Alaska

USDI INSPECTION OF HERRING-EGGS-ON-KELP:

Food scientists of the Bureau of Commercial Fisheries, U. S. Department of the Interior, made in April 1966, the first USDI fishery product inspection in Alaska, announced the Bureau's Technological Laboratory at Ketchikan. The product inspected was herring-eggs-on-kelp, a product which has only recently been commercially harvested in Alaska. The herring-eggs-on-kelp were purchased by a United States firm for consignment to a Japanese firm in New York and required an inspection certificate as to quality as a condition of sale. The eggs were to be exported for consumption in Japan.

Herring spawn in large schools releasing their eggs and milt into the water en masse. They spawn in local areas along the Alaska coastline. The eggs contain a glue-like substance that causes them to stick to the bottom or to any growth over the bottom. Herring-eggs-on-kelp result from a small proportion of the spawn that attaches to a special type of large seaweed that belongs to the group of brown algae. In Alaska, the kelp and herring spawning occur together at Fish Egg Island near Craig, and on beaches near Hydaburg and Sitka.

Herring-eggs-on-kelp is a unique product and the USDI inspector was faced with some unusual problems. The primary concern of the Japanese buyer was that the cover of eggs on the kelp was sufficient. He specified that it was to exceed 350 eggs per square inch. The egg cover was estimated by first determining the number of eggs per gram by counting accurately weighed samples. Samples of kelp from the lot were then measured for area and the eggs stripped from these measured areas were accurately weighed to calculate egg cover.

Interior's USDI voluntary Inspection Service provides an impartial, official inspection service for processed fishery products. It is administered by the Bureau of Commercial Fisheries and is available on a fee-for-service basis to anyone who has financial interest in the fishery product involved.

* * * * *

PEELABILITY OF FRESH PINK SHRIMP DISCUSSED:

A member of the U. S. Bureau of Commercial Fisheries Ketchikan Technological Laboratory presented in Seattle during March a special demonstration cutting of canned shrimp to about 25 industry, Bureau, and National Canners Association technologists. Generally, the group was favorably impressed by the quality of the shrimp peeled "fresh" after short heat treatments instead of aging to loosen the shells. Color, flavor, texture, and possible yield are improved by the new process. The consensus seemed to be that progress is being made. The next step needed is commercial-scale production using the new process to determine its economics. Industry technologists did not seem particularly concerned about the gelling typical of shrimp peeled fresh and then heat processed.

Alaska Fishery Investigations

EARLIER RED SALMON EGGS REQUIRE THE MOST THERMAL UNITS:

Studies of the embryological development of eggs collected from the three spawning waves of Brooks River sockeye are showing that eggs from the earliest wave require the greatest number of thermal units to hatching while eggs from the latest wave require the least number of thermal units. The thermal regimen for eggs of each wave of spawning sockeye is different. Experiments have been designed and tests will be made for both genetic and environmental influences as they may affect the Brooks River sockeye to dis-

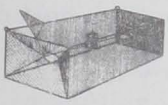
er whether or not the separate waves of
wners are distinct genetic stocks.

* * * * *

WNING CHANNEL PINK FRY
VIVAL ENCOURAGING:
esults at Little Port Walter, after sam-
g fry in the streambeds in Sashin Creek
Lovers Cove, were to be summarized in
il 1966 by Bureau scientists. However,
overwinter survival appears to have been
ood in the newly constructed spawning
nel in Lovers Cove as in the natural
vel beds in Sashin Creek. Since the gravel
e channel will not be graded and cleaned
ilt and organic debris until this summer,
preliminary egg survival test indicates
the channel will be a good testing site for
re experiments. The channel survived the
er weather in excellent shape.

* * * * *

RIMP BEHAVIOR STUDIES CONTINUED:
Shrimp behavior trap studies at Little
t Walter were continued in March 1966.
imp were readily available during the
nth, providing a steady supply for aquari-
studies. Bureau gear research scientists
divers from the Auke Bay Biological Lab-
tory spent a week observing the distribu-
of shrimp in the bay and their reactions
raps.



erican Samoa

NA FLEET STATUS, JANUARY 1966:
A total of 104 foreign tuna fishing vessels
Japanese, 38 South Korean, and 26 For-
san) was fishing out of American Samoa
January 1966. In September 1965, 58 Jap-
se, 27 South Korean, and 11 Formosan
ssels were fishing out of American Samoa.
ile the number of Japanese vessels has
lined, there has been a sharp increase in
th Korean and Formosan vessels. (Suisan-
Nippo, March 4, 1966, and other sources.)

California

EXPERIMENTAL ANCHOVY FISHERY AS OF APRIL 20, 1966:

California's anchovy reduction fishery in Zone 2 (the area between San Pedro and Catalina) was expected to reach its 10,000-ton quota before the end of April 1966, and was scheduled for closure at midnight, April 26, according to the California Department of Fish and Game. However, catches in the other four zones were relatively light and closure of those zones was not anticipated before the overall season ended on April 30. The total catch for all five zones was 11,801 tons as of April 20, out of a total quota of 75,000 tons.

The regulations adopted by the California Fish and Game Commission provided that the Director of the Department of Fish and Game shall terminate the fishery in any zone if the zone reaches its quota before the overall season ended.

Through April 21, a total of 8,551 tons had been landed in Zone 2. Landings for the four previous days were 5 tons April 17, no landings on the 18th or 19th, and 352 tons on April 20. When the April 20 landings were completely tallied on April 21, it was decided to give the legally required five days notice to terminate the fishery in Zone 2, because of the possibility that the quota of 10,000 tons might be reached by April 26.

The Zone 2 area extends from Port Hueneme on the North to Dana Point on the South and reaches out to sea as far as Catalina Island. No anchovy reduction fishing was allowed within three miles of the mainland shore or the mainland side of Catalina Island. Most of the fishing effort was in that zone, because of its nearness to the majority of the fishing fleet and processing plants.

Through April 20, quotas and landings in the five zones were: Zone 1 (Point Conception to Port Hueneme) 10,000-ton quota, 811 tons landed; Zone 2, 8,324 tons landed; Zone 3 (Dana Point to the Mexican border) 10,000-ton quota, 930 tons landed; Zone 4 (the entire open ocean area west of Catalina and the Santa Barbara Islands) quota 35,000 tons, 1,402 tons landed; Zone 5 (from Point Conception North) 10,000-ton quota, 334 tons landed. (California Department of Fish and Game, April 23, 1966.)

* * * * *

ANCHOVY TAGGING PROGRAM CONDUCTED:

Nearly 15,000 anchovies were tagged and released by marine biologists of the California Department of Fish and Game during March-April 1966 in a tagging program designed to obtain vital information on anchovy movement, mortality, and commercial catch results.

The tagging program was conducted in connection with the experimental anchovy reduction fishery authorized by the California Fish and Game Commission which was scheduled to end on April 30, 1966.

When the anchovies are caught by commercial fishermen and taken to a reduction plant for grinding into fish meal, magnets on the reduction line pick up the metal tags and make it possible to recover them.

As of mid-April, a total of 7,990 anchovies in the $4\frac{1}{2}$- to $6\frac{1}{2}$-inch size range had been tagged in the San Pedro area and released into the ocean in various spots outside Los Angeles Harbor. Another 6,992 anchovies were similarly tagged off Port Hueneme and released in the same area.

About 60 tags had been recovered by the middle of April. Data from these tags was being analyzed, but State biologists reported that the tagged fish were caught in the approximate areas of release.

The tagging program was to continue, with hopes that about 100,000 anchovies would be tagged and released in 1966.

Cans--Shipments for Fishery Products, January 1966

A total of 123,973 base boxes of steel and aluminum was consumed to make cans shipped to fish and shellfish canning plants in January 1966 as compared with 178,968 base boxes used during January 1965.

Note: Statistics cover all commercial and captive plants known to be producing metal cans. A "base box" is an area of 31,360 square inches, equivalent to 112 sheets 14" x 20" size. Tonnage figures for steel (tinplate) cans are derived by use of the factor 23.7 base boxes per short ton of steel.

Source: U.S. Department of Commerce, Bureau of the Census.

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Central Pacific Fisheries Investigations

HUGE SKIPJACK TUNA POTENTIAL SEEN:

There are at least enough skipjack tuna in the eastern half of the Pacific Ocean to come near to doubling the entire present United States tuna catch, and possibly much more. That was one of the chief conclusions of a Governor's Conference on Central Pacific Fishery Resources, held in Honolulu and Hilo, Hawaii, February 28-March 11, 1966, at the invitation of Governor John A. Burns of the State of Hawaii.

The conference was sponsored by the Hawaii Department of Planning and Economic Development, the Hawaii Department of Land and Natural Resources, the U.S. Bureau of Commercial Fisheries, and the Department of Economic Development of Hawaii County.

Divided into three sessions, the conference first saw a group of biologists weigh the evidence on the abundance of skipjack, yellowfin, and big-eyed tuna. Next, the findings of the scientists were discussed with industry representatives and government officials. On the last day of the conference the group reported to the public on its findings.

The conference participants agreed that the Pacific holds enormous stocks of skipjack tuna. A minimal estimate of the potential annual yield for the eastern half of the Pacific was 100,000 tons. The conference stressed that this was probably a very low figure, and said that the true magnitude of the skipjack tuna resource cannot as yet be estimated, because of a lack of adequate data.

Locating and catching the skipjack of the central Pacific present great technical problems, however. The fish are found in an area about 10 times the size of the continental United States. Schools of young skipjack appear along the margins of the Pacific, and skipjack of all age groups near Hawaii and in various other island groups. Surface schools of skipjack, however, are only infrequently seen in the open seas.

Studies of the distribution and behavior of subsurface tuna with sonar and the modification or design of appropriate gear were seen as requisites to the harvest of these resources.

As for the Hawaiian fishery, the conference recommended that purse seining again

tried in Hawaiian waters. Experiments in 50 and 1951 suggested that the method was t profitable in Hawaii, but there have been many developments in purse seining since n that the conferees thought it worthwhile make new tests.

Although strongly emphasizing the potenl of the skipjack tuna fishery, the conferce also considered the possibilities of two er fisheries, those for yellowfin and bigd tuna. Estimates of potential catch of yellowfin were placed at an increase of ,000 to 50,000 metric tons over the present cific long-line catch of 100,000 tons (exclue of the eastern Pacific fishery area). Lit increase in the present long-line big-eyed tch of 100,000 tons was seen as possible.

Cited as one of the chief scientific problems ing tuna research was that of establishing e identity of subpopulations of the various ecies. The U.S. Bureau of Commercial isheries Biological Laboratory in Honolulu s developed techniques to distinguish beeen subpopulations of skipjack tunas. So r, these have shown that there are at least o such subpopulations present in the Hawain fishery.

The Proceedings of the Conference will published by the State of Hawaii. They ll consist of two volumes, the first of which ll contain the reports of the five working oups on Skipjack Tuna, Yellowfin Tuna, g-eyed Tuna, Gear Development, and Reearch Program. The second volume will rry a group of background papers, pred primarily by members of the staff of e Bureau's Laboratory in Honolulu, dealing th tuna problems. The volumes should be blished later this year.

* * * * *

CEANOGRAPHIC RESEARCH PROJECT ONDUCTED SOUTH OF THE AWAIIAN ISLANDS:

M/V "Townsend Cromwell" Cruise 20 October 22-November 15, 1965): To study e wake system downstream of the Hawaian Islands, locating the major eddies that ake up this system and determining their pparent origin while studying the changes n salinity and temperature distributions in e area of the wake, was the principal objecive of this cruise by the research vessel ownsend Cromwell. The vessel is operated y the U. S. Department of the Interior's Bueau of Commercial Fisheries Biological aboratory, Honolulu, Hawaii. The area of operations was south of the Hawaiian Island chain, within the area bounded by latitude 16° N. to 21°30' N. and longitude 156° W. to 162° W. (fig. 1).

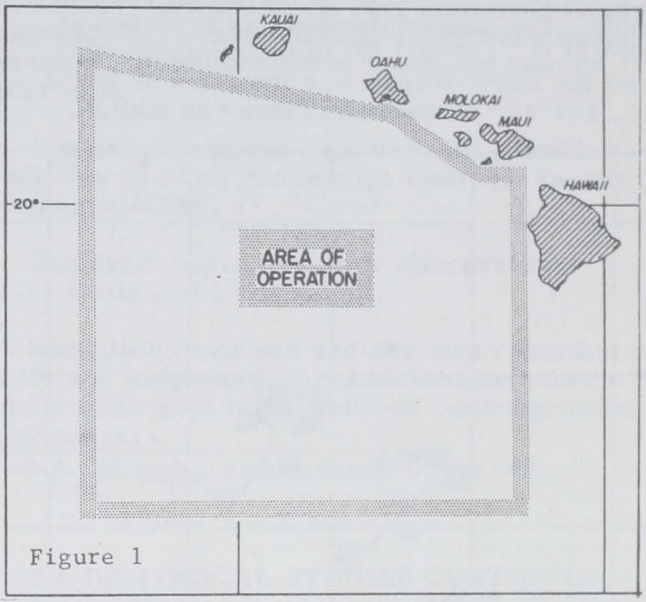


Fig. 1 - Area of operation, Townsend Cromwell, Cruise 20 (October 22-November 15, 1965).

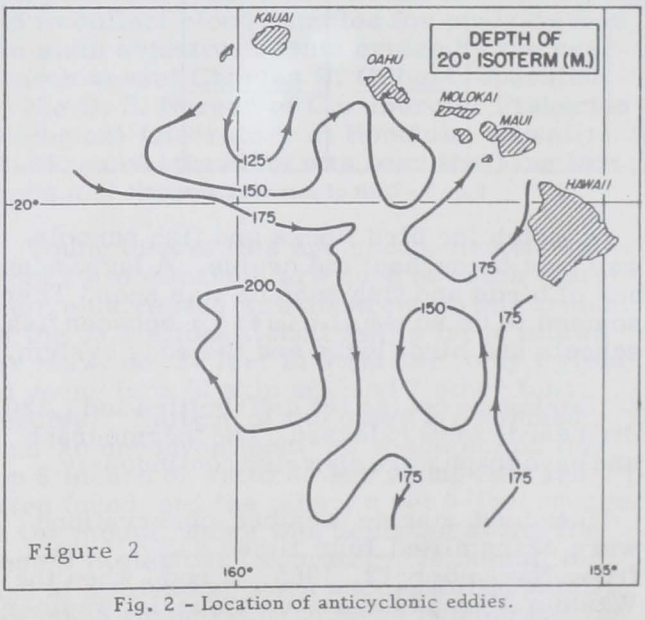


Fig. 2 - Location of anticyclonic eddies.

During the cruise 4 eddies were located by bathythermographs and the STD; their thermal structure was studied. Two cyclonic eddies were present with their centers at 21°10' N., 158°40' W. and 18° N., 157°10' W. Two anticyclonic eddies were also present with their centers at 19°50' N., 156°40' W., and 18° N., 159°30' W. (fig. 2).

After completing the preliminary survey, the pair of anticyclonic and cyclonic eddies nearest the island of Hawaii were studied. The first parachute drogue was launched at 19°41' N., 156°36' W. in the anticyclonic eddy. The second drogue was launched at 18°13' N., 157°41' W. in the cyclonic eddy, and the third drogue was launched at 18°51' N., 157°17' W. between these two eddies.

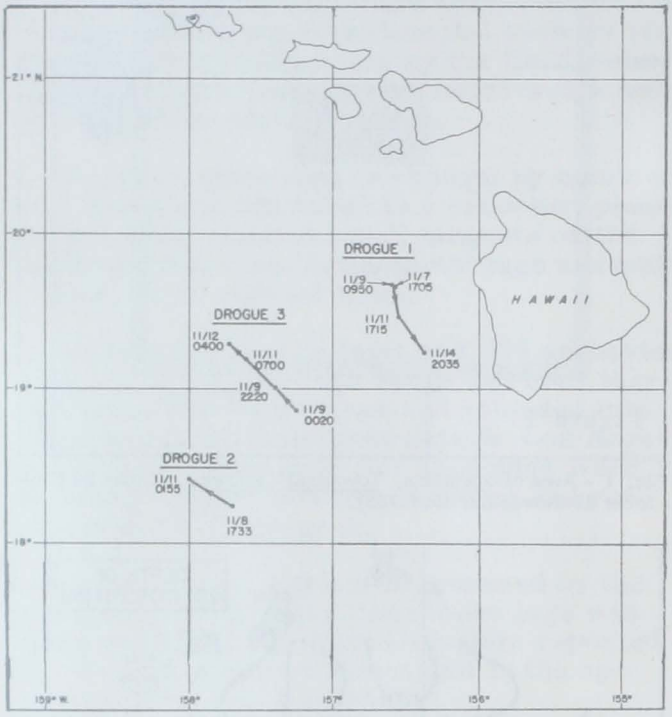


Fig. 3 - Drift of parachute drogues.

A watch for bird flocks and fish schools was kept throughout the cruise. A large number of birds and fish schools was seen. There seemed to be no association between fish schools and bird flocks and the eddy system.

During the cruise 786 drift bottles and 1,220 drift cards were released. The thermograph and barograph were operated continuously.

Standard marine weather observations were transmitted four times daily, except from November 12, 1965, at noon when the Weather Bureau requested a special weather report every 2 hours. These reports were transmitted until the cruise terminated.

The pyranometer was operated during the daylight hours.

Net radiometer readings were also taken for the Trade Wind Zone Oceanography Program.

Bathythermograph data were coded and transmitted four times daily to Fleet Numerical Weather Facility, Monterey, Calif.

The first drogue was nearly stationary for 2 days then moved south approximately 5 nautical miles per day. The second and third drogues moved in a northwest direction 8 and 12 miles per day, respectively (fig.3).

The trough and domes in the thermocline topography, which were associated with the eddies, showed displacement similar to those of the drogues.

The radio buoys (manufactured by Aquadyne Corp.) were acquired in order to determine the effective operating range under local conditions of these low-cost, low-power units. The 4-watt units could be detected at distances up to 8 miles with the ship's receiver and 2.8 miles with the radio direction finder, under the best conditions. The 1-watt unit could be detected at distances of up to 2 miles with the receiver and 0.3 mile with the RDF.

* * * * *

TRADE WIND ZONE OCEANOGRAPHIC STUDIES CONTINUED:

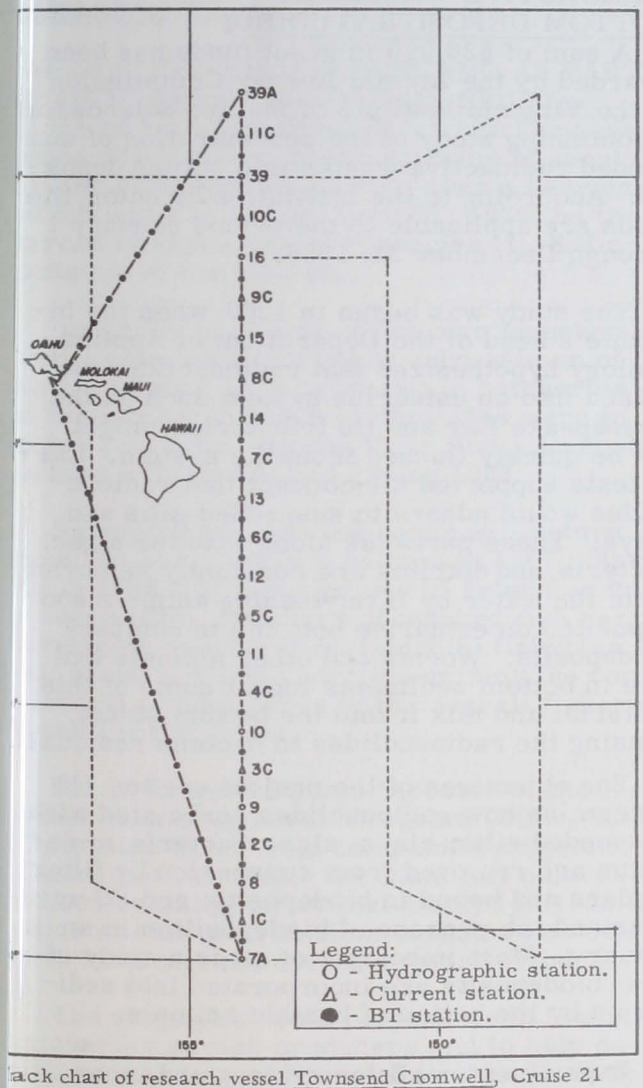
M/V "Townsend Cromwell" Cruise 21 (January 19-February 3, 1966): As part of the Trade Wind Zone Oceanography pilot study, the relationships between measured ocean currents and the distribution of properties are to be examined. To establish the necessary techniques and test the feasibility of such a study, this cruise of the Bureau's research vessel Townsend Cromwell was planned. The area of operations was in the Central North Pacific bounded by latitude 10° N., 27° N., and along longitude 154° W.

The primary purpose of the cruise--to develop techniques to measure ocean currents in the upper 500 m. from a moving ship--was accomplished. Field examination of data indicates that this method is feasible and applicable to the study of a variety of problems. There was also evidence that the major water masses in the upper 300 m. of the North Pacific Equatorial Current may flow at different speeds and/or direction. This was inferred from previous Trade Wind Zone Oceanography pilot study cruises, but was not measured directly.

At current station 6, southeast of Hawaii, the current changed from a westerly set at

m. to a northerly set at 150 m., and then an easterly set at 250 m.

On each of 12 oceanographic stations ced 90 miles apart along longitude 154° , and between latitude 10° N. and 26.5° temperatures and salinity samples were lected at 20 levels to 1,500 m. Determi- ions for dissolved oxygen were made at h station and samples for PO_4-P analysis re collected and frozen.



ack chart of research vessel Townsend Cromwell, Cruise 21 (January 19-February 3, 1966).

Eleven current stations, located midway etween oceanographic stations, were occu- ied for periods of 12 hours. Due to failure f other current meters on current stations 1 nd 2, measurements at current stations 3 to 1 were made with an Ekman meter. On 26 urrent profiles from 10 m. to 1,000 m., 325 ndividual current measurements were made.

Bathythermograph casts were made to 270 m. at intervals of 3 hours on the way to station 7A, and between station 39A and Honolulu. Others were taken midway between and on oceanographic and current stations. Time-sequence bathythermograph casts were made on each current station at generally hourly intervals.

Bathythermograph data were transmitted each day to Fleet Numerical Weather Facility, Monterey, Calif.

Standard marine weather observations were made and transmitted.

Radiation from sun and sky was recorded daily and long-wave radiation measurements were made each night while on oceanographic stations.

Note: See Commercial Fisheries Review, October 1965 p. 29.

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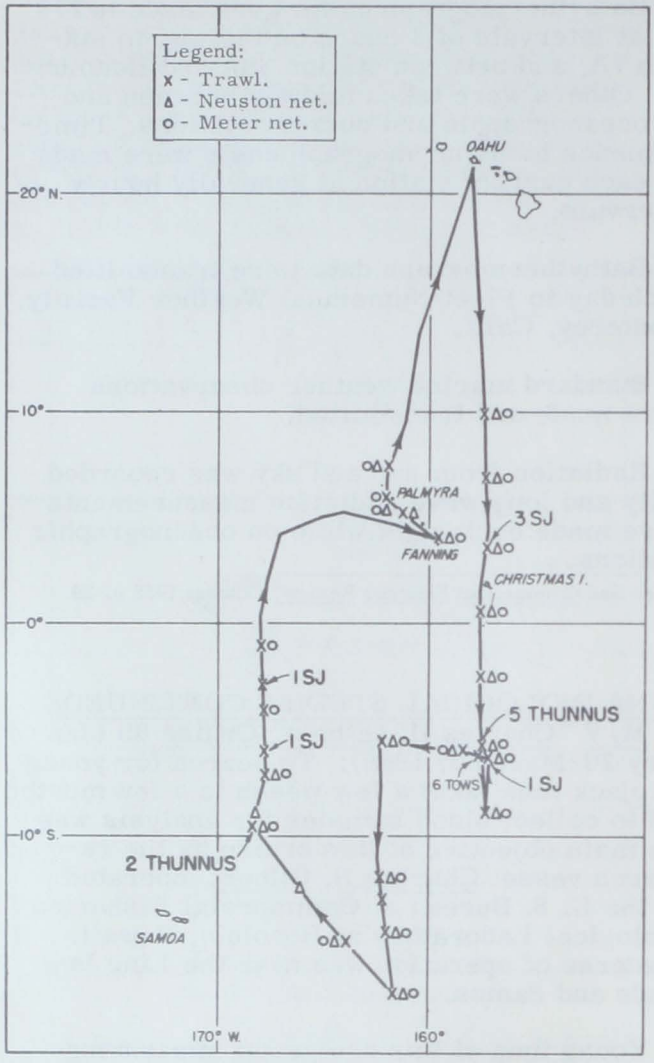
TUNA BIOLOGICAL STUDIES CONTINUED:

M/V "Charles H. Gilbert" Cruise 89 (January 20-March 3, 1966): To search for young skipjack tuna (aku) a few weeks to a few months old to collect blood samples for analysis was the main objective of this cruise by the research vessel Charles H. Gilbert, operated by the U. S. Bureau of Commercial Fisheries Biological Laboratory at Honolulu, Hawaii. The area of operation was near the Line Islands and Samoa.

Young tuna of this age group, measuring from $1\frac{1}{2}$ to 4 inches, are hard to catch and their elusiveness was apparent on this cruise. Of the 32 stations fished with a large midwater trawl net 25 feet in diameter, only 6 yielded young tuna (6 skipjack and 7 other tuna species). Neither of the other 2 nets used (one an unconventional net which skims the top 6 inches of water where young fish are often found, and the other, a net 6-feet square at the mouth, which was designed at the Bureau's Biological Laboratory, Honolulu, to fish at all depths) were successful in catching these young tunas in large numbers. The latter net, however, caught many larval tuna from $\frac{1}{4}$- to $\frac{1}{2}$-inch in length. Unfortunately larvae this small does not provide blood in sufficient quantities for analysis.

Blood samples were obtained from 4 of the young skipjack. Although this is far from the hundreds of blood samples required to determine whether the fish came from a single group



Shows areas of operation during M/V Charles H. Gilbert Cruise 89 (January 20-March 3, 1966).

or whether they could be separated into several genetically different groups or subpopulations, it showed that it was indeed possible to draw blood samples from these tiny fish and the ultimate feasibility of this approach.

A large number of deep-sea fish and shrimp were also taken in the midwater trawl. Many of these fish represented rare groups. These fish and shrimp were quick frozen for subsequent study of deep water parasites by the University of California, Santa Barbara, Calif.

The Gilbert made a stop at Palmyra Island, where about 900 pounds of groupers and snappers were collected. These fish will be examined by the University of Hawaii scientists.

The vessel also brought back 140 live fish, mostly large mullets from Palmyra Island, which are to be used for experiments at the Oceanic Institute.

Note: See Commercial Fisheries Review, May 1966 p. 19.

Chesapeake Bay

RADIOACTIVE WASTES IN BOTTOM DEPOSITS STUDIED:

A sum of $20,000 in grant funds has been awarded by the Atomic Energy Commission to the Virginia Institute of Marine Science for a continuing study of the concentration of suspended radioactive wastes into bottom deposits. According to the Institute's Director, the funds are applicable to the period January 1 through December 31, 1966.

The study was begun in 1960 when the Institute's head of the Department of Applied Biology hypothesized that radionuclides released into an estuarine system such as the Chesapeake Bay and its tributaries, might not be quickly flushed from the system. Early tests supported his concept that radionuclides would adhere to suspended silts and clays. These particles along with the algae, bacteria, and detritus are constantly removed from the water by filter-feeding animals and deposited on estuarine bottoms in compact biodeposits. Worms and other animals that live in bottom sediments ingest some of this material and mix it into the bottom strata, causing the radionuclides to become residual.

The objectives of the project are to: (1) Determine how radionuclides associated with suspended silts, clays, algae, bacteria, or detritus are removed from suspension by filter feeders and bound in biodeposits; and (2) understand the process of biodeposition in an estuary. Most important of all is a study of how biodeposits are incorporated into sediments by the action of benthic animals.

Experiments call for oysters and other test animals to be held in troughs where they will continually receive filtered water containing particles of known size. Sizes and numbers of particles entering each trough will be measured by a Coulter Counter. Particle removal by the test animals may then be determined.

The Institute's Director said, "We live in an age in which it becomes imperative to un-

rstand the final disposition of these some-
mes dangerous by-products of man's inven-
eness. There is no way of knowing when
where radioactive substances may be re-
sed upon society, and we must have knowl-
ge of the possible effects and how to com-
them." (Virginia Institute of Marine Sci-
e, April 14, 1966.)

olumbia River

PERATION COHO" LAUNCHED AS PART
F HATCHERY EVALUATION STUDY:

Plans for a Columbia River hatchery eval-
tion study involving the marking of about 6
illion coho (silver) salmon over a two-year
riod was announced April 27, 1966, by the
reau of Commercial Fisheries, U. S. De-
rtment of the Interior.

Under the program, which was launched in
ne, some 3 million young coho salmon of
e 1965 brood year produced in hatcheries
the Columbia and its tributaries were to
marked by clipping their fins. An equal
mber will be marked during 1967.

Some of those marked cohos will return
om the ocean as jack salmon in 1967. Start-
g in 1968, the remainder will return as full
own adults. Numbers of marked fish re-
vered in sport and commercial fisheries
ll provide a basis for determining the con-
bution of hatcheries to the overall fishery
the Pacific Coast.

Dr. L. Edward Perry, Director of the Bu-
au's Columbia River Program Office, said
Operation Coho" is a companion project to
Operation Fin Clip," the giant fall chinook
lmon marking effort that started in 1962 in
hich a total of 32 million of that species
ve been marked over a 4-year period.

The purpose of both projects is to evaluate
atcheries as fish producers and to help de-
de whether expenditure of further funds to
eep them operating is economically sound.

"Operation Coho" will involve 20 hatcher-
es. Of those, 5 are National Fish Hatcheries
perated by the Bureau of Sport Fisheries and
Wildlife, and Wildlife Service, U. S. Depart-
ent of the Interior; 9 operated by the Wash-
gton Department of Fisheries; and 6 by the
ish Commission of Oregon.

About 10 percent of the coho salmon pro-
duced in each hatchery will be marked, ex-
cept at Eagle Creek National Fish Hatchery,
where 20 percent are to be clipped.

Cooperating with the Fish and Wildlife
Service in "Operation Coho" are Fish Com-
mission of Oregon, Oregon Game Commis-
sion, Washington Department of Fisheries,
California Fish and Game Department, and
fishery agencies of British Columbia.

Note: See Commercial Fisheries Review, May 1966 p. 21; Sept. 1963 p. 45; Oct. 1963 p. 31.

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CLARIFICATION SOUGHT ON
INDIAN COMMERCIAL FISHERY:

The proposed start of commercial fishing
by Yakima Indians on the Columbia River a-
bove Bonneville Dam on April 18, 1966, caused
the Oregon Fish Commission to be very much
concerned, according to the State Fisheries
Director. The Indians would be fishing within
the framework of an ordinance passed by the
Tribal Council on March 23 but in violation of
State law. The Fisheries Director pointed out
that the Washington Department of Fisheries
and the Oregon Fish Commission, the agen-
cies responsible by statute for managing the
commercial fisheries on the Columbia River,
are still collecting vitally needed biological
data before making any decision on a possible
season for the non-Indian commercial fishery.
A public hearing was scheduled on April 26 in
Portland to consider the matter.

Important information was being collected
from the test fishing program conducted by
the two departments from March 15 through
the end of April. In addition, dam counts were
being studied carefully and other pertinent in-
formation collected as a basis for predicting
the size of the spring run which in turn will
govern thinking on proposed fishing regula-
tions.

Because the run was expected to be some-
what smaller than in 1965, and in view of an-
ticipated upriver passage problems, the two
departments were very apprehensive about
extensive fishing on that run. Apparently the
very vital biological data which are still be-
ing collected were not considered by the Trib-
al Council in establishing their regulations
which were set in March. As a result, the
action by the Yakima Tribal Council (ostensi-
bly to permit fishing to begin 9 days in ad-
vance of the regulation meeting by the State

agencies) was particularly disappointing. The Oregon Fish Commission believes that the needs of the resource are not being given the consideration they deserve by the Indian body.

The Yakimas who fish commercially with gill nets in the Bonneville pool area and on upstream contend they are within their rights granted by the treaty of June 9, 1855. During a press conference on Indian fishing problems in Portland on March 4, 1966, it was announced that the State planned to take action against Indians fishing above Bonneville Dam in violation of State laws. Some progress has been made in resolving the Indian fishing problem in recent years but the gains were rather insignificant in the face of the growing problem, Oregon's fisheries director said.

When the Dalles Dam flooded out Celilo Falls, the Indians were paid $27 million to compensate for loss of their dip-net fishery there. Following loss of the Celilo site, the Indian commercial fishery in the Columbia declined temporarily. However, from a low catch of 39,000 pounds of salmon and steelhead in 1959, the Indian commercial fishery has increased steadily each season until 1965 when an estimated 1 million pounds were taken by the tribesmen. The Commission believes that the sharp increase in the Indian fishery will threaten the future of the Columbia River resource (particularly certain runs) and jeopardize the existing salmon management program.

The Fisheries Director said law enforcement officers of Washington and Oregon had mutually drawn up plans to enforce commercial fishing regulations. In Oregon, both the Governor and Attorney General support the stand that the State has exclusive authority to manage the fishery resources of Oregon and that present State conservation laws and regulations apply equally to all citizens, Indian as well as non-Indian. Consequently, enforcement of State laws will be undertaken irrespective of any Indian tribal ordinance.

Early in March wholesale fish dealers were notified of the intention of the fisheries agencies to step up enforcement activities. In a letter widely distributed to buyers and others it was stated that any fish dealer purchasing fish taken from closed waters will be subject to prosecution.

Because any commercial fishing by the Yakima Indians above Bonneville will be in violation of State law, citations will be issued to fishermen or dealers involved in taking or handling fish from the closed area.

Enforcement activities are to be closely coordinated by the Oregon State Police and Washington fish and game law enforcement office. An all-out effort is planned to uphold the State laws in both states to assure protection of the very vital spring chinook stocks. This planned action received support when the Federal District Court refused to issue an injunction requested by the Yakima Tribal Council to prohibit State agencies from arresting Yakima Indians fishing under the provisions of the tribal ordinance. The Court's decision indicated the Indians will have to take their chances in court if they choose to ignore State conservation regulations.

The Fisheries Director said, "It is not our intention to deprive the Indians of any treaty right by this action. We are in need of further meaningful clarification of treaty rights and State authority over Indian fishing activities. In the absence of this, but with our present statutory authority we are taking this action to insure having runs of fish to work with when the determination is made. The resource needs the protection of a meaningful management program." (Oregon Fish Commission, April 15, 1966.)

Federal Purchases of Fishery Products

DEPARTMENT OF DEFENSE
PURCHASES, FEBRUARY 1966:

Fresh and Frozen: The Armed Forces are a major buyer of fresh and frozen fishery products. Purchases of fresh and frozen fishery products for the Armed Forces in February 1966 totaled about 2.5 million pounds with a value of about $1.6 million. This represents an important market for the U. S. fishing industry.

Table 1 - Fresh and Frozen Fishery Products Purchased by Defense Personnel Support Center, February 1966 with Comparisons

QUANTITY				VALUE			
February		Jan.-Feb.		February		Jan. Feb.	
1966	1965	1966	1965	1966	1965	1966	1965
(1,000 Lbs.)				($1,000)			
2,531	2,036	4,754	4,406	1,642	1,311	2,907	2,776

In February 1966 purchases of fresh and frozen fishery products for the Armed

Forces were up 13.9 percent in quantity and 29.8 percent in value from the previous month. The increase was due mainly to larger purchases of shrimp, scallops, salmon steaks, ocean perch fillets, and haddock fillets and portions.

Table 2 - Principal Fresh and Frozen Fishery Products Purchased by Defense Personnel Support Center, February 1966 with Comparisons

Product	February 1966 Qty.	February 1966 Avg. Cost	February 1965 Qty.	February 1965 Avg. Cost	Jan.-Feb. 1966 Qty.	Jan.-Feb. 1965 Qty.
	Lbs.	¢/Lb.	Lbs.	¢/Lb.	Lbs.	Lbs.
Shrimp:						
raw headless	92,230	112	94,700	97	144,230	184,400
peeled and deveined	93,100	146	51,080	135	127,100	154,160
breaded	337,917	98	242,020	89	515,867	603,420
molded and breaded	21,900	68	19,150	72	28,900	95,250
Total shrimp	545,147	108	406,950	96	816,097	1,037,230
Scallops	273,750	56	156,180	84	526,500	321,580
Oysters:						
Eastern	46,848	123	99,296	100	95,904	138,772
Pacific	13,000	91	23,982	80	38,550	62,226
Total oysters	59,848	116	123,278	96	134,454	200,998
Fillets:						
Cod	33,300	43	82,850	36	54,300	114,750
Flounder	270,700	47	236,000	37	627,200	624,450
Ocean perch	583,600	41	325,500	36	987,600	694,790
Haddock	164,000	39	145,900	38	384,500	272,000
Haddock portions	230,138	52	101,050	48	467,388	309,550
Steaks:						
Halibut	107,500	50	105,750	49	197,100	208,650
Salmon	20,577	71	9,490	65	31,937	14,490
Swordfish	-	-	320	61	500	860

Compared with the same month in the previous year, purchases in February 1966, were up 24.3 percent in quantity and 25.2 percent in value. Average prices were gnerally higher in February 1966 as compared with the same month in 1965.

Canned: Salmon and sardines were the main canned fish items purchased for the Armed Forces in January-February 1966.

Table 3 - Canned Fishery Products Purchased by Defense Personnel Support Center, February 1966 with Comparisons

Product	QUANTITY February 1966	QUANTITY February 1965	QUANTITY Jan.-Feb. 1966	QUANTITY Jan.-Feb. 1965	VALUE February 1966	VALUE February 1965	VALUE Jan.-Feb. 1966	VALUE Jan.-Feb. 1965
	(1,000 Lbs.)				($1,000)			
Tuna	1/	-	821	641	2/	-	466	291
Salmon	11	5	2,061	6	7	4	1,377	5
Sardines	179	80	211	111	102	49	118	69

1/Less than 500 pounds.
2/Less than $500.

Notes: (1) Armed Forces installations generally make some local purchases not included in the data given; actual total purchases are higher than shown because data on local purchases are not obtainable.

(2) See Commercial Fisheries Review, May 1966 p. 22.

Source: U. S. Department of Defense, Defense Personnel Support Center, Philadelphia, Pa.

* * * * *

VETERANS ADMINISTRATION REQUIREMENTS FOR 1966:

Following are the estimated requirements of the Veterans Administration for fishery products to be procured in 1966:

Item	Case Size	Quantity Case
Canned:		
Clams, chopped, in nat. juice	No. 3 Cyl.	2,000
Salmon:		
coho, dietetic	No. 1/2	2,100
medium red or coho with skin and backbone	No. 1	2,400
red or sockeye	No. 1	3,100
Sardines, veg. oil, Fancy Grade	15-oz.	1,000
Shrimp pieces, freeze-dried (peeled, headless, precooked)	No. 10	200
Tuna:		
lt. meat, solid pack, lge. pieces, dietetic	No. 1/2	2,300
lt. meat, chunk style, packed in veg. oil	64-oz.	6,300
	Size	Pounds
Frozen:		
Cod portions	4-oz.	43,000
Flounder portions	4-oz.	33,000
Haddock portions	4-oz.	74,000
Halibut steaks	4-oz.	27,000
Salmon steaks	4-5 oz.	6,200
Ocean perch fillets	8-12 per lb.	115,000
Sea scallops	med.	37,000

Note: Requests for bids will be announced as they are issued. For additional information, contact the Marketing Division for Subsistence, Veterans Administration Supply Depot, P. O. Box 27, Hines, Ill. 60141.

Fish Farming

POND-REARED CATFISH HAS GOOD MARKET POTENTIAL:

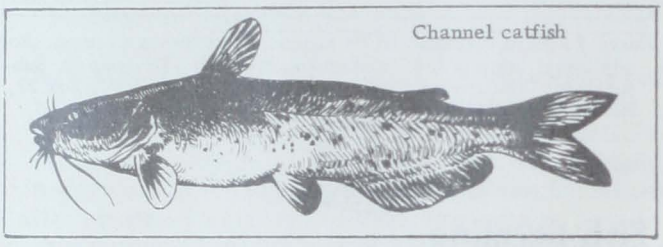
Probably more catfish are now raised annually in the United States than any other fresh-water fish--about 35 million pounds. Fish farmers are devoting more than 20,000 acres to raising catfish; about one-third of the acreage is in the South-Central States. Arkansas leads, followed by Texas, Louisiana, Mississippi, Missouri, Oklahoma, and some states outside this area. In addition to those acres where catfish are raised intensively, there are thousands more where raising catfish is part of a system of crop rotation--catfish one year, rice the next. After one year's growth, catfish (in the round or whole) sells for about 50 cents a pound at the fish farms or, after dressing and packaging, at 90 cents a pound at the retail level.

Catfish is also known by other names. It is often called Rocky Mountain dressed catfish, Mississippi River channel catfish, and farm-raised catfish. Occasionally, it is called barbed trout. The catfish has been tradi-

tionally accepted in the South-Central States, and the channel catfish is the most popular member of the family.

Economists of the Department of the Interior's Bureau of Commercial Fisheries say the commercial production of catfish in the United States can reach 60 million pounds a year.

Fish ponds in which to raise catfish range in size from less than 1 acre to 4 or 5 acres. To build a pond, the farmer builds a levee. A rectangular pond with a smooth bottom is favored because it permits the easiest use of a net to collect the fish. To get every last one of them, the pond is drained. Later, it may be planted with crops. It costs $200-$300 an acre to build a pond. The standard rental is $50 an acre, with ponds and water supply provided. Water is obtained from wells 75-175 feet deep. In the Mississippi Delta, the supply of groundwater is unlimited because it is fed by the river and its tributaries.



Channel catfish

The most important fish raised in these ponds is the channel catfish, but farmers also produce bait minnows--fathead, golden shiners, goldfish--and buffalofish, crappies, bass, and frogs.

Nearly all farmers feed their pond-raised fish with pellets prepared to meet the nutritional requirements of the fingerlings. About 1.8 pounds of feed produce about one pound of weight gain in one year. The fish then weigh from $1\frac{1}{4}$ to $1\frac{1}{2}$ pounds and, after they are cleaned to be sold as food, weigh a pound or less. The farmers also fertilize the water to grow plants for the fish to eat. Production per acre per year is 750 to 1,000 pounds.

There are several alternatives for marketing catfish. Some farmers provide spawning facilities and raise the fish to fingerlings, which they can sell to other farmers at 5 cents apiece--or continue to raise the fingerlings to market size. Grown fish can be sold to stock ponds for fee fishing--or to restaurants or retailers as whole or dressed fish. Nearly all sales of catfish as food products are made within 300 to 500 miles of the fish farms.

The main problem for the fish farmer to overcome is the expense of processing. It costs him 25 cents a pound to raise a fish and 10 cents to process it, during which 45 percent of the weight is lost. The farmer invests 52-53 cents a pound before he can sell the dressed fish for 90 cents. That's why most fish producers prefer to sell their fish live for about 50 cents a pound. Of necessity, fish farmers are trying to merchandise the catfish on its own identity, i.e., it is not a catfish caught just anywhere but one raised under ideal conditions in a farm pond.

Raising catfish has a good potential for the fish farmer. The possibility of expanding the industry is very good because production per acre is high and water supply is more than adequate. The Bureau is developing and demonstrating the use of gear best suited to the industry and gathering information on market conditions. However, Bureau economists warn that if production is greatly expanded, the market potential will change considerably. A significant increase in production could saturate existing markets and other less profitable outlets would have to be sought.

Fish Protein Concentrate

LEGISLATIVE AUTHORITY TO BUILD LARGE-SCALE PLANT RECOMMENDED BY INTERIOR DEPARTMENT:

Legislation which would authorize the U.S. Department of the Interior to develop practicable and economic means for the commercial fishing industry to produce a purified protein product known as fish protein concentrate (FPC) has the Department's support, it announced April 29, 1966. A bill now in Congress (S. 2720) would increase the present research and experimentation program and finance plants to produce FPC.

The Interior Department said there is a present need for one new plant and that it would cost no more than $1 million. It would be based on research findings from the existing model-scale unit at Beltsville, Md., which is operated by Interior's Bureau of Commercial Fisheries. Scientists using a solvent extraction process developed a tasteless and

orless fish protein concentrate from whole d hake, which has been termed "highly nu-tious, inexpensive, and entirely fit for man consumption" by the National Acade-y of Sciences.

The next necessary step is to determine an equally satisfactory product can be pro-ced on a semi-commercial scale, Interior id. It added that it is also necessary to eate more concentrate for testing purposes it can be determined where and how much it can be used as a supplement to other odstuffs.

Building one plant at this time would pro-de guidance for future construction of sol-nt-extraction plants if and when they be-me necessary, the Interior Department id, explaining that research under way con-nues to seek whether fish other than hake n be used as successfully. Also, two other sic processes for producing the concen-ate are being studied. It may be that devel-pment of either or both these processes uld produce a better product and make the lvent-extraction process relatively uneco-mical or even obsolete, Interior said.

It has been noted by Interior that several ajor United States food manufacturers are terested in testing the feasibility of incor-rating FPC into one or more of their prod-ts.

Organizations such as the Agency for In-rnational Development, the United Nations ildren's Fund, World Health Organization, d the Food and Agriculture Organization the United Nations also are interested in pplementing the diets of millions of pro-in-starved people in developing nations by ing the protein concentrate, the Interior partment said.

ur Seals

RICES FOR ALASKA SKINS T SPRING 1966 AUCTION:

The semiannual auction of United States overnment-owned sealskins was held April 1-22, 1966, in Greenville, S.C. Approxi-ately 21,000 Alaska sealskins were offered r sale for the account of the United States overnment, together with 4,700 Alaska seal-kins for the Government of Japan, 23,000 South African sealskins, and 2,800 Uruguayan sealskins. Prices in general were up about 25 percent over the October 1965 sale. Aver-age prices per skin for the U.S. skins were (changes from October 1965 sale shown in parentheses): Matara $120.51 (up 21.2 per-cent); Black $138.61 (up 27.1 percent); Kitovi $118.46 (up 22.9 percent); Natural Lakoda $102.10 (up 26.3 percent); Brown Lakoda $56.69 (up 46.8 percent); Black Lakoda $64.79 (up 4.0 percent).

At the spring 1966 auction, male and fe-male skins were sold in mixed lots the same as in the fall 1965 auction. A total of 16,283 fur sealskins were offered for sale by the U.S. Government at the previous auction held in October 1965 (11,760 dressed, dyed, ma-chined, and finished skins, 3,148 Lakoda skins, and 1,375 sheared skins).

Note: See Commercial Fisheries Review, January 1966 p. 30, and June 1965 p. 21.

Great Lakes

MICHIGAN'S FIRST PLANTINGS OF SILVER SALMON:

The State of Michigan's introductory plant-ings of silver or coho salmon were made this past March by the Conservation Department of that State in the Platte River, Benzie Coun-ty, and Bear Creek, Manistee County. The first release was made on March 22 when 50,000 silver salmon smolts were stocked in the Platte River at the bridge on Maple City Road. On the following day, another 200,000 fish were liberated into the same stream directly from the Department's Platte River Trout Rearing Station.

Plantings also got under way March 23 in Bear Creek where about 350,000 of the salm-on were to be released the following week. The releases were earlier than expected due to an unexpected spring break-up. As soon as stream conditions permitted in the Upper Peninsula, 225,000 young silver salmon were to be stocked in Baraga County's Big Huron River. This would complete the State's first-year program of introducing these fish in Michigan's Great Lakes waters. If all goes well, the 5-6 inch fish planted this past spring will quickly migrate downstream into Lakes Michigan and Superior. They will grow for about two years in those big waters, then re-

turn to the rivers to spawn in the fall of 1967.

As part of the State of Michigan Conservation Department's overall program to revitalize fishing in the Great Lakes, the Platte River and Bear Creek each received 50,000 yearling rainbow trout during March when the salmon releases were made. Another 50,000 rainbows were to go into the Big Huron River at the same time the salmon were planted. It was hoped the additional plantings will help step up runs of steelheads (migratory rainbows) in Great Lakes streams.

Michigan's full-scale releases of silver salmon will put Michigan sportsmen strictly on their honor since those fish are not protected by law. Anglers catching silver salmon this past spring were urged to return them to the planted waters. Actually, fishermen may have a hard time telling the difference between silver salmon and rainbow trout because the two species as yearlings bear a striking resemblance to each other. However, one clue in distinguishing them is that the salmon has spots only on the top half of its tail while the rainbow's entire tail is spotted. Also, the anal fin of the salmon and trout differ. In the salmon, this fin is greater in length than it is in height. The opposite is true of trout, including the steelhead.

Since silver salmon are new in Michigan and not covered by regulations, there is yet no size limit for them. However, anglers can help future fishing for silver salmon by not creeling any fish under the seven-inch limit which covers rainbow trout. In most cases, this will automatically rule out keeping silvers because the big majority of salmon smolts planted this past spring are below that size. (News Bulletin, Michigan Department of Conservation, Lansing, March 24, 1966.)

Note: See Commercial Fisheries Review, February 1966 p. 18.

Great Lakes Fisheries Explorations and Gear Development

ALEWIFE SPAWNING MIGRATIONS STUDIED:

M/V "Kaho" Cruise 31 (March 29-April 28, 1966): To delimit alewife concentrations and to follow their spring spawning migrations shoreward was the objective of two 10-day surveys in southern Lake Michigan by the exploratory fishing vessel Kaho, operated by the Bureau of Commercial Fisheries, U. S. Department of the Interior. The surveys were scheduled to cover the portion of Lake Michigan in waters from off Ludington, Mich., and Two Rivers, Wis., southward.

U. S. Bureau of Commercial Fisheries exploratory fishing vessel Kaho.

The characteristics and timing of the alewife runs are of extreme importance to the newly developing Lake Michigan industrial fish fisheries which now supply both pet-food manufacturers and fish-meal reduction plants. The information will also help lakeside municipal and industrial water users to cope with alewife spawning migrations which create problems at some Lake Michigan water intakes.

A high-resolution, fish-detecting white-line, echo-sounder was the primary assessment tool to be used. Sounding runs were to be made at and between previously established fishing stations around the perimeter of the Lake. A standard 50-foot (headrope) bottom trawl was to be used to verify the composition and density of fish concentrations revealed by the echo-sounding runs.

ulf Fishery Investigations

Some of the highlights of studies conducted the U. S. Department of the Interior's Buau of Commercial Fisheries Biological aboratory, Galveston, Tex., during January-arch 1966:

SHRIMP BIOLOGY PROGRAM: Shrimp Larvae udies: During the quarter, examination of plankton mples collected in July and August 1964 indicated at planktonic stages of Penaeus sp. shrimp were six es more abundant in waters between Galveston and rt Mansfield than between Galveston and the Mississpi River. Greatest numbers were in samples from e 15- to 25-fathom depth zone. Of the total catch of enaeus sp. 11 percent were nauplii, 76 percent protoeae, 5 percent myses, and 3 percent postlarvae. The undance of indicators of recent spawning (nauplii and rotozoeae) suggests that more spawning occurred durg July and August than in May and June.

Four cruises were made in waters off Galveston to cate bottom concentrations of Penaeus sp. postlarvae ring the period December 1965-February 1966. Samles were collected from the water column as well as om the substrate at station depths of 3 to 20 fathoms. esults showed that Penaeus sp. postlarvae were more undant both on bottom and in the water column inore at 3-fathom stations. A major objective of this udy was to determine whether postlarvae had left the ater column and burrowed into the substrate when wa-r temperatures fell below 16° C. (60.8° F.) Relavely cold water temperatures (mean 13.4° C. or 56.2° .) prevailed during that study period. Although few ostlarvae were taken in the initial cruises, it appeared that they were more readily available on bottom an in the water column. This was most evident at epths greater than 6 fathoms. In the later cruises, articularly at 3-fathom stations, large numbers of ostlarvae occurred both in the water column and on e bottom.

It is planned to resume this study next fall and win-er. With improved gear and better knowledge of where ese postlarvae are, it is hoped to gain a better understanding of the habits of Penaeus sp. postlarvae before eir spring movement into the nursery area.

A morphological study comparing measurements of ost of the body parts of pink and brown shrimp larae was near completion during the quarter. Preliminary examination of the data indicates that nauplial substages exhibit no significant differences between species. In the protozoeal and mysis stages, however, there are slight differences, which we hope will be sufficient to differentiate the species.

Cultivation of Shrimp in Artificial Ponds: Preparation of ponds and equipment for the next rearing season were made. The ponds were drained and all potential shrimp predators were removed. The filter boxes, through which inflowing water passes, were cleaned and refilled with crushed shell. A scanning tele-thermometer with a continuous recorder was tested, adjusted, and installed. Its thermal probes were placed at critical positions in the ponds. Screens for sorting postlarval shrimp were made and the collecting and sampling nets used the previous season were repaired.

Algal cells, occurring in the waters of the shrimp culture ponds, were being cultured in several concentrations of inorganic and organic fertilizers. This information will be an aid in establishing guidelines for fertilizer applications to the rearing ponds.

Surveys of Postlarval Abundance and Fisheries for Bait (Juvenile) Shrimp: Semiweekly sampling for postlarval shrimp at Galveston Entrance, and weekly sampling at Aransas Pass, Rollover Pass, and Sabine Pass continued during the quarter. Relatively mild weather prevailed during the early part of the winter and a few postlarvae came into the bays until mid-January. At that time, cold weather apparently curtailed immigration. Catches of postlarval brown shrimp increased during late February and March, but it was too early to tell whether the peak migration for the year had been reached.

Statistical coverage of the bait-shrimp fishery in Galveston Bay was continued on a weekly schedule. As is characteristic of the season, few juvenile shrimp were taken by the Galveston Bay bait shrimp fishery. Most of the shrimp sold as bait were white shrimp from the Freeport area.

Drift bottles and seabed drifters were released in mid-February in near-shore depths (3 to 7 fathoms) between Galveston and Freeport. The aim of this study is to define inshore currents and to determine their possible role in the transport of postlarval shrimp to the passes. Through March, 27 percent of the seabed drifters and 47 percent of the drift bottles had been recovered. Water movement, according to recoveries, has been from east to west. Almost half of the bottles recovered were found on south Padre Island.

Migrations, Growth, and Mortality of Commercial Shrimp: Work during the quarter was devoted to analyzing data from past mark-recapture studies. Examination of the growth information collected from the experiments conducted on pink shrimp in Florida during January and October of 1965, reveals that the estimates from those two studies are similar. Investigation of white shrimp growth in Galveston Bay during 1965 produced rates that are comparable to those gathered in 1963. Analysis of brown shrimp data collected from Mississippi during 1963 has yielded good estimates of the growth parameters for this species.

Efforts are under way to increase the efficiency and mobility of field staining operations. Toward that end, fiberglass tanks have been constructed to replace heavy wooden ones formerly used for holding shrimp; a light weight, disposable container for releasing shrimp was being tested; and a rapid means for staining shrimp has been devised.

ESTUARINE PROGRAM: Ecology of Western Gulf Estuaries: The previous year's biological sampling pattern was evaluated and modified during this quarter. Sampling stations were maintained in each subbay area of the Galveston estuarine system on the basis of major estuarine nursery units. These nursery units are Dickinson Bayou (lower Galveston Bay), Clear Lake (upper Galveston Bay), Cedar Bayou (mouth of San Jacinto River), Cross Bayou and Double Bayou (Trinity Bay), and Marsh Point (East Bay). One station was maintained in the Bolivar Roads Tidal Pass to monitor the movement of animals through that area.

The croaker was the most numerous major species caught in trawls during the quarter, followed in de-

scending order of abundance by the bay anchovy, spot, large-scale menhaden, blue crab, white shrimp, sand sea trout, whiting, brown shrimp, hardhead catfish, and gafftopsail catfish. The croaker and bay anchovy accounted for over 85 percent on the trawl catch. Croakers and spot (0 year class) increased in abundance during the quarter. A few juvenile white and brown shrimp evidently remained in the estuary all winter.

Postlarval brown shrimp were not caught in the estuary during early winter as they were in 1965. They were first caught (average 2 per 5-minute tow) in Bolivar Roads Tidal Pass, lower Galveston Bay (except in the peripheral areas), and in East Bay during late February. By early March, postlarvae were collected everywhere in the estuary except Trinity Bay. Cool water temperature in combination with low salinities probably excluded postlarvae from those waters.

EXPERIMENTAL BIOLOGY PROGRAM: Behavior and Ecological Parasitology: The potential ecological significance of burrowing as a low temperature response of postlarval brown shrimp was examined further during the quarter. Analysis of the laboratory's field results reveals a marked non-random distribution of brown shrimp postlarvae in regard to water temperatures. Most of those shrimp were taken at temperatures of 19°-22° C. (66.2°-71.6° F.), a range similar to that which caused emergence of burrowed postlarvae in the laboratory. Those and other field results have been incorporated into a manuscript titled, "A Behavioral Comparison of Postlarval Penaeus aztecus and P. setiferus, With Special Reference to Burrowing as a Response to Reduced Temperature." The included field and laboratory data support the conclusion that burrowing may have survival significance to brown shrimp postlarvae before and after their arrival at bays in early spring.

Experiments designed to provide estimates of postlarval swimming stamina are in progress, representing one phase of a continuing study on the nature of postlarval movements.

Continuous measurement of field temperatures is nearing completion at the Bureau's East Lagoon Laboratory. Measurements made in 1965 showed a shallow peripheral zone to be consistently warmer than nearby deeper water during the spring period when brown shrimp postlarvae move into the estuarine environment. One annual cycle has been recorded and data being taken will be used for comparison with spring temperature patterns in 1965.

Growth and Survival Studies: A study was conducted with postlarval brown shrimp to observe growth at various population densities. In past growth experiments there has been a wide final size range of animals in a given aquarium. The current test was made to determine if size variation could be attributed to crowding or container size. Test containers were different size beakers--1-, 2-, and 4- liter capacity. Four densities of animals were tested at each capacity--1, 5, 10, and 20 shrimp. These were maintained for 28 days at approximately 26° C. (78.8° F.) 23‰ salinity. Water was changed in all containers at about 5-day intervals. At the end of the test period, all animals were weighed and measured.

At densities of 1, 10, and 20 shrimp the difference in growth between containers was slight. With the exception of beakers containing one animal, there was an increase in growth with increase in beaker size. The difference in size was most pronounced with 5 animals in the beakers. Best growth was in the group of 5 animals in a 4-liter beaker. Those shrimp exhibited an average growth rate of 1.11 millimeters per day during the 28-day test period.

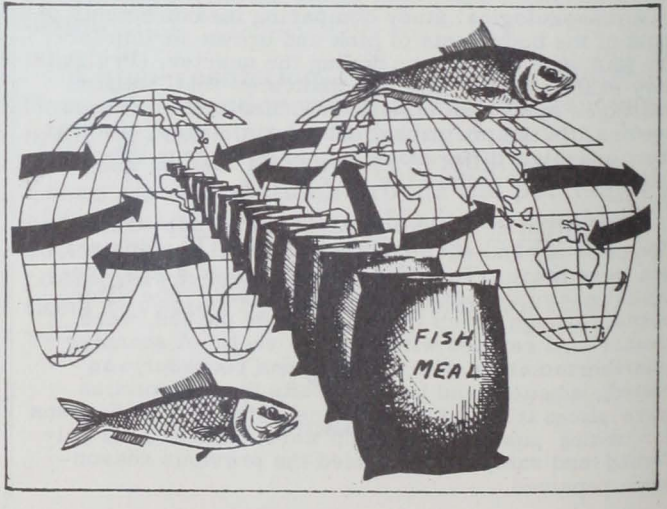
Two studies are being conducted at the request of the laboratory Shrimp Dynamics Program. The first study involved testing survival of postlarval brown shrimp exposed to low temperatures. Such information is needed as a guide in field sampling for abundance of postlarvae arriving in nursery areas after winter's last lethal low temperatures. Shrimp were exposed to low temperature for 24, 48, and 72 hours. Three temperatures were used--2°, 5°, and 8° C.--with a control group held at 17° C. (62.6° F.). No animals survived exposure to 2° for 24 hours. After 48 hours, survival at 5° decreased to 55 percent. Survival at that temperature decreased to 14 percent after 72 hours with other temperatures (8° and 17° C.) maintaining near 100 percent survival. The second study, which involves testing the effect of crowding on survival of juvenile and subadult white shrimp has been in progress.

Note: See Commercial Fisheries Review, March 1966 p. 24.

Industrial Fishery Products

U. S. FISH MEAL SUPPLIES IN 1965 AND EARLY 1966:

World fish meal production in 1965 dropped for the first time since Peru became the major producer-exporter of this protein-rich poultry and animal feed ingredient. The decline in world production was the result of a large decrease in Peruvian output which more than offsets production increases in the United States, Iceland, and Norway. As world demand for fish meal continued to increase, the lower production forced prices up to record levels.



U. S. supplies of fish meal in 1965 totaled 5,000 tons--down 22 percent from 1964. U. production of 253,000 tons increased 6 ent over the previous year, but imports--ely from Peru--amounted to only 271,000 t or down 38 percent.

With a strong domestic demand and small plies available, prices of both domestic imported fish meal in New York City ad-ed from near $140 a ton in January 1965 .86 in December and averaged $165 for year. This was $33 a ton above the 1964 age price, and the highest on record.

During January and February 1966, im-ts from Peru were 17 percent below a r earlier. United States demand for fish al was strong along with continued expan-in the broiler industry, but considerable istance has built up to the high price els.

Peru normally accounts for about two-ds of the fish meal production of the six or fish exporting countries and contrib-s about three-fourths of total U.S. imports. there has been some concern among Pe-ian biologists that Peru could not main-her position as leading producer-exporter he anchovy catch was continued at the lev-f the 1963/64 season. With this in mind, after a decrease in output during the 4/65 season, the Peruvian Government osed a three-month closed season begin-g June 1 with the 1966/67 season opening September 1, 1966. Should fish meal pro-tion for the balance of the 1965/66 season be a par with the previous season, production the entire 1965/1966 season would not be erially different from the 1964/65 sea-n. Peruvian marketing organizations and lers expected world production would be r that of 1965 and attempted to maintain high price level that existed in Decem-r 1965.

However, record anchovy landings in Jan-ry and February 1966 caused stocks to ac-mulate rapidly, and by mid-March they had reased to nearly 50 percent above a year rlier. As Peruvian stocks began to build prices started to weaken.

About mid-April 1966, Peruvian fish meal ices (burlap bagged) f.o.b. East Coast and lf ports averaged $152 a ton, compared with 50 a ton at the same time a year earlier.

(U.S. Bureau of Commercial Fisheries, Branch of Current Economic Analysis, Industrial Fishery Products Section.)

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U. S. FISH MEAL, OIL, AND SOLUBLES:

Production by Areas, March 1966: Preliminary data as collected by the Bureau of Commercial Fisheries, U. S. Department of the Interior:

U. S. Production[1] of Fish Meal, Oil, and Solubles, March 1966 (Preliminary) with Comparisons

Area	Meal	Oil	Solubles
	Short Tons	1,000 Pounds	Short Tons
March 1966:			
East & Gulf Coasts	1,216	258	1,682
West Coast[2]	2,495	289	1,416
Total	3,711	547	3,098
Jan.-Mar. 1966 Total	8,111	1,153	5,617
Jan.-Mar. 1965 Total	8,181	1,709	2,667

1/Does not include crab meal, shrimp meal, and liver oils.
2/Includes American Samoa and Puerto Rico.

* * * * *

Production, February 1966: During February 1966, a total of 268,000 pounds of marine animal oils and 2,064 tons of fish meal were produced in the United States. Compared with February 1965 this was a decrease of 210,000 pounds of marine animal oils and 193 tons of fish meal and scrap. Fish solubles

U. S. Production of Fish Meal, Oil, and Solubles February 1966[1] with Comparisons

Product	Feb. 1966	Feb. 1965	Jan.-Feb. 1966	Jan.-Feb. 1965	Total 1965
	(Short Tons)				
Fish Meal and Scrap:					
Herring	2/	298	2/	542	12,859
Menhaden 3/	-	-	2/	2/	175,838
Tuna and mackerel	1,360	1,635	2,958	3,549	25,410
Unclassified	704	324	1,442	936	27,984
Total 4/	2,064	2,257	4,400	5,027	242,091
Fish Solubles:					
Menhaden	2/	-	2/	-	74,405
Other	1,350	803	2,519	1,710	23,612
Total	1,350	803	2,519	1,710	98,017
	(1,000 Pounds)				
Oil, body:					
Herring	-	124	-	287	8,603
Menhaden 3/	-	-	-	2/	175,368
Tuna and mackerel	183	254	370	490	4,799
Other (inc. whale)	85	100	236	274	6,864
Total oil	268	478	606	1,051	195,634

1/Preliminary data.
2/Included in "unclassified" or "other."
3/Includes a small quantity of thread herring.
4/Does not include a small quantity of shellfish and marine animal meal and scrap because production data are not available monthly.
Source: U. S. Department of the Interior, Bureau of Commercial Fisheries.

production amounted to 1,350 tons--an increase of 547 tons as compared with February 1965.

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U. S. FISH MEAL AND SOLUBLES:

Production and Imports, January-February 1966: Based on domestic production and imports, the United States available supply of fish meal for the first 2 months in 1966 amounted to 44,961 short tons--1,579 tons (or 3.4 percent) less than during the same peri- in 1965. Domestic production was 627 tons (or 12.5 percent) lower and imports were 952 tons (or 2.3 percent) lower than in January-February 1965. Peru continued to lead other countries with shipments of 27,118 tons.

U. S. Supply of Fish Meal and Solubles, January-February 1966

Item	Jan.-Feb. 1966	Jan.-Feb. 1965	Total 1965
	(Short Tons)		
Fish Meal and Scrap:			
Domestic production:			
Menhaden	-	1/	175,838
Tuna and mackerel	2,958	3,549	25,410
Herring	1/	542	12,859
Other	1,442	936	39,264
Total production	4,400	5,027	253,371
Imports:			
Canada	6,839	6,046	43,830
Peru	27,118	32,512	209,801
Chile	1,932	2,080	5,651
Norway	22	-	78
So. Africa Rep.	500	200	5,100
Other countries	4,150	675	6,206
Total imports	40,561	41,513	270,666
Available fish meal supply	44,961	46,540	524,037
Fish Solubles 2/:			
Domestic production	2,519	1,710	98,017
Imports:			
Canada	149	249	1,488
Iceland	33	-	-
Other countries	12	2,066	3,650
Total imports	194	2,315	5,138
Available fish solubles supply	2,713	4,025	103,155

1/Included with "other."
2/Wet weight basis except for imports from South Africa Republic.
Source: U. S. Department of the Interior, Bureau of Commercial Fisheries, and U.S. Department of Commerce, Bureau of the Census.

The United States supply of fish solubles during January-February 1966 amounted to 2,713 tons--a decrease of 32.6 percent as compared with the same period in 1965. Domestic production of fish solubles increased 47.3 percent and imports of fish solubles decreased 91.6 percent.

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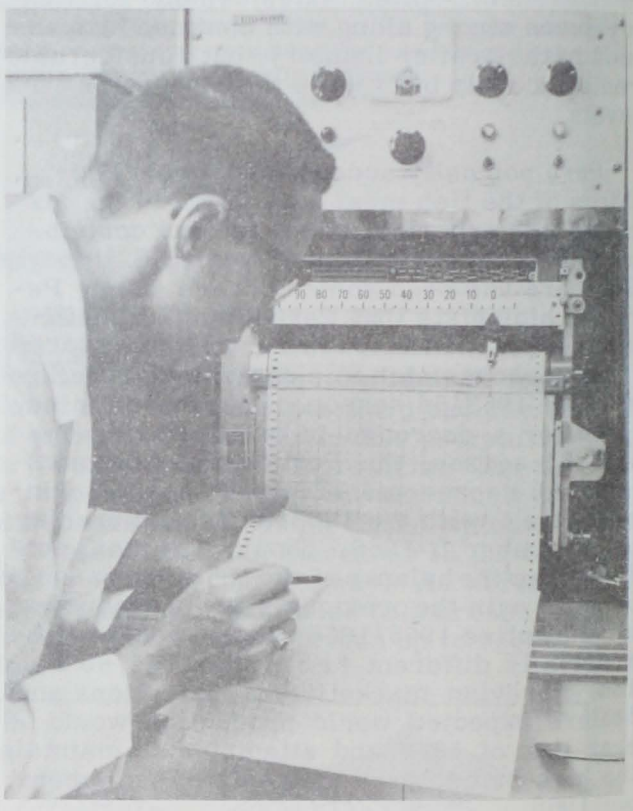
SCIENTISTS STUDY WHY FISH OILS BECOME RANCID:

A new research unit of the Bureau of Commercial Fisheries, U. S. Department of the Interior, has begun studying the problems produced by the oxidation of fish oils. Oxidation is the combination of oxygen from the air or other source with these oils--producing new compounds and ultimately undesirable flavors or odors.

Scientists at the Bureau's Seattle, Wash., technological laboratory will study the oils while they are still in the fish, after they are extracted, and especially at very early stages of the normal storage period.



A chemist of the U. S. Bureau of Commercial Fisheries Technological Laboratory at Seattle, Wash., studies a fatty acid analysis of fish oil as the results evolve from an instrument called a gas chromatograph.

Fish oils are used today to make pharmaceuticals, plastics, and chemicals. A large market for fish oils exists in the European margarine industry.

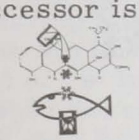
In the past, research revealed much information about the changes fish undergo after extensive oxidation. But little was discovered

about the way oil from freshly-caught fish oxidizes, and how this can be controlled. Early changes have an important impact both on the quality of industrial oils and on the flavor and quality of fresh fish. These changes do not cause fresh fish to become inedible; however, they do lower quality by producing either a flat tasteless condition or a slightly unpleasant rancid flavor. Researchers hope the long-term findings of the new unit will establish the fundamental knowledge necessary to control such changes.

New research data may prove valuable in producing industrial oil of better quality. In time, research of the type conducted by the new unit may develop fish oils, prepared under food-plant conditions, that will be acceptable as human food in the United States. A significant potential use of fish oils was recently foreshadowed by a statement of the American Heart Association. The Association recommended greater use of polyunsaturated fats in the human diet to reduce blood serum cholesterol, which may reduce the incidence of the heart condition known as atherosclerosis. Fish oils have a high proportion of polyunsaturated fatty acids.

The new group, called the Food Science Pioneer Research Unit, occupies space in the new Bureau laboratory building on Montlake Boulevard East, in Seattle. It has seven full-time and four part-time employees. Some of its work will be done in cooperation with the University of California at the Davis and Berkeley campuses.

The unit is headed by Maurice E. Stansby, who has been Laboratory Director of the Bureau's Technological Laboratory in Seattle since 1942. He will continue to hold this post, at least until his successor is chosen.



Maine Sardines

PROGRESS IN LONG RANGE PREDICTIONS OF HERRING SUPPLY:

Progress on a method for predicting the quantities of herring that might be available off the Maine coast from several months to a year in advance was reported by scientists of the U. S. Bureau of Commercial Fisheries at an industry-government meeting, held in Augusta, Me., this past April.

This and other developments were presented to 40 Maine sardine canners and their representatives during a briefing on a major long-term Gulf of Maine herring research program being conducted by the Bureau's biological laboratory at Boothbay Harbor. At the meeting, the difficult matter of making accurate predictions was pointed out and that several promising breakthroughs were being further evaluated. The industry looks upon such predictions as being of incalculable importance in the successful operation of sardine canneries in Maine.

Activities of a large Soviet fishing fleet in the Gulf of Maine was another principal topic of the meeting. The Bureau's project director said the Soviet operations were being closely studied in the hopes of ascertaining what effect, if any, they may be having on the State of Maine inshore sardine herring supply. Other phases of the research studies were described in detail by scientists of the Bureau's biological laboratory. (Maine Sardine Council, Augusta, Me.)

National Fisheries Institute

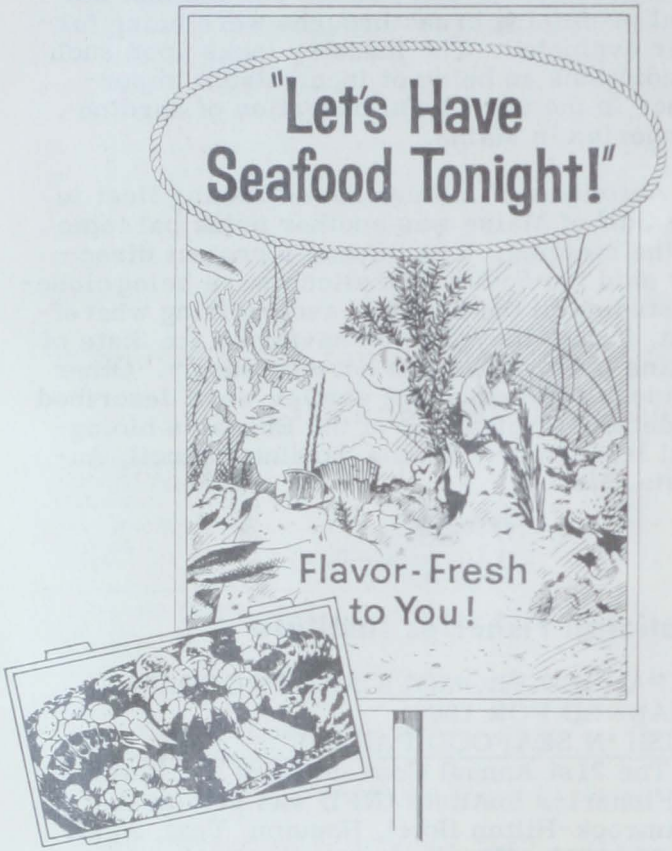
EXPANDED PROMOTIONAL PROGRAM PLANNED FOR 1966 "FISH 'N SEAFOOD PARADE":

The 21st Annual Convention of the National Fisheries Institute (NFI) was held at the Shamrock-Hilton Hotel, Houston, Tex., April 22-26, 1966. The Convention's theme was "Yesterday is History--Tomorrow is Opportunity." It was the biggest convention in NFI's 21-year history, with attendance topping all previous records.

The general sessions included talks on "Highway to Profits," presenting the fisheries' new and expanded promotional program, and the "Exploding Market," a discussion of the institutional market.

Arthur H. Frohman of Chicago, Ill., the newly elected president of NFI, and former chairman of its Fish 'n Seafoods Promotions Division, said that the economic importance of young people is fully realized. Of the some 4 million people who reach the age of 18 each year, nearly half of them are going to decide whether and how often they buy fishery products. Also to be considered at the other end

of the age spectrum is the number of persons 75 years of age and older, and that this age group will increase by 20 percent between now and 1975. "The great health and longevity benefits of seafood are well known to us. But only by the full force of a determined industry can we realistically stress the national consumption of fish and seafood," he said.



Poster and pole display material for the 1966 national Fish n' Seafood Parade.

The "Fish 'n Seafood Parade" promotional program for 1966 will include something new to give added stimulus to the entire campaign. Two new phases are being inaugurated by the NFI Fish 'n Seafoods Promotion Division which should be particularly helpful in increasing fishery products sales through retail outlets.

The first phase of the program is the development of a promotional book for distribution to retailers. The book will include theme headers for newspaper ads, in hand lettering and with line art work samples of the headers in 8-, 5-, and 3-column material, as well as in spot color and shading and screening. It will also include examples of how elements can be rearranged to create store ads with fishery products. With the promotional book, the food-store advertising manager will be in a better position to promote fishery products and tie-in with the national campaign.

The second phase of the program will be a unique trade contest aimed at the Advertising and Merchandising managers of the supermarket chains. All studies show that the homemaker thoroughly reads food store ads. The contest will have full-page ads in which "fish 'n seafood" will be the dominant theme. This will make the trade much more aware of fishery products and alert the consumer to buy more. NFI members who are sponsoring the program will be identified with the contest. Their representatives will have the opportunity to present the contest to the trade.

These new phases of the program will be backed up by a large food publicity program of pictures, recipes, and articles in all media. Also, there will be trade ads in the retail and mass feeding magazines. A guide book of the entire program will be issued to assist the "Fish 'n Seafood Parade" committees to take advantage of the expanded 1966 promotional campaign.

All promotions--both national and regional--will have the full cooperation of the U. S. Bureau of Commercial Fisheries, as in the past. The Bureau's field representatives will work closely with committees of businessmen in carrying out their regional promotion programs. Fishery bulletins and cookery leaflets distributed by the U.S. Bureau of Commercial Fisheries will feature the economy and easy availability of fishery products.

Note: Merchandising materials for the promotional campaign may be obtained through local seafood packers and processors.

Nautical Charts

LIST FOR PACIFIC COASTAL WATERS:

The free distribution to mariners of catalogs listing all available nautical charts for use in navigating U. S. Pacific coastal waters from the Mexican to the Canadian border, was announced by the Coast and Geodetic Survey, U. S. Department of Commerce, on April 29, 1966. The catalog for the Pacific coast also includes Hawaii, Guam, and the Samoan Islands.

A catalog will be issued in late summer f Alaskan waters. A similar catalog is al-dy available for the Atlantic and Gulf sts, Puerto Rico and the Virgin Islands. e catalogs are accordion-folded, similar ormat to road maps.

The catalogs list the numbers of all charts, areas they cover, chart prices, and the le of each chart. Both small craft and nventional charts are listed. Small craft art numbers and the outline of the area cov-d are shown in green and the conventional utical charts in magenta and blue. The cat-gs also include a list of tide tables, coast ots (sailing directions), current tables and al current charts.

Nautical chart diagrams have been avail-le before, but on a much more limited ale. Information up to now has generally en furnished only for specific areas rather n for entire coasts.

The catalogs are available, in person or mail, from Coast and Geodetic Survey art distribution centers at 121 Custom-use, San Francisco, Calif. 94126; 620 Fed-al Office Building; 90 Church St., New York, Y. 10007; and 1125 Commerce Building, shington, D. C. 20230. A list of the 600 nts who sell nautical charts is also avail-le in a similar format.

orth Atlantic Fisheries Investigations

STRIBUTION OF LARVAL RRING IN GULF OF MAINE STUDIED: M/V "Rorqual" Cruise 2-66 (February 14-rch 6, 1966): To determine the distribu-n of larval herring along the coastal Gulf Maine was the objective of this cruise by S. Department of the Interior's Bureau of mmercial Fisheries research vessel Ror-al. The vessel operated in the coastal area tween Cape Ann and Grand Manan Channel.

BIOLOGICAL OBSERVATIONS: Fifty sta-ns were occupied. Three-mile oblique ws were made at each station using the oothbay trawl no. 4. One oblique tow with Gulf III sampler was made in the Grand anan Channel.

PRELIMINARY FINDINGS: Some 1,912 rval herring were caught ranging in stand-ard length from 17 to 46 mm. The heaviest concentrations were found in Ipswich Bay and off Bluehill, Frenchmans, and Pleasant Bays. Mean lengths were generally larger in the west and east and smallest near Penobscot Bay. The largest mean length was from a catch off Machias Bay.

Surface temperatures and salinities were taken at each station. Five drift bottles and five sea-bed drifters were released at 21 standard stations. A Nansen bottle cast, a bathythermograph cast, and a Secchi disc reading were taken at the Grand Manan station.

Note: See Commercial Fisheries Review, January 1966 p. 42.

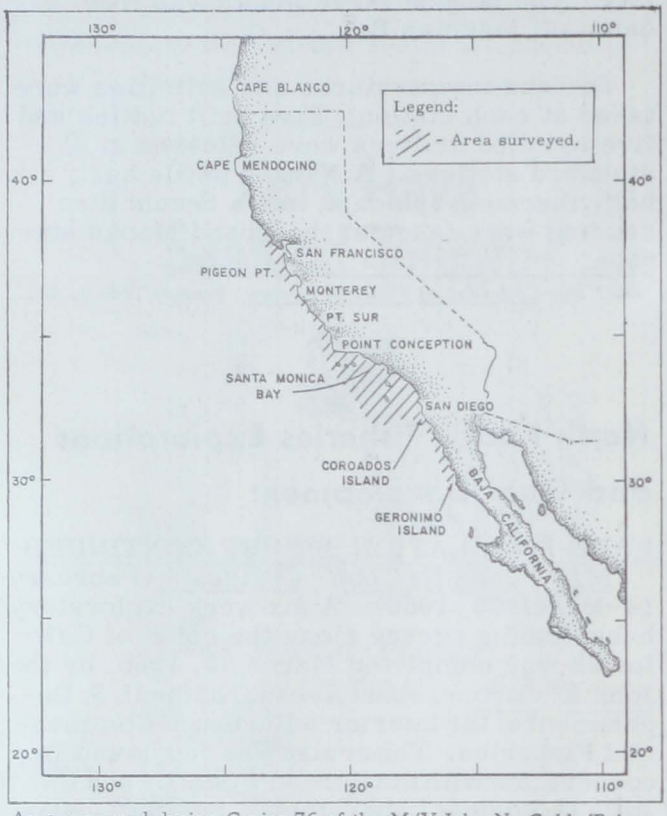
North Pacific Fisheries Explorations and Gear Development

HAKE POPULATION SURVEY CONTINUED: M/V "John N. Cobb" Cruise 76 (February 14-March 25, 1966): A six-week exploratory hake-fishing survey along the coast of California was completed March 25, 1966, by the John N. Cobb, research vessel of the U. S. Department of the Interior's Bureau of Commercial Fisheries. The cruise was conducted in cooperation with the Bureau's Seattle and La Jolla Biological Laboratories, Seattle Technological Laboratory, and the California Department of Fish and Game.

Objectives of the cruise were to: (1) determine the geographic and bathymetric distribution of schools of Pacific hake (Merluccius productus) with the major emphasis on locating and sampling spawning hake concentrations; (2) obtain biological data on hake; and (3) obtain additional data relative to the catching efficiency of the "Cobb" pelagic trawl.

The principal gear used was a standard "Cobb" pelagic trawl constructed of 3-inch mesh multifilament webbing. It was fished with the standard two aluminum hydrofoil-type otter boards on 30-fathom bridles. A high-resolution, low-frequency echo sounder was used to locate the fish and a dual electrical depth telemetering system was used to monitor the fishing depth of the net. An experimental anchovy trawl was also used in the latter part of the cruise. This net is fished in the same manner as the "Cobb" pelagic trawl, and it is constructed of $\frac{3}{4}$-inch number 9 thread, knotted multifilament nylon.

Echo-sounding transects were conducted in accordance with information gained from preliminary hake egg and larvae surveys. Traces of fish observed on the sounder were fished with the "Cobb" pelagic trawl.



Area surveyed during Cruise 76 of the M/V John N. Cobb (February 14-March 25, 1966).

The Scripps Institute of Oceanography's research vessel Alexander Agsasiz conducted hake egg and larvae surveys in conjunction with the Bureau vessel's cruise to help locate spawning schools of hake. The Institute's vessel surveyed the area from Point Conception, Calif., to Geronimo Island, Baja California. A number of stations in the northern sector yielded fair catches of hake eggs and larvae.

The John N. Cobb sounded the coastal waters from San Francisco to Geronimo Island, mainly in the waters between Point Conception and San Diego. The stations where the eggs and larvae were found were surveyed in detail as well as the area off Coronado Islands, where hake were found during 1965, but no adult concentrations were located.

Good signs of fish were observed off Point Sur and Monterey Bay. They were about 125 to 150 fathoms below the surface and over a bottom depth that ranged from 300 to 600 fathoms. But the weather was such that no hauls were made.

The only other distinct sign of fish observed during the cruise was in Santa Monica Bay. The trace was fair, but the size of the school was small, 1 to 3 miles in length and width. They were located at a depth of 110 fathoms, over a bottom depth of 150 fathoms.

Two 1-hour hauls were made through that school, which yielded 50 and 100 pounds of small immature hake. Those fish ranged from 13 to 29 centimeters (5.1-11.4 inches).

The school was observed with the echo-sounder throughout the afternoon and evening; it rose in the evening and dispersed. The following morning it was relocated in approximately the same place after sunrise.

A port call was made in San Francisco on the return trip to Seattle. Representatives of a fishing company there supplied samples of hake caught by a local trawler. The fish, which were large and spawned out, were taken off Pidgeon Point in 145 to 150 fathoms of water, and the tracing of the echogram was excellent. This seemed to be the time of year the hake start appearing in the San Francisco area.

The research vessel Alaska of the California Department of Fish and Game was scheduled to work in conjunction with the Bureau's vessels in fishing and locating hake. But a leak occurred in their fuel tanks and they were in the shipyard during most of the cruise. During part of the week of March 14-18 the two vessels worked together in scouting for fish and comparing sounding traces.

Note: See Commercial Fisheries Review, April 1966 p. 29.

Oceanography

NEW RESEARCH VESSEL "OCEANOGRAPHER" DELIVERED TO GOVERNMENT:

The Oceanographer, the largest, most modern and completely automated vessel built in the United States to probe the secrets of the oceans was delivered to the Federal Government on April 26, 1966.

Delivery of the $7 million "floating laboratory," the most advanced vessel of its kind in

e world, was accepted on behalf of the Gov-nment by the Maritime Administration, S. Department of Commerce, which de-gned it and supervised its construction. It l be operated by the Coast and Geodetic rvey.

The Oceanographer brought to 14 the num-r of vessels in the fleet of the Coast and odetic Survey, an agency of the Commerce partment's new Environmental Science rvices Administration. It is the largest ssel ever built in the United States for the press purpose of deep-sea oceanographic rveys and research. It will be followed er this year by a sistership, the Discoverer.

The Oceanographer is constructed so that can operate equally well in any area of the obal sea, including waters of the Arctic and ntarctic. A bow thruster of 400 hp. located a transverse tunnel through the vessel's ll enables it to maintain a constant heading low speeds despite wind and wave condi-ons. The vessel's specialized equipment rmits extensive oceanographic, meteoro-gical and marine geophysical research. (U.S. epartment of Commerce, April 26, 1966.)

te: See Commercial Fisheries Review, January 1966 p. 45.

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EW HYDROGRAPHIC VESSEL AUNCHED FOR U. S. COAST ND GEODETIC SURVEY:

A new hydrographic survey vessel, the vidson, of the Coast and Geodetic Survey, S. Department of Commerce, was launched ay 7, 1966, at Norfolk, Va.

The Davidson is named for George David-n, a 19th century geodesist, geographer, and stronomer of the Coast and Geodetic Survey, metimes referred to as "the father of Pa-ific Coast geography."

The Davidson's keel was laid November 2, 1965, and the vessel is scheduled for com-letion early in 1967. Following commission-ng, she will become part of the Coast and Geodetic Survey's expanding fleet, which now consists of 14 vessels. They survey coastal waters, search for underwater navigational hazards, make gravity and magnetic meas-rements, conduct tidal and tidal current sur-veys, and engage in deep sea oceanographic surveys and research.

The Davidson is being equipped with spe-ialized depth recorders and positioning sys-tems. She is being built of welded steel con-struction strengthened for navigation in ice and will be propelled by diesel engines, with twin-screw, reversible-pitch propellers. The vessel will have accommodations for 6 offi-cers and a crew of 30.

While the Davidson will engage primarily in hydrographic surveys, she will also have limited oceanographic facilities. The ship is designed for hydrographic coastal surveying, including the setting up and support of shore parties.

Officers who man the Davidson will be commissioned personnel of the Environmental Science Services Administration (ESSA). Last year, the commissioned corps of the Coast and Geodetic Survey became a part of ESSA, a new Commerce Department bureau formed by the amalgamation of the Coast and Geodetic Sur-vey, the Weather Bureau, and the National Bu-reau of Standards' Central Radio Propagation Laboratory, to serve as the national focus for the study of environmental problems.

The Davidson is a sistership of the Mc-Arthur, which was launched at Norfolk No-vember 15, 1965. (U. S. Department of Com-merce, May 7, 1966.)

Oregon

STEELHEAD STOCKING PROGRAM:

Liberation into the Willamette River sys-tem above Willamette Falls of 55,000 steel-head smolts from the Oregon Fish Commis-sion's Big Creek hatchery near Astoria was scheduled for completion in early April 1966, according to the Commission. The Oregon Game Commission, cooperating in the proj-ect, furnished supplemental trucks and drivers to help haul the fish to the upriver planting sites. Among the streams receiving Big Creek steelhead were the South Yamhill River, Wil-lamina Creek, Agency Creek, North Yemhill River, and Mill Creek near Buell. This is the second year of the program which has as its objective the establishment of a steelhead run in the Yamhill River system. Last year 45,000 yearlings were released into South Yamhill tributaries.

The young steelhead measure from 7 to 8 inches in length and are ready, after a year of rearing at Big Creek hatchery, to migrate

to the ocean. The survivors will return as adults on their initial spawning run during the late fall and winter of 1967/68. Although they were reared at Big Creek, the transplanted fish will return to the streams in which they were liberated and from which they began the long trip to the ocean. Enthusiastic about the fine physical condition of the fish, the Commission predicted that returns from the current liberations could be excellent. Returning adults from this plant, due back during the 1967/68 season, will have the benefit of the new Willamette Falls ladder.

An additional 55,000 yearlings reared at Big Creek, a lower Columbia River tributary, were scheduled for liberation into the hatchery stream in late April. The Commission said 4,169 adult steelhead returned to Big Creek hatchery in the past season. Eggs were taken from 200 females to supply fish cultural needs and 116 females plus a like number of adult males were transported with a Game Commission truck to the North Yamhill River and liberated to help build up the run in that stream. The remaining 3,000 adults were allowed to pass upstream to spawn naturally in Big Creek.

The egg take this season totaled 702,000, some 115,000 more than last year's 587,000 take. During recent years, steelhead eggs surplus to the Big Creek hatchery's requirements were transferred to other Commission hatcheries and, this year, to the Federal hatchery on Eagle Creek near Estacada.

A check on sport fishing activities in the northwestern Oregon area, revealed that no regular creel census is conducted on Big Creek as there is on some Oregon Streams. Based on frequent checks of anglers during the season, however, it was estimated that at least 50 steelhead a day were taken from a $\frac{1}{4}$-mile section of the stream during the 3- to 4-week peak of the steelhead season. Large numbers of steelhead were also caught in other portions of the stream.

The fish culture director commented that they were well pleased with the steelhead program at the Big Creek hatchery. Heavy returns of coho indicated the Big Creek station was doing mighty well in the salmon department also. (Oregon Fish Commission, April 1, 1966.)

Note: See Commercial Fisheries Review, July 1965 p. 43.

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WILLAMETTE FALLS STEELHEAD COUNT HIGH:

It appeared certain that the spring migration of steelhead in the Willamette River in 1966 would go on the books as the best in the 16 years that the upstream-bound steelhead have been tabulated at the Willamette Falls fishway, according to the project leader of the Oregon Fish Commission's Columbia River fishery development program. As of mid-April, more than 7,000 steelhead had negotiated the ladder, The 1957 count, the closest to this year's record, was several hundred fish lower, with 5,456 steelhead actually counted. The counting is done by an observer stationed at the upper end of the fishway. He counts 50 minutes out of each hour, with a 5-minute rest period between each half-hour session. Tabulation is conducted essentially during daylight hours with some periods of night observation to provide a basis for calculating the total run. Allowances are also made for the number of fish passing during the 10 minutes of each hour the observer is off duty.

The peak of the steelhead movement this season was on April 5 and 6 when 1,073 and 1,567 steelhead, respectively, passed the falls, the project leader said. With a record high already listed as of those dates, the count was expected to continue to climb by 100-200 fish a day for two weeks more. Spring chinook movement over the falls was just starting and was expected to build up over the following few weeks to reach a peak sometime during May. High water during the March 4 to April 1 period prevented any large number of steelhead from ascending the fishway. High flows also prevented Commission personnel from reaching the counting station on the west side of the falls.

Large numbers of steelhead fry, smolts, and adults have been liberated into the system during recent years by both the Fish and Game Commissions. Although the precise degree of contribution of these efforts is not known, these plants have undoubtedly had some effect on the 1966 run, and quite possibly, have substantially supplemented naturally produced fish.

At any rate, the steelhead picture in the Willamette system was viewed as most encouraging. By the time of completion of the new Willamette Falls fishway, it was believed, there could well be a heavy traffic of steelhead to put the facility to good use. (Oregon Fish Commission, April 12, 1966.)

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DIAN FISHERY IN
LUMBIA RIVER SURVEYED:

The Oregon State University was awarded ntract, by the U. S. Department of the In-or for a survey to determine the magni-te of the Indian fishery in the Columbia er. The $25,000 survey is financed joint-y the Bureau of Indian Affairs and by the eau of Commercial Fisheries.

Approximately 1 percent of the adult chi-k salmon passing Bonneville Dam were to tagged this past spring and cash rewards $1 to $50 were to be paid to Indians who ght the marked fish and returned the tags. gging of the salmon at Bonneville began ril 1.

The extent of the Indian fishery was to be culated from the number of tags returned.

"The purpose of the survey is to provide an urate picture of how extensive the Indian hery is in the Columbia River," said Dr. Edward Perry, Director of the Bureau of mmercial Fisheries Columbia River Pro-am Office. The survey is part of an over-program to find out the magnitude of the n-Indian as well as the Indian fishery. The eau already has in operation an extensive luation program known as "Operation Fin p" to measure the contribution of fish hatch-es in that area to the total sport and com-rcial catch.

"Under terms of the Oregon State Univer-y contract, Indians who caught tagged salm-above Bonneville Dam could collect their ard by returning the tags to a collecting ion.

In order to get the reward, the Indian pre-nting the tag was required to state where caught the tagged fish.

e: See Commercial Fisheries Review, May 1966 p. 21.

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LMON HATCHERY CONSTRUCTION
NTRACT AWARDED:

A contract to construct a salmon hatchery the North Fork of the Nehalem River (Ore-n) was awarded to a firm in Portland by e Oregon Fish Commission in late April 66. The 15 proposals submitted to the mmission ranged from $276,912 to $390,648. e contract was given to the low bidder.

Under terms of the agreement the contrac-r will have 160 days to complete the job. The initial project calls for construction of rearing ponds, water supply systems, egg collection facilities, a service building, and gravel roads. A second construction contract to include 3 dwellings was expected to be advertised late in June.

The new facility, not yet formally named, will be located on the south bank of the North Fork of the Nehalem River about 8 miles south of Necanicum Junction on Oregon Highway 53 in Clatsop County. Initial plans call for annual production of 1 million yearling silver (coho) and 1 million 90-day reared fall chinook.

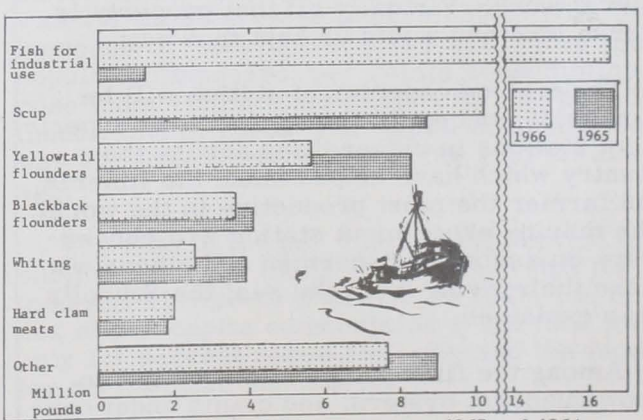
With official approval of the construction contract, the Oregon Fish Commission adds another modern hatchery to its string of fish-production facilities. This latest salmon hatchery will pump new life into the old Nehalem, as well as help boost the offshore sport and commercial fisheries. (Oregon Fish Commission, April 15, 1966.)

Rhode Island

FISHERY LANDINGS, 1965:

Landings of fish and shellfish at Rhode Island ports during 1965 were 48.1 million pounds valued at $4.5 million. Compared with 1964, this was an increase of 30 percent in quantity and 20 percent in value. The catch used for industrial purposes was up 15.3 million pounds.

The catch by otter trawls, as usual, accounted for the major quantity and value of the State's landings, and in 1965 represented 75 percent of the quantity and 51 percent of the value. The otter trawl lobster catch was al-



Rhode Island landings of certain species, 1965 and 1964.

most double the quantity taken a year ago, and while representing only about 4 percent of the volume accounted for 38 percent of the total value for the 1965 otter-trawl catch. Industrial fish taken by that gear was over 15 million pounds greater than the previous year. That figure represented landings during the last 4 months of 1965 when the renovated fish meal plant at Point Judith operated.

Floating trap catches added up to another record year, the fourth in a row. Scup made up 83 percent of the total catch by floating traps. The fishery is primarily seasonal with most of the catch being made in the spring of the year. During May, 65 percent of the total 1965 trap catch was made.

Hard clam (quahog) production increased 11 percent over 1964 with the catch by hand tongers and rakers down 3 percent while dredge production was up 79 percent.

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MARINE EXPERIMENT STATION TO BE ESTABLISHED BY UNIVERSITY OF RHODE ISLAND:

The establishment of a marine experiment station within the Graduate School of Oceanography at the University of Rhode Island has been approved, announced the dean of the School, April 8, 1966. The University has been seeking state-owned land for construction of a small building which would house the station and provide quarters for an initial program in shellfish culture. Preliminary discussions were held with the Director of the Rhode Island Department of Natural Resources. It was indicated that the state would be willing to enter into an agreement to allow the University exclusive use of 200 acres of land in Jerusalem, R. I., for experimental work. Virtually all that property is marsh land and would be kept that way.

The marine experiment station will be similar in concept to the agricultural experiment stations in universities across the country which have helped make the American farmer the most productive in the world. The marine experiment station will concentrate on assisting fishermen and others who make their living from the sea, the School's dean explained.

Among the first projects will be one to grow quahogs, oysters, and clams under controlled conditions in Potter and Pt. Judith Ponds. In addition, a continuing study will be made of the fish and other life in the marsh.

The station will be headed by Saul B. Saila, associate professor of oceanography who has been a member of the University of Rhode Island faculty since 1956. (University of Rhode Island, April 8, 1966.)

Salmon

U. S. PACIFIC COAST CANNED STOCKS, MARCH 1, 1966:

On March 1, 1966, canners' stocks (sold and unsold) in the United States of Pacific canned salmon totaled 1,485,947 standard cases (48 1-lb. cans)--427,833 cases less than on February 1, 1966, and 480,240 cases less than on March 1, 1965, when stocks totaled 1,966,187 standard cases.

On the basis of total stocks of 2,010,097 actual cases (consisting of cans of $\frac{1}{4}$-lb., $\frac{1}{2}$-lb., 1-lb., etc.), red salmon accounted for 1,315,770 cases (mostly 1-lb. and $\frac{1}{2}$-lb. cans) or 65.5 percent of the total canners' stocks on March 1, 1966; pink salmon accounted for 365,595 cases or only 18.2 percent (227,414 cases were 1-lb. talls). Next came chum (142,969 cases, mostly 1-lb. talls), followed by coho or silver (119,342 cases), and king salmon (66,421 cases).

Table 1 - Total Canners' Stocks of Pacific Canned Salmon, March 1, 1966

Species	Mar. 1, 1966	Feb. 1, 1966	Jan. 1, 1966
	. . . . . .(No. of Actual Cases).		
King	66,421	87,321	109,284
Red	1,315,770	1,553,294	1,801,354
Coho	119,342	155,072	173,560
Pink	365,595	520,292	651,279
Chum	142,969	201,711	263,268
Total	2,010,097	2,517,690	2,998,745

Carryover stocks at the canners' level totaled 733,575 standard cases on July 1, 1965, the approximate opening date of the Pacific salmon-packing season. Adding the 1965 new season pack of 3,541,187 standard cases brought the total available supply for the 1965/66 market season to 4,274,762 standard cases.

Shipments at the canners' level of all salmon species from July 1, 1965, to March 1,

Table 2 - Total Stocks on Hand March 1, 1966 (Sold and Unsold) by Species and Can Size

Can Size	King	Red	Coho	Pink	Chum	Total
	(Actual Cases)					
4-lb.	3,774	161,449	51,937	2,480	66	219,706
4-lb.	58,176	455,052	42,824	128,973	33,717	718,742
4-lb.	4,174	695,549	19,850	227,414	104,673	1,051,660
1-lb.	297	3,720	4,731	6,728	4,513	19,989
Total	66,421	1,315,770	119,342	365,595	142,969	2,010,097

Table 3 - Canners' Shipments from July 1, 1965 to March 1, 1966 by Species and Can Size

Can Size	King	Red	Coho	Pink	Chum	Total
	(Actual Cases)					
4-lb.	10,426	263,599	72,901	6,013	1	352,940
4-lb.	110,676	527,963	89,724	283,367	60,375	1,072,105
4-lb.	16,557	765,074	88,250	822,223	393,870	2,085,974
1-lb.	42	5,739	9,538	51,211	12,108	78,554
Total	137,617	1,562,375	260,413	1,162,814	466,354	3,589,573

16, totaled 2,788,815 standard cases. The cryover of 733,575 standard cases on July 1965, the beginning of the 1965/66 sales ar, was substantially lower (37.6 percent) tn the carryover of 1,175,588 cases a year elier.

The 1965 U. S. pack of Pacific canned smon (including Alaska) of 3,672,435 standa cases was 2.3 percent below the 1964 pk of 3,759,198 cases. By species, the new pk was made up of (1964 pack in parenthes): king, 130,556 standard cases (95,804); 2,051,667 cases (776,894); coho, 176,391 ses (219,066); pink, 998,552 cases 940,061); chum, 311,522 cases (724,459); elhead, 3,747 cases (2,914).

Data on canned salmon stocks are based reports from U.S. Pacific Coast canners o packed over 97 percent of the 1965 salm pack. (Division of Statistics and Econom , National Canners Association, April 2, 6.)

See Commercial Fisheries Review, May 1966 p. 31.

ellfish Farming

TENTIAL ALONG U. S. EAST COAST:

Profitable shellfish farming can become reality along the United States east coast thin five years, according to the chairman the University of Rhode Island's Marine sources program. Writing in the official arterly publication of the University's Graduate School of Oceanography, he said this goal can be achieved through careful management backed by scientific knowledge.

The University chairman said there are about a dozen exploratory shellfish farms operating in southern New England and New York. He termed this shellfish farming "aquaculture," and said research in this area was in progress at the University of Rhode Island.

Shrimp

U. S. CONSUMPTION UP IN 1965:

U. S. consumption of shrimp in all forms was estimated at 323 million pounds (heads-off weight) in 1965, a sharp increase of 8 percent over 1964. Shrimp consumption has risen for three consecutive years, and in 1965 was 2.3 times greater than in 1950. With the increase in total consumption well above the population increase, per capita consumption rose from 1.56 pounds in 1964 to 1.67 pounds (heads-off) in 1965. Per capita consumption was 27 percent greater than the 1957-59 average.

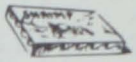
The rise in the per capita consumption of shrimp has been much greater than that for food and all fish as a whole. In 1965, the index of per capita consumption of all food was only 1.1 percent above 1957-59, and the index for all fish was unchanged.

Fig. 1 - Shrimp being transported from landing dock to processing plant.

Ordinarily, the consumption of a commodity will increase with a decline in its price relative to prices of competing products. Last year was a good example: Although the price of fresh and frozen shrimp averaged 4 percent higher than 1964, the increase was less than the price rise for scallops, lobsters, spiny lobster tails, oysters, and most other shellfish. Shrimp may also have benefited from higher prices for meat products last year. Reduced supplies of meat resulted in 4 percent higher retail prices and a 2-percent per capita reduction in consumption of all meat products.

Fig. 2 - Tempting shrimp salad ready for serving.

Rising incomes have been an important factor in the postwar increase in shrimp consumption. Since 1950, for example, per capita consumption of shrimp has trended upward at a rate of 2.8 percent per year, even though the average retail price advanced at a rate of 2.25 percent per year. (U.S. Department of the Interior, Bureau of Commercial Fisheries, Branch of Current Economic Analysis.)



South Carolina

FISHERIES BIOLOGICAL RESEARCH PROGRESS, JANUARY-MARCH 1966:

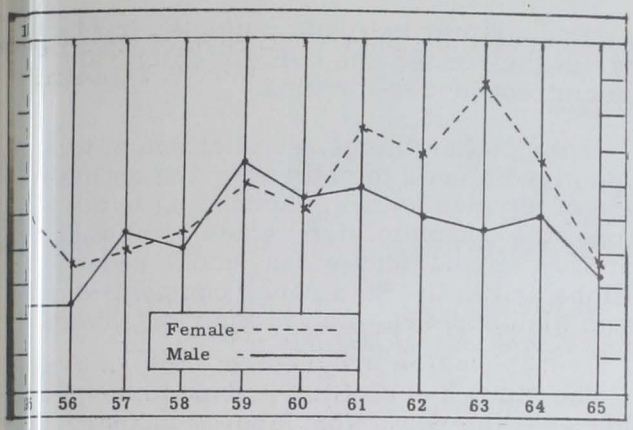
A report on the progress of biological research by the Bears Bluff Laboratories, Wadmalaw Island, S. C., for January-March 1966, follows:

Oyster Studies: The State-Federal oyster project continued to locate and chart subtidal oyster beds, and has very carefully charted 45 linear miles in Colleton, Charleston, and Berkeley Counties. Transplanting of seed oysters from deep-water beds in the Wando River to the Stono and Ashepoo Rivers was carried out during the quarter. Detailed studies of small creeks in the vicinity of McClellanville, to which oysters have been successfully transplanted in the past, were studied in order to try to determine the environmental factors which may control successful transplanting. Quite a number of bottom samples were sent to the State Geologist for analyses.

A repeat survey of 8 stations in the vicinity of Folly River was completed. Those stations were surveyed in 1960 and in 1961, and now in 1966. Comparison of the surveys show that the total number of all sized oysters found in one square yard has steadily declined. The percentage of oysters in each size group has changed. In the 1960 and 1961 surveys small oysters (seed and canning stock) made up about 70 percent of the total population. In 1966, only 50 percent of the oysters were in this size group. This may indicate either heavy harvesting of this size oyster or a lack of recruitment. In 1960 and in 1961, the 2- to 3-inch size oysters made up 20 percent of the oysters taken in sampling. In 1966 this ratio increased to 35 percent. The most striking change occurred in the large (usually single) oysters 3 inches or more in length. The populations in 1960 and in 1961 contained only 6 percent and 7 percent, respectively, of that size. However, in 1966 there were 16 percent of the oysters of that size. Apparently these larger oysters are being underharvested.

Pesticides: The pesticide monitoring program showed that the DDT residuals in fish were 86 percent higher in January and February than during the previous quarter. Dieldrin residuals showed even a higher increase than DDT. Four of the 5 sampling stations which showed this accretion were in the Charleston Harbor area. Oysters were not contaminated by Dieldrin or DDT, except those which were taken from the Ashley River.

Crab Studies: In 10 years of experimental trawling throughout the States, 38,678 crabs were taken in 1,920 tows, according to a study completed in this quarter on available crab information at Bears Bluff Laboratories. The accumulated data show that the sex ratio on these crabs was 77 males to 100 females. Fluctuations in the relative abundance of blue crabs throughout South



Rive abundance of mature male and female blue crabs at 18 regular experimental stations throughout South Carolina, 1955-65.

Carolina as determined by this study are shown in detail (see fig.).

Sampling population densities by the use of crab pots in three different areas of the State, but which were comparable in general physical characteristics, showed that the same amount of effort (i.e. the same number of pots, set the same length of time, using the same type of bait, in approximately the same depth of water) yielded the highest catch in the central, or Price Inlet area. The northern or Murrells Inlet area produced only 80 percent as much and the Harbor River or southern area, yielded only 36 percent of the number caught in the Price Inlet area. This type of population sampling will continue in those three areas for 2 months and may give general information on the three regions, which differ considerably as to fishing pressure.

According to information obtained by experimental trawling throughout the State by the research vessel, adult blue crabs were of about the same abundance in experimental trawling during January-March 1966 as in the same quarter of 1965 (see table). Immature blue crabs, however, were only about one half as numerous during the quarter as in 1965. This may be due to the lower water temperatures observed this year. By late March the numbers of both immature and mature blue crabs began to increase with rising water temperatures.

Shrimp Studies: Small white shrimp were very plentiful throughout coastal waters during January 1966, and an average catch of over 225 in each 20-minute drag with a 20-foot net was recorded at regular survey stations. During the last week of January, however, a sudden cold wave sent air temperatures down to 11° F., and water temperatures in sounds and rivers dropped into the low 40's. On January 31, water temperature was 41° F. in the North Edisto River and almost no shrimp were found there. On the same date, shrimp were found to be fairly abundant in the ocean just off the mouth of the river, where the water temperature was 44.6° F. But within a few days, white shrimp became scarce at all sampling locations.

The extent of the effect of the cold wave on the white shrimp population is not known with certainty, but a few dead shrimp were found in the Charleston Harbor area in February, and several reports were made of shrimp being killed by cold in small creeks. Even though the three-month average catch for white shrimp (see table) was considerable higher this year than in 1965 (due to the high January catch) the abundance of these shrimp in February and March of 1966 was much lower than in 1965. During February the average catch per unit of effort for white shrimp dropped to about 5.0 and in March it declined to 2.0, whereas in 1965 during the same two months the average CPUE was 8.0 and 11.0.

The fact that some shrimp still remain in coastal waters is encouraging, but the outlook for white shrimp is not nearly as promising as it was earlier.

Spot and croaker were less plentiful in experimental trawling during January-March 1966 as compared with the same period of 1965 (see table). Judging from the numbers of postlarvae of those fish in plankton collections made so far in 1966, it appears that both species had successful spawning seasons this past winter and will be quite abundant later on in the year.

Average Catch Per Unit of Effort of Commercial Species at Regular Survey Stations, January-March 1962-1966

Yr	Spot	Croaker	White Shrimp				Blue Crab	
			Jan.	Feb.	Mar.	3 Mos.	Mature	Immature
66	2.9	4.1	228.6	5.3	2.0	78.8	6.9	6.2
65	7.2	5.7	28.7	8.0	10.9	15.7	6.2	12.0
64	0.7	9.5	0.3	0.0	0.0	0.1	3.2	9.4
63	7.9	10.2	9.6	0.0	0.0	3.2	8.1	8.6
62	22.1	18.6	23.4	35.8	19.1	26.3	14.1	23.9

Brown shrimp postlarvae began to enter coastal waters somewhat later this year than in 1965, and it was mid-February before they began to show up in plankton collections. Lower water temperatures during the past winter are quite possibly responsible for the later appearance of these postlarvae this year. Peak abundance of postlarval brown shrimp as of this quarter occurred from middle to late March, and additional recruitment during April was expected.

Pond Cultivation: During the extreme cold spell which occurred in late January and early February 1966, a fish kill took place in a $2\frac{1}{2}$-acre experimental pond. The water temperature at the time of the kill was 33.4° F. Most of the winter trout and croaker in the pond succumbed to cold, but some spot and practically all of the channel bass in the pond revived when temperatures rose a few days later. Most of the channel bass were 2- to 3-year old fish ranging in length from 18-27 inches. Mortality among mullet and flounder in the pond was also negligible.

Two experimental shrimp ponds of $\frac{1}{10}$ and 1 acre in size were drained and treated with triple superphosphate fertilizer at the rate of 40 pounds P_2O_5 per acre. This was done to determine whether added phosphate will increase the productivity of shrimp in ponds. In a preliminary experiment conducted in heated concrete tanks during the quarter, the mud bottom of one tank was treated with phosphate fertilizer, and the other was kept untreated. Both tanks were stocked with small

white shrimp which were fed the equivalent of 2,500 pounds of food per acre during a $2\frac{1}{2}$-month period. Although growth was not extraordinary in either tank, the mortality in the phosphate treated tank was much less than in the untreated control. Reduced mortality through the use of fertilizers has been reported for fish in brackish water ponds in the Far East, and results indicate that the same may hold true for shrimp in ponds.

Note: See Commercial Fisheries Review, March 1966 p. 34.

Tuna

ECONOMIC STUDY OF TUNA FISHING BY U.S. BUREAU OF COMMERCIAL FISHERIES:

Recent changes in the efficiency and composition of the California-based tuna fishing fleet, along with the trend toward building more and larger tuna purse seiners has pointed up the need for a detailed analysis of the economics of United States tuna fishing in the eastern tropical Pacific Ocean. Such an analysis entitled "Costs and Earnings of Tropical Tuna Vessels Based in California" has been published in Fishery Industrial Research, Vol. 3, No. 1, a publication of the U.S. Department of the Interior's Bureau of Commercial Fisheries.

The study was made by a fishery biologist of the Bureau's Tuna Resources Laboratory, La Jolla California, in collaboration with an analyst of a California tuna-packing firm who was formerly associated with the Inter-American Tropical Tuna Commission.

The authors present a method of estimating earnings of various size purse seiners in the size range of 100- to 500-ton capacity, under any prevailing catch rate and price structure for yellowfin and skipjack tuna. Earnings are examined from the standpoints of both vessel owner and crew.

Costs of operation for a substantial portion of the California-based tuna fleet obtained by the authors were broken down into individual categories, and examined in each category in relation to vessel size. These were then recombined according to vessel size, with other information relating directly to vessel income. The income data included the varying prices and catch rates for tuna, relative efficiency of different sizes of vessels, average days at sea per year, average capacity filled, and the average proportions of the two species in the annual catch; again related to vessel size. Using these data, the article shows in considerable detail how estimations of earnings may be made, using as inputs the size of the vessel, the current catch rate, and the current prices for tuna.

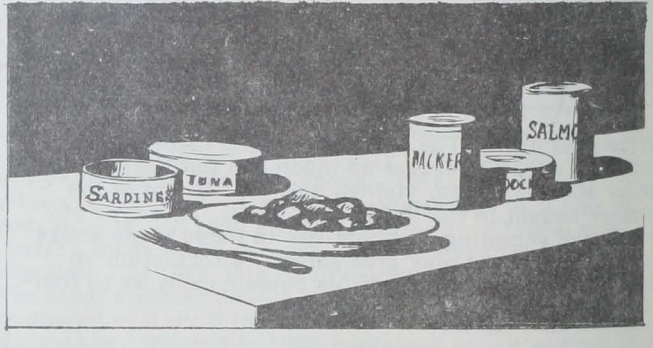
Among other things, estimations of this type may be used to determine the optimum size of a purse seiner. According to the authors, the optimum size varies somewhat with catch rates and prices, but, under recent conditions and in the size range considered, optimum size appears to be in the range from 350- to 500- ton capacity.

The study has already proved to be of considerable interest to the fishing industry.

United States Fisheries

FISH CONSUMPTION IN 1965 HIGHEST IN TEN YEARS:

Preliminary data for 1965 indicate that per capita consumption in the United States of commercially-caught fish and shellfish amounted to 11.0 pounds, edible weight--up from 10.5 pounds in 1964 and 10.6 in 1963. The 1965 per capita fish consumption was



the highest since 1954 when 11.2 pounds were consumed at considerably lower prices. The increased consumption did not occur because of lower prices, as the 1965 retail fish price index was at its highest level at 110.6. The retail fish price index was 95.8 in 1954 and 107.4 in 1964. The increased consumption in 1965 resulted largely from a greater consumption of canned fishery products--4.4 pounds in 1965 compared with 4.1 in 1964. The consumption of fresh and frozen fishery products in 1965 amounted to 6.1 pounds per person--up 0.2 pounds from a year earlier. Cured products were consumed at the rate of $\frac{1}{2}$-pound per person, the same as in 1964. Part of the increased consumption came from decreases in some storage stocks. (U. S. Department of the Interior, Bureau of Com-

cial Fisheries, Branch of Current Economic Analysis.)

* * * * *

CENSUS OF COMMERCIAL FISHERIES:

ross receipts of U.S. commercial fishing operators amounted to $339 million in 1963, according to a survey by the Bureau of the Census, U.S. Department of Commerce.

he 1963 Census of Commercial Fisheries conducted by the Census Bureau in cooperation with the Bureau of Commercial Fisheries, U. S. Department of the Interior, is the first survey since 1908.

here were 23,249 operators engaged in commercial fishing in 1963. Of that total, 11,398 had no paid employees. The remaining 11,251 operators had 20,300 employees with a 1963 payroll of $102 million. Only 82 had 20 or more paid employees and only 3 had more than 100.

he Pacific area with 8,601 operators and gross receipts of $128.5 million, topped the nation. In second place was the South Atlantic area with 6,338 operators and gross receipts of $65 million, followed by the New England area with 3,199 operators and gross receipts of $56 million.

here were 10,666 vessels engaged in commercial fishing in 1963, of which 8,095 were 30-59 feet in length. Only 196 exceeded 11 feet.

* * * * *

DINGS AND VALUE OF COMMERCIAL ERIES HIGHER IN 1965:

nited States fishery landings in 1965 totaled 4.7 billion pounds (4 percent higher than in 1964) with a record ex-vessel value of $451 million--almost 16 percent more than the $) million value in 1964, the U. S. Department of the Interior's Bureau of Commercial Fisheries said. Per capita consumption of fishery products in the United States of 11.0 pounds was one-half pound more than in 1964. st of the gain was attributed to tuna.

The United States remained fifth among the world's fishing nations, led by Peru, Japan, Mainland China, and the Soviet Union in that order. For the first time the United States imported (principally from Canada, Japan, Mexico, Peru, Iceland, and Norway) more than half its supply of edible fishery products.

Shrimp was again the most valuable species--the 1965 catch had an ex-vessel value of $82 million. The salmon catch was valued at $67 million, and tuna at $42 million.

Fig. 1 - Heading of shrimp aboard a fishing vessel.

New catch records were set for Atlantic and Pacific flounders, spiny lobsters, blue crabs, and Alaska king crabs. Spiny lobsters are the source of what many consumers purchase as "lobster tails." The increase in the catch of Alaska king crab was greater than the total catch of that species just five years ago.

Menhaden (an inedible species), which is made into fish meal and used for poultry feed, oil, and other commercial products, was again the most abundant fish taken by United States

Fig. 2 - Menhaden being conveyed on belt system from the hold of a vessel to the cookers of a reduction plant on the east coast of the United States.

fishermen, accounting for 36 percent of the total catch (or 1.7 billion pounds).

Declines were noted in several species, among them mackerel taken off the coast of California, and Atlantic ocean perch. Sardines--at one time the largest fishery with well over a billion pounds landed annually--virtually disappeared from waters off the Pacific Coast.

The Nation's oyster industry also declined. The 54-million-pound catch in 1965 was down 6.7 million pounds from 1964 and was the lowest on record; oyster landings were up in Maryland, but down sharply in New Jersey, Virginia, Alabama, Mississippi, and Louisiana.

Louisiana again led all states in the volume of catch in 1965--794 million pounds--followed by Alaska, Virginia, California, and Massachusetts. Menhaden accounted for a large part of the Louisiana landings.

Alaska continued to lead all states in value of catch--$72 million--followed by California, Massachusetts, and Louisiana. Salmon and king crab made up a major portion of the Alaska catch.

Note: See Commercial Fisheries Review, April 1965 p. 38.

U. S. Fishing Vessels

FISHERIES LOAN FUND AND OTHER FINANCIAL AID FOR VESSELS, JANUARY 1-MARCH 31, 1966:

From the beginning of the program in 1956 through March 31, 1966, a total of 1,792 applications for $45,695,111 was received by the Bureau of Commercial Fisheries, U. S. Department of the Interior, the agency administering the Federal Fisheries Loan Fund. By that date, 930 applications ($20,239,076) had been approved, 575 ($13,323,939) had been declined or found ineligible, 242 ($8,730,158) had been withdrawn by the applicants before being processed, and 45 ($1,338,599) were pending. Of the applications approved, 338 were approved for amounts less than applied for--the total reduction was $2,063,339.

The following loans were approved from January 1, 1966, through March 31, 1966:

New England Area: Sigvald Osmundsen, Rio Grande, New Jersey, $9,000.

South Atlantic and Gulf Area: Merlin, Inc., Port Isabel, Texas, $32,200.

California Area: Walter T. Cramer, Eureka, $47,154; Walter E. Wallin, Eureka, $22,000; Henry R. Endly, Jr., Morro Bay, $18,374; Trans World Marine, Inc., San Diego, $3,000; Arthur O. Baade, San Pedro, $4,664.

Pacific Northwest Area: Donald M. Hall, Astoria, Oreg., $11,500; Frank Parker and Eben Parker, Jr., Astoria, Oreg., $21,140; Paul C. Smith, Newport, Oreg., $16,000; Frank W. Phillips, North Bend, Oreg., $3,500; Arthur F. Todenhoft, Aberdeen, Wash., $8,500; Hubert J. Brabant, Blaine, Wash., $10,000; Thane B. Ohler, Blaine, Wash., $7,000; Rodney Hurd and Ralph B. Peyton, Mountlake Terrace, Wash., $47,163; Jack J. Childers, Port Angeles, Wash., $15,000; Joe A. Nevaril, Port Angeles, Wash., $9,860; Bert A. Bender, Seattle, Wash., $5,200; Arnold O. Jangord, Seattle, Wash., $8,667; Donald D. Knutsen, et all, Seattle, Wash., $25,500; Oceanus, Inc. Seattle, Wash., $20,000.

Alaska: Jerry R. Peterson and John W. Weber, Anchorage, $28,000; Kenneth R. Lyon, Homer, $1,500; Wayne A. Murphy and Charles H. Nims, Homer, $68,000; Leight Sydney Wright, Hoonah, $4,000; Harry T. Brensdal, Juneau, $4,500; Charles R. Lesher, Juneau, $14,000; Jack Williford, Kenai, $10,000; George R. Hippert, Ketchikan, $5,000; Lee G. Andrich, Kodiak, $92,000; Howard Ulrich, Pelican, $4,000; Robert J. Leekley, Petersburg, $33,000; Aril T. Mathisen, Petersburg, $9,500; Andrew J. Barlow, Jr., Wrangell, $8,000.

Under the Fishing Vessel Mortgage Insurance Program (also administered by the Bureau) during the first quarter of 1966, a total of 15 applications for $1,157,750 was received. Since the program began (July 5, 1960) 109 applications were received for $9,722,245. Of the total, 79 applications were approved for $5,709,076 and 18 applications for $2,223,550 were pending as of March 31, 1966. Since the mortgage insurance program began, applications received and approved by area are:

New England Area: Received 15 ($1,796,750), approved 10 ($1,217,178).

California Area: Received 2 ($1,262,000), proved 2 ($1,262,000).

South Atlantic and Gulf Area: Received ($4,160,524), approved 56 ($2,585,539).

Pacific Northwest Area: Received 13 ,127,375), approved 7 ($579,585).

Alaska Area: Received 7 ($375,596), approved 4 ($64,774).

The first applications for a Fishing Vessel Construction Differential Subsidy under the Bureau's expanded program were received in December 1964. Through March 31, 1966, a total of 66 applications for $15,488,500 was received. Public hearings on 42 applications were completed during that period and invitations to bid on a vessel were sent out.

Note: See Commercial Fisheries Review, February 1966 p. 39.

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DOCUMENTATIONS ISSUED AND CANCELLED, YEAR 1965:

During 1965, a total of 663 vessels of 5 net tons and over was issued first documents as fishing craft, as compared with 503 in 1964. There were 422 documents can-

Table 1 - U. S. Fishing Vessels--Documents Issued by Tonnage and Area, Year 1965 2/

Gross Tonnage	New England	Middle Atlantic	Chesapeake	South Atlantic	Gulf	Pacific	Great Lakes	Puerto Rico	Total
				(Number)					
5-9	7	2	33	10	51	30	-	-	133
10-19	9	2	17	10	72	76	1	1	188
20-29	1	1	3	8	18	23	1	-	55
30-39	2	1	-	3	8	6	-	-	20
40-49	-	5	-	5	13	11	-	-	34
50-59	-	-	-	3	5	7	-	-	15
60-69	-	-	-	2	21	4	-	-	27
70-79	2	1	-	2	11	3	-	-	19
80-89	-	-	-	2	24	-	-	-	26
90-99	1	1	-	29	60	1	-	-	92
100-109	-	1	-	2	6	-	-	-	9
110-119	1	-	-	-	1	-	-	-	2
120-129	1	-	-	1	-	-	-	-	2
130-139	2	-	-	-	-	1	-	-	3
140-149	1	-	-	-	-	-	-	-	1
150-159	4	-	-	-	-	-	-	-	4
160-169	2	-	-	-	1	-	-	-	3
170-179	4	-	-	-	-	-	-	-	4
180-189	-	-	-	-	-	1	-	-	1
190-199	1	-	-	-	-	1	-	-	2
210-219	-	-	-	-	-	1	1	-	2
260-269	-	-	-	-	-	1	-	-	1
270-279	-	-	-	-	-	1	-	-	1
300-309	-	-	-	-	-	1	-	-	1
310-319	-	-	-	-	-	1	-	-	1
320-329	-	-	-	-	-	1	-	-	1
330-339	-	-	-	-	-	1	-	-	1
360-369	-	-	-	-	2	-	-	-	2
420-429	-	-	-	-	-	1	-	-	1
430-439	-	-	-	-	-	1	-	-	1
510-519	-	-	-	-	2	-	-	-	2
520-529	-	-	-	-	3	-	-	-	3
550-559	-	-	-	-	1	-	-	-	1
570-579	-	-	1	-	-	-	-	-	1
580-589	-	-	1	-	-	-	-	-	1
590-599	-	-	1	-	-	1	-	-	2
720-729	-	-	-	-	-	1	-	-	1
Total	38	14	56	77	299	175	3	1	663

Note: For explanation of footnotes, see table 4.

Table 2 - U. S. Fishing Vessels--Documents Issued by Vessel Length and Area, Year 1965 2/

Length in Feet	New England	Middle Atlantic	Chesapeake	South Atlantic	Gulf	Pacific	Great Lakes	Puerto Rico	Total
				(Number)					
20-29	3	-	1	5	19	42	-	-	70
30-39	11	4	41	18	97	70	1	1	243
40-49	5	1	11	6	31	37	-	-	91
50-59	-	5	-	11	23	6	1	-	46
60-69	2	3	-	35	117	6	-	-	163
70-79	3	1	-	1	2	1	-	-	8
80-89	7	-	-	-	1	1	-	-	9
90-99	6	-	-	1	1	1	-	-	9
100-109	1	-	-	-	-	1	-	-	2
110-119	-	-	-	-	-	3	1	-	4
120-129	-	-	-	-	-	2	-	-	2
130-139	-	-	-	-	2	2	-	-	4
150-159	-	-	-	-	-	2	-	-	2
160-169	-	-	1	-	6	1	-	-	8
200-209	-	-	2	-	-	-	-	-	2
Total	38	14	56	77	299	175	3	1	663

Note: For explanation of footnotes, see table 4.

Table 3 - U. S. Fishing Vessels 1/--Documentations Issued and Cancelled, by Areas, Year 1965 with Comparisons

Area (Home Port)	Total 1965	Total 1964
	(Number)	
Issued first documents 2/:		
New England	38	33
Middle Atlantic	14	11
Chesapeake	56	39
South Atlantic	78	50
Gulf	298	221
Pacific	175	141
Great Lakes	3	4
Hawaii	-	2
Puerto Rico	1	2
Total	663	503
Removed from documentation 3/:		
New England	33	53
Middle Atlantic	21	27
Chesapeake	32	29
South Atlantic	84	62
Gulf	131	106
Pacific	98	151
Great Lakes	20	14
Hawaii	2	-
Puerto Rico	1	-
Total	422	442

Note: For explanation of footnotes, see table 4.

Table 4 - U. S. Fishing Vessels--Documents Issued by Horsepower and Area, Year 1965 2/

Horsepower	New England	Middle Atlantic	Chesapeake	South Atlantic	Gulf	Pacific	Great Lakes	Puerto Rico	Total
				(Number)					
Under 50	-	-	2	-	1	4	-	-	7
50-99	3	1	3	4	36	20	-	-	67
100-149	7	1	16	8	56	45	-	-	133
150-199	-	7	8	13	61	48	-	-	137
200-249	4	1	10	11	52	17	-	1	96
250-299	2	-	7	2	5	13	-	-	29
300-349	4	2	1	32	68	10	-	-	117
350-399	-	-	4	3	3	3	-	-	13
400-449	8	2	-	-	1	1	1	-	13
450-499	1	-	-	2	5	4	-	-	12
500-599	5	-	1	2	1	2	1	-	12
600-699	2	-	1	-	2	3	-	-	8
700-799	2	-	-	-	-	-	-	-	2
800-899	-	-	-	-	-	2	1	-	3
1,000-1,099	-	-	1	-	1	1	-	-	3
1,300-1,399	-	-	-	-	-	1	-	-	1
1,450-1,499	-	-	-	-	1	-	-	-	1
1,500 over	-	-	2	-	6	1	-	-	9
Total	38	14	56	77	299	175	3	1	663

1/Includes both commercial and sport fishing craft. A vessel is defined as a craft of 5 net tons and over.
2/There were 51 redocumented vessels in 1965 previously removed from the records. Vessels issued first documents as fishing craft were built: 428 in 1965; 33 in 1964; 8 in 1963; 5 in 1962; 3 in 1961; 4 in 1960; 31 in 1950-59; 141 prior to 1950, 10 unknown.
3/Includes vessels reported lost, abandoned, forfeited, sold aliens, etc.
Source: Monthly Supplement to Merchant Vessels of the United States, Bureau of Customs, U. S. Treasury Department.

celled for fishing vessels in 1965 as compared with 442 in 1964.

U.S. Foreign Trade

IMPORTS OF CANNED TUNA IN BRINE UNDER QUOTA:

United States imports of tuna canned in brine during January 1-April 2, 1966, amounted to 17,608,572 pounds (about 838,503 standard cases), according to preliminary data compiled by the Bureau of Customs, U.S. Treasury Department. That was considerably more than the 5,631,316 pounds (about 268,158 standard cases) imported during January 1-April 3, 1965.

The quantity of tuna canned in brine which can be imported into the United States during the calendar year 1966 at the 12½-percent rate of duty is limited to 65,662,200 pounds (or about 3,126,771 standard cases of 48 7-oz. cans). Any imports in excess of that quota will be dutiable at 25 percent ad valorem.

In 1965, the quota was 66,059,400 pounds (or about 3,145,685 standard cases). The total imports for that year were below the quota set. (See p. 108 of this issue.)

Washington

SALMON FISHING REGULATIONS FOR 1966 IN GRAYS AND WILLAPA HARBORS PROPOSED:

Proposed regulations for commercial salmon fishing in Grays and Willapa Harbors during 1966 were discussed at a public hearing held in Olympia, Wash., April 16, 1966, by the Washington State Department of Fisheries.

The current aims of the management of coastal salmon stocks, toward which the proposed regulations were directed, include the maintenance of the present level of fishing intensity and catch-to-escapement balance on the following stocks: 4- and 5-year old Grays Harbor fall chinook; early-run Grays Harbor coho; 4- and 5-year old Willapa Bay chinook and Willapa Bay coho, the State's Fisheries Director said.

Proposals called for a reduction in fishing intensity on Grays Harbor chums to allow adequate escapement.

Increases in fishing intensity, to allow additional harvest, were proposed for 3-year-old Grays Harbor and Willapa Bay fall chinook (predominately males); early-run Grays Harbor fall chinook (Satsop-Chehalis runs); late-run Grays Harbor coho and Willapa and North River coho.

One miscellaneous regulation was proposed to make lawful for the entire year the taking and possession for commercial purposes of hard-shell clams. A statute provides that hard-shell clams may be taken commercially only from licensed clam farms; obviously a clam farmer would refrain from harvesting his clams during spawning time, so there is no need for a closed season, as is presently called for, on Puget Sound east of Dungeness Spit or in Grays or Willapa Harbors.

The regulation proposals and aims were sent fishermen and organizations concerned with the Grays and Willapa Harbors salmon fisheries and written comments were invited.

Following public comment on the proposal, regulations were to be adopted at another public hearing to be held later. (Washington State Department of Fisheries, April 1, 1966.)

* * * * *

SALMON FISHING REGULATIONS FOR PUGET SOUND IN 1966 ADOPTED:

Commercial salmon fishing regulations for Puget Sound for 1966 were adopted at a public hearing held in Olympia, Wash., March 29, 1966, by the Washington State Department of Fisheries. Regulations are similar to those of 1965, and are the same as those proposed at a previous hearing in Seattle with some exceptions.

Included in the changes made were: (1) A new commercial salmon fishing preserve was created in Gig Harbor; (2) The minimum size limit for commercially-caught coho salmon in Puget Sound net fisheries was changed from 22 inches to 16 inches to crop mature coho that are under 22 inches; (3) A partial opening of the Samish Bay Salmon Preserve during the fall chinook season to crop the abundant returns of hatchery-reared chinook in that area; and (4) The chum salmon fisheries will be closed from October 23 to November 30 in all areas except portions of areas

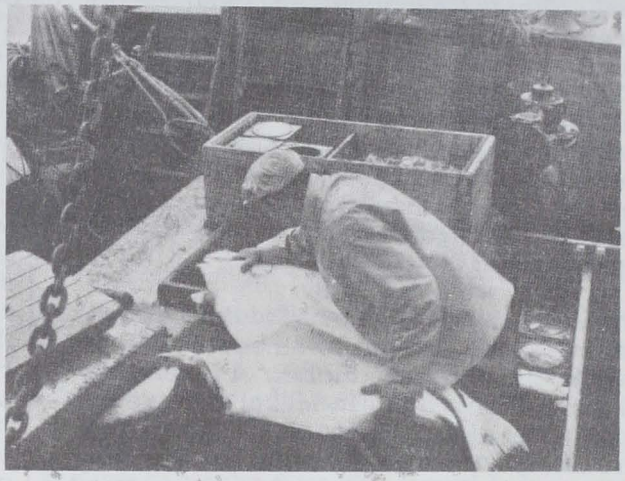
4A[illegible] 6 lying southerly of a line drawn from Lig[illegible] Point on Marrowstone Island to Double Blu[illegible] buoy on Whidbey Island and to the Point Wee[illegible] flashing red range lights. This was do[illegible] o protect dwindling chum runs in northern [illegible]get Sound.

[illegible]e species were added to the foodfish lis[illegible]d some deleted, and regulations of the Int[illegible]ational Pacific Salmon Commission and Int[illegible]ational Halibut Commission concerning W[illegible]ington catches were also adopted. (W[illegible]ington State Department of Fisheries, M[illegible] 29, 1966.)

Wholesale Prices

EDIBLE FISH AND SHELLFISH, APRIL 1966: [illegible]e April 1966 wholesale price index for edi[illegible] fishery products (fresh, frozen, and ca[illegible]d) was down 0.2 percent from the previou[illegible]onth. April prices were somewhat mi[illegible]id--lower or about unchanged for some it[illegible]s but higher for several products including shrimp. At 126.5 percent of the 1957-59 average, the overall index this April was 16.3 percent higher than the same month a year earlier. With very few exceptions, prices were higher for nearly all items than in April 1965.

The subgroup index for drawn, dressed, or whole finfish was down 1.6 percent from March



Dressed halibut being stored in ice in a vessel's hold.

Wholesale Average Prices and Indexes for Edible Fish and Shellfish, April 1966 with Comparisons

Group, Subgroup, and Item Specification	Point of Pricing	Unit	Avg. Prices 1/ ($)		Indexes (1957-59=100)			
			Apr. 1966	Mar. 1966	Apr. 1966	Mar. 1966	Feb. 1966	Apr. 1965
ALL FISH & SHELLFISH (Fresh, Frozen, & Canned)					126.5	126.7	123.2	108.8
Fresh & Frozen Fishery Products:					125.0	125.3	124.9	113.3
Drawn, Dressed, or Whole Finfish:					116.6	118.5	123.7	111.0
Haddock, lge., offshore, drawn, fresh	Boston	lb.	.12	.12	92.0	89.8	111.3	69.5
Halibut, West., 20/80 lbs., drsd., fresh or froz.	New York	lb.	.48	.48	140.5	140.5	139.0	119.8
Salmon, king, lge. & med., drsd., fresh or froz.	New York	lb.	.86	.87	120.5	121.2	122.3	115.3
Whitefish, L. Superior, drawn, fresh	Chicago	lb.	.53	.71	78.3	105.9	108.2	126.9
Yellow pike, L. Michigan & Huron, rnd., fresh	New York	lb.	.85	.85	139.1	139.1	139.1	163.7
Processed, Fresh (Fish & Shellfish):					130.1	129.4	130.5	114.5
Fillets, haddock, sml., skins on, 20-lb. tins	Boston	lb.	.40	.39	97.2	94.8	109.3	85.0
Shrimp, lge. (26-30 count), headless, fresh	New York	lb.	1.10	1.05	128.9	123.0	123.0	117.2
Oysters, shucked, standards	Norfolk	gal.	8.13	8.50	137.0	143.3	143.3	115.9
Processed, Frozen (Fish & Shellfish):					123.0	122.8	116.0	109.5
Fillets: Flounder, skinless, 1-lb. pkg.	Boston	lb.	.43	.42	109.0	106.4	106.4	93.8
Haddock, sml., skins on, 1-lb. pkg.	Boston	lb.	.39	.39	112.9	114.3	117.3	108.5
Ocean perch, lge., skins on 1-lb. pkg.	Boston	lb.	.32	.32	112.2	112.2	112.2	105.2
Shrimp, lge. (26-30 count), brown, 5-lb. pkg.	Chicago	lb.	1.09	1.09	129.2	128.6	115.6	111.5
Canned Fishery Products:					129.6	129.6	120.7	101.2
Salmon, pink, No. 1 tall (16 oz.), 48 cans/cs.	Seattle	cs.	28.50	28.50	124.2	124.2	124.2	88.3
Tuna, lt. meat, chunk, No. 1/2 tuna (6-1/2 oz.), 48 cans/cs.	Los Angeles	cs.	14.85	14.85	131.8	131.8	112.1	101.6
Mackerel, jack, Calif., No.1 tall (15 oz.), 48 cans/cs.	Los Angeles	cs.	7.63	7.63	129.3	129.3	120.9	120.9
Sardines, Maine, keyless oil, 1/4 drawn (3-3/4 oz.), 100 cans/cs.	New York	cs.	10.25	10.25	131.5	131.5	131.5	131.5

1/Represent average prices for one day (Monday or Tuesday) during the week in which the 15th of the month occurs. These prices are published as indicators of movement and not necessarily absolute level. Daily Market News Service "Fishery Products Reports" should be referred to for actual prices.

Source: U. S. Department of Labor, Bureau of Labor Statistics.

to April. Prices at Chicago for Lake Superior fresh whitefish (down 26.1 percent) were sharply lower than in March when low supplies brought considerably higher prices, together with slightly lower prices for western frozen king salmon (down 0.6 percent). The lower prices were partly offset by slightly higher prices at Boston for ex-vessel large haddock. Prices remained unchanged from the previous month for western frozen dressed halibut and Great Lakes fresh yellow pike at New York City. Compared with April 1965, prices this April were higher by 5.0 percent. Prices were higher for nearly all items in the subgroup. The exceptions were lower prices for Great Lakes whitefish (down 38.3 percent) at Chicago and yellow pike (down 15.0 percent) at New York City.

The April 1966 subgroup index for processed fresh fish and shellfish rose 0.5 percent from the previous month. Prices this April were higher than in March for fresh haddock fillets (up 2.5 percent) at Boston and fresh shrimp (up 4.8 percent) at New York City, but were lower for standard shucked oysters (down 4.4 percent) at Norfolk. As compared with the same month a year earlier, the subgroup index this April was higher by 13.6 percent. Prices were considerably higher than in April 1965 for all items in the subgroup.

The processed frozen fish and shellfish subgroup index rose only slightly (up 0.2 percent) from March to April. April prices for frozen flounder fillets at Boston were higher by 2.4 percent and frozen shrimp at Chicago rose 0.5 percent from the previous month. Prices for small haddock fillets at Boston this April were lower by 1.2 percent but for ocean perch fillets they remained unchanged. The subgroup index this April was 12.3 percent higher than in the same month in 1965 because of generally higher prices--substantially higher for flounder fillets (up 16.2 percent) and frozen shrimp (up 15.9 percent).

Prices for all canned fishery products were unchanged from March to April 1966. Market conditions were steady to firm and stocks of several products were low. But compared with the same month a year earlier, the index this April was up 28.1 percent. Prices were higher than in April 1965 for canned pink salmon (up 40.7 percent), canned tuna (up 29.7 percent), and California jack mackerel (up 6.9 percent). Prices for canned Maine sardines remained unchanged for for each of the months indicated. (U. S. Department of the Interior, Bureau of Commercial Fisheries, Market News Service.)

WAYWARD DRIFT BOTTLE RETURNS AFTER 40 YEARS

A record of some sort was established recently when the Woods Hole Oceanographic Institution (Massachusetts) was notified of the recovery of a drift bottle that had been launched into the ocean nearly 40 years ago.

A drift bottle is one of the oldest and simplest means of measuring ocean currents. It consists of a corked glass bottle with a card inside. The position and date of release are recorded and the card asks the finder to report the date and location of recovery. From hundreds of returns, a picture of the surface circulation can be drawn.

Most of the bottles that are recovered turn up in a few weeks or months. Number 1456, however, was released by the U. S. Bureau of Fisheries vessel Halcyon on July 12, 1922, about 120 miles east of the entrance to Delaware Bay. It was found on February 20, 1962, on the beach at Oregon Inlet, N. C., some 220 miles from the release point. It was probably buried in the shifting sands for 40 years, according to a Woods Hole oceanographer. (Sea Secrets, Vol. 6, No. 9, October 1962.)