

The objectives of the survey are: 1) to estimate the total number of Atlantic bluefin tuna caught and landed by recreational fishermen in 1975; 2) to obtain a representative sample of length, weight, sex, age, and stock characteristics of tuna landed in the area; 3) to estimate the Atlantic bluefin tuna recreational fishing effort; and 4) to establish a data and sampling base for

future monitoring of bluefin tuna recreational fishing catches.

Several means are being used to obtain the required data, but most of it is gotten from interviews with captains of charter boats, party boats, and private boats at designated fishing ports on a daily basis. Charter boat crews have been solicited to maintain daily logs of fishing activity and catch. Postal cards were distributed to selected fish-

ermen who volunteered to report their daily catch and effort data. A list of bluefin anglers was compiled and weekly telephone surveys were made to augment catch and effort data received from other sources.

"We feel that this sampling will give us the data necessary to make sound management decisions and maintain the bluefin tuna as a viable recreational resource," said Beardsley.

Fast and Accurate Method Developed for Detecting "Red Tide" Poison in Shellfish

A procedure for detecting the presence in shellfish of saxitoxin—the paralytic shellfish poison sometimes associated with the so-called "red tide" blooms on the west coast—one hundred times more sensitive than any previous method has been devised by National Oceanic and Atmospheric Administration (NOAA) Sea Grant chemists at the Berkeley campus of the University of California. "We are hopeful," said Robert B. Abel, Director of NOAA's Office of Sea Grant, "that this new technique may be used to prevent the unnecessary closing of shellfish areas. It should allow for the specific, rapid, and reliable inspection of shellfish for toxicity and be a much more desirable substitute for the present method of closing areas by calendar."

The new technique, developed under the sponsorship of the Office of Sea Grant of NOAA which is part of the Commerce Department, involves a chemical analysis of the shellfish that could provide a more scientific approach to the problem of paralytic shellfish poison than seasonal closings. Meat from the suspected animals is ground up and subjected to a series of relatively simple steps to extract any saxitoxin which may be present. The amount of saxitoxin, if any, can then be determined using a standard laboratory instrument called a fluorescence spectrophotometer.

"The procedure is so straightforward," claims Henry Rapoport, leader of the Sea Grant group at the University of California's Berkeley campus, "and the equipment needed so uncomplicated, that testing can be carried out on board a ship or in a small van on shore. The results are immediate and a

decision can be made on the spot whether or not to harvest."

The Berkeley Sea Grant team analyzed several samples of Alaska butter clams and California mussels taken from 15 separate areas that had been closed to shellfishing. The scientists were able to detect saxitoxin in concentrations as low as four parts per billion and found that shellfish from some of the closed beds would be considered safe for human consumption according to the compliance guidelines set by the Food and Drug Administration.

According to Rapoport, the chemical test can be carried out much more easily than the standard bioassay procedure in which mice are injected with an extract of shellfish suspected of harboring the poison—a method that is costly, time-consuming, and not always accurate. "While in theory," said Rapoport, "mice bioassay should be fairly sensitive, in practice however, this just hasn't been so, because the sodium ions normally found in shellfish mask the presence of saxitoxin at low concentrations." Rapoport noted a number of mice of a specified weight must be used to obtain significant results, and

even then there can be differences in susceptibility among various strains of mice.

No one understands exactly what triggers the blooms of toxic plankton called dinoflagellates or how to control them, but it is known that shellfish, feeding on the plankton, can retain minute quantities of saxitoxin. Although the shellfish themselves appear to be unaffected by the poison, people can become ill from eating the tainted meat. The amount of sunlight and the temperature and nutrient level of the water can affect the timing and size of the blooms. Since these events are generally seasonal, some state agencies, not wanting to expose people to the toxin, have felt the safest course is to close whole shellfish beds during certain months, even though the areas may pose no demonstrable threat to health. California, for example, prohibits the taking of mussels from May through October.

The results of Rapoport's research have been published in an article entitled "A Chemical Assay for Saxitoxin, the Paralytic Shellfish Poison," in *Agriculture and Food Chemistry*. Reprints are available free by writing Henry Rapoport, Department of Chemistry, University of California, Berkeley, CA 94720.

Foreign Fishery Developments

Canada Bars Soviet Fishing Fleet from Atlantic Ports, Claims Excessive Fishing

Canada closed its Atlantic ports to Soviet fishing vessels on 28 July because of alleged overfishing by the Soviets in international waters off Canada's coast, the Office of International Fisheries, NMFS, NOAA, reports. Fishing in that area is regulated

by the 16-member International Commission for the Northwest Atlantic Fisheries (ICNAF).

Romeo LeBlanc, Canadian Minister of State for Fisheries, stated in a news conference that in some ICNAF areas in both 1974 and 1975, the Soviets had

taken 70-100 percent more than their quotas for certain species allowed them.

The Canadian Government also asserted that the Soviets have not settled claims for damages by Soviet vessels to Canadian fishing gear. A spokesman at the Soviet Embassy in Ottawa stated, however, that all "verified claims" have been promptly paid and the captains of the offending vessels punished. He added that the USSR had proposed in November 1974 that Ottawa and Moscow set up a fishery claims board, or a joint commission to mediate gear conflict problems, but that the Canadian Government has not accepted the proposal. (The Soviets have fishery claims boards with the United States and Norway.)

Both the USSR and Canada will be affected by the port closure. The Soviet fishing fleet, which made about 400 calls at Canadian ports in 1974, will have to find other means to replenish supplies, while Canadian ports like Halifax in Nova Scotia and St. John's on New-

foundland will lose the substantial business that the Soviet vessels brought.

At present, Soviet vessels are allowed 4 calls a month under the U.S.-USSR Mid-Atlantic Fisheries Agreement at each of the following U.S. ports: Boston, New York, Philadelphia, and Baltimore.

The NMFS Office of International Fisheries reports mixed Canadian reactions to the port closure and mixed predictions of its effect on Soviet fishing in the Northwest Atlantic. The Atlantic Fishermen's Association in Halifax said that its 2,000 members "are 100 percent behind the move." However, the local Halifax manager of Kerr Steamships, the Soviet fishing fleet's North American agent, estimated that the Soviet fleet spends \$4 million annually in Canadian east coast ports, and predicted that many companies there will be seriously affected by the loss of the Soviet business. Three out of every four Soviet fishing vessels calling at Canadian Atlantic ports come

to Halifax; of approximately 300 Soviet vessels that came to Halifax in 1974, over 230 called for water and provisions, 44 to have repairs made and 20 came due to medical emergencies.

With Canadian ports closed to them, the Soviets will have to call at the French islands of St. Pierre and Miquelon, about 20 miles off Newfoundland, or come to the United States, or both, and will in any case have to increase their own fishery support operations. The Executive Secretary of ICNAF, Lewis Day, opined that "St. Pierre and Miquelon offer viable alternatives" for the Soviet vessels, but Minister LeBlanc quoted the French Government (with which the Canadian Government apparently consulted prior to taking its action) to the effect that the two islands "in no way could . . . increase their facilities" to provide what is offered to foreign fleets by Canada's Atlantic ports. There is no doubt that to fish in the Northwest Atlantic will become more inconvenient and more costly for the USSR, but no one feels that the Canadian action will, by itself, solve the overfishing problems in ICNAF.

Japan's Fishery Budget Increases

The Japanese government has published its budget for Japanese Fiscal Year (JFY) 1975 (1 April 1975-31 March 1976). The Fisheries Agency, under the Ministry of Agriculture and Forestry, budgeted a total of 7 billion yen (US\$23.6 million) for the new year. This is an increase of over 2.2 billion yen over

JFY 1974. Larger appropriations are noted in funds allocated for the exploration of new fishing grounds (from 1.7 to 2.7 billion yen, or US\$5.7 to 9.1 million) and for the expansion of coastal fisheries (from 0.8 to 2.0 billion yen, or US\$2.7 to 6.7 million). The Fisheries Agency budget is given below in detail:

Item	Cost (10 ⁶ yen)	
	1975	1974
Exploration of new fishing grounds	2,741	1,758
Exploration of marine fishery resources	1,809	1,730
Maintenance and exploration of foreign coastal fishing grounds	28	28
Exploration of high-seas fishing grounds	904	0
Promotion of marine farming	1,106	987
Promotion of maricultural fishery	1,106	974
Experimental large-scale breeding of fish species	0	13
Formation of large-scale fishing and breeding grounds	917	823
Exploitation of shallow water fishing grounds	879	786
Study to develop large-scale breeding grounds	38	38
Expansion of coastal fishing grounds	2,082	838
Study to enlarge coastal fisheries	117	67
Expansion of coastal fisheries	1,939	757
Breeding of designated fish species	26	14
In-shore and off-shore fisheries and forecasting	32	89
Promotion of fisheries technology	144	274
Expansion of fishery experimental stations	144	124
Promotion of agricultural, forestry, and fisheries research	0	150
Total	7,022	4,769

Source: Marine Development Division, Research Coordination Bureau, Japanese Science and Technology Agency.

Jamaica Issues New Fishing Regulations

The Jamaican Government has issued the Fishing Industry Act of 1975 which establishes new fishing regulations, according to the Office of International Fisheries, NMFS, NOAA. Overall responsibility for enforcement of the Act is given to the minister "responsible for fisheries," currently the Minister of Agriculture. The authority to license, register and inspect fishing vessels is further delegated to lower officials, specified as Licensing Authorities and Fishery Inspectors.

In general, the Fishing Industry Act sets guidelines for, and establishes complete control of all aspects of fishing in Jamaican waters, and allows the Minister of Fisheries, and in most cases his subordinates, a fair amount of discretion in defining and enforcing the specific terms of the act.

The act states that all persons fishing in Jamaican waters must possess a valid license issued by the Licensing Authority. Such licenses may be temporary or

have a validity of 2 years, and, in the words of the Act, "may be granted subject to such conditions as the Licensing Authority thinks fit to impose." In addition, all boats used for fishing must be inspected and registered. The Licensing Authority has the power to "refuse to register a fishing boat if it is satisfied that the registration thereof would not be in the interest of the fishing industry." However, such a refusal can be appealed to the Minister. Exclusions for both, registration of fishermen and vessels, can be granted if the licenses are to be used for scientific and research purposes, or on the behalf of the Jamaican Government, or for other reasons specified by order of the Minister. Terms and procedures for cancellation or revocation of licenses, transfer of ownership, or recording of changes in the status of vessels are outlined in the Act.

The Act also allows the Minister to declare any area a fish sanctuary or to close a season for any species of fish in order to protect the resources. To enforce this provision, the Act provides that any fishery inspector, described generally as any law enforcement officer, may board and inspect any vessel and its equipment, and may demand to see licenses and registrations, if he suspects the boat is "engaged in fishing in contravention of the provisions of this act." In addition, any fishery inspector may seize any boat or equipment which he deems is being used illegally. The Act provides various penalties and fines, for offenses and violations of the law, beginning at 20 Jamaican Dollars (US\$18.17) or one month in jail, for not carrying one's fishing licenses. The maximum fine is J\$5,000 (US\$4,543), or 12 months imprisonment, for not making arrangements to rescue fishermen in emergencies, or for the payment of fines incurred for fishing without a license in foreign jurisdictions.

Finally, the Act defines the power and authority of the Minister to make regulations concerning licenses, registers, inspections, marketing, records, and safety measures for fishermen. The law concludes by noting that any vessel or equipment, used in the commission of an offense against the Act, may be seized and forfeited to the Government.

Mexico Acts to Boost Fisheries Production

One of the principal goals for Mexico of the Echeverría Administration has been to double fisheries production during the 6-year term 1971-76, according to George Rees, Regional Fisheries Attache, U.S. Embassy, Mexico City. Under this program, the Government is attempting to increase fish landings from 254,000 metric tons in 1970 to 500,000 tons in 1976. In the first 3 years of the Echeverría Administration (1971-73) fish landings increased nearly 30 percent to almost 330,000 metric tons. However, at this rate the goal of 500,000 tons will not be reached by 1976. It is probably not possible to increase fish landings to 500,000 tons as long as the industry is based on traditional fisheries. For this reason, the Mexican Government is striving to develop new fisheries for anchovy and merluza (hake), which are untapped resources of large potential.

LANDINGS

During the last 10 years Mexican fishery landings increased an impressive 82 percent from 181,000 tons in 1963 to 329,000 tons in 1973. During the first 3 years of the present Administration, landings have steadily increased from 254,000 tons in 1970 to 329,000 tons in 1973, a gain of almost 30 percent.

The greatest emphasis has been placed on increasing the catch of edible species for domestic consumption. As a result, during 1971-73, the overall catch of species for human consumption rose 33 percent, primarily because of the following particularly significant increases: large sharks, 186.5 percent; sardines, 82.6 percent; small sharks, 79.8 percent; tunas, 65.2 percent; and king mackerel, 49.9 percent.

Under Mexican laws only members of cooperatives can catch certain species of fish. The Mexican fishing industry is thus divided into two sectors, cooperative and private. The cooperatives receive considerable aid from the government, while, according to private industry sources, the private sector receives very little assistance. In 1973, the cooperatives accounted for 34.1 percent of the total landings, consisting almost entirely of shrimp and oysters. The private sector accounted for the remaining 65.9 percent, including edible

finfish, fish meal, and marine algae. By value, however, the catch of the cooperative fishermen was about twice that of the private sector.

THE FISHING FLEET

In 1973, a total of 2,307 Mexican vessels was registered as high-seas fishing vessels. The Pacific coast had 1,041 shrimp trawlers, 7 finfish boats, 68 sardine vessels, and 21 tuna vessels. The Gulf and Caribbean coasts had 914 shrimp trawlers, 254 finfish boats, and 2 codfish trawlers.

ADDITIONS TO THE FLEET

The current status of the national program to increase the number of fishing vessels is as follows. A total of 150 shrimp trawlers has been built in Mexico and delivered to cooperatives; 238 others are said to be in various stages of construction. Also, 201 permits have been issued for the importation of new and used vessels. These vessels, primarily for shrimp and snapper fisheries, were purchased mostly from U.S. shipyards. Nine tuna seiners, each with 650 tons carrying capacity, will be built in Poland. The first was expected in mid-1975 with a new one to be delivered every 2 months thereafter.

In November 1974, the Bank of Brazil announced that it had extended a credit of US\$30 million to Mexico for the purchase of fishing vessels built in Brazilian shipyards. The number and type of vessels were not specified. In April 1974, the Inter-American Development Bank approved a loan of \$43 million for the construction of 323 vessels. The loan will make possible the purchase of 120 shrimp trawlers; 30 sardine and anchovy vessels; 60 finfish, 10 mackerel, 100 snapper, and 2 merluza vessels; and 1 training vessel.

DEVELOPMENT OF NEW FISHERY RESOURCES

In March 1974, the Mexican Government and two private companies entered into an agreement with a Peruvian consortium to explore for anchovy off Baja California. The Peruvians provided three vessels and an aircraft. Subsequently, the Government chartered two U.S. seiners, the *Astronaut*

and the *Santa Teresa*. The Peruvian vessels had difficulties in adapting their purse seining methods to the Mexican anchovy, which schools at greater depths than the Peruvian anchovy, but received technical assistance from fishermen on the American seiners. As a result, the exploratory fishing proved highly successful.

The Zapata Corporation of Houston, Tex., has formed a company with a group of Monterrey industrialists and has been given permission to build a fish meal plant and to bring in U.S.-flag vessels to fish for anchovy. The resource off Baja California is estimated to have a sustainable yield of 500,000 tons a year.

In November 1974, the two West German trawlers *Bonn* and *Wesser* arrived at Mazatlán to begin an 18-month program of exploratory fishing in the Pacific, primarily for merluza. There will be a 9-month period of fishing and 9 months for analysis of the results. There is no cost to Mexico for the program. For the privilege of fishing out of a Mexican port, the Germans must give to Mexico 50 percent of the catch over 1,000 metric tons.

MEXICO'S TECHNICAL FISHERY SCHOOLS

The Mexican Government, as part of its program of fisheries development, is carrying out an ambitious project of fisheries education to provide the fishing industry with capable personnel at all levels. Under the authority of the Plan Nacional de Educación Pesquera Integral (Coordinated National Plan of Fisheries Education), as many as 30 technical fishing schools have been functioning since September 1972. Of these schools, 10 are classified as "experimental" due to their innovative educational methods. The schools are supervised by the Dirección General de Educación en Ciencias y Tecnologías del Mar (Directorate General of Education in Marine Sciences and Technology). They are located along the coast throughout Mexico as well as on Mexico's inland lakes (Fig. 1). Depending on the school's location, the curriculum specializes in inland fisheries and fish culture and in marine and/or estuarine fisheries.

The schools are equipped with vessels, processing laboratories, work-



Figure 1.—Location of technical fishing schools in Mexico.

shops for navigation, machinery, and fishing gear. Of the total 30 schools, 16 operate as boarding institutions—each has dormitories, laundry, kitchen, dining hall, barbershop, and recreational and sports facilities.

The fishery schools are not the traditional Mexican secondary schools, but are rather technical institutions specifically oriented toward the training of highly-qualified youngsters for the fishing industry. To attend the schools, the students must have completed primary schools and be between 14 and

in refrigeration, machinery, and electronics; gear technician; and skilled fish culturist. The study program also includes traditional academic subjects permitting the students to continue their studies to a higher level if they so desire (Table 1).

MALTA EXPANDS FISHING FLEET

The U.S. Embassy, Valleta, Malta, reports that Libya's Minister for Fisheries and Natural Resources, Omar Al Maaqsi, and Malta's Minister of Agriculture and Fishing, Freddie Micallef, signed in Malta on 11 June an agreement for closer cooperation in fisheries. Under this agreement Libya will provide two trawlers which will be fully manned by Maltese fishermen and allowed to fish in the territorial waters of both countries. The catch will be shared equally.

On the same day as the Libya-Malta fisheries cooperation agreement was signed, FAO expert and adviser to the Maltese Government, George Ford, announced that FAO will supply an additional two trawlers to Malta for a 2-year period. FAO also will provide two masters and chief engineers as well as two technical advisers. One adviser, Jan Heide, a Norwegian expert on the storage and distribution of fish, has already arrived in Malta on a 2-month assignment. The second adviser was

Table 1.—Curriculum of the Mexican technical fishing schools.

Subject	Sessions per week		
	First year	Second year	Third year
Spanish	4	4	4
Math	4	4	4
Natural science	5	5	5
Social science	5	5	5
Foreign language	0	4	5
Fishing skills and technology	6	6	6
Machinery skills and technology	6	5	5
Nautical skills and technology	4	5	5
Physical education	2	2	2
Artistic education	2	2	2
Total	38	42	43

17 years of age. The students in the basic course train as technicians and workers and can upon graduation obtain immediate employment in any of the following positions: cadet captain or mechanic; assistant fishing technician

scheduled to arrive in July on a 2-year assignment as Director of the Maltese fishing fleet.

According to the NMFS Office of International Fisheries, Malta has tried previously to establish a high-seas fishing fleet with both Japan and Tunisia, but has thus far been unsuccessful. Maltese fishermen have never been deep-sea fishermen. They prefer to fish close to the Maltese Islands despite poor catches. If they will adapt successfully to high-seas fishing in the Mediterranean, the Maltese Government will probably try to promote expansion into the Atlantic fishing grounds. It has also been suggested that Italy may provide one or two additional vessels.

Canada Tries Interim Fishing Vessel Subsidy

Canadian Minister of State for Fisheries Romeo LeBlanc announced last summer an interim fishing vessel subsidy. The policy, which was put into effect immediately by the Fisheries and Marine Service, is available only to full-time fishermen, and excludes those who had full-time employment outside the primary fishing industry. The policy is a short-term measure (to the end of 1975) and will eventually be replaced with a fleet development plan, which will be part of the overall program for the rehabilitation of the Canadian demersal fisheries.

Subsidies are available for vessels over 35 feet in length. New vessels added to the fishing fleet may be subsidized only if they are not used in the "limited entry" fisheries such as salmon, herring, scallop, snow crab, and lobster fisheries. However, subsidies for replacement vessels are available for vessels used in both "limited" and "non-limited entry" fisheries, provided that they qualify for licenses and that the vessel to be replaced is at least 8 years old. "The qualification that replacement vessels in the limited entry fisheries have the capability to operate in at least one of the open fisheries will encourage fishermen to diversify and expand their operational capacities," LeBlanc said. The total amount of the fishing vessel subsidy was not announced.

Source: U.S. Embassy, Ottawa.

Regional Fisheries Training School Set for Persian Gulf

Kuwait, Saudi Arabia, Qatar, the United Arab Emirates, and Iran signed a draft agreement on 17 June 1975 in Kuwait to establish a Persian Gulf Regional Center to train their citizens in commercial fisheries, the U.S. Embassy, Kuwait, reports. Oman and Iraq were also expected to sign, but it was not certain if Bahrain would do so.

The Center will be located in Kuwait and will be financed jointly by all the signatory countries. Its purpose will be to train candidates in the technology of commercial fishing (for example, the handling of gear) for such positions as ship captains, assistant captains, and mechanics. Training courses will be in English and Arabic. The Persian Gulf Regional Fisheries Training Center organizers are expected to seek some assistance from the UN Development Program to help design the program and to provide instructors. Other aspects of commercial fisheries, such as the development and management of resources, and the distribution and marketing of fishery products will be studied by the Fishery Resources Sur-

vey and Development Center to be located in Doha, Qatar.

The agreement did not specify the waters in which the participating countries plan to fish, but rather referred to "regional" and "subregional" areas, thus perhaps avoiding any questions on territorial waters and fisheries jurisdictions. The agreement also makes no mention of the labor shortages which exist in oil-rich nations like Kuwait, or how will they recruit potential trainees. It has been suggested that Bahrain has not signed the agreement because its representatives realized that there would be a shortage of trainees for the program.

Norway's Fishing Fleet Declines

The registered Norwegian fishing fleet at the end of 1974 consisted of 27,800 vessels, the Norwegian Information Service reports. The fleet has decreased in size by 3,100 vessels since the end of 1972. Most of the reduction has involved undecked boats, of which only about 2,100 remain. There has also, however, been a significant drop in the number of decked craft.

Fishery Notes

Record Alewife Harvest Hikes U.S. Great Lakes Commercial Fish Catch 16 Percent

Commercial fishermen operating in U.S. and Canadian waters of the Great Lakes last year harvested over 125 million pounds of fish, the highest total since 1967, according to *The Great Lakes News Letter*. The landed value of the catch, nearly \$19 million, exceeded the peak years of the mid-1950's. A Great Lakes Commission analysis of the 1974 catch statistics completed by NOAA's National Marine Fisheries Service in Ann Arbor and preliminary data prepared by the Ontario Ministry of Natural Resources reveal, however, that a record harvest of alewives and increasing prices were key factors in the high 1974 figures.

Of the U.S. catch totaling some 77.6 million pounds in 1974, over 45.5 million or 59 percent were alewives. This har-

vest was all in Lake Michigan, and here it accounted for about 76 percent of the total commercial catch. The previous high for this species was 41.9 million pounds landed in 1967, the year that also was marked by a massive die-off of alewives. In terms of dollar value, the 1974 U.S. production was about \$10.5 million, with the sale of alewives contributing \$643,000 or only 6 percent of the value of the total U.S. catch and 10 percent of the value for Lake Michigan.

In the Canadian Great Lakes catch, the alewife and the shad, another low-value species, for the first time in 1974 became a factor in the commercial catch statistics, as Lake Erie landings for the respective species totaled 1.3 and 1.7 million pounds and sustained the total for the Province of Ontario at 47.8

million pounds, virtually the same amount as for 1973.

The U.S. landings excluding alewives totaled 32.0 million pounds in 1974 and were some 1.7 million over the 1973 catch for species other than alewives. With respect to the individual lake basins, U.S. production increased from 1973 to 1974 in all areas except Huron. In Canadian waters, gains were made in Lakes Huron and Superior, while Lake Ontario production continued at the 1973 level and Erie's north shore catch declined about 3 percent with the important yellow perch harvest down about 30 percent from 1973.

For the eight Great Lakes states, the extent of the commercial catch in their jurisdictional waters was as follows (in thousands of pounds):

Illinois	1,130 ¹	New York	679
Indiana	217 ¹	Ohio	8,654
Michigan	15,419 ¹	Pennsylvania	473
Minnesota	2,408	Wisconsin	48,693 ¹
¹ Alewife catch: Ill. 40; Ind. 2; Mich. 5,787; Wis. 39,726			

The accompanying tables indicate the weight and dollar value of 1973 and 1974 landings by Great Lakes commercial fishermen for the U.S. and Canadian sections of each of the lakes and also present totals for the principal species caught in U.S. and Canadian waters. Some features and developments in the several lake basins are noted below.

LAKE MICHIGAN

The weight of last year's catch, excluding the record harvest of alewives, totaled 14.2 million pounds having a landed value of \$5.6 million. Both figures substantially surpass the amounts for any of the other U.S. lake areas, although falling well below the U.S.-Canadian totals for Lake Erie.

The most valuable species in the U.S. lakes commercial fishery are chubs and whitefish, and a large share of their production is in Lake Michigan. In 1974 their combined landings in this lake totaled 6.7 million pounds which was sold for \$4.7 million, the value figure representing 45 percent of the total for the U.S. catch that year. Chub landings have been decreasing since 1968 and the 1974 production was at a record low of 3.3 million pounds. To counter this situation, the chub fishery in Lake Michigan was closed around mid-1975 except for a small quota for assessment

	Pounds (× 1,000)		Value (× 1,000)	
	1973	1974	1973	1974
U.S. catch				
Lake Ontario	305	332	\$ 91	\$ 117
Lake Erie	8,352	9,849	1,481	2,087
Lake Huron	1,942	1,718	448	464
Lake Michigan	50,730	59,720	5,296	6,243
Lake Superior	5,496	6,054	1,308	1,594
Total	66,825	77,673	8,624	10,505
Canadian catch				
Lake Ontario	2,356	2,364	466	507
Lake Erie	39,829	38,607	7,038	5,627
Lake Huron	2,540	3,371	950	1,412
Lake Superior	3,161	3,512	700	802
Total	47,886	47,854	9,154	8,348
Grand total, U.S.-Canada	114,711	125,527	17,778	18,853

Leading species in U.S. and Canadian Great Lakes catch.

Leading species	Pounds (× 1,000)		Value (× 1,000)	
	1973	1974	1973	1974
United States				
Alewives	36,563	45,556	\$ 369	\$ 643
Carp	6,389	7,058	312	396
Chubs	5,915	4,887	2,666	2,837
Whitefish	4,422	4,369	2,652	3,182
Smelt	3,021	4,358	96	194
Yellow perch	3,006	3,951	1,150	1,489
White bass	2,430	2,918	455	766
Total	61,746	73,097	7,700	9,507
Canada				
Smelt	17,181	16,862	996	961
Yellow perch	19,021	13,350	5,822	4,241
White bass	1,509	2,355	303	406
Lake herring	2,322	1,709	368	341
Whitefish	1,055	1,296	591	798
Total	41,088	35,572	8,080	6,747

purposes. Whitefish production in Lake Michigan, at 3.4 million pounds in 1974, was down moderately from the previous year and marked a reversal of catch increases since 1967.

LAKE ERIE

Last year's U.S.-Canadian production of 48.5 million pounds was about the same as in 1973, with a U.S. gain of 1.5 million pounds offsetting a minor decline in the Canadian catch. The combined landings accounted for 39 percent of the Great Lakes total and the landed value of \$7.7 million was 41 percent of the 1974 total for the lakes. The principal species contributing to the U.S. gain were yellow perch, white bass, and carp. The Ontario production of 38.6 million pounds in the northern half of Lake Erie was 80 percent of last year's total for the lake and also accounted for 80 percent of the total Canadian Great Lakes catch. Smelt and yellow perch continued as the principal species landed by the north-shore

fishermen, but the two-species total of 28 million pounds (which represented 72 percent of their total catch) was a substantially lower percentage than in previous years.

LAKE HURON

The 1974 production total for the lake was 5.1 million pounds with the U.S. catch accounting for about one-third of this weight and for a quarter of the landed value of the catch. While total U.S. production was at a new low of 1.7 million pounds, the catch of whitefish, totaling 270,000 pounds, was nearly double the 1973 figure. The whitefish is the leading species caught in the Canadian waters of Huron where production approached the million-pound mark in 1974.

LAKE SUPERIOR

Moderate increases in the U.S. catch of smelt, chubs, and lake trout contributed to the half-million pound gain in

1974 landings, while the decline in lake herring production, which began in 1962 when the catch was nearly 10 million pounds, was at a new low of 575,000 pounds in 1974. Canada's commercial fishery in Superior has had a relatively stable production at 3.0-3.5 million pounds in recent years. In 1974, lake

herring landings were 1.6 million pounds, thus representing nearly half the total catch by Ontario fishermen.

LAKE ONTARIO

The 1974 production in this relatively small, stable commercial fishery was 2.7 million pounds, with the Canadian

catch providing about 88 percent of the total. The yellow and white varieties of perch combined comprise about 40 percent of the total landings in both the New York and Ontario sections of the lake, but these waters also account for most of the Great Lakes commercial catch of bullheads, eels, and rock bass.

Publications

Recent NMFS Scientific Publications

Data Report 102. Monk, Bruce H., Earl Dawley, and Kirk Beiningen. "Concentration of dissolved gases in the Willamette, Cowlitz, and Boise Rivers, 1970-72." June 1975. 19 p. on 1 microfiche. For sale by U.S. Department of Commerce, National Technical Information Service, 5285 Port Royal Rd., Springfield, VA 22131.

ABSTRACT

Data on dissolved nitrogen, dissolved oxygen, total gas pressure, and water temperatures are presented for the Willamette, Cowlitz, and Boise rivers. Water samples were taken upstream and downstream of dams and over a wide

range of river and dam discharges to obtain data on the relation between river flow and dam discharges and their effect on the total gas regime of the rivers.

NOAA Technical Report NMFS SSRF-692. Cook, Steven K. "Expendable bathythermograph observations from the NMFS/MARAD Ship of Opportunity Program for 1972." June 1975, 81 p. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

ABSTRACT

Results of the second year of operation of the NMFS/MARAD Ship of Opportunity Program are presented in the form of vertical distributions of temperature and horizontal distributions of sea surface salinity and temperature. Operational and data management procedures also are discussed.

LOS Casebook Is Published

Law of the Sea: Cases, Documents, and Readings, by H. Gary Knight, has been published by Nautilus Press, 1056 National Press Bldg., Washington, DC 20004 (\$25.00). The author is Campanile Charities Professor of Marine Resources Law at Louisiana State University and has been teaching law of the sea at LSU's Law Center for six years. The book constitutes a revision and complete updating of teaching materials developed there.

The book is meant for use by government officials and industry executives, as well as teachers and students. Punched for a three-ring binder, the publisher will provide annual supplements to the book. Almost 900 pages, the book includes most primary documents of importance to the development and continuing negotiation of the law of the sea. Annexes include the four 1958 Geneva Conventions and a number of statistics relating to the law of the sea.

ARTIFICIAL REEF VOLUME PRINTED

Proceedings of an International Conference on Artificial Reefs, edited by Laura Colunga and Richard Stone, has been published by the Texas A&M University. Cosponsored 20-22 March 1974 by Texas A&M's Center for Marine Resources, the Texas Coastal and Marine Council, and the National Marine Fisheries Service, the conference was the first devoted entirely to artificial reefs. The 33 contributions in the 152-page volume cover: Artificial reefs around the world; the scientific view; building artificial reefs; and economic and legal views.

Historic reviews of artificial reef programs in Japan, Puerto Rico, Virgin Is-

lands, France, and Australia are presented while other papers discuss reef construction in such states as North and South Carolina, Florida, California, Hawaii, Texas, Georgia, and Alabama. Use of baled tires and baled urban refuse for artificial reefs, geological considerations for reef sites, artificial reefs as experimental tools, and oil structures as artificial reefs are also described.

Legal aspects discussed include the regulatory policies of the Environmental Protection Agency, U.S. Coast Guard, Corps of Engineers, and the National Oceanic and Atmospheric Administration, as well as possible legal problems in siting artificial reefs on the continental shelf. Commercial fishing and shipping industry views are also presented.

Copies of the proceedings (publication number TAMU-SG-74-103) are available from the Center for Marine Resources, Texas A&M University, College Station, TX 77843 at \$4.00 each.

Tuna Potential Noted for Western Australia

The Department of Fisheries and Wildlife in Western Australia has recently published a report by J.P. Robins entitled **Some Aspects of Tuna and its Potential in the Oceanic Waters off Western Australia** (Report No. 17). The report briefly describes the growth of the tuna fishery in Australia, world production, utilization, price and future demand, tuna species descriptions, species occurrence around the Australian coast, and the results of two aerial surveys for tuna off the west and northwest coasts of western Australia. Requests for this publication should be sent to the Department of Fisheries and Wildlife, 108 Adelaide Terrace, Perth, Australia.