cynoglossus sp and Penaues notialis.* Catch quotas*:* used to reduce the level of resource exploitation to a reference predetermined level as MEY have not been implemented yet. Trawling is forbidden within the three mile area; the use of scpahandras; the use of explosives or chemicals, poison or electric power or lights, guns or automatic traps; development of barrages; toxic material, agricultural, domestic or industrial pollutants…there is also a list of protected species.

III. 1.2 Input controls: (regulations to reduce or contain effective fishing effort)
The regulations dealing with those aspects include: *-law n° 94/01 of 20th January 1994 to lay down forest, fauna and fishery regime*; *-Decree n° 95/413 /PM of 20 June 1995 to set up enforcement of fish regime;-Decree n° 75/528 of 16 July 1975 to determine exploitation of motorised fishing vessels in Cameroon*; *-Arretee n° 0025/MINEPIA/DIRPEC/SPI forbidding the fishing technique of pair trawling 'Chalut-boeuf';(gear restriction);-Arretee n° 0021/MINEPIA of 11 April 2002 to set up inspection of industrial fishing vessels, Scientific observations and Surveillance of fishing Activities;*
-Decision n° 024/MINEPIA of 15 February 2006 to set up Satellite Surveillance of fishing vessels.

III.1.3 Closures and Marine protected areas:
The marine protected areas include the 3 nautical miles area forbidden for trawling as well as the rivers mouths and estuaries. The marine protected areas are counted from the lowest sea level, at 3 nautical miles from the coast and in bights and gulfs as follows:
-*Rade of the river Akpwa Yafe*: strait line from Bakassi point to Hanley point, and from that point to Sandy point, up to the East point;- *Rio del Rey embouchure* : strait line from Bakassi cape to Betika point: -*Bibundi bight*: strait line from Madale to Debundscha cape;-*Ambas bight*: strait line from Limboh cape to South of Ambas island, than from that point to Nachtigal cape;- *Bight of Navire de Guerre*: strait line from Nachtigal cape to Bimbia cape;-*Bimbia embouchure*: strait from Bimbia cape to the intersection of the coast with international meridian: 9 º 21' 40'' East. -*Cameroon estuary*; strait line from the line defined below up to Souellaba point.
Four other areas are declared marine protected areas: -the Douala-Edea faunal reserve which includes a subtidal component including Lake Ossa at the mouth of Sanaga River (World bank, 1993; Robinson and De Graaf, 1992; IUCN/UNEP (1987); both cited in IUCN, 1995); -the Campo faunal reserve is protected, including protection of marine turtles; -Cameroon estuary mangrove area (Tiko-Douala area); -Bakassi peninsula mangrove area[3]. Some provisions are also made against poisonous devices and dynamite. Additional regulations have been signed related to mesh size and very recently. The fishery operates the whole year. A biological rest period of three months (closure) is expected from January to March but has not been implemented.

III. 2 ENFORCEMENT OF REGULATIONS AND MCS ORGANISATION

III. 2. 1 The Institutional framework
The institutional framework for law enforcement on fisheries is defined in the Decree n 2005/152 0f 04 May 2005 organising the Ministry of Livestocks, Fisheries and Animal Industries. According to the law 94, agents of the Ministry of Livestocks, Fisheries and

Animal Industries who have swore in, are surveillance agents in charge of research and routine investigations in terms of fishing activities. The difficulties involved in managing a Cameroon fisheries resource are related to the number and types of user groups and the distribution and mobility of the fish stock. Three main groups are involved in the exploitation: the industrial fishery with almost 71 vessels; the semi-industrial fishermen with 100 canoes and the bigger group of small scale fishermen 24 435 using 7335 canoes. Resource allocation problems also exist where exploited species are distributed over the 402 km of coastline with other countries around, Gabon, Nigeria, and Equatorial Guinea.

The MCS activities were implemented at two different levels derived from the organization chart of the Ministry of Livestocks, Fisheries and Animal industries, in Central services for the design and implementation in the field with chiefs of fishing control posts, Divisional heads of fisheries sections and Heads of regional fisheries services, Regional and Divisional delegates operated as administrators. Their activity consisted in the control of fishing techniques, gears, fish quality and collection of fishing taxes and fees, forwarding licenses and fishing permits applications according to the fishery law. In that organization, there was not a specific body in charge of MCS. In the new organization chart of the ministry, the MCS *Brigade is a sub-department in the Department of Fisheries and Aquaculture in charge of Monitoring, Control and surveillance, following the Decree 2005/152 of 4 may 2005*. The brigade is in charge of the followings: - Control and Surveillance of fishing activities; - Control of the respect of fishing regulations; Surveillance of fishing grounds and biological rest periods; -organization and monitoring of the protection of fish resources; control of gears and fishing techniques, commercial size of target species; follow up of landings of fish products from authorized fishing units.

The Human resources involved in MCS include all the regional delegates and their collaborators. The Brigade is located at the central services in Yaoundé, under the Director of Fisheries and Aquaculture; the Minister; the General secretariat; two Technical advisers; General Inspector and two Inspectors. At regional level, 10 regions as a whole, the Brigade can operate with Regional delegates; Sub-divisional delegates (580) and divisional delegates and their collaborators (Regional heads of Fisheries; Controllers and heads of Fishing Control and breeding centers) in the country. These structures can undertake MCS activities and report to the Department via the Minister. This cumbersome structure constitutes one of the main weaknesses of Cameroon MCS and has been criticized for its functionality.

The MCS include three components: the marine and inland waters patrols; the Vessel Monitoring System (VMS) and the scientific observer programme. Marine and Inland patrols are either by Surveillance team conducted by the Brigade using the patrol boat at sea, while heads of fishing control posts, using fiber glasses canoes perform patrols at sea to control the three nautical mile or the lakes and rivers. The VMS is conducted at two stations, Yaoundé at the Headquarters and at Douala, with the Argos system. Fines are given to default fishermen and paid either at each fishing control post or the Head quarters, but the reports are sent to the Department of Fisheries and the Brigade via the Minister.

III. 2. 2 The marine and inland patrols:

The marine patrols will be conducted by the Brigade team composed with military gun men and agents of the ministry of livestocks. The patrol boat can move from Douala to Limbe or to Campo. This is because there is only one patrol boat and one team.

III. 2.2.1Equipments and cost of implementation (Control and Surveillance)

Since its creation in 2005, the MCS have acquired some materials: one patrol boat 6m LOA propelled with two out boards 85 HP engines (60 million CFAF); 10 fiber glasses canoes propelled with 25 hp engines along the coast (Littoral region and South-West), for a cost of 30 million CFAF (90 million CFAF). There is a need to continue acquisition of those canoes for the inland lakes and rivers and the south Region.

It is expected that the patrol boat will perform two outings per week; 4 per month and 48 per year for a total cost of 20 million CFAF per year. while for canoes, In 2007, the SOWEDA surveillance scheme, organized 62 outings at sea, 12 surveillance outings per month, meaning 4 per station for a cost of 792 000 CFAF, for almost 334 sailing hours, fuel consumption 3000 liters, equivalent to 1 752 500 CFAF; 5 infringements notices were issued for a contribution of 2 000 000 CFAF, for fueling and other expenditures (risk allowance, salaries of night watchmen, salaries of boat driver and assistant, feeding at sea, maintenance and overhauling the engine) cost 1500 000 CFAF, give 22 500 000 CFAF for three boats. The other stations are Tiko; Kangue; Cap Cameroon; Manoka; Youpwe; Tonde; Yoyo; Mbiako; Londji Kribi and Campo, equipped with canoes and 40 hp engine.

III. 2.2.2 Expected incomes from low enforcement:

Some of the provisions of the 94 law can be charged as follows: for violation of articles 121-122/ (lack of fishing license or permit), 131-132/ (lack of authorization for an aquaculture farm), and 139 (lack of respect of processing, transportation and storage norms); a fine of *50 000 CFAF* is charged*;*For the violation of articles 116 – 117/ (default of fishing license, permit or agreement), 125/ (default in declaration of catches), 127f/ (setting up dams, channels without authorization),g (pouring pollutants and toxic substances in water sheds), h/ (environment destruction within a distance of 50 m or a area of 100m), i/(use of non authorized fishing gears), l/ (introduction of live foreign fish resources), 129 (use of vessels of more than 250 GRT), 134/ (creation of fish plan without authorization), 137/(selling fish product without any veterinary sanitary inspection), a *fine of 200 000 CFAF* is charged or 20 days jail for against the defaulter.For the violation of articles 118/ (issuance of licenses for companies established in Cameroon only); 127 b)/ use of devices to reduce the mesh size; c), d)/ (carrying guns on board a vessel or scaphandrous) k) / (fraudulent exports of fish products), the fine will *be 1 million*.The *fine will be 3 million the defaulter locked for one year for the violation* of article 127 a)/ (use of dragging gears or trawlers within the three nautical mile area, j/ (carrying dangerous substances or destroying gears), m)/ catching unauthorized fish species (dolphins…). The fine will be *10 million CFAF* or the defaulter locked between 1 to three years in case of use of fake documents. For a foreign vessel, the fine is 100 million CFAF, associated with the seizure of the catch and fishing gears. All those fines from article 154 to 160 are implemented together with the collection of fraudulent gears or material used to commit the offense, including damages and restoring the state of places. All delay on the payment of taxes is punished with an increase of the fine from 10 (three months delay) to 100 percent (12 months delay).

Based on the list of infringements below that can happen following the violation of some articles, if we assume each of these offenses to happen once a year, expected incomes from the fines will be (10 millions + 3 millions + 1 million + 200 000 CFAF + 50 000 CFAF) = *14 750 000 CFAF~29500 US $*. A vessel usually land almost 20 tons of fish, with average price around 1200 CFAF in 2008 = *24 000 000 CFAF~ 48 000 US $.*

II. 2. 3 The Vessel Monitoring System (VMS)

The vessel monitoring system provides agencies with accurate locations of fishing vessels equipped with beacons; at periodic time intervals (less than 30 minutes); the speed of the vessels which can help fisheries agencies to draw conclusions on activities of the vessel. Transmission of catch and effort data from the fishing vessel is also possible by the vessel operator. Prior to VMS, fisheries management agencies have had to rely on information provided by vessel operators, information which may not be reliable, since there are many reasons for the operators giving inaccurate information. Apart from the possibility of illegal fishing, location of successful fishing ground can be highly valuable commercial information[5]. The Argos system is the satellite communication used in Cameroon, connected to the ground station at Toulouse (CLS).

***III. 2.3.1 Cost of the Argos system and effectiveness*:**

After the pilot stage in 2006, each vessel applying for a license must pay for a transmitter, and the services. In 2007, all the vessels (71) paid their transmitters for a total cost of 88 750 000 CFAF ~177 500 US $. -Fees for services / vessel/ month: 75 000 CFAF x 71 x 12 = 63 900 000 CFAF for 2007 and 63 900 000 CFAF for 2008. The total services paid within two years: 127 800 000 CFAF and for ten year period, the total fees paid will be: 639 000 000 CFAF; installation fees; -Internet connections and computers for the reception are not included. The VMS can be effective for the restrictions on the MPA, due to some troubles in the Internet connection, the educational phase is still going on.

II. 2. 4 The scientific observers

Scientific observers are part of the monitoring in MCS, in terms of continuous requirement for the measurement of fishing effort characteristics and yield useful for fisheries management. They are required to collect resource data used in establishing stock distribution patterns, provide catch and effort statistics and biological information for stock assessment; examine the effects of gear types on exploited fish stocks, record the associated by-catch and discard rates, collect information on fleet fishing patterns and collect detailed production data. The observers' data set is now considered an important complement to research cruise data and port sampling data, because it provides a source of information by area, time and species not often covered by the latter group. Length, age, and catch per unit effort data, all collected by observers, are now used regularly in stock evaluation studies[5]. Monitoring such data is good sign of management. According to Beverton & Holt (1957), Ricker (1975) and Gulland (1969), data on catch and effort are useful and affordable information to determine abundance index measured as the catch per unit of effort (c.p.u.e). The main factors that can affect the c.p.u.e are the type of fishing gears and vessels, fishing grounds, and availability of fish. In the case of bottom trawling, several studies have established a linear relationship between engine power and c.p.u.e (Anon. 1976) and thus, the number of fishing days is a good proxy of the effort measure[17]. The observers do not have the legislative authority to enforce fishery regulations. Since information provided by vessel operators, may not be reliable, that there are many reasons for the operators giving inaccurate information, and that catch and effort data including by-catches, discards are useful for stock assessment and management, scientific observers programmes are today justified in the fishery sector as a whole.

II.2. 4. 1 Running the Programme:

The objective of the programme is to collect relevant data on board all the vessels on a daily basis. Scientific observers are embarked randomly on board vessel and stay up to the end of the sea trip and then disembarked. An observer cannot stay more two times on the same vessel. Following the law n^0 94/01 of 20th January 1994 to lay down Forest, Fauna and Fisheries regime and its subsequent regulations, the vessel owner applying for a fishing license should engage on honor to contribute to sustainable management of fish resources and thus embark scientific observers on its own.

Coordination of the programme :

The scientific observer programme is located at the Department of Fisheries and Aquaculture and its execution in the field will be handled by the Head of the brigade of Control and Surveillance of Fishing Activities in relationship with other partners (Sub-department of industrial and Artisanal fisheries; the head of the Oceanographic and fish research Centre of Limbe; Regional Delegates for Littoral, South and South West, and NGOs.

Human resources needs:

The observer programme aims at a full coverage of the activity, which means an observer per boat and per sea trip. In 2008, 71 boats were registered and taking into account cases of resign by some observers, at least 100 persons will be selected, among agents of the ministry working in the coastal area. The fishery agents (48) are not enough and there is a need to recruit some more agents (52).

Data collection, processing and analysis and sampling:

Data collected belong to the Ministry of Livestocks, Fisheries and Animal Industries/ Departement of Fisheries and Aquaculture (DPA). The data are used for various reasons including MCS or stock assessment. Analysis of data collected will be made using relevant models (Schaefer) or the NANSIS. In this last case, there is a need of setting the NANSIS on board commercial vessels like in Namibia. Data collection approach will be the same as under REBYC/FAO project, which consisted of a list of sheets: -By-catch; catch and catch composition; -Economic and financial performance of the vessels (Earnings, Running cost; Labor cost, financial duties and Investments); technical characteristics of trawls; technical characteristics for vessels; fleet census). At the end of a sea trip, a sample of discards is taken to the laboratory for fish identification; length frequencies of the species and biodiversity assessment. One bag of various species is collected per fishing ground. Fish identification and discards analysis may be conducted at the Regional delegation of livestocks at Douala or the Research center at Limbe. The flow and quantity of data collected will be analyzed using Excel or SPSS. Every year, a workshop to share results with the industry and NGOs or other partners is organized.

Salaries of the observers:

The duration of the sea trip varies from 15 to 21 days for trawlers and 30 to 45 days for shrimpers. The salary will be 50 000 CFAF per sea trip on board trawlers (due to the low value of fish products compared to shrimps) and 60 000 CFAF for shrimpers. These salaries are not paid directly by the vessel owner, but through a special account in order to receive full reports of the observer.

Profile of the scientific observer:

The scientific observer is an expert endowed with practical abilities and capacities and a strong background on fish biology; fishing techniques and operations; regulations; equipment and fishing gears, sailing and communication. Should have a university degree on natural science or be fishery technician. This background may be trained or strengthened during two to three weeks training or workshop.

III. 2.4. 2 Budget of the Programme:

Even though observers are to be paid by the industry, there is a need of additional funding to support the programme for the following expenditures: -Transport fees of the observer from the residence of the observer to the port; -Printing collection sheets and typing; - Insurance cost for the observers; -Medical care and fees in case of accident or illness of the observer; -Recruitment of personnel, production analysis and processing of information from the observers; -recruitment of 52 scientific observers (part time workers) ; -Follow up of embarking observers and telephone communications;-Organization of a two-three days workshop on presentation of observers results to the industry.

Expenditures

1-Transport fees for agents*:* for 12 months and 71 agents, it gives 24 days / year and by observer for a cost of 20 000 CFAF= 71x 20 000 FCFA x 12 = 17 040 000 CFAF;

2- Salary of the Secretariat: 60 000 CFAF/month x 12 = 720 000 CFAF;

3- Monthly follow up of the observers / DPA/BCSAP/SDPIA: 2 days per month x 12 = 330 000 x 12= 3 360 000 CFAF;

4-Ink for lazer printers and papers: 75 000 CFAF x 6 cartridges = 450 000 CFAF, 5 blocks of papers per month x 5000 CFAF x 12= 750 000 CFAF.

5- Observers kits 100 000 CFAF x 71 = 7100 000 CFAF

6-Workshop to present observers results and the state of fish resources: 10 000 000 CFAF.
Total Expenditures: 39 420 000 CFAF.
Entries:
1-Contributions from vessel owners:
15 trawlers X 50 000 CFAF / 12 = 9 000 000 CFAF/year;
56 Shrimpers: 56 shrimpers x 60 000 x 12 = 40 320 000 FCFA, 49 320 000 CFAF;
2/other potential contributions:-AMO (Support to working Master) - international Cooperation (FAO, USA…). - Organizing a benchmark test to recruit 52 scientific observers (part-time workers); 5000 CFAF per worker.
-Running the programme by the MINEPIA in 2010 will cost: 39 420 000 CFAF, while the contributions from vessel owners: 49 320 000 CFAF for a total of 88 740 000 CFAF ~ 177 480 US $ per year.

IV. The Fishery Policy and Contribution to the Economy

The Cameroonian fisheries policy is well documented Corsi et al., 1991; Kébé et al., 1993; Njock, 1997 observed that the fishery authorities in charge of the development and management of the sector favour, in general, multisectoral integration and community involvement[13]. The main objectives of the fisheries policy are to achieve animal protein self-sufficiency in fish production and therefore reduce imports which average 100000 mt per year since the 2000's; to improve upon livelihood conditions of fishing communities and to ensure the sustainability of the fisheries, including if necessary the renewal of the industrial fleet through the following strategies: (i) strengthening of institutional arrangements, including organisations, training, improvement of regulations; (ii) management of fisheries according to responsible fisheries principles, safety at sea and environment protection, (iii) funding of the fishery sector. In order to achieve the above mentioned objectives, the government through the Ministry of fisheries has to: -train fishermen and finance the construction of necessary infrastructures;-Make fishing material available; -facilitate progress in handling, processing, storage and marketing of the products of fisheries;-improve upon aquaculture fish production through the equipment of "fish farming stations" and making fingerlings available to fish farmers;-modernize the production systems; improvement of the institutional framework and incentives; and sustainable management of fish resources.

In 2002, the Ministry of Livestocks, Fisheries and Animal Industries as its counterpart formulated a three year midterm programme from 2003 to 2005 for an amount of 6,810,000,000 CFAF. The government established five institutions to support the fishery sector: the Fund for the Development of Maritime Artisanal Fishery (CDPM); the National Authority for the Development of Small Scale Fishery (MIDEPECAM), the Foumban Fishery Training Centre, the Limbe Fishery and Oceanographic Research

Station and the Industrial Fishery section which has been created in October 2006 at Douala University[1]. A school for nautical works is built at Limbe to be operational as from 2010.

IV.1 Strengths and Weaknesses

The Cameroon fishery as its counterparts in the Guinea Current Large Marine Ecosystem (GCLME) region, is suffering from various constraints such as the lack of management plan for different fishing grounds; poor statistic data collection and monitoring, control and surveillance body; relative poor human resources, poor aquaculture development[15].

IV.1.1 Strengths***:***
The policy objectives are the following: -Improving production systems; -Restructuring the institutional framework;-Improving incentives measures; -Sustainable management of natural

resources; these objectives aim at: -Poverty alleviation; Satisfying the increasing demand for animal protein; Ensuring the sustainability and performance of production systems by taking into account the rise of social and ecological hazards in many areas; Achieving integration to international and sub-regional markets through competitiveness so as to limit commercial deficits. In formulating policies, most objectives of government policies fall into one to five broad groups: -*Independence objectives* aimed at a satisfactory degree of political and economic autonomy; -*Economic efficiency* objectives are concerned with increasing the level of real national income and its growth rate over time; -*Resource conservation* objectives are concerned with pressuring the natural resource base in order to ensure long term efficiency and independence; ;-*Stability objectives* are concerned with abrupt and large changes in incomes, in the price and availability of domestically produced basic commodities and inputs, and in the consequent need for foreign exchange to buy essential inputs; -*Equity objectives* gear towards the fair distribution of income and wealth within the society[8]. These include also the distribution of income and assets among different types of fishermen within and between fishermen; the relative well-being of producers and consumers; the availability of employment opportunities.
A new organisation chart has been signed giving birth to the *Control and Surveillance of fishing Activities Brigade* and *Fish Processing and Fishing Techniques sub department* in the Department of Fisheries and Aquaculture. A new law with the introduction of the principles of the code of conduct of responsible fisheries has been reviewed and is about to be promulgated; - the bottom up approach used in the new fishery law and the planning of some projects should be underlined.

IV.1.2 Weaknesses:
Poverty alleviation weaknesses are a national concern. The policy instruments “means of a policy, action used to carry it out and the methods by which its objectives are achieved, don’t match with the objectives. - The new organisation chart of the Ministry has mixed fishing and aquaculture positions with stock breeding which will lead to conflicts and non specific interventions.- Incentive measures as stated cannot lead to sustainable management of natural resources; - Lack of clearly defined strategy for data collection in the fishery in the fishing sector; - For training of fishermen, there is no clear link between the centres and the Zootechnical Training Centre of Foumban; -No budget provision is made to maintain these training centres out of the HIPC Initiative.
- The time frame allocated to achieve these objectives is not defined as well as the institutions or services assigned are not defined or identified. Apart from some projects like ‘Reduction of Post-Harvest losses’ ice plants have been built in Kribi, Mouanko and Mbakaou, to be extended nationwide; the training of small scale fishermen in Douala and Limbe, most of the activities don’t clearly show the linkages among them to achieve

these objectives. None of the following policy aims, objectives of managing the fishery are well defined:
-1/*maximizing sustainable catches*: this is by estimating a MSY (maximum sustainable yield). 2/*maximizing economic yield (MEY*); particularly appropriate in strictly commercial fisheries where the major part of the catch of shrimp is exported. The advantage of maintaining a fishery at the level of MEY from a biological perspective is that fishing effort is generally lower than that required to maximize yield in weight. Because of this, fishing to secure MEY reduces the possibility of recruitment overfishing.
3/ fishing to biological reference points:
Management objectives are based on a recommended Total Allowable Catch (TAC), which can be framed in terms of biological reference points such as MSY, or economic reference points such as MEY. *4/maintaining minimum stock size; 5/ maintaining spawning stocks:*

The decline of many fisheries has been due to reduced recruitment caused by low levels of the spawning stock. Although many species show great resilience to reductions in stock levels, recruitment failure is the ultimate fate of all stock levels reduced below some minimum critical level.

6/ *Ecologically Sustainable development (ESD*), to include an ecosystem-based approach to fisheries management */ Adaptive management strategies / Risk assessment*/ *Technology creep*
Management targets based on fishing efforts, rather than on fishing mortality or catches, suffer from the fact that increases in efficiency will cause increases in effective effort even though apparent effort remains the same[12].

IV.2 Contribution of the fishery sector to the economy and food security
Fish production is estimated at 100,000 metric tons of which almost 80,000 tons from small scale fishery. The fishing industry employs more than 200 000 persons of which 65 000 directly and 135 000 indirectly. To close the gap between demand and supply, the country imports since the mid nineties almost 100 000 mt annually leading to a deficit to the fish products trade balance, estimated at 20 billion CFAF. The contribution to food security is estimated at 15 kg/capita/annum, 5.2% in percentage of primary sector and 1.7% of national GDP. However, the contribution of livestocks, fisheries and animal industries is wrongly evaluated due to lack of accurate data on production, consumption and prices. The main setbacks in the development of small scale continental and marine fishing are: -Difficult access and distance of the production areas an lack of conducive network for the distribution of fish products within the country; leading to heavy post harvest losses; -Poor production, equipment and conservation techniques; -Poor access to loans; -Lack of organisation among the fishermen; -Relative poor marine waters and various illegal fishing activities; -Poor aquaculture development[1].

IV. 3 Costs and benefits/Advantages of the Three Strategies and Discussion
The focus here is on management tools since for a comprehensive study, the cost of the exploitation should also be included. In terms of advantages, we limit to fines since the sustainability may also include the value of all the landings and trade and the increase of the catch both in size and weight as a result of good management.

If the sea outings by the surveillance patrol vessel and canoes; the vessel monitoring system and the scientific observers contribute to the management of fish resources, it is interesting to compare various costs/benefits or advantages related to each instruments to achieve the fishery conservation and management objectives or goals (Table 2). The table shows that using the three instruments on a yearly basis will cost roughly 121 830 000

CFAF ~ 243 660 US $, against 14 750 000 CFAF for fines (29500 US $) and almost 2 billion in the long run (10 years) ~ 4000 000 US $, against 147 500 000 CFAF of fines ~ 295 000 US $, meaning that the cost of management tools is 14 times, the expected incomes from fines. In the long run or a yearly basis, the VMS is the most expensive instrument 793 000 000 CFAF (1586000 US $) followed by the observers programme 600 200 000 CFAF (1200 400 US $) and the sea patrols in the actual stage.

In terms of benefits or advantages, the observer programme can satisfy several management needs: data collection of vessel operations; effective fishing effort; fishing grounds; number and duration of hauls; catch data, vessel positions …monitoring of other environmental factors such as climate, mammals, birds… and contribute to stock assessment and sustainable management. The observer programme is indicated in the case of Cameroon where most of the vessels coming from foreign countries don't or declare poorly their catches leading to heavy losses to the economy. The VMS is effective in terms of continuous tracking of vessel positions and thus the respect of protected areas and contribution to the conservation of nurseries and spawning areas usually targeted by defaulter vessels, one of the main objectives of fisheries management. This tool has a direct link with infringements to defaulters. Compared to the observer programme, the VMS is a limited instrument when it comes to data collection, while the former contribute poorly to the follow up of protected areas.

The sea patrols are the third costly instruments of fisheries management. The actual study does not include patrols conducted separately by the Navy or the Merchant marine. Due to the length of the coast (402 km), the actual equipment should also be completed by two more patrol boats to operate from Kribi to Campo and another to operate from Limbe to Bakassi, which will increase the cost of sea patrols. Another problem with the sea patrols is that they are not conducted during the night when most of the defaulters operate which reduces the efficiency of this instrument.

The building blocks of these management tools are the fishery law where the fines should be high enough to discourage poor behavior from vessels. Unfortunately, as demonstrated, expected fines for one year will generate only 14 750 000 CFAF (29 500 US $) when actually, the whole catch of a boat, 20 tons of fish is 24 000 000 CFAF (48 000 US $). The highest amount for a fine is 10 million CFAF (5 000 US $) for the use of fake documents, when actually the violation of the three mile area (protection of nurseries and spawning area) which is the most dangerous act against the sustainability of fish resources is just 3 million (6000 US $). This means, the intrusion of a vessel in search of a good catch in that area can be interesting since the fine is lower. In fact, in case of fake documents or fishing within the three mile area will lead both to the fine and the seizure of the whole catch. This latter aspect of law enforcement has never been used except for foreign vessels. This can be explained by poor implementation or understanding of the law.

Limitation of the number of fishing units has not been yet implemented (license limitation, as opposed to an open access system; the number of licenses issued is set at a level believed capable of imposing some predetermined level of fishing mortality or taking a total allowable catch. It is preferable from an economic view point, to have a smaller number of efficient fishing units than a larger number of inefficient ones[12].

Conclusion and Recommendations

Findings of the study indicate that current benefits/advantages from the management tools do not compensate the cost of their implementation neither on a yearly basis nor in the long run. This situation lasting since many decades shows that the management tools are yet to protect fish resources on a sustainable basis. While the VMS is a good tool for the protection of nurseries and spawning areas and thus a very good instrument for conservation measures, the observer programme is the best instrument in terms of fishing operations and data collection and thus a good instrument for stock assessment and advice to managers in terms of state of fish resources. The sea patrols will also contribute to the management in terms of enforcement but their efficiency is limited by the equipment, the coast length and their use in day time when actually most of defaulters operate during the night still covered by the observers and VMS. An efficient use of VMS and a good observer programme can be combined with a light programme of sea patrols. To compensate the cost of implementation and contribute to sustainable management of fish resources in Cameroon, the fishery law should be reviewed to increase the level of fines in such a way that, the occurrence of each of the penalties should reach at least the yearly costs. These economic aspects of the fishery should be monitored on a yearly basis and included in the fishery policy. The observer programme and VMS should be the main management tools while sea patrols will be focused on the three mile area. For a better implementation of the law, training should also be organized on MCS.

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Estimates of Costs and benefits/Advantages of the various management tools in Cameroon			
management strategy	**Cost items value in CFAF**		**Benefits/Advantages**
1/Vessel Monitoring System (VMS)	one year	10 years	
Beacon acquistion 71 once	88 750 000		Follow up of vessel positions using GPS
Services/month and year	63 900 000	639 000 000	Follow up of bounderies and fishing grounds
Computers 5 for 10 years	5000 000		Fines against defaulters
Internet supply for 10 years	1000 000	10 000 000	protection of sensitive areas (nurseries and spawning)
Human ressources involved 6 (salary)	14400 000	144 000 000	dissuasive effect on fishermen (day and nigth)
Total 1	**88 775 000**	**793 000000**	
2 /Sea Patrols			
patrol boat acquisition	70 000 000		
GPS/Radio VHF/Antenna/Camera...	5 000 000		Mainly daily operations
Fuel/year	10000000	100 000 000	Boat inspection
Outing per diems (96)for (5persons) per yea	8160000	81600 000	control of fishing grounds (river mouths and three mile
acquisition of 12 fiber glass canoes	48 000 000		fines against defaulters
acquisition of 12 engines 40 hp	48 000 000		protection of sensitive areas
Fuel/year	684 000	6 840 000	
Outing per diems (96)for 4persons per year	3840000	38 400 000	
Salaries	37 000 000	370 000 000	
Total 2	**22000000**	**586 840 000**	
3**/ Scientific observers programme**			
Transport fees for 71 observers	17040000	170 040 000	
Secretariat salary	720000	7200000	
Follow up of observers	3360 000	33 600000	Collection of all relevant fisheries data
Observer kit	7100 000		Stock assessment using various methods
Ink for printing and paper	690000	6900000	Sustainable management of fish ressources
Workshop to present observers results	10000000	100000000	Participation of the fishermen to the management
Observers perdiems	49320000	493000000	
Total 3	**77770000**	**607100000**	
Overall total	**121770000**	**1986940000**	

*Supplemental Figure 2: – Estimates of cost and benefits/advantages of the various management tools in Cameroon

Appendix 2

Observer Bill of Rights

List of Observer Rights:
In order to guarantee an experienced corps of observers, the following basic rights must be protected for all observer programs:

1. Observers have a right to a living wage, including but not limited to:
a) Health Insurance (Option for year-round coverage and consideration of a national pool to decrease cost).
b) Disability insurance.
c) Life Insurance.
d) 401-K retirement plan.
e) Paid vacations and holidays.
f) Counseling (peer as well as professional).
g) Personal and professional insurance.
h) Transferability of observer credit for purposes of financial compensation from one program to another.

2. Definition of "Observer work" for the purpose of compensation should include the following for each program:
a) Training.
b) Debriefing.
c) Deployment.
d) Stand-by time (including time between deployments and briefing/debriefing).
e) Step-based pay system that encourages experience and exceptional work.
f) Travel.
g) Searching for vessel.

3. Observers have the right to a safe working environment
a) Right of refusal to any vessel without repercussions.
b) No observer to be placed on a vessel that is considered unsafe.
c) Define the procedure for what to do if a vessel is considered unsafe (A national protocol should be developed; information of the vessel's safety should be provided to observers).
d) Increase minimum safety training standards for all programs and design training to be observer program-specific.
e) Establish better communications between Coast Guard and fisheries agencies.
f) Ensure reasonable accommodations and food.
g) Provide observers with vessel's past safety records via web access.

4. Observers have the right to be acknowledged for their contribution to science and resource management, encompassing the following:
a) Attendance at workshops.
b) Credit in publications and other literature.

5. Observers have the right to support from their program/agency

a) The program should develop support mechanisms for observers which cultivate a sense of belonging.
b) Each program needs to develop protocols to improve communication, understanding, and support for observers.
c) A grievance procedure should be established that encompasses the work performed by the contractor or government agency.

6. Additional goals suggested for observer programs:
a) Standardise data forms and species/gear codes nationally or internationally (e.g., electronic logbook program).
b) Creation of a clearinghouse on national/international level for certified observers who span various programs.
c) Establishment of an electronic forum devoted to observer issues.
d) Direct management staff (e.g., debriefers and trainers) should be required annually to serve at sea as observers, but not as a displacement for regular observers.

Notes:

1. Observer Bill of Rights presented at the 5th IFOMC, and reported in the 5th IFOMC Proceedings.

Appendix 3

List of Exhibitors

Disclaimer: Exhibitor company information in taken directly from the company or organizations website

Archipelago Marine Research Limited

Archipelago Marine Research Ltd. is a biological consulting firm that has provided fisheries and marine biological services to both public and private sector clients since 1978. Archipelago has built a strong reputation for dealing with multidisciplinary projects in an objective, professional manner. As a result, our clients have come to value our role in handling sensitive resource management issues.

Archipelago specializes in two key service areas:

- Near-shore habitat inventory, assessment, and environmental impact analysis
- Data collection programs in support of commercial fisheries management

Project experience includes work carried out along both coasts of North America, Australia, and New Zealand.

Archipelago maintains a staff of 175 employees, including Biologists, Technicians, Administrative and Information Technology staff, and Government-certified Observers for dockside and at-sea monitoring programs. These employees are located in the head office in Victoria, regional offices in Port Hardy and Prince Rupert, as well as in many other port locations throughout coastal British Columbia.

www.archipelago.ca

A.I.S. Incorporated

AIS is dedicated to the collection of accurate, complete, and reliable marine and ecological data. We supply observers for the collection of catch data on commercial fishing vessels; we also supply observers for deployment on scows and hopper dredges for monitoring endangered species, and we supply inspectors for the recording of disposal data on harbor and waterway dredging operations.

All of our observers and inspectors are fully trained and certified by appropriate government agencies such as, the National Marine Fisheries Service and/or the Army Corps of Engineers.

www.aisobservers.com

NOAA Fisheries Service

NOAA's National Marine Fisheries Service is the federal agency, a division of the Department of Commerce, responsible for the stewardship of the nation's living marine resources and their habitat. NOAA's National Marine Fisheries Service is responsible for the management, conservation and protection of living marine resources within the United States' Exclusive Economic Zone (water three to 200 mile offshore). Using the tools provided by the Magnuson-Stevens Act, NOAA's National Marine Fisheries Service assesses and predicts the status of fish stocks, ensures compliance with fisheries regulations and works to reduce wasteful fishing practices. Under the Marine Mammal Protection Act and the Endangered Species Act, NOAA's National Marine Fisheries Service recovers protected marine species (i.e. whales, turtles) without unnecessarily impeding economic and recreational opportunities. With the help of the six regional offices and eight councils, NOAA's National Marine Fisheries Service is able to work with communities on fishery management issues. NOAA's National Marine Fisheries Service works to promote sustainable fisheries and to prevent lost economic potential associated with overfishing, declining species and degraded habitats. NOAA's National Marine Fisheries Service strives to balance competing public needs.

www.nmfs.noaa.gov

IAP World Wide Services

IAP is a leading provider of support services to the U.S. Department of Defense, other federal customers, commercial industry and state and foreign governments. Integrating capabilities throughout our global operations allows us to provide superior, customized and cost-effective solutions for our customers.

IAP specializes in responding to the new types of complex emergencies our world increasingly encounters today. We build and operate remote base camps, provide air traffic control services and generate power for military operations. We provide around-the-clock maintenance services to keep military bases running smoothly. And we help the U.S. government supply urgently-needed disaster relief supplies to civilians.

For all these services, IAP has a track record of achieving mission success for our customers. Our Business Operating System (BOS) – a proprietary Web-based management tool – has made IAP a recognized leader in administering contracts with proven efficiency, transparency and budget discipline.

www.iapws.com

Lat 37

Lat 37 operates from the beautiful Bay of Plenty in the North Island of New Zealand.

Simon Anderson is the principal operator of Lat 37 and has a long history in fisheries data collection. He spent more than 10 years with the NZ Ministry of Fisheries as a Fisheries Observer and since 1999 has been working as a fisheries research provider to several New Zealand Government agencies and fisheries stakeholder groups.

During 2001, while under contract to the New Zealand Rock Lobster Industry Council (NZRLIC), Simon managed the successful conversion from a paper to an electronic data entry system, for use at sea. He took the project from initial conception to full implementation of the electronic system for rock lobster catch sampling and tag and release programmes.

It was due to the successful implementation of this system that Lat 37 was conceived. We wanted to offer natural resource solutions for electronic data collection in the field to other people and organisations through the experience we've accumulated.

Our aim is to provide a prompt, personal and cost effective service for clients working with electronic data collection in the field. We understand the environmental conditions and exposure that the equipment will be used in and are experienced in developing programmes with which your technicians and operators will quickly become proficient.

www.lat37.co.nz

OLFISH

OLRAC (Ocean and Land Resource Assessment Consultants) is the developer of Olfish.

OLRAC was founded in 1989 by Dr Amos Barkai and Dr Mike Bergh to provide support for the international fishing industry. Specialty to assist with the assessment and management of living marine resources. OLRAC consults to most of the major fishing groups in South Africa and has in the past consulted extensively in Namibia.

At a time that international fisheries management is becoming increasingly dominated by complex numerical arguments and a very conservative tendency, OLRAC provides the fishing industry with the opportunity to communicate with management agencies on an equal technical footing, ensuring that decisions embody the principles of sustainability, scientific objectivity, political impartiality and economic pragmatism.

Although OLRAC's business is based on state-of-the-art quantitative science, the economic and practical realities of fishing are also integrated into management recommendations. OLRAC is continuously involved in critical management issues across a broad spectrum of fish resources and other marine topics. These include demersal, pelagic and lobster fisheries, small-scale subsistence fisheries, research into near-shore shark dynamics, environmental impact assessments, fisheries policy issues and the development of new fisheries.

OLRAC specializes in the implementation of sophisticated quantitative tools in fisheries science and management using a highly critical and pragmatic approach.

In addition, OLRAC has rich experience in conducting logistically complex field operations involving large numbers of divers and vessels. IKRAC adheres to strict timetables and deadlines in accordance with the needs and realities of the fishing industry.

www.olfish.com

Juniper Systems

Juniper Systems, Inc. provides intuitive field computing solutions for rugged applications

High-quality rugged field computers are designed for use in harsh outdoor and industrial environments. Systems complete with hardware, software, and accessories are provided for land survey, natural resource, industrial, agriculture, and other rugged applications. HarvestMaster brand products provide on-combine seed research and electronic field note taking.

We design, test, manufacture, and market our products from our Juniper Systems' facility, allowing us to focus on quality and provide excellent support to our customers. Mobile data collection solutions and application expertise are enhanced through strong relationships with our business partners.

Our Juniper Systems' facility is located in Logan, Utah in the northern end of the state. We are lucky to have easy access to the beautiful sites and recreational opportunities shown above. In November of 2004 our dream of owning our own building became a reality. An addition to the building was finished in 2008, more than doubling the size of our facility. A visit here for a product demonstration or training will be well worth the trip.

We celebrated our fifteen-year anniversary in 2008, although our roots go back much further. Our parent company, Campbell Scientific, Inc., is known world-wide for its quality measurement instrumentation. If you are looking for a weather station, take a look at their web site: Campbell Scientific.

www.junipersys.com

NOAA Fisheries National Observer Program

The National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) deploys fishery observers to collect catch and bycatch data from US commercial fishing and processing vessels**.** Annually 42 different fisheries are monitored by observer programs logging over 60,000 observer days at sea. NOAA Fisheries has been using observers to collect fisheries data from 1972 to the present. Observers have monitored fishing activities on all US coasts, collecting data for a range of conservation and management issues.

NOAA Fisheries coordinates observer program management through its Office of Science and Technology/National Observer Program (NOP). The NOP seeks to support observer programs and increase their usefulness to the overall goals of NOAA Fisheries. Improvements in data collection, observer training, and the integration of observer data with other research are among the important issues that the NOP works to achieve on a national level.

The NOAA observer map builds upon information collected at previous IFOC. It displays information about coverage of the observer programs worldwide. The map is featured on the

NOAA, National Observer Program website. To update your information about the observer program in your country, please visit the US National Observer Program Website below.

www.st.nmfs.noaa.gov/st4/nop/

We are grateful for all of the exhibitors' support of the 6th IFOMC.

Appendix 4

Conference Evaluations

Below is a summary of the over 70 collected conference evaluations filled out after the 6th IFOMC. Please not that not all evaluations had all questions or all parts of questions completed.

	Ratings				
	5	**4**	**3**	**2**	**1**
Range of topics	39	31	4	0	0
Quality of speakers	27	42	4	0	0
Poster program	28	35	8	1	0
Trade exhibition	15	35	13	9	0
Social events	38	30	4	3	0
Catering	30	20	17	9	2
Venue facilities	36	20	15	1	0
Overall conference organisation	41	30	3	0	0
Value for money	33	30	9	1	0

Gender and ethnicity responses to the conference evaluation

Female: 25
Male: 41

Ethnic minority in the country being represented:

USA: 28
Canada: 8
Senegal: 3
Namibia: 3
New Zealand: 3
The Netherlands: 2
France: 2
United Kingdom 1

India: 1
Australia: 1
Indonesia: 1
Sweden: 1
China: 1
Cote d ‘Ivoire: 1
Bangladesh: 1
Falkland Islands: 1

Denmark: 1
Indonesia: 1
Argentina: 1
Turkey: 1
Morocco: 1
Venezuela: 1

Below are 6 random responses from the evaluations from each question that appeared on the conference evaluation form

1. **What did you enjoy most about the Conference?**

   - To understanding current situation on the implementation observer program in each country, including challenges and opportunities, that presented in the workshop and discussed with others participants as well.
   - Understanding the current situation on the implementation of observer programs in each country, including challenges and opportunities that presented in the workshop and discussed with other participants as well.
   - I thought the diversity of speakers and topics was great. I met many different people and learned a lot from very different programs. I also liked the common themes of keeping observers safe, trying to make progress in ways of to ease the burden of stringent data collection, and also advocating that observers are not a catch-all for all initiatives, namely enforcement as that becomes more and more of an issue.
   - Opportunities, formal and informal networking and learning about programs all over the world.
   - The breathe of more international delegates. The Moving Sushi images were wonderful, but difficult to see the connection between what they're doing and observer programs.
   - Meeting colleagues from around the world committed to quality data.

2. **Did you participate in a Work Group? Breakout session? Other? Please comment.**

   - Yes, I did, I enjoyed it so much since I can choose the subject group that would be my concern. For the future, need to develop more subjects and theme for breakout sessions, so there are more choices to participate in a variety of breakout groups.
   - I participated in the data extrapolation workshop which I thought was very well done, although the content was a bit beyond my realm of expertise.
   - Data Extrapolation Workshop was great!
   - Yes, the Data Extrapolation Workshop. I would have liked a more discrete outcome, but it was a start.
   - I interviewed during the Observer Professionalism working group. Enjoyed it, but wished I wouldn't have had to miss panels to attend.
   - Yes, the data extrapolation workshop was very interesting.

3. **Did the conference adequately address the vision statement?** ***To develop, promote and enhance effective fishery monitoring programs to ensure sustainable resource*** *management throughout the world's oceans.*

Yes 68

No 11

- Consider more participation from Asia and Africa. Politician and fishery manager presence at the conference is a must.
- During the deliberations I really had and overview on how one has to address issues related to sound sustainable resources management, enforcement related matters, and way of science approach throughout the world's oceans (to a certain extent).
- It would be great to hear less about North American programs and more about some well established places around the world.
- To gain MSY in the world's oceans, more stock assessment and extrapolation is necessary to conserve the aquatic resources and management.
- Cannot assess sustainability without adequate monitoring, and without an emphasis on good quality data.
- Promote? Yes. Development and Enhance? Not that I could see.

4. **Did the conference adequately address the mission statement?** ***To improve fishery monitoring programs worldwide through sharing of practices and development of new methods of data collection and analysis. To provide a forum for dialog between those responsible for monitoring fisheries and those who rely upon the data they collect.***

Yes 64

No 5

- Yes, to provide a forum for dialog between those responsible for monitoring fisheries.
- No. I think the conference would benefit from wider participation by fishing industry representatives. I was one of the three or four industry folks at the conference and found that level of participation to be quite meager and insufficient.
- Yes, very much so, I enjoyed hearing about observer programs from other continents.
- Yes, I felt that there was a good range of topics and that most panel sessions had a good range of different perspectives.
- Yes, good job in creating a dialog amongst those responsible for monitoring; there is a need to better engage with those that rely on the data… fishermen.
- No, again we have to work more time on specific matters and not just speak about his in a multitude of speakers. So, we have to reduce the number of speakers

5. **Is there anything we could improve?**

    - I hope more academic topics will be presented at the next conference. For example, topics about how to design sampling, strategy, optimum sample size, and spatial and temporal scale sample

    - Posters, Organize them by theme so that they are easier to find

    - Maybe, screen for content for NGOs. Pew video somewhat inflammatory- not good for effective communication.

    - Food variety was very limited to seafood and vegetarian options. Would have liked to see chicken/ beef dishes.

    - Would have preferred more focused sessions perhaps with fewer speakers to allow more detailed exploration of specific issues. >70 speakers in a 4 day period does not allow time for discussion. Felt a little like a massive data dump. However, appreciate that many prefer this way.

    - Food- not enough choice@ breakfast and lunch. Poster session more- fund more observers.

6. **Any other topics/program elements you would find valuable at future Conferences?**

- Workshops talking about how to scientifically use observer data, how to develop database for storing observed data will meet much interests.

- I would like to see opportunities to exchange/ standardize training methodologies/possible curricula among different countries.

- People not overly confident to speak at the microphone in front of such a huge audience. Conference is excellent. Very useful. Most presentations were very informative but some presenters overlapped on same material and info was not different. I hope more academic topics will be presented at the next conference. For example, topics about how to design sampling strategy, optimum sample size, and spatial and temporal scale of sample.

- There are probably many groups working to develop similar technologies and I would've liked more detailed discussions about technologies such as: Video, database design and data management, data base confidentiality and dissemination, and catch estimation techniques.

- Social studies on fishers by observer programs.

- Electronic reporting and observer monitoring on recreational for-hire vessels is an emerging topic with some new challenges to address.

7. This conference is currently held biennially, should it be held more or less frequently?

- Ok.
- Its fine.
- If you offer the conference too often, you will dilute the impact.
- I feel that there should 2-2.5 years between conferences.
- Frequency is fine.
- Biennially is good.

8. Other comments:

- Maybe it would be important to have simultaneous translation that would improve participation of interested people.
- I enjoyed it a lot.
- Idea for prizes- to encourage questions from various groups, there could be a lottery for people who ask questions or participate. The conference is still pricey- discourages developing world participation.
- Strengthen competence in surveillance and control and create a pool of observers on maritime African Coast, which appears to be vulnerable.
- The international element of the conference is invaluable and inspiring. Hope we can continue to get more countries and strong participation outside- the U.S and Canada.
- I enjoyed the conference and glad that I attended.

Tell us about yourself:

(This question allowed for multiple selections by evaluators, the total number of responses is over the total evaluation forms filled out.

9. What is your current involvement in the fisheries observer profession (check all that apply):

Fisheries observer
4
User of observer data (eg. Fisheries manager, scientific analyst, NGO member)
20
Shore-based member of an observer provider/contracting company
8
Fisherman/fisherwoman or fishing industry representative
1
Staff of a governing body
22
Other:
17

Appendix 5

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Appendix 6

Commonly Used Abbreviations

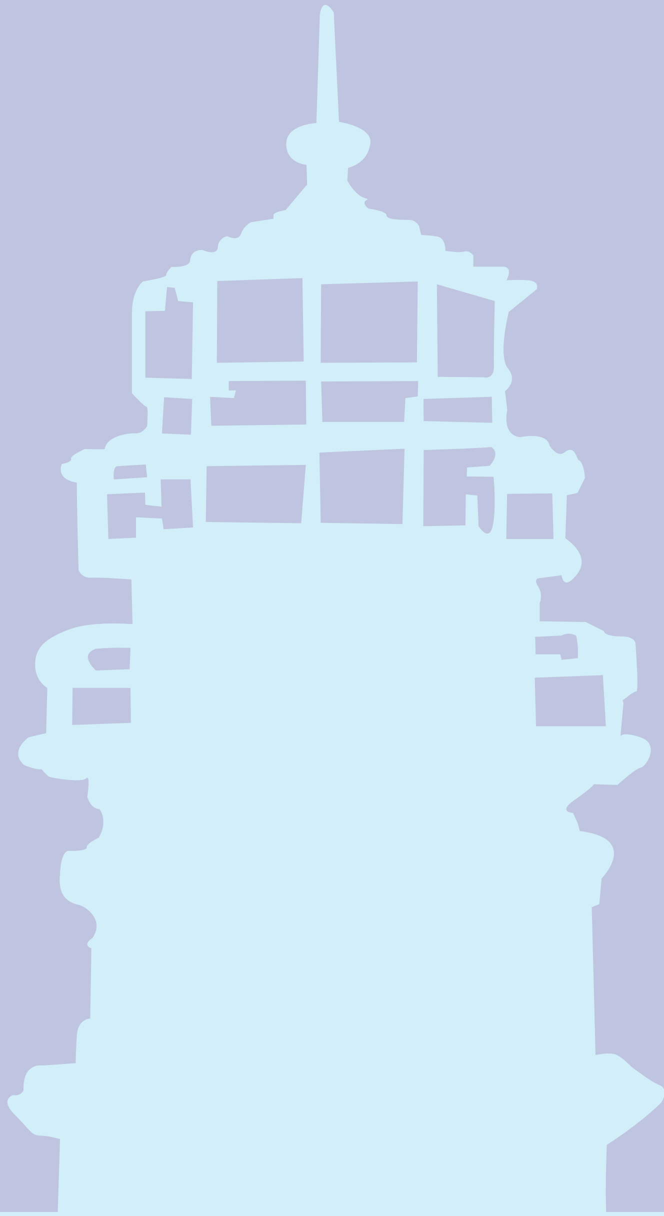
AA	Aves Argentinas
ABARE	Australian Bureau of Agricultural and Resource Economics
ACL	Annual Catch Limit
ACP	African, Caribbean and Pacific Group of States
ADFG	Alaska Department of Fish & Game
AFA	*American Fisheries Act*
AFMA	Australian Fisheries Management Authority
AFSC	Alaska Fisheries Science Center
AHP	Analytic Hierarchy Process
AIC	Akaike Information Criteria
AIDCP	Agreement on the International Dolphin Conservation Program
AMR	Archipelago Marine Research Ltd.
AMSEA	Alaska Marine Safety Education Association
APO	Association for Professional Observers
ASHOP	At-Sea Hake Observer Program
ASOP	American Samoa Observer Program
ASOP	At-sea observer program
BC	British Columbia
BRTs	By-catch Reduction Technologies
BSAI	Bering Sea / Aleutian Islands
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CCCHFA	Cape Cod Commercial Hook Fishermen's Association
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CECAF	Committee for the Eastern Central Atlantic
CENDEPESCA	Centro de Desarrollo de la Pesca y la Aculcultura (El Salvador)
CFP	Common Fisheries Policy
CFVS	Commercial Fishing Vessel Safety
CI	Confidence Interval
CIDA	Canadian International Development Agency
CoML	Census of Marine Life
CPUE	Catch Per Unit Effort
CSIRO	Commonwealth Scientific & Industrial Research Organisation (Australia)
CSP	Conservation Services Programme
CV	Coefficient of Variation
DAS	Days-at-Sea
DCR	Data Collection Regulation
DFO	(Department of) Fisheries & Oceans Canada
DINARA	Área de Recursos Pelágicos of the Dirección Nacional de Recursos Acuáticos (Uruguay)
DMS	Data Management Systems
DoFi	Department of Fisheries (Vietnam)
DWLLF	Distant water long-line fleet
EA	Ecosystems Approach
EA	Environmental Assessment
EAF	Ecosystem Approach in Fishing
EBM	Ecosystem-based management
EEZ	Exclusive Economic Zone
EIS	Environmental Impact Statement

EIS	Enterprise Information System
ELB	Electronic Logbook
E-Logs	Electronic Fishing Logbooks
EM	Electronic Monitoring
EMS	Electronic Monitoring System
ENGO	Environmental Non-Governmental Organisation
EPIRBs	Emergency Position Indicating Radio Beacon
EPO	Eastern Pacific Ocean
EU	European Union
EVTR	Electronic Vessel Trip Report
FAD	Fishery Attraction Device
FAO	Food and Agriculture Organisation
FERF	Fishery Enhancement and Research Foundation
FFA	Forum Fisheries Agency
FFDA’s	Fish Farmer’s Development Agencies
FIMP	Fisheries Information Management Program
FIT	Fisheries Interaction Team
FLDRS	Fisheries Logbook Data Recording Software
FMA	Fisheries Monitoring and Analysis (AFSC)
FMP	Fisheries Management Plan
FOS	Fisheries Operating System
FoS	Friend of the Sea
FPN	Fundación Patagonia Natural
FRS	Fisheries Research Services
ft	Feet
FVSA	Fundación Vida Silvestre Argentina
GCEL	NOAA Office of General Counsel for Law Enforcement
GCMD	Global Change Master Directory
GDP	Gross Domestic Product
GIS	Geographic Information System
GloBAL	Global By-catch Assessment of Long-lived Species
GPS	Global Positioning System
H&G	head and gut
HCE	Humboldt Current Ecosystem
HTB	High-opening trawl
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tuna
ICES	International Council for the Exploration of the Sea
ICZM	Integrated Coastal Zone Management
IDCP	International Dolphin Conservation Program
IEZ	Inshore Exclusive Zone
IFMP	Integrated Fishery Management Plans
IFOC	International Fisheries Observer Conference
IFQ	Individual Fishing Quota
IMARES	Institute for Marine Resources & Ecosystem Studies (The Netherlands)
IMARPE	Instituto del Mar del Perú
INP	National Fisheries Institute of Ecuador
IOTC	Indian Ocean Tuna Commission
IPHC	International Pacific Halibut Commission
IREPA	Istituto Ricerche Economiche per la Pesca e l’Acquacoltura (Italy)
ITBP	Innovative Technology and Business Process Program (DFO)
ITQ	Individual Transferable Quota
IUCN	International Union for Conservation of Nature & Natural Resources

IUU	Illegal, Unreported and Unregulated
IVR	Interactive Voice Response
IW	Integrated weight longlines
IWPS	Integrated weight longlines with paired streamer lines
kg	Kilogram
LMRs	Living Marine Resources
LOOP	Logbook-Onboard Observers Program
MCS	Monitoring, Compliance and Surveillance
MFish	Ministry of Fisheries (NZ)
MFMR	Ministry of Fisheries & Marine Resources (Namibia)
MMPA	*Marine Mammal Protection Act (U.S.)*
MOU	Memorandum of Understanding
MPAs	Marine Protected Areas
MSA	*Magnuson Stevens Act*
MSC	Marine Stewardship Council
MSFCMA	*Magnuson-Stevens Fishery Conservation and Management Act*
Mt	Metric ton
m	Metre
MUN	Memorial University
NAFO RA	Northwest Atlantic Fisheries Organisation Regulatory Area
NBR	National By-catch Report
NEFOP	Northeast Fisheries Observer Program (NMFS)
NEFSC	Northeast Fisheries Science Center (NMFS)
NEPA	*National Environmental Policy Act*
NERO	Northeast Fisheries Regional Office
NGOs	Non-government organisation
NIWA	National Institute for Water and Atmospheric Research (New Zealand)
NLMA	Nantucket Lightship Management Area
NMFS	National Marine Fisheries Service, also NOAA Fisheries Service
NOAA	National Ocean and Atmospheric Administration (USA)
NOP	National Observer Program (NMFS)
NOPAT	National Observer Program Advisory Team
NPFMC	North Pacific Fisheries Management Council
NPGOP	North Pacific Groundfish Observer Program
NSW	New South Wales
NWFSC	Northwest Fisheries Science Center
NZ	New Zealand
NZ RLIC	New Zealand Rock Lobster Industry Council
NZFIB	New Zealand Fishing Industry Board
OBIS	Ocean Biogeographic Information System
OBR	*Observer Bill of Rights*
OBSCON	Observer Contract database
ODA	Official Development Assistance
ODS	Operational Data Store
OFCF	Overseas Fishery Cooperation Foundation
OLE	NOAA Office of Law Enforcement
OP	Observer program
OPWG	Observer Professionalism Working Group
OTBs	Bottom trawl
OTIS	Observer Trip Information System
OTL	Ocean Trap and Line (NSW)
OY	Optimum yield
PA	Precautionary Approach

PBR	Potential biological removal
PBS	Pacific Biological Station (Nanaimo, BC)
PCR	Polymerase chain reaction
PDA	Personal Digital Assistant
pdf	probability density functions
PFD	Personal Flotation Device
PIFSC	Pacific Islands Fisheries Science Center
PIRO	Pacific Islands Regional Office
PIROP	Pacific Islands Regional Observer Program
PNOFA	Programa Nacional de Observadores a Bordo de la Flota Atunera Uruguaya
POP	Pelagic Observer Program
POPA	Azores Fisheries Observer Program
PSC	Prohibited Species Catch
PTB	Paired bottom trawl
QAC	Quality Assurance & Control
QMS	Quota Status Report
RCMP	Royal Canadian Mounted Police
RFMOs	Regional Fisheries Management Organisations
RFOs	Regional Fisheries Organisations
RIMF	Research Institute for Marine Fisheries (Vietnam)
RONS	Regional OBIS Nodes
ROP	Regional Observer Program
SAPs	Special Access Programs
SARA	*Species at Risk Act*
SBT	Southern Bluefin Tuna
SCL	Steering Committee Liaison
SEAFDEC	Southeast Asian Fisheries Development Centre
SEDAR	Southeast Data Assessment and Review stock assessment number ten
SEFSC	Southeast Fisheries Science Center
SET	South-east trawl
SG	Sea Grant
SP	Service Providers
SPC	Secretariat of the Pacific Community
STB	Single bottom trawl
T	tonnes
TAC	Total Allowable Catch
TD	temperature-depth
TEDs	Trawl efficiency devices OR Turtle Excluder Devices
TFP	Total Fish Production
TRN	Net Register Tonnage
TTS	Text to Speech
US	United States
USA	United States of America
UIW	United Industrial Workers (Alaska Fisheries Division)
UK	United Kingdom
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNIPESCA	Unión Nacional de Pescadores Conservacionista (Guatemala)
UNIVALI	University Universidade do Vale do Itajaí
USB	cable Universal Serial Bus
USCG	United States Coast Guard
UW	Unweighted longlines
UWPS	Unweighted longlines with paired streamer lines

VMS	Vessel Monitoring System
VTR	Vessel Trip Report
WCGOP	West Coast Groundfish Observer Program
WCPFC	Western and Central Pacific Fisheries Commission
WFT	World Fisheries Trust
WGL	Working Group Leader
WKDRP	Workshop on Discard Raising Procedures
WTO	World Trade Organisation
WWF	World Wildlife Fund



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