FISHERIES

(formerly Trade News) OF CANADA

Vol. 19 No. 7 January, 1967

In This Issue

Department of Fisheries of Canada, Ottawa

FISHERIES OF CANADA

(formerly Trade News)

Editor

E. H. HEARNDEN

Vol. 19 No. 7 January, 1967

CONTENTS

COVER PHOTOGRAPH - Lake trout caught in Saskatchewan was one of several Canadian freshwater species shown to buyers visiting the Canadian exhibit at the International Food Fair held in Paris, France, recently. Shown holding the trout are: Mr. W. Lederman, head chef at a Hull, Que., restaurant; Mrs. P.M. Klosevych, Assistant Chief of the Consumer Branch of the Department of Fisheries in Ottawa; and Mr. R.W. Bedard, Commodity Officer with the Fisheries Division of the Department of Trade and Commerce, Ottawa.

Cortisone-like Hormone Isolated from Skate by Fisheries Scientists

By G.J. Gillespie

TO DEEPSEA fishermen the kite-shaped fish with the flat body is known as skate. To the biologist skate is a name applied to several species of the genus *Raja* with cartilaginous skeletons which embraces a family of fishes including many types of sharks and rays.

While the skate is by no means rare, it has a unique feature that distinguishes it from many other subjects in King Neptune's kingdom. Somewhere along the line -- 300 million years ago, some scientists believe -- the skate never boarded the evolutionary band wagon and has retained the same physical characteristics it had eons ago.

This lowly creature with spreading pectoral fins somewhat resembling the wingspread of a modern jet fighter plane, never did have the status rating of the more conventional fish like cod, haddock or halibut. They are edible but have no significant commercial value, at least to Canadian fishermen in the Northwest Atlantic.

HORMONE ISOLATED

Lately, however, the skate has been brought into interesting focus by Fisheries Research Board of Canada scientists. They opened a new chapter in the fascinating story of fish endocrinology by isolating a cortisone-like hormone from the blood of two species of skate -- *Raja radiata* (admiral or thorny) and *Raja ocellata* (big skate).

This discovery initiated by Dr. D. R. Idler, Director of the Board's Halifax Laboratory, has already made its impact on the scientific world. The Halifax scientist presented a paper on the subject to the Second International Congress on Hormonal Steroids in Milan, Italy, last May. Associated with Dr. Idler in the hormone study was Miss Beryl Truscott, a member of Dr. Idler's scientific staff.

Dr. D.R. Idler, Director of the Fisheries Research Board's Halifax Laboratory, conducts a hormone experiment on a skate.

A hormone may be simply described as any substance normally produced in one organ of the body and carried by the circulating blood to another tissue which it affects to bring about a specific reaction. Thus, there are hormones which regulate reproduction, the amount of sugar in the blood and a multitude of other body processes. Hormone therapy is making a tremendous impact on biological controls in both humans and animals. Once the chemical structure of a hormone is established, organic chemists can frequently produce it synthetically. A typical example of the latter is the use of the sex hormones in human contraception.

Dr. Idler's interest in fish hormones had its beginning in the late 1950's with biochemical studies on the Pacific sockeye salmon during spawning migration. There were many questions begging answers: the effects, for instance, of river obstructions such as power dams on salmon migration; the metabolic changes leading to the death of Pacific salmon after spawning as contrasted with the frequent survival of Atlantic salmon; the biological

mechanism responsible for making salmon adaptable both to fresh and saltwater.

CLUES FROM SALMON

The salmon hormone probe gave clues and, in several instances, partial answers to those questions. Investigators found that there was an impaired hormone metabolism in sockeye salmon after spawning. In Atlantic salmon, which frequently survive spawning, the manner of hormone elimination several days after spawning was comparable to that with sexually immature sockeye salmon. Dr. Idler and his associates concluded that major impairment of hormone metabolism was a sign of approaching death rather than a result of spawning. Further investigation demonstrated impaired hormone metabolism in dying Atlantic cod, while this same form of hormone upset has been identified in humans at the point of death by other scientists.

Investigations initiated on the West coast were switched to the Atlantic seaboard where Dr. Idler and his fellow-scientists commenced to probe the hormonal mysteries of skate, among other fish.

From this evolutionary-retarded species inhabiting the dark, green depths of the Atlantic, Dr. Idler isolated the cortisone-like substance from the blood of two skate species. This hormone, known by the scientific name of 1α-hydroxycorticosterone, had never before been isolated from a natural source nor reported in the scientific literature. The skate produces this hormone from the fish-equivalent of the adrenal gland in humans.

SECOND DISCOVERY

This is the second completely new hormone that has been isolated by the group. A few years ago they identified a new potent sex hormone, 11-ketotestosterone, in the blood of salmonid fishes.

A companion to the new hormone in the blood of skate is testosterone, a potent sex hormone. The Halifax group found the latter to be present in the skate at a "fantastically" high level by comparison with the amount found in mammals, including man.

Tests have begun to determine the function of the new hormone. Inditial results with laboratory mammals show it to be a potent regulator of salt metabolism.

The newly-discovered hormone is not produced at the temperature of warm-blooded animals. Scientists have prepared the steroid in a radioactive form and are studying the route it follows through the skate's bloodstream and tissues.

To the average layman the significance of research on fish hormones is a bit abstruse, but they have real meaning to scientists interested in manipulating the fisheries resource. Hormones have already been used to improve methods of propagation of sturgeon, salmon and other commercial species. Hormones have been implicated in providing the "trigger" for spawning migration of salmon. Improved knowledge of fish hormones may one day make it possible to predict movements of fish species well in advance of their actual occurrence. Any successful rearing of fish in captivity must take account of the influence of hormones of sexual maturation, feeding, tolerance to fresh and salt water, tolerance to temperature fluctuation, feeding habits and related phenomena.

In medical science, the steroid of the lowly skate might have a significance belying its humble origin. However, the full impact of a new hormone cannot be known until experimentation unfolds more about its biological function.

Every time a new hormone is discovered, or new knowledge is gained of the function of hormones in fish, man is closer to the day when he will manipulate the aquatic organisms and their environment rather than being limited by the vagaries of nature.

New Navigation Chart

A new navigation chart issued by the Department of Energy, Mines and Resources will aid offshore oil exploration as well as East Coast fishermen.

Chart 4015, Sydney to St. Pierre, is the third in a new series of coastal charts prepared by the Canadian Hydrographic Service. Previously issued were Chart 4010, Bay of Fundy, and Chart 4012, Yarmouth to Halifax.

This series, based on surveys controlled by modern electronics means, eventually will cover Canada's eastern seaboard. The latest chart covers an area where large reserves of petroleum and natural gas may lie beneath the ocean.

Drawn to a scale of 1:350,000 (about five miles to an inch), it outlines the shape of the ocean floor by means of closely-spaced blue contour lines.

Chart 4015 is also available in two latticed versions: L(D6) 4015, which shows the Decca lattice for Cabot Strait Chain 6; and 4015-L, which shows the four Loran-A rates covering the area.

Copies of Chart 4015 may be obtained for $1.00 each, or $2.00 each for the latticed versions. They are available from chart dealers or from the Hydrographic Chart Distribution Office, Department of Energy, Mines and Resources, Ottawa.

New Brunswick's North Shore Fishery

A Study of Costs and Earnings of Selected Enterprises

SIX 48-foot Danish seiners fishing out of New Brunswick North Shore ports during 1965 landed an average of 420,823 pounds of fish per vessel with an average landed value of $15,240 according to a preliminary report on Costs and Earnings of Selected Fishing Enterprises of New Brunswick North Shore, 1965. Average rate of return per vessel on total assets was 11.91 per cent.

The report, issued jointly by the Department of Fisheries of the Province of New Brunswick and the Economics Service of the federal Department of Fisheries, contains operational and financial summaries on 20 fishing vessels, including six 48-foot Danish seiners, ten 65-foot and four 86-foot wooden draggers, operating mainly in the Gulf of St. Lawrence.

All vessels were equipped with depth sounders and radio-telephones. Only one Danish seiner was equipped with a loran (long-range navigation); seven 65-foot draggers were equipped with a loran and one with radar; three 86-foot draggers were equipped with loran and one with a Decca navigator, also all four carried radar equipment.

The Danish seiners were equipped with 13 or 13A seines. The 65-foot draggers used otter trawls in the sizes of standard 35, full 35, 36, 41A, 41 or Western Atlantic trawl. All of the 86-foot draggers used 41 otter trawls.

Average landings by 65-foot draggers in 1965 amounted to 989,679 pounds per vessel with a landed value of $33,994 while 86-foot draggers landed an average of 2,141,641 pounds per vessel in that year with an average landed value of $69,353. The Danish seiners spent an average of 93 days at sea, the 65-foot draggers spent 126 days, while the 86-foot draggers spent 163. These data show that average landings and landed values are related to the size of vessel and fishing effort.

HIGHLINER DANISH SEINER

The highliner 48-foot Danish seiner spent 106 days at sea and landed 572,165 pounds of fish valued at $20,254; the figures for the 65-foot dragger were 113 days, 1,207,270 pounds and $41,144, respectively. The 86-foot highliner dragger spent 227 days at sea and landed 2,875,849 pounds of fish with a landed value of $93,716.

The sample of Danish seiners included in the 1965 study fished on grounds located in the Gulf of St. Lawrence. The 65-foot draggers caught 96.8 per cent of their landings on grounds in the Gulf of St. Lawrence and 3.2 per cent outside the Gulf. The 86-foot draggers caught 80.5 per cent of their landings on grounds in the Gulf of St. Lawrence and the remaining 19.5 per cent on grounds outside the Gulf.

The average net profit after depreciation but before income taxes for the 48-foot Danish seiners was $2,178 per vessel, for the 65-foot draggers it was $1,801 and for the 86-foot draggers it was $9,972. However, the average profit for the 86-foot draggers includes interest which was so far not charged to all of the vessels in this class; these vessels on the average were only two years old and complete transfer of ownership from the Loan Board to the captain-owners was not executed.

The ranges in profit per fishing enterprise are shown by the following:

Type of Vessel	Length	Vessels Making Loss	Vessels Making Profit	Range in Profit Lowest	Range in Profit Highest
	ft.	no.	no.	$	$
Danish seiners	48	-	6	1,407	3,251
Draggers	65	1	9	-3,509	6,435
Draggers	86	-	4	7,500	15,327

The most profitable 48-foot Danish seiner returned $3,251 to the owners; the figure for the 65-footer was $6,435 and for the 86-footer $15,327.

Another measure of profitability is the rate of return on total capital investment. The rates of return are compared in the following table:

Return on Total Assets before Income Taxes
New Brunswick Vessels, 1965

Type of Vessel	Length	Vessels in Sample	Average Rate of Return on Total Assets	Highest Rate of Return
	ft.	no.	%	%
Danish seiners	48	6	11.91	19.70
Draggers	65	10	2.33	8.89
Draggers	86	4	5.38	8.91

The average rate of return per 48-foot Danish seiner was 11.91 per cent on an average total asset of $18,280, and the highest rate of return was 19.70 per cent. Figures for 65-foot draggers were 2.33 and 8.89 on average total assets of $77,367. For the 86-foot draggers the average rate of return was 5.38 per cent on average total assets of $185,251, and the highest return was 8.91 per cent.

The average take-home pay for the deckhands on 48-foot Danish seiners for a fishing period of 93 days at sea was $2,096 or $22.54 per day at sea; for 65-foot draggers the figures were $2.778 for a fishing period of 126 days at sea or $22.05 per day at sea; and for the 86-foot draggers for a fishing period of 163 days at sea the net earnings for the average deckhand were $3,416 or $20.96 per day at sea. The specialized crew members did somewhat better as is shown by the data in the table below.

Average Net Returns to Labour, New Brunswick Vessels, 1965

Item	Averages per Vessel		
Length of vessel in ft.	48	65	86
Men in crew	3.3	4.5	6.0
Days at sea	93	126	163
Crew Category	Average Net Earnings per Man per Season		
	$	$	$
Captain	2,140	2,832	4,601
Mate			3,989
Boatswain			3,446
Cook	2,097		3,705
First engineer			3,852
Second engineer			3,439
Icer			3,461
Deckhand 1/		2,782	
Deckhand 2/	2,096	2,778	3,416
	Average Net Earnings per Man per Day at Sea		
	$	$	$
Captain	23.01	22.48	28.23
Mate			24.47
Boatswain			21.14
Cook	22.54		22.73
First engineer			22.63
Second engineer			21.10
Icer			21.23
Deckhand 1/		22.08	
Deckhand 2/	22.54	22.05	20.96

1/ Including crew expense rebates and co-operative dividends.
2/ Includes crew that did not receive rebates or dividends.

For the captain-owner vessels, the sharing arrangements do not assign large returns to the captain. However, the captain-owner in addition received the residual from the boat share, which includes a return to management.

The report was prepared by John Proskie, of the Economic Services of the federal Department of Fisheries. ✔

UN Training Vessels

Two 81-foot fishing-training vessels of the Food and Agriculture Organization of the United Nations have become the first boats of their kind ever to cross the wide Pacific under the "white and light blue" of the UN banner.

The boats, the *Alcyon* and the *Calamar* docked in San Diego, California in November after a 30-day crossing from Japan. They were on their way to the Caribbean where they will be used to study the area's marine resources and to train fishermen as part of a major FAO fisheries project being carried out under the United Nations Development Program.

The *Alcyon* will have its home port at Kingston, Jamaica, and the *Calamar* at Bridgetown, Barbados, headquarters for the FAO project. Participating states and territories are Barbados, Guyana, French Guiana, Guadeloupe, Martinique, Jamaica, the Leeward Islands, Netherlands Antilles, Surinam, Trinidad and Tobago, Grenada, St. Lucia and St. Vincent, the Dominican Republic and Puerto Rico.

Though 12 of the 15 participants are islands, or chains of islands, none of them catch as much fish as they need. Present Caribbean fishing methods are usually more picturesque than productive. Marketing and distribution is inefficient, and there are not enough trained people to intelligently exploit the Caribbean's rich fisheries potential.

The project's aim, therefore, is to build a sound base for future fisheries development. This is to be accomplished through exploratory fishing, marketing studies, and training. The project is to run four years.

Heading the project is Harry C. Winsor of St. John's, Newfoundland, a man with a long experience in unknotting difficult fisheries problems. Winsor was one of FAO's first fisheries experts, serving from 1946 until 1952 as executive officer of FAO's Fisheries Division. From 1953 until 1964, when he returned to FAO service as manager-designate of the Caribbean project, he headed many important commercial fisheries operations in Canada and was a member of the Newfoundland Fisheries Development Authority, with direct responsibility for community development and planning, construction and operation of community fish-processing plants.

Gain and Loss in the Weight of Fillets During Processing and Storage *

By C.H. Castell

FILLETS of groundfish, such as cod, haddock or flounder, contain 80 to 84% water. This water is a very important component of the muscle. Removing it decreases the palatability of the fish by changing both its texture and its flavour.

Most of the water in fish muscle is not "free" and cannot be squeezed out as water can be pressed from a sponge. It is chemically bound to the proteins and helps to give the fish muscle its charateristic texture. In addition to the chemically bound water, fish muscle also contains smaller amounts of "free" water that can be removed by pressure. It is also possible to add to the amount of "free" water in a fillet simply by letting it stand for awhile in water. It literally soaks up water and increases its weight. For example, fillets that are conveyed through a plant by fluming them in running water may have their weight increased anywhere from 1 to 15% or more.

This sounds like a good proposition from the standpoint of the fish-producer -- if he can add to the weight of a product which he sells by the pound. Most of those who are experienced in marketing fresh fillets know that this is not the case. Actually the loosely bound water is the cause of considerable trouble and usually ends up by losing money for the producer. The reason for this is that the added weight is not permanent. Long before the fillets reach most of the consumers this absorbed water will seep out again, taking with it water-soluble nutrients and producing a soggy, unattractive package. The purpose of this article is to discuss this problem of the gain and loss of loosely bound water in fillets and to illustrate it with data obtained from experiments with commercial cod fillets.

WATER ABSORPTION

We will start by asking three questions: (1) How much water can be picked up by fillets? (2) What factors determine the rate of absorption? (3) How long will this absorbed water remain in the fillets? The amount of water absorbed by fillets is determined chiefly by two factors: their size and physical condition, and the length of time they are immersed. Smaller, thinner fillets pick up proportionally more water than larger, thicker fillets. This is owing to the relatively larger surface area of the smaller fillets. It is for this same reason that soft, ragged, broken fillets pick up more water than smooth, firm, fresh fillets. The effect of the immersion period is also interesting. At first the water is absorbed rapidly and then the rate quickly tapers off. The greatest pick-up occurs during the first minute or so and then gets progressively less and less. This means that fillets left standing in water for 30 minutes will not pick up very much more water than fillets standing in the same water for only 15 minutes. Let us look at a few typical experiments.

Seventy fresh fillets, ranging in size from 3 ounces to $2\frac{1}{2}$ pounds, were individually weighed, immersed in water for 10 seconds and then placed on inclined metal screens to permit excess surface water to drain off. Each fillet was then reweighed. During this 10-second dip the larger fillets gained approximately 1 to 1 1/2% in weight. Some of the smaller fillets gained up to 3 and 4%.

IMMERSION TEST

A group of similar size fillets (just under one pound) were immersed in tap water for various periods between 10 seconds and 10 minutes. The average increases in weight were as follows:

Immersion Time	% Increase in Weight
10 seconds	1.29
20 seconds	2.09
1 minute	2.22
3 minutes	2.47
5 minutes	3.31
10 minutes	3.34

In another test, small sole fillets gained 2.55% after 10 seconds, 3.85% after 1 minute and 4.33% after 5 minutes.

The gain in weight is interesting but it is much more important to find out how long the absorbed

*Material for this article has been taken from New Series Circular No. 27, issued by the Fisheries Research Board of Canada Halifax Laboratory, Halifax, N. S., from where reprints may be obtained.

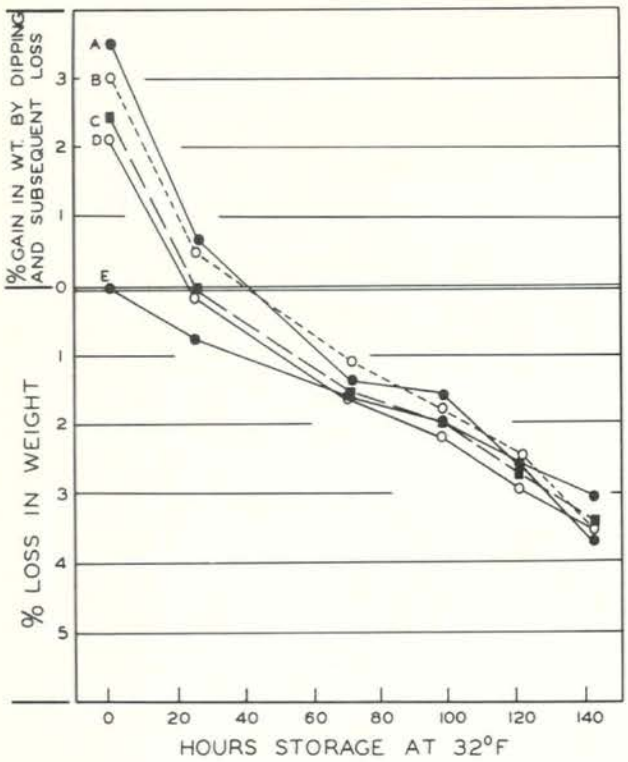


Fig. 1. Percentage increase in the weight of cod fillets that had been immersed in tap water for various periods, and their subsequent loss of weight during 140 hours storage at 32°F. (A = 10 min., B = 5 min., C = 3 min., D = 1 min. immersion periods, and E was undipped).

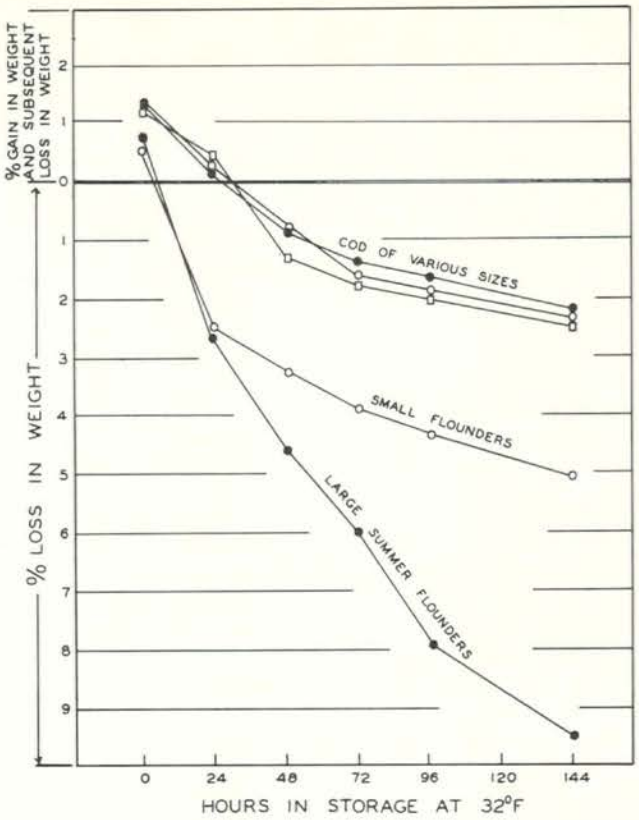


Fig. 2. Changes in the weight of cod and flounder fillets that had been immersed in tap water for 10 seconds and then stored for 144 hours at 32°F.

water will remain in the fillets. To answer this question, fillets that had been immersed in water were placed in air-tight aluminum containers, fitted with a false bottom so that any water that seeped out would collect in the chamber below. Special care was taken to prevent loss of water through evaporation. The containers were stored in ice so as to keep the temperature of the fish close to 32°F.

By this procedure it was possible to check periodically on the changes in the weight of the fillets and to check the values obtained by weighing the amounts of water in the bottom of the containers. Experiments of this type were repeated many times, using fillets of various sizes and in various physical conditions. In almost every instance, before 24 hours had elapsed the water taken up by the fillets had seeped out again. But the loss of water did not stop at this point. The fillets continued to lose weight and the water continued to accumulate in the bottom of the containers. The results of typical experiments are seen in Figure 1 and 2.

PROBLEMS FOR PROCESSORS

These results indicate the problems that face the fish processors. The weight of the fillets obtained at the end of the cutting lines are not the same as the weight of the fillets by the time the fish reach the wholesale market; and they will have changed still further by the time they reach the consumer 3 to 8 days later.

Under commercial conditions fresh fillets are usually packed in ice and the lost water escapes with the water from the melting ice and is usually unnoticed unless someone checks the weights. Most processors who are shipping fresh, iced fillets to wholesale markets add from 5 to 10 pounds extra weight for every 100 pounds they ship out.

It is also important to realize that this water loss may vary greatly with different types of fillets. This is shown in Figure 2. After 7 days the cod

fillets had lost the 1.3% they had gained by being dipped, plus 2 to 2 1/2% of their undipped weight. This is a total loss of approximately 3 1/2%. Under the same conditions the sole fillets lost approximately 6% (1 + 5) and the large, soft, blackback flounder fillets lost about 11 1/2%. With some of the individual large fillets from the summer flounders the weight losses, by the end of 7 days, reached 18 and 20%. At this time of year these fish are not a very good proposition from a financial standpoint where a regular weight loss of 10 to 20% might be expected. In general, with all species, the softer fillets from summer-caught fish lose more weight than firmer fillets cut from the same fish during the winter and spring.

In addition to the monetary loss, there are other problems that develop as a result of the inability of fresh fillets to hold their "free" water. If the fish are in plastic bags or cardboard boxes the exuded water makes a messy appearance. The water also removes some of the soluble nutrients from the fish and this in turn provides a very suitable medium for the growth of fish-spoiling bacteria wherever it collects. It is not unreasonable, therefore, that fish processors are always extremely interested in any process that gives promise of reducing the loss of "free" water from fillets.

RETARDING WATER LOSSES

There are several ways of significantly reducing this loss of water from fresh fillets. Unfortunately the processes also have disadvantages and the processors are faced with the problem of determining whether the advantages outweigh the disadvantages. For example, a polyphosphate dip will greatly reduce the loss of "free" water from fresh fillets (although it is usually recommended to prevent "drip" in frozen fillets). This is permissible by the food and drug regulations. Many of our fresh fish processors also use the antibiotics "Acronize" or "Biostat" as preservatives. Properly used, these antibiotics can add significantly to the keeping time of the fillets, enabling the producers to reach more distant markets. Polyphosphate destroys the preservative action of these antibiotics.

Brine made from common salt also can be used to reduce water loss in fillets. Brine has three disadvantages: (1) It tends to make the fish slightly salty; (2) it increases the sodium content of the fish and many people on diets look upon fish as being relatively low in sodium; (3) salt, in the concentrations that would be used to prevent water loss, is slightly incompatible with the anti-biotic solutions, although not as drastic as the polyphosphate. If very pure salt could be obtained it might be used with less risk, but many of the impurities (barium, calcium, magnesium and iron) in the cheaper fishery salts react with antibiotics to destroy their preservative action.

USE OF BRINE SOLUTIONS

Having pointed out some of the probable disadvantages of using brine on fresh fillets, let us now examine how it might be used to reduce water loss. In one experiment two lots of similar fillets were immersed for one minute in ordinary tap water and in a 15% brine (15 pounds of salt made up to 100 pounds with water). Where no salt was used the fillets once again lost their absorbed water within 24 hours and then continued to lose weight so that at the end of a week they were about 3% under weight. The brine-dipped fillets also gained and lost weight, but much more slowly. At the end of the week they were just about back to their original pre-dipped weight.

Most processors would not like to dip fresh fillets in such a strong brine solution because of the strong salty flavour that would be added. Further tests with cod fillets showed that good results could still be obtained by the use of weaker brine solutions and shorter immersion periods. Figure 3, for example, shows the effect of 5 different brine con-

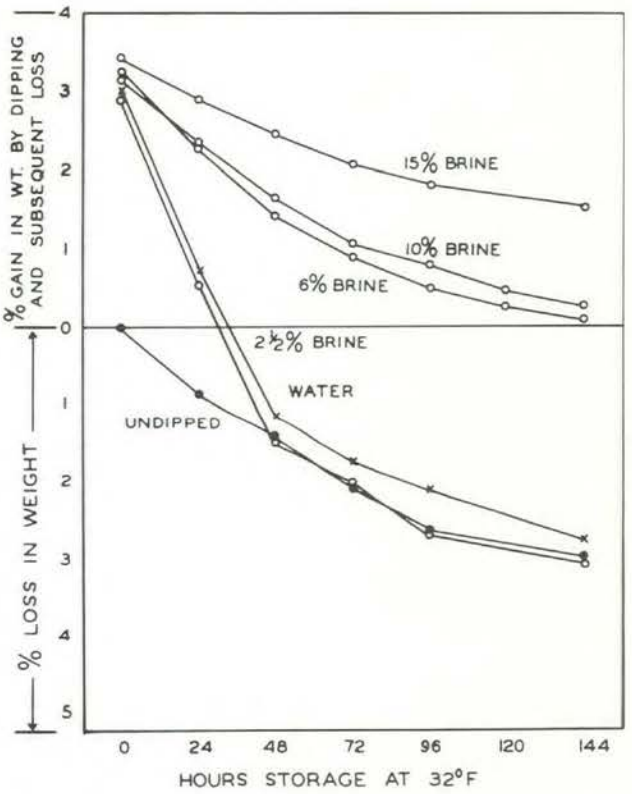


Fig. 3. The effect of different concentrations of brine in the dipping solutions on the weight changes of small cod fillets that had been immersed for 20 seconds and then stored for 144 hours at 32°F.

centrations. The 2 1/2% solution was not much better than plain tap water, but the 6% solution gave quite satisfactory results. It was found further that with the 6% solution the immersion periods could be reduced to 10 seconds and still beneficially retard the water loss from the fillets.

SUMMARY

When fillets are immersed in water, even for short periods, they add weight by absorbing moisture. This absorbed water is held very loosely in the muscle and usually within 24 hours it will have all seeped out again. The muscle also contains some of its normal water content in a similar loosely bound state. During storage of fresh fillets this moisture also continues to seep out. This loss of weight is of considerable economic importance to the producers who buy and sell their fish by the pound. With medium to large size cod or haddock, caught in the winter or spring, this loss will range between 2 to 4% after 6 or 7 days at 32°F. With softer, summer-caught fish the loss is slightly greater. Fillets cut from small haddock, young cod and flounders have losses ranging between 3 and 8%. Fillets from larger, soft, summer-caught flounders may lose from 10 to 20% of their weight during a week's storage at 32°F. These figures are for reasonably fresh, first quality commercial fish. With older, softer fish, the losses will be greater. Although it is not generally known, most fish processors compensate for this loss by packing 110 or 112 pounds of fish in a box that is billed as containing 100 pounds. In addition to this economic loss, the accumulating juices (water + soluble nutrients) create problems in packaging the fresh fillets.

Over the years there has been a considerable discussion regarding the relative merits of transporting fillets through the plant by mechanical conveyors or water fluming. Both methods have certain advantages and disadvantages so that there is no simple answer to which is best. Those who suggest that the increased weight of the fillets is one advantage for water fluming are quite mistaken. Unless the fillets are sold on the day they are processed, the extra weight will have disappeared and they will then be the same as the mechanically conveyed fillets as far as weight is concerned.

Dipping fillets in preservative solutions will also add to their weight in much the same way as dipping them in water. This also is only a temporary weight gain. The question comes up as to whether the seepage of the water from the fillets will remove the preservatives that have been added. This depends upon the type of preservative that has been used. Fortunately the antibiotics "Acronize" and "Biostat", although water soluble, tend to combine with or be adsorbed on the proteins. Our tests have shown that they are not significantly reduced as the loosely bound water seeps out of the fish.

No completely satisfactory method has been devised for preventing water loss from fresh fillets. Where fillets are not being treated with a preservative, either brine or polyphosphate solution may be used to some advantage. Most processors find the added keeping time, resulting from the use of the preservative, to be of more value than a reduction in the loss of water. They cannot be used together. The polyphosphate is strongly alkaline and destroys the preservative action of the antibiotic solutions. The salt is a little more compatible if it has been highly purified. Most of the cheaper fishery salts are not suitable for this purpose and should not be used without being thoroughly checked by some competent person.

Periodically, well-intentioned, but poorly informed persons raise their voices against any attempt on the part of the producers to stabilize the moisture content of fresh (or frozen) fillets. They believe they are protecting the consumers. Most of their statements are based on weights of the fish immediately after they have left the processing line and never at the time they have reached the consumer. The chief purpose of this article has been to show that these are not the same. It would be to the advantage of the consumer if the normal loss of water from the fillets could be prevented. Decrease in moisture through seepage means loss of some of the components that contribute to the flavour of the fillet, and creates greater difficulties in the handling, storing and packaging of the fish. ✔

Staff Recruiting

Recruiting teams from the Civil Service Commission will visit the United States and Britain during the early part of 1967 seeking university graduates in the biological sciences and engineering to fill positions with the Department of Fisheries and other Government departments.

The recruiting team will conduct interviews in Britain for bio-science graduates on the following dates: Birmingham -- Feb. 27, 28; London - March 1 - 3; Liverpool -- March 6, 7; Glasgow -- March 9, 10. Interviews will be held in Dublin, Ireland, on March 13, 14.

Teams will also visit a number of universities in the United States between Jan. 27 and Feb. 14 to interview bio-science graduates. This follows an extensive schedule of visits to Canadian universities over the past two months. Interviews abroad for engineering graduates will be held later in the year.

Fishery biologists and engineering graduates are needed for the Resource Development Service of the Department of Fisheries in the Pacific, Maritimes and Newfoundland regions, while there are openings for biologists, engineers and graduates with training in chemistry, bacteriology or food technology with the Department's Inspection Service.

Technical News

by James Kinloch

European Herring Fishing Methods

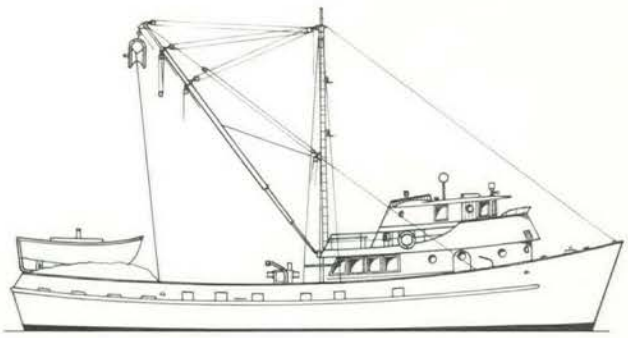
In the main, herring are captured in the Northeast Atlantic by drift gill nets, set gill nets, ring nets, purse seines, bottom trawls, and midwater trawls. The fish caught are utilized for fish meal, fresh, fresh frozen, smoked, salted or cured in one form or another, and as canned products.

In Norway, the main methods of catching herting are by drift gill netting, set gill netting, purse seining and trawling. Drift gill nets are used mainly when the season opens in the winter when the herring are in more offshore locations. Set gill nets are employed when the fish are in close proximity to the land, or in the fjords, by smaller inshore fishing vessels. Purse seines are used in the open sea and also when the fish are in close to the land. Trawling is becoming increasingly popular, both bottom and midwater.

Norwegian fishermen prosecute the herring fishery off the coasts of Iceland, the Faroe Islands and Jan Mayen. They leave Norwegian waters in the larger boats around the beginning of July and return to their home ports as late as the end of November.

The principal fishing methods in Germany are trawling and drift gill netting. The fleet working the English Channel and North Sea was at one time made up almost entirely of drifters and small motor boats. However, the Germans have perfected trawling for herring and now a large part of the catch is landed by bottom and midwater trawlers. The main fishing season is from May to December. The catching methods used in Denmark are much the same as those of Germany. Of late years the main method of capturing herring by Faroe Islanders has been with the purse seine. The inshore fleet in the Faroe Islands still uses bottom and floating gill nets.

Fishing methods in the Netherlands are, again much the same as those of Germany, with the emphasis placed on trawling. The principal fishing areas for the Dutch fleet are the North Sea, the English Channel, and the Irish Sea.



A typical herring purse seiner

In Great Britain, the principal methods of herring fishing in use today are purse seining, ring netting, trawling and drift gill netting. The main fishing areas are off the Shetland Islands from May to July, off the coast of north east Scotland from June to August, and off east Anglia from October to December.

The main herring fishing methods in use in Iceland are purse seining and drift gill netting. The major fishing grounds are off Iceland and the Faroe Islands. Herring fishermen of the U.S.S.R. use bottom and drift gill nets and purse seines. The major fishing areas are off Murmansk, the White Sea, Barents Sea, the western part of the Baltic Sea, the Norwegian Sea, the North Sea, and the Atlantic Ocean.

Before World War II, most of the herring caught in European waters was taken by means of gill nets, in particular drift gill nets. There are two types of arrangement for drift gill nets; one is for setting in shallow water and the other for setting in deep water. Drift gill netting is declining greatly in almost all countries, with the major exception of the U.S.S.R.

The most common ring net in use is the small two-boat type with a corked line of approximately 100 fathoms long and a depth of about eight fath-

This information was obtained from a paper prepared by Rupert Prince of the Industrial Development Service of the Department of Fisheries, for the Canadian Atlantic Herring Fishery Conference held in Fredericton, N. B., May 5-7, 1966.

oms. The Scottish ring net has wide mesh wings outside a narrower stronger bag or middle part. Actually, it is not a bag but square netting set in, very slack on ropes, to form a bunt as the gear is hauled in. To achieve this bag effect, the net must be pulled in very swiftly. The ends are towed together and the net hauled quickly until the wide mesh wings are inboard. The ring net method has been used in Ireland since the 1950's.

Icelandic purse seines, with a bunt in one end, have been in the development stages for over 20 years, first designed to serve the one skiff system and later for hauling with a power block. In Iceland, herring seine construction and design is not standardized. Each net loft and, for that matter, each fishing captain, has his own preference and these are incorporated in the seine.

Icelandic seines are usually hung with less slack web than Canadian types, and the weights have been increased to 1 - $1\frac{1}{2}$ pounds per foot to accelerate the sinking rate. The power block has had a marked effect on Icelandic and Norwegian seining techniques. Instead of using a powered skiff to tow off the net when setting operation begins, the Icelanders use a ready buoy and flag pole. The buoy is secured to the headline and the end of the purse line is also shackled to the float. The vessel makes the set and returns to pick up the buoy upon completion of this operation. The purse line is then shackled to a short line running through the pursing gallows to the winch. When the pursing is completed, the ropes and the wing ends of the nets are taken through the power block and the net is hauled continuously until drying up is sufficient for brailing.

Countries such as Germany, Denmark and Holland have had a great deal of success in the catching of herring by means of trawls, either by using the single or two vessel midwater type, or the bottom or wing trawl.

Midwater trawl fishing in European waters can be divided into two categories: (1) two-vessel operation; (2) single vessel operation. The first midwater trawl was originally developed for fishing off the Danish coast. After successful testing in these waters, other countries became interested and midwater trawling became an accepted method for catching herring.

Advantages of the two-boat midwater trawl method are said to be that there are no doors or otter boards to disturb fish. Also, there is no propeller noise in the direct path of the trawl and, of course, larger trawls can be used, thereby increasing the catching potential. Disadvantages are said to be higher operational costs (two boats), the requirement of more skilled manpower, and serious limitations due to weather.

Bottom trawling is used to catch herring when they are located very close to the sea floor. Usually the net "rides" just above the sea floor and it fishes in much the same manner as the bottom trawl.

Traps are not considered today to be large producers of herring in any country. In most areas, the trap is subject to the migrations of the fish and also the pressures of other fishing methods on the stock. Therefore the use of traps for the catching of herring has declined greatly.

Of all the catching methods referred to here, purse seining is becoming, very quickly, the most popular manner in which herring are caught. This is the case in almost every fishing country in the world. Much of this popularity can be credited not only to the fact that the seine is a volume producer, but also to the introduction of new construction materials, new net hauling devices such as the power block, and the use of electronic searching devices such as sonar.

Shrimp Research

Scientists of the Fisheries Research Board of Canada's biological station at Nanaimo, B. C. are focusing attention on the potential of the net-catching of shrimp in the outer coastal waters off British Columbia.

In co-operation with the Industrial Development Service of the federal Department of Fisheries, the Board has carried out a survey in Hecate Strait and Queen Charlotte Sound. This was done aboard the motor vessel *Belina* under the command of Capt. R. Wood. The survey extended over a 70-day period.

While it is yet too early for the scientists to finally assess the results, they have agreed that only one or two spots have commercial possibilities. In the scores of net tows made by *Belina*, the best showing of shrimp was found off Milbanke Sound, near the northeast corner of Goose Island fishing grounds. That is in the general area of water sprawling from Cape Mark to Currie Island. Twenty-two tows were made there to depths down to 700 feet. The best tow yielded more than 550 pounds. The average catch of all tows in that area yielded about 135 pounds.

Interesting prospects were found in Laredo Sound. Nine tows were completed from Kitasu Bay to Moody Banks. In one tow off Lombard Point, 182 pounds of shrimp were landed. The average tow yielded 89 pounds.

Shrimp Fishing in British Columbia

IN THE WATERS off the British Columbia coast six species of shrimp are found in sufficient quantities to support an enterprising minor fishery. Landings of shrimps and total marketed values for eight selected years are as follows:

YEAR	LANDINGS IN CWTS.	MARKETED VALUE
1939	831	$ 12,246
1946	1,185	40,431
1948	3,540	84,900
1951	4,986	148,933
1955	10,880	181,000
1958	19,090	305,000
1960	16,777	299,000
1965	17,546	281,000

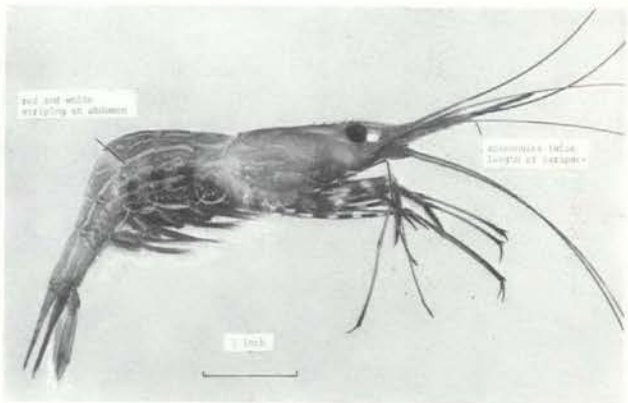
In general the six species are quite similar in appearance and size. However, there are a number of anatomical features which can be used for positive identification. In addition to distinctive anatomical features, most species possess unique colour patterns. The common names used by West Coast shrimpers are based mostly on colour characteristics. The accompanying pictures show features used in identification. Characteristic features are indicated in the photograph of each species.

The life histories of the six commercial shrimps are quite similar. The mature shrimps breed in the late autumn or early winter. The developing eggs appear on the abdomen of the female shortly after breeding, and are carried over the winter months. The young shrimps are hatched in the early spring and swim freely for about two months before settling to the bottom to begin adult life. The commercial shrimps generally mature first as males in the first or second year, depending on the species. After one or two seasons as sexually active males, these shrimps change sex and function as females for the rest of their lives.

SIDESTRIPE or GIANT RED *(Pandalopsis dispar)*

In size this shrimp is second only to the prawn. A large specimen may measure eight inches in overall length. The long antennules and striped abdomen easily distinguish this species from other commercial shrimps.

The sidestripe shrimp is found on muddy bottoms. The distribution on the Pacific coast is from



Sidestripe or Giant red shrimp (Pandalopsis dispar)

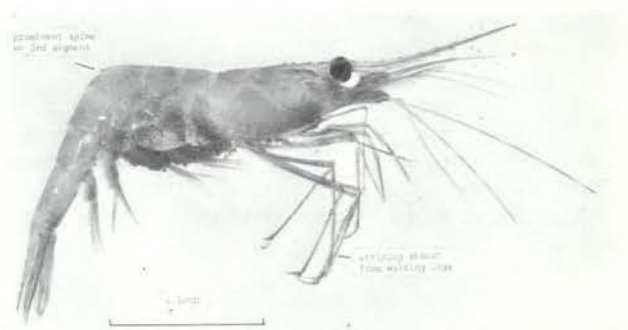
the Bering Sea to the Washington coast. In British Columbia it is fished in English Bay, Barkley Sound, and Chatham Sound.

The side stripe shrimp functions as an active male during its second year and then changes sex during the third year.

PINK SHRIMP *(Pandalus borealis)*

Generally, the length of this shrimp is three to four inches but larger individuals may reach six inches. The sharp spine or lobe pointing backward on the third abdominal segment is the most distinctive feature of this species.

The distribution of this shrimp is circumpolar, ranging from the Columbia River on the Pacific coast to Massachusetts Bay on the Atlantic coast of



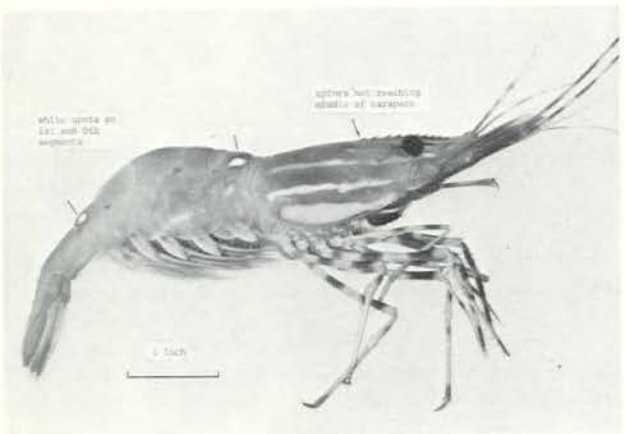
Pink Shrimp (Pandalus borealis)

America. It is found on muddy bottoms. Local fishing areas are Burrard Inlet, Howe Sound, and Chatham Sound.

The pink shrimp is an active male in its second year, and becomes a female during the third year. The entire life is at least three years. Some individuals mature first as females, never functioning as males.

PRAWN or SPOT SHRIMP *(Pandalus platyceros)*

This species is the largest of the commercial shrimps. Large individuals may reach almost nine inches in length. The colour of the body is usually reddish brown with distinctive white spots on the first and fifth abdominal segments, and with horizontal white bars on the carapace.



Prawn or Spot Shrimp (Pandalus platyceros)

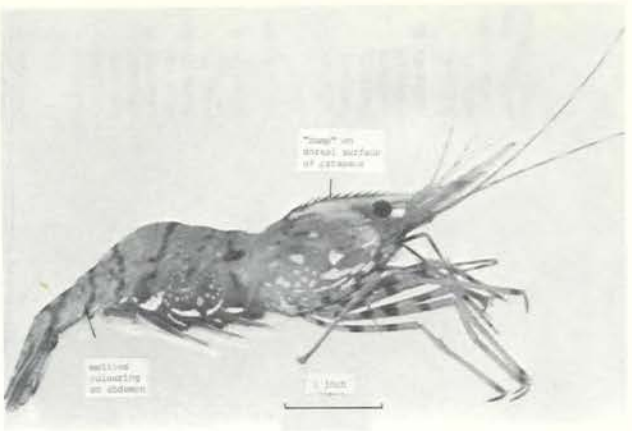
The prawn, as an adult, is generally found on rocky bottoms. The distribution on the Pacific coast is from Unalaska, Alaska, to San Diego, California. Trapping grounds are located in the Strait of Georgia, and in coastal inlets.

The prawn functions as an active male during its second year, and to a lesser extent in the third year then changes sex during the third and fourth years.

HUMPBACK or KING SHRIMP *(Pandalus hypsinotus)*

This shrimp may reach a length of six inches. The humpback shrimp is given its common name because of the arched shape of the carapace. The body is covered with a mottling of reddish brown which is conspicuous on the abdomen.

The recorded distribution is from the Bering Sea to the Strait of Juan de Fuca. This shrimp usually is found on muddy bottoms. It is of minor importance, entering trawl catches along with pink



Humpback or King Shrimp (Pandalus hypsinotus)

shrimps in such local areas as Stuart Channel and Burrard Inlet.

The Humpback shrimp is an active male in its second year, and becomes a female during the third year. Some individuals mature first as females, never functioning as males.

SMOOTH PINK *(Pandalus jordani)*

This species is very similiar in size, colour, and body characters to the pink. However, the smooth pink lacks the prominent spine or lobe on the third segment of the abdomen.

The smooth pink is found on muddy bottoms. The distribution is from Unalaska to San Diego. Local trawling grounds are found in Barkley Sound and along the east coast of Vancouver Island.

This shrimp is an active male in its second year, and changes to a female in the third year. Some individuals mature first as females, never functioning as males.

COONSTRIPE SHRIMP *(Pandalus danae)*

A large coonstripe shrimp may attain the length of five inches. This shrimp derives its common name from the irregular striping of brown and red on the abdomen.

The coonstripe shrimp is found on sand or gravel bottoms, usually where a rapid tidal current exists. The distribution is from Sitka, Alaska, to San Francisco, California. The only known commercial ground in British Columbia waters is in Burrard Inlet.

This species functions as a male during the first and second years, and becomes a female in second and third years. Some individuals mature first as females, never functioning as males.

FISHING METHODS AND AREAS

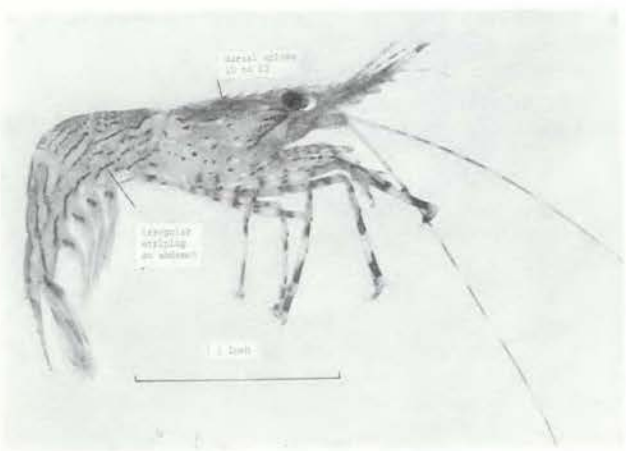
The commercial shrimps are fished at moderate depths, ranging from 15 to 70 fathoms. The species generally found on muddy or sandy bottoms are caught by towing a bag-shaped net over the bottom, a method known as trawling. The trawl net is conical in shape, open at one end and tapering to an apex at the other end. As the net is towed along the bottom, shrimps are gathered in the mouth of the net and pass into the apex, or cod end.

In order to fish effectively the mouth of the net must be kept open. In the otter trawl the upper edge of the mouth of the net is supported by glass floats, and the sides of the net are attached in a special way to two vane-shaped boards, so that when the gear is towed along the bottom the resistance of the water causes the boards to spread the mouth of the net open.

The larger shrimp boats (about 40 feet in length) generally use the otter trawl, as it is gear to be handled by two men. The beam trawl is used on the smaller one-man boats (about 36 feet in length). The size of the mesh (stretched) used in shrimp nets is from 1 1/8 to 1 1/2 inches, depending on the net material. As this mesh size is smaller than allowed for the fish trawl (4 inches), any fish caught in the shrimp net must be returned to the water.

Trawls used for shrimps are designed so that the upper edge of the mouth goes first. The idea is that when the shrimps are disturbed from the bottom by the ground line, they cannot escape by swimming rapidly above the net. Shrimp trawls are towed relatively slowly. Doing so prevents the capture of too many fish and gives a catch which is reasonably free of mud.

The smaller, one-man boats used in the fishery are usually converted salmon gill-netters, and can be readily adapted to salmon fishing when that species is running. They have a drum on the stern, which serves as a winch to reel in the tow line of the trawl net. The trawl net is similar in shape to that used on the two-men trawlers, and is kept open by a wooden beam of up to 40 feet in length. A ground line of rope weighted with chains or some other heavy material keeps the bottom of the net slightly above the sea floor, while glass floats secured to the upper part of the trawl mouth hold that part above and forward of the ground line.



Coonstripe Shrimp (Pandalus danae)

The trawl or "drag", as it is sometimes called, may last from one to four hours, depending on the nature of the fishing ground.

A green manila tow rope runs from the drum through a block at the head of the vessel's mast. When the fisherman is hauling in the net, he turns the winch with a foot pedal or hand control, this winds the rope in even layers around the drum. When the mouth of the trawl reaches the surface, the beam is detached at one end and allowed to float alongside the boat. The remainder of the net is hauled up over the vessel until the cod end appears.

A fisherman can expect several hundred pounds of shrimp from a good drag. The cod end is doused in the sea before being brought aboard, as this helps to rid the net of mud and also makes for better quality. When the cod end is untied, the shrimp are dropped to the deck.

Prawns, which occur on rocky bottoms, are caught by means of traps. Prawns traps are generally rectangular in shape, made of a light iron frame covered with shrimp netting. At each end of the trap is a funnel-shaped opening through which the prawns enter the trap. In the fishing operation, traps are baited and set along the bottom in a line; the position of the traps is shown by means of a floating buoy. The traps are raised to the surface at regular intervals to remove the prawns and renew the bait.

Important shrimp fisheries are located in Burrard Inlet, Howe Sound, Knight Inlet, Chatham Sound, along the east coast of Vancouver Island, and Barkley Sound. The peak fishing period is in February and the low in November.

Shrimps are cooked fairly soon after capture, and the meat is removed from the shells. The shells are processed for use as fertilizer or animal feed. Until recent years a small amount of shrimp meat was canned. At the present time the entire catch is marketed fresh or frozen. Hotels and stores in Vancouver, Victoria, New Westminster, and other B. C. cities absorb the bulk of the catch, although a small proportion is shipped, frozen, to markets in the Prairie provinces; a limited supply is iced and exported to cities on the west coast of the United States.

(Prepared by the Nanaimo Biological Station of the Fisheries Research Board of Canada).

News Roundup

New Patrol Vessel

A contract for the construction of a multi-purpose Department of Fisheries patrol vessel for the Pacific coast has been awarded to Yarrow's Limited of Victoria, B. C. The contract is valued at $2,798,468.

Of all-welded steel construction, the 180-foot vessel will be the largest and most versatile craft of the Department's protection fleet on the Pacific coast. Besides performing regular patrol duties, she will be equipped for experimental fishing, research projects and search and rescue activities.

Designed for deep water navigation, the vessel will provide all-weather surveillance of offshore grounds where Canadian fishermen have been increasing their fishing effort. Among her primary responsibilities will be the enforcement of Canadian fisheries regulations and territorial limits.

The new patrol ship will have a cruising speed of 12 knots and top speed of 15 knots. Her cruising range of several thousand miles will permit patrols to and from the Bering Sea without refueling.

Equipped with the most modern navigational and electronic aids, the vessel will provide living and laboratory accommodations for fisheries scientists to conduct oceanographic and biological observations at sea. One design feature, an Alpine-Pleuger active rudder, will allow great maneuverability of the vessel, particularly for fishing operations and docking.

The hull design will be similar to that of two patrol vessels built for Atlantic coast patrol duties, the *Cape Freels* and the recently-launched *Chebucto*. The vessel is due for delivery in mid-1968.

Centennial Speech

The Fisheries Council of Canada has invited entries to a competition for the selection of a speaker to deliver a special "Centennial Address" during the 1967 annual meeting of the Council at Montreal, May 8-10.

The Council will be awarding $500 to the speaker selected, plus expenses from any point in Canada to Montreal and return.

The one-hour address is to be on a subject related to the basic theme of Expo '67--"Man the Provider"--as related to sea and fresh-water fisheries.

The competition is open to any Canadian citizen engaged in the business, educational, scientific, or governmental aspects of the fishing industry of Canada.

Sea Lamprey Scarcer

Sea lamprey are scarcer as a result of control measures on Lake Superior and are spawning in fewer streams, according to the most recent surveys by the U. S. Bureau of Commercial Fisheries. Other reports made at a meeting of the Great Lakes Fishery Commission at Ann Arbor, Mich., indicate a reduction in sea lamprey in Lake Superior and Lake Michigan, and the recovery of important species, particularly lake trout.

Representatives from Wisconsin and Michigan reported an increase in angling for lake trout in Lake Superior with charter-boat operations tripling in the last three years. Although natural reproduction has been resumed, most of the lake trout being taken are hatchery fish. Federal, State and Provincial agencies have co-operated in planting almost 16 million hatchery fish since 1958 to help re-establish the species following lamprey control.

In Lake Huron, where chemical treatment of streams began this year and has not had time to take effect, a high incidence of lamprey wounded whitefish (17 percent) was reported as compared with less than 1 percent on Lake Michigan. The U. S. Bureau of Commercial Fisheries and the Department of Fisheries of Canada, acting as the Commission's agents, have completed treatment on 28 Lake Huron streams -- about one-third of the total to be treated by 1970.

Ontario representatives from the lower lakes stressed the importance of extending lamprey control to Lake Ontario where fisheries have reached a record low.

More intensive study of the walleye in Lake Erie and Lake St. Clair to discover if fluctuations in abundance could be stabilized, was also urged. The Commission asked agencies working on Lake Erie to pool and analyze existing information as soon as possible to see if some measures could be developed from the data.

The Sea Scallop

Prepared by Fisheries Research Board of Canada Biological Station, St. Andrews, N.B.

SCALLOPS are widely distributed throughout the warm and temperate oceans of the world; nearly 300 species have been identified. They are among the most famous of shellfishes, rivalling even the oyster in flavour and historical interest. Today a scallop shell is the well-known trade mark for an oil company. At the time of the Crusades the shell of a European species was the symbol of holy pilgrimage and it is sometimes called the "pilgrim" or "St. James' Shell".

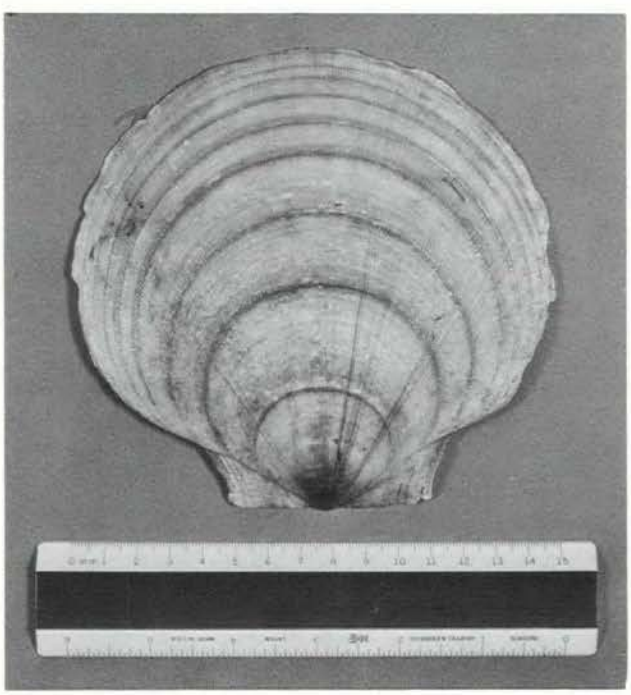


Fig. 1. - Twelve-year-old Bay of Fundy sea scallop (upper side). The shell rings which are formed in winter when growth comes to a standstill, indicate age.

The sea scallop, also called the giant or smooth scallop, *Placopecten magellanicus*, is the most important commercial species of molluscan shellfish on the Canadian east coast. The Iceland scallop, *Chlamys islandicus*, is the only other scallop in our east coast waters. Like the sea scallop it is found in deep water but it is more northern in distribution, less abundant, and of no economic importance. It is very common on the Grand Bank of Newfoundland. Maritime fishermen sometimes improperly call it the Bay or Cape Cod scallop, *Aequipecten irradians*, which is commercially important in the United States and which closely resembles the emblem of the Shell Oil Company. It is doubtful if the Bay scallop has occurred in recent times on the Canadian mainland but a fossil population has been discovered on Sable Island.

DISTRIBUTION AND IMPORTANCE

Sea scallops are found in the northwest Atlantic from the north shore of the Gulf of St. Lawrence to Cape Hatteras, North Carolina. In the northern portion of their range they occur in shallow water, less than 10 fathoms, while in the southern portion they are found in much deeper water, deeper than 30 fathoms. In the most favourable portions of the range, scallops frequently occur in dense local populations called beds which may be extensive enough to support commercial fisheries. In the last 10 years, major fisheries have occured and in most cases continue off the Virginia Capes, Virginia, off New York City, around Block Island, Rhode Island, on Georges Bank, in Cape Cod Bay, Massachusetts, along the coast of Maine, in the Bay of Fundy (particularly off Digby, Nova Scotia), in the southern Gulf of St. Lawrence, on St. Pierre Bank, and in Port au Port Bay, Newfoundland.

The value of Canadian catches of sea scallops has increased dramatically in the last few years and since 1955 the annual landed value has been

Fig. 2. - When you remove a scallop's lower shell the large circular white muscle shows in centre. This is the only part eaten in Canada. The developing kidney-shaped roe is vaguely seen immediately below the muscle.

more than the combined landed value of all other molluscs. Total scallop landings in 1964 amounted to 16.45 million pounds of meats (136.5 million pounds, whole weight) valued at 7.2 million dollars. That year the sea scallop was third in landed value of all species of fish landed on the Canadian east coast (lobster first and cod second). Of these 1964 landings, 88% came from offshore banks; 79.6% came from Georges Bank alone. The scallop fishery is primarily a Nova Scotian industry--over 95% of the catch is landed in that province.

DESCRIPTION

The sea scallop grows to a maximum diameter of seven to eight inches. It is a bivalve, i.e., it has two almost circular valves or shells which are held together by a comparatively small straight hinge formed by two "ears" or triangular projections of almost equal size. From the outside the two valves are not alike; the lower one is flat, smooth and has a white or cream color, while the upper one is arched, usually reddish in color and sometimes overgrown with barnacles or seaweeds. Young shells, in particular, frequently have delicate and attractive colors, some with beautiful pink and white radiations. The inner surfaces of both valves are smooth, pearly-white and have a satin-like lustre. The body of the scallop consists of vari-colored parts and a large centrally-located white muscle which is used to close the valves. This muscle, sometimes called the "meat" or "eye", is the only part of the sea scallop eaten in Canada.

The Iceland scallop differs from the sea scallop in that its maximum size is only four to five inches. Its two valves are almost alike and have 50 to 100 raised and radiating ribs on their outside surface. Both valves are reddish and arched, and the "ears" of the hinge are unequal in shape and size.

HABITS

Sea scallops are found on different types of ocean bottom but prefer a firm type such as gravel, shells or rock. They are mostly sedentary, lying with the flattened valve against the ocean floor. The very small ones and some of commercial size attach themselves to bottom objects by means of strong threads (byssus) like those produced by the common mussel.

Unlike most other shellfish, scallops can swim. By contractions of the powerful muscle they "clap" their shells together, forcing water out from the corners of the hinge and so propelling themselves forward "mouth first". As the scallop moves forward it appears to be taking great bites out of the water. From the recapture of tagged adult sea scallops it has been established that they do not move far but spend their lifetime on their native beds.

There is a most interesting association between the sea scallop and two species of fish, the sea-snail and the common hake. The young of these fish live between the valves of sea scallops. Although as many as five fish may be found in one scallop, it is apparently not disturbed or affected in any way.

FOOD

Although scallops can swim, they cannot move far. Hence scallop beds form only in areas where the food supply and other conditions are generally suitable. Like most other bivalves, scallops feed on minute plants and animals which they strain from the water by an elaborate filtering mechanism involving the gills.

REPRODUCTION

Scallop reproduction closely resembles that of oysters, clams and mussels. The sexes are separate. Mature female sea scallop roes are a rose or coral colour and the male roes are a creamy white. The time of major spawning varies from area to area--from late August and early September in the Bay of Fundy region, to late September or early October on Georges Bank. At this time the microscopic eggs are shed into the water by the female and are fertilized there by the sperm which the male similarly releases into the water.

As in all stationary marine bivalves, the eggs develop into free-swimming larvae. This stage probably lasts at least 3 weeks and during that time

the larvae are at the mercy of currents and may be carried long distances from their parents before they settle. This aids in the distribution of the species. Settlement takes place when the larvae are about the size of a pinhead. At this time they give up their free-swimming habits, settle to the bottom of the sea and attach themselves by means of byssus to objects on the bottom. This marks the beginning of their sedentary bottom living life. By the onset of their first winter scallops are about one-fifth of an inch in diameter.

GROWTH

The growth rate of sea scallops has been carefully studied. Annual growth rings are formed on the shells each year at the time of cold water (February to April). Scallops can be aged by counting these rings and the growth rate can be determined by measuring the distance between annular rings. The rate of growth varies from area to area and from year to year, depending on the availability of food, temperature of the water and other factors. In general the growth rate is slowest in the Gulf of St. Lawrence and fastest on Georges Bank.

On Georges Bank 4-year-old scallops have a shell diameter of approximately $3\frac{1}{2}$ inches and the major part of the commercial catch is made up of 4- to 8-year-old scallops. The maximum life-span is 16 to 17 years of age, at which time the diameter of the shell may measure 8 to 9 inches.

ENEMIES

There is a high natural death-rate when scallops are in the microscopic free-swimming larval stage. At this stage they are easy prey to larger animals and to unfavourable conditions in the water. After they descend to the bottom of the sea, fish such as cod, plaice and catfish feed freely on them. Flesh-eating marine snails and starfish are believed to destroy adult scallops. One enemy of older scallops is the boring sponge which perforates and honeycombs the shell. The scallop is weakened by its constant efforts to repair this shell damage and the meat becomes dark and stringy and of such poor quality that it is no longer marketable.

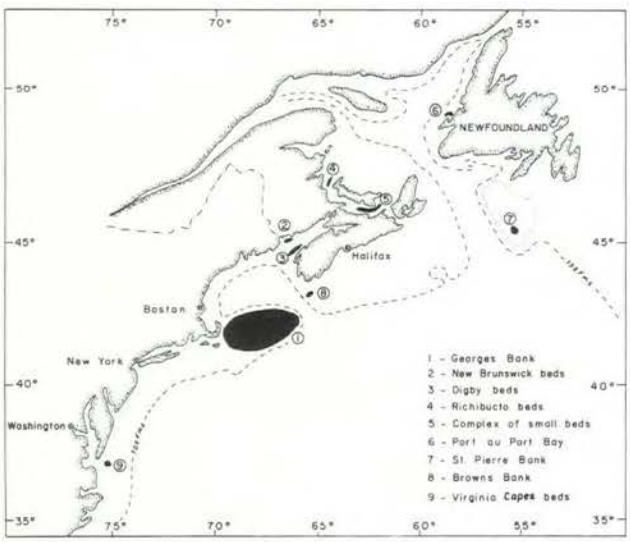


Fig. 3. - Chart of major scallop beds fished by Canadians. Georges Bank is the giant producer.

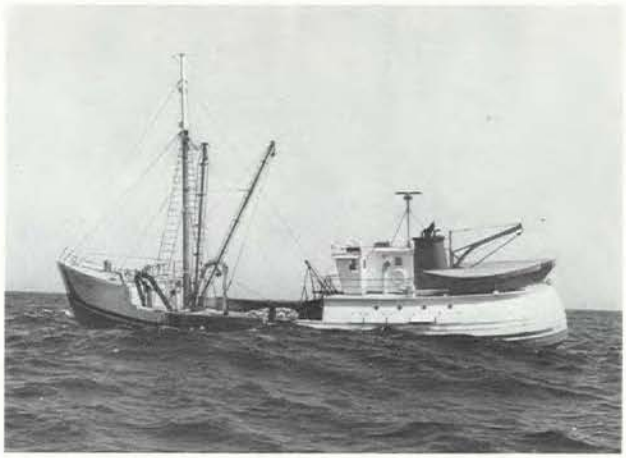


Fig. 4. - MV Stuart and Lynne, a 95-foot modern offshore scallop boat dragging Georges Bank.

FISHERY

Until 1945 the Canadian scallop fishery was an inshore operation and total landings fluctuated from about $\frac{1}{2}$ to $1\frac{1}{2}$ million pounds annually. This fishery was centred mainly on scallop beds in the Bay of Fundy off Digby, Nova Scotia. Since 1945 an offshore fishery has developed and the recent dramatic increase in landings has been due entirely to the rapid development of this fishery. In the last 6 years the offshore fleet has provided over 90% of the annual Canadian scallop landings. Although this fleet has fished on several offshore banks, it has concentrated most of its effort on Georges Bank (over 85% in the last 10 years). This large bank (9,000 square nautical miles within the 50 fathom depth contour) extends eastward from Cape Cod. The northeast peak of the bank is about 90 nautical miles SSW of the southwest tip of Nova Scotia.

The offshore scallop fleet sails out of several Nova Scotian ports, the most important being Lunenburg, Riverport, Liverpool, Shelburne, Yarmouth and Saulnierville. It has grown from one small dragger in 1945 to 50 large boats in 1964. Offshore scallop draggers are sturdily built, about 95-100 feet in overall length, have a 22-24 foot beam and are powered by diesel engines of 400-800 h.p.

Fig. 5. - Bringing aboard a 12-foot offshore scallop drag after a 20-minute tow on Georges Bank. Empty drag weighs 1400 pounds, with a full catch as much as 8,000 pounds.

These boats are capable of scalloping on the offshore banks for 12 months a year and can stay at sea for as long as 15 days. Offshore scallopers tow two drags at the same time, one on each side of the boat. The standard offshore drag consists of a heavy metal frame, 10-13 feet wide, with a bag attached. Part of the back of the bag is made with rope webbing (rope back) and the remainder of the bag is knit with steel rings which have an inside diameter of 3 inches. The drags are hoisted with powerful winches because of the depth (30-50 fathoms) and great weight; a fully loaded drag may weigh upwards of 4 tons.

The two major centres of the inshore scallop fishery are the southern Gulf of St. Lawrence and the Bay of Fundy, particularly the beds off Digby, Nova Scotia. The latter region is by far the most important inshore area and at one time as many as 90 boats sailed out of Digby but in recent years the number has fluctuated around 30. Fluctuations in the fleet size follow closely the abundance of scallops on the fishing grounds. The boats in this fleet are mostly 60-foot draggers towing a gang of up to seven rectangular-mouthed iron drags with wire meshed bags. These drags are also hoisted by winches.

There are no fishing restrictions in the offshore fishery. In the Bay of Fundy area however the beds are limited and because of the intense nature of the fishery, restrictions have been introduced to try and conserve the resources.

1. No one may fish for scallops on certain inshore grounds during the summer months.

2. The total width of scallop drags used must not exceed 18 feet.

3. The meshes of the scallop rake bags must not measure less than 3 1/4 inches inside diameter. This allows for the escape of the small scallops.

HANDLING

In both the inshore and offshore fisheries, scallops are shelled or "shucked" as soon as they are caught. The first step in this operation is to remove one shell (the flat shell) and all the soft body parts except the adductor muscle, meat or "eye" which is left attached to the other shell (see figure). This meat constitutes about one-third of the weight of the soft parts and is easily separated from the shell. The shells and remaining soft parts are discarded. The meats are iced and marketed fresh, frozen or breaded and partially fried. Most of the catch is sold in the United States but there are also good markets in Canada. Recently there has been an attempt to market the mature roes. They are also a fine delicacy and are customarily marketed along with the meats in the European and Australian scallop fisheries.

Scallop shells have been sold each year as souvenirs; the most perfectly shaped are artistically coloured, being used as ash trays and ornaments.

REFERENCES

Bourne, N. 1964. Scallops and the offshore fishery of the Maritimes. Fisheries Research Board of Canada, Bulletin No. 145, 60 pp.

MacPhail, J.S. 1954. The inshore scallop fishery of the Maritime Provinces. Fisheries Research Board of Canada, Atlantic Biological Station Circular, General Series, No. 22 4 pp.

Fishery Figures For October

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May-October 1965		May-October 1966[2]	
	'000 lbs	$'000	'000 lbs	$'000
CANADA - TOTAL	1,538,341	105,845	1,687,681	119,005
ATLANTIC COAST - Total	1,271,571	67,679	1,361,191	66,768
Cod	452,267	18,490	418,947	18,167
Haddock	50,263	3,259	57,383	4,028
Pollock, Hake, Cusk, etc.	49,528	1,625	48,116	1,728
Rosefish	91,368	2,419	130,156	3,631
Catfish	3,551	117	3,496	116
Halibut	2,859	903	2,628	892
Plaice & Other Flatfish	155,069	4,874	176,399	5,716
Herring & Sardines	338,249	3,474	409,712	5,266
Mackerel	23,816	775	24,428	829
Alewives	12,084	202	8,068	141
Salmon	4,585	2,199	5,114	2,658
Smelts	776	60	752	63
Swordfish	6,402	2,594	6,251	2,661
Other Fish	13,900	547	12,678	258
Lobsters	31,560	18,655	27,979	15,256
Clams & Quahaugs	3,172	183	3,837	217
Scallops	12,100	6,626	11,456	4,503
Other Shellfish	20,022	677	13,791	638
PACIFIC COAST - Total	266,770	38,166	326,490	52,237
Pacific Cods	16,371	1,203	18,000	1,623
Halibut (1)	31,306	10,601	30,829	11,046
Soles & Other Flatfish	4,726	300	7,704	488
Herring	120,712	1,586	101,537	1,689
Salmon	81,654	23,602	152,481	36,212
Other Fish	5,278	172	8,195	364
Shellfish	6,723	702	7,744	815
BY PROVINCES				
British Columbia	266,770	38,166	326,490	52,237
Nova Scotia	410,041	27,958	490,587	26,901
New Brunswick	240,616	8,611	259,785	8,854
Prince Edward Island	41,378	6,531	51,337	5,648
Quebec	130,416	5,900	101,942[2]	5,862[2]
Newfoundland	449.120	18,679	457,540	19,503

(1) - Includes halibut landed in U. S. Ports by Canadian Fishermen.

(2) - Figures for Quebec available to the end of September 1966 only.

MID-MONTH WHOLESALE PRICES - OCT. 1966

		Montreal $	Toronto $
Cod fillets, Atl, fresh, unwrapped	lb.	.386	.453
Cod fillets, Atl, frozen, cello 5's	lb.	.369	.397
Cod fillets, smoked	lb.	.422	.473
Haddock fillets, fresh, unwrapped	lb.	.475	.580
Herring, kippered, Atl.	lb.	.258	.307
Mackerel, frozen, round	lb.	.198	.243
Lobsters, canned, Fancy	case 48-½s	59.947	61.367
Sardines, canned	case 100-¼s	9.693	9.567
Halibut, frozen, dressed	lb.	.568	.620
Silverbright, frozen, dressed	lb.	.615	.643
Coho, frozen, dressed	lb.	.762	.803
Sockeye, canned, grade A	case 48-½s	27.573	29.140
Pink, canned, grade A	case 48-½s	16.497	17.067
Whitefish, fresh	lb.	.483[1]	.417
Lake trout, frozen	lb.	.446	.523

(1) Dressed

PRICES PER CWT. PAID TO FISHERMEN

(Week ending Oct. 15)	1965 $	1966 $
Halifax	4.75	5.25
Cod Steak	4.5	5
Cod Market	7.5	8.5
Haddock	4	5
Plaice		
Yarmouth		
Haddock	6	8
Black's Harbour		
Sardines	-	-
St. John's Nfld.		
Cod	4	-
Haddock	-	-
Rosefish	2.5	-
Vancouver		
Ling Cod	10-12	10-16
Gray Cod	5-7	5-7
Soles	6-9	6-8
Salmon (Rdspg)	-	23-75

Fishery Figures For October

FROZEN FISH STOCKS AS AT END OF SEPT.

	1965 '000 lbs	1966 '000 lbs
TOTAL - Frozen Fish, Canada	94,968	121,160
Frozen - Fresh, Sea Fish - Total	68,802	93,030
Cod, Atlantic, Fillets & Blocks	12,110	26,592
Haddock, fillets & blocks	2,748	4,478
Rosefish, fillets & blocks	6,030	7,793
Flatfish, (excl. halibut), fillets & blocks	6,585	7,167
Halibut, Pacific, dressed & steaks	9,733	10,108
Other Groundfish, dressed & steaks	2,522	2,878
Other Groundfish, fillets & blocks	5,486	10,159
Salmon, Pacific, dressed & steaks	12,863	12,966
Herring, Atlantic & Pacific	644	534
All Other Sea Fish, all forms	5,775	6,671
Shellfish	4,306	3,684
Frozen - Fresh, Inland Fish - Total	7,205	7,777
Perch, round or dressed	157	411
Pickerel, (Yellow & Blue) fillets	293	541
Sauger, round or dressed	363	(1)
Tullibee, round or dressed	101	223
Whitefish, round or dressed	2,440	2,305
Whitefish, fillets	369	279
Other, all forms	3,482	4,018
Frozen - Smoked Fish - Total	2,023	1,960
Cod Atlantic	876	1,106
Sea Herring, kippers	825	546
Other, all forms	322	308
Frozen for Bait and Animal Feed	16,938	18,393

(1) - Confidential, included with "Other".

SALTED FISH STOCKS AS AT END OF OCTOBER

Salted and Pickled Fish, Atlantic Coast		1965 '000 lb.	1966 '000 lb.
Wet-salted - Total		33,331	28,086
Cod		28,315	24,227
Other		5,016	3,859
Dried - salted - Total		19,631	17,858
Cod		18,670	16,766
Other		961	1,092
Boneless - Total		1,092	746
Cod		1,007	666
Other		85	80
Pickled - Total	(barrels)	21,390	18,947
Herring	"	8,010	5,328
Mackerel	"	8,252	6,380
Alewives	"	4,378	6,966
Turbot	"	750	273
Bloaters	(18 lb. boxes)	214,744	149,232
Boneless Herring	(10 lb. boxes)	7,895	5.192

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS, MAY - JULY

(Value in Thousands of Dollars)

		1965		1966
		(thousand dollars)		
Total Exports		58,179		54,905
By Markets:				
United States		46,577		44,325
Caribbean Area		5,062		3,802
Europe		5,452		6,000
Other Countries		1,088		778
By Forms:				
Fresh and Frozen		44,639		42,855
Whole or Dressed	11,532		11,757	
Salmon, Pacific	2,757		3,738	
Halibut, Pacific	2,472		2,203	
Cod, Haddock, Pollock, etc.	126		116	
Swordfish	1,399		1,150	
Other Seafish	1,524		1,833	
Whitefish	1,163		905	
Pickerel	886		638	
Other Freshwater Fish, n.o.p.	1,205		1,174	
Fillets	17,707		18,264	
Cod, Atlantic	7,805		5,657	
Haddock	1,523		1,990	
Rosefish, Hake, Pollock, etc.	869		2,006	
Flatfish	2,686		4,288	
Pickerel	623		659	
Other	4,201		3,664	
Shellfish	15,400		12,834	
Lobster (Alive & Meat)	12,273		10,222	
Other	3,127		2,612	
Cured		5,400		4,815
Smoked	484		380	
Herring	304		184	
Other	180		196	
Salted, Wet & Dried	4,330		4,011	
Cod	3,661		3,547	
Other	669		464	
Pickled	586		424	
Herring	367		343	
Mackerel	134		13	
Other	85		68	
Canned		4,142		2,568
Salmon	1,659		431	
Sardines	1,031		918	
Lobsters	1,065		924	
Other	387		295	
Miscellaneous		3,998		4,667
Meal	2,651		3,021	
Oil	160		111	
Other	1,187		1,535	

Current Reading

COMMONWEALTH ECONOMIC COMMITTEE: 41st REPORT TO GOVERNMENTS - FISH. (Published by Her Majesty's Stationery Office and obtainable from the Queen's Printer, Ottawa. Price: 17s. 6d.)

While the primary object of this report is an examination of the production and consumption of fish by the Commonwealth countries, it is also, of necessity, a study of the general background of world fisheries as a whole, including world fish stocks and their conservation.

The report describes the overall position up to the end of 1965, giving detailed statistical and other information from 1957 up to 1964, for the world as a whole, for the individual countries of the Commonwealth and for certain other countries or country groupings. In addition to data on production and consumption a detailed analysis is made, with full statistical illustration, of the pattern of international trade in fish and fish products; a chapter is devoted to the treatment and uses of fish and problems that arise in this context; another chapter discusses the problems of fisheries development in general and outlines the trends of development in Commonwealth countries. A final chapter summarizes the report and draws conclusions from it.

Outstanding features of fisheries development throughout the world in recent years, according to the report, have been the increase in the power, size and scope of operation of fishing vessels and the growing use of synthetic fibre nets. On the subject of factory ships, the report states that a fleet of eight new Soviet vessels of this kind are reported to be capable, when in operation in 1967, of processing a volume of raw fish in the course of a year equal to the entire 1964 catch of Canada.

With growing pressure on the stocks of certain marine fish, increasing interest has been shown in the encouragement of fish farming, which has become an integral part of the fishery development plans of many Commonwealth countries. The report points out the opportunities presented generally for increasing fish supplies through fish farming; it emphasises the important role played here, as in world fisheries as a whole, by international co-operation.

FISHERIES YEAR BOOK AND DIRECTORY, 1966-67. Published by British Continental Trade Press Ltd., London, Eng. Price 40 shillings.

A comprehensive reference book of the world's fishing industries and fish trade, the 1966-67 edition The Fisheries Year Book and Directory contains a revised encyclopaedia of market fish describing nearly 100 specimens. It lists the names and countries of over 6,000 firms connected with the fishing industry.

The editorial chapters cover developments in vessel construction during the past year, processing and marketing of frozen fish, fisheries research, production, preservation, exports, imports and consumption of fish and by-products across the world, also the fish and meal industries.

The reference section includes a list of fishing vessels built last year and their equipment, a fish supply calendar giving type of fish, period and country of availability, a dictionary of fish terms in eight languages, and a list of specialized journals.

The world directory includes names, addresses, and other particulars of commercial fishing enterprises, exporters, canners, quick freezers, importers, wholesalers of fish, suppliers of equipment, machinery and materials, cold storage and transport firms, and a classified Buyers' Guide.

UNDERWATER OBSERVATION USING SONAR. Published by Fishing News (Books) Ltd., London, Eng. Price $6.25.

The word SONAR stands for SOund NAvigation and Ranging, and describes a form of underwater radar using sound waves. This type of observation is already of great importance in the fields of fisheries and oceanography, as well as in naval operations, and is likely to be even more so in the future.

The first part of this book reviews the whole problem of underwater observation and includes sections on fish catching and fisheries research.

The second part explains just what sound waves are, how beams are formed, and how objects in the beam produce echoes which form the basis of sonar observation.

The third part of the book explains how sonar systems operate, what limits their performance, and how their expected performance can be calculated. This part is of necessity more technical than the rest, but does not go too deeply into the fields of mathematics and physical theory.

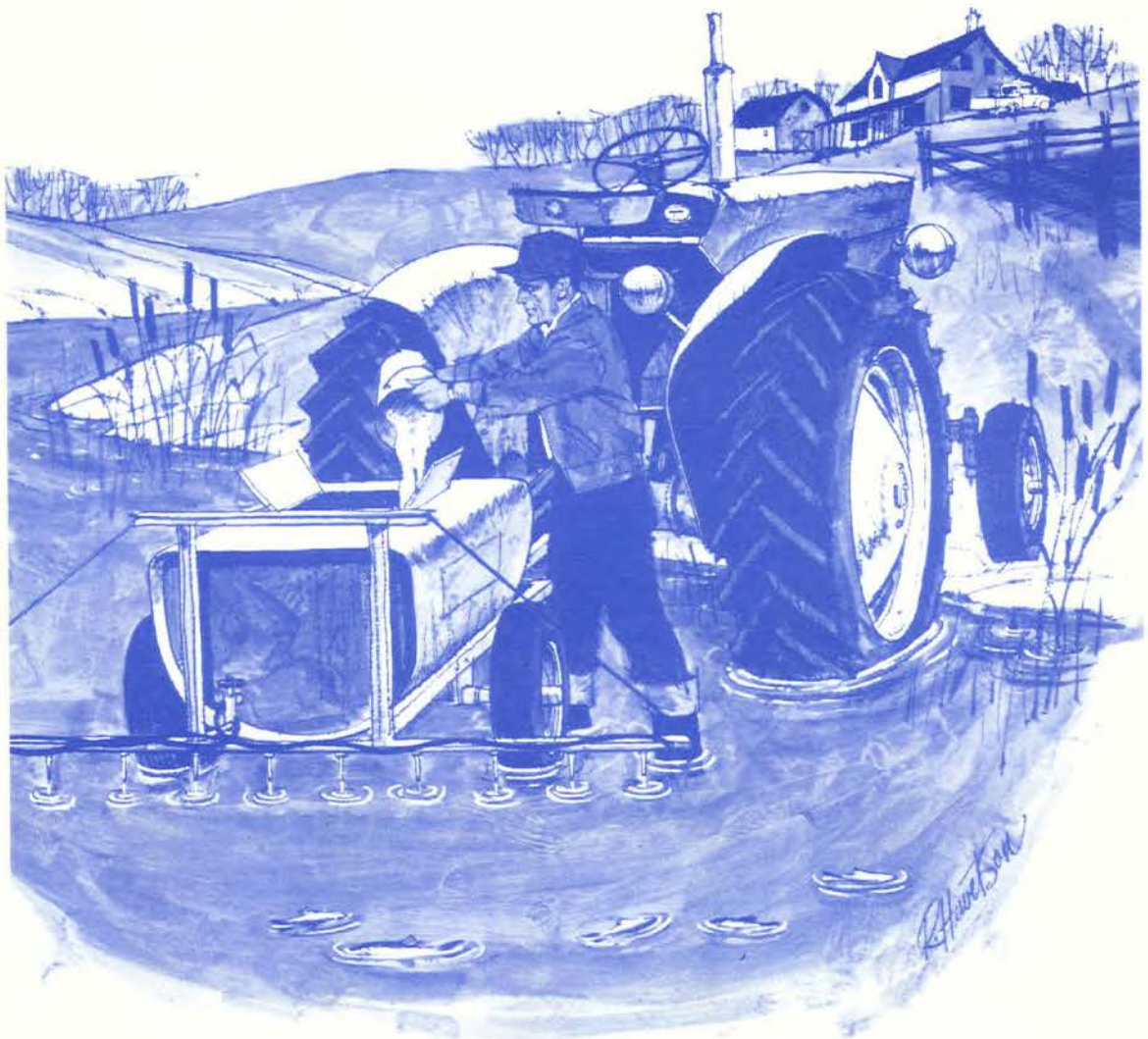
The book is well illustrated.

If undelivered return to:
Department of Fisheries of Canada
OTTAWA

CANADA
POSTAGE PAID
PORT PAYÉ

POISON—HANDLE WITH CARE

INSECTICIDES KILL FISH, TOO. Farm ponds, lakes and streams need to be protected from insecticides to prevent fish mortality. Spraying should be done with this in mind. Washing spray equipment should be undertaken well away from running water since even small streams can carry lethal doses of poisons to rivers or lakes. Canada's game and food fish are a valuable asset. They should be nurtured in every possible way. If you do your part they will be.



DEPARTMENT OF FISHERIES
Hon. H. J. Robichaud, M.P., Minister — Dr. A. W. H. Needler, Deputy Minister

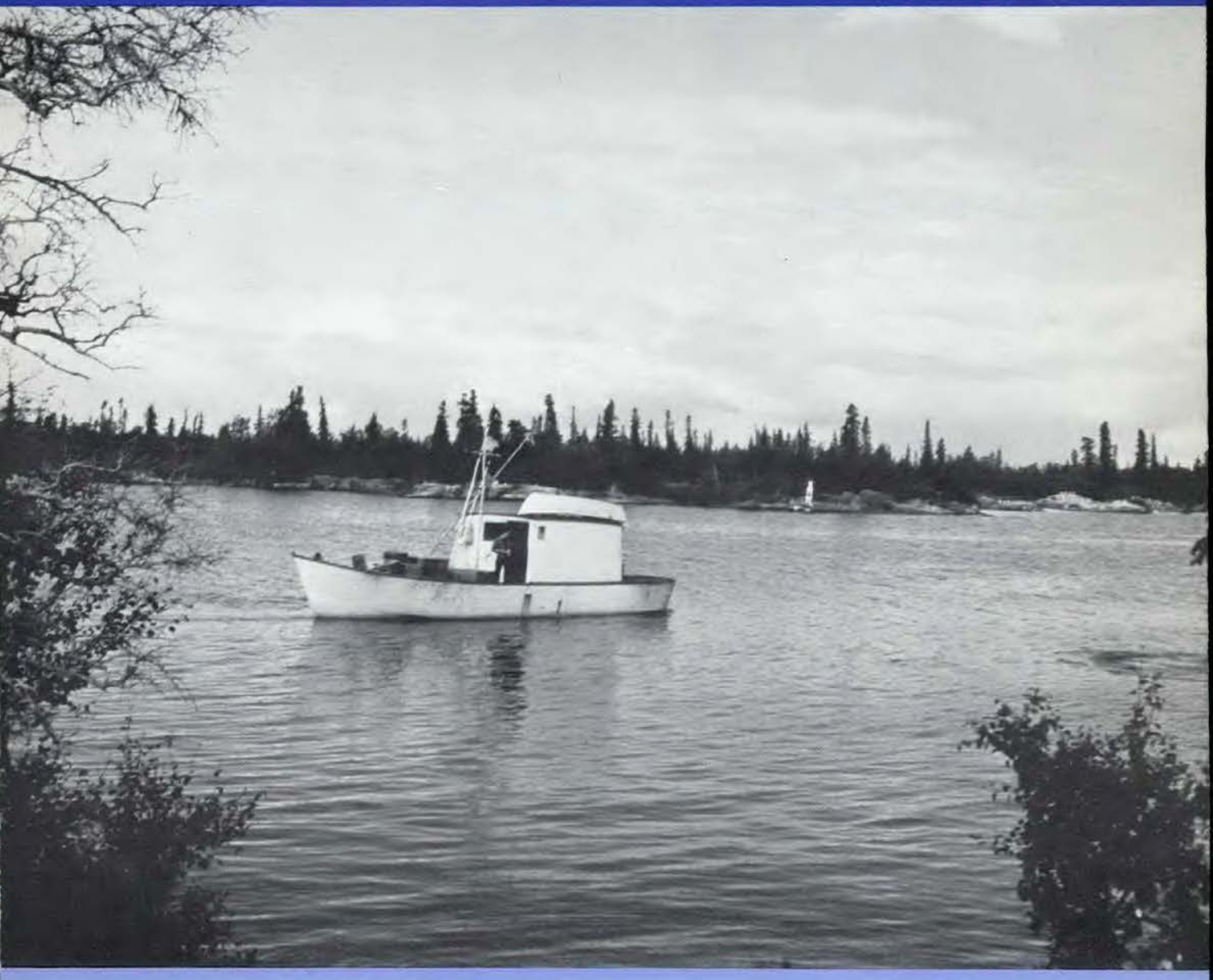
Ottawa, Canada

ROGER DUHAMEL, F.R.S.C., Queen's Printer and Controller of Stationery, Ottawa, 1967

FISHERIES

(formerly Trade News) OF CANADA

Vol. 19 No.8 February, 1967



In This Issue

- ★ Probe Migratory Habits of Chinook
- ★ Minister Issues Statement on Sealing
- ★ Study Training Methods in Russia

Department of Fisheries of Canada, Ottawa

FISHERIES OF CANADA

(formerly Trade News)

Editor

E. H. HEARNDEN

Vol. 19 No. 8 February, 1967

CONTENTS

FEATURES

COVER PHOTOGRAPH - A fishing vessel puts out from Ptarmigan Point on Great Slave Lake, Northwest Territories.

Probe Migratory Habits of Chinooks

By G.J. Gillespie

ON THE drizzly morning we cleared Nanaimo Harbor for the Gulf of Georgia we were on the hunt for the silvery king of Pacific salmon, the spring or chinook salmon. Aboard the sturdy 38-foot salmon troller *Hub City* were weatherbeaten Capt. Ted Plensky, federal Department of Fisheries technician Bob Armstrong and the writer.

While the chinook was our game, it wasn't a hunt in the true sense of the word. No fish were to be killed. They were being tagged as part of a federal fisheries program to study the migratory movements of this species of salmon.

The tagging project is a part of the department's applied biological research in the important commercial and sport fishing waters of the Gulf of Georgia. The aim is, of course, the achievement of the optimum exploitation of the species.

Captain Plensky -- a fisherman since the age of fifteen -- steered *Hub City* toward Northumberland Channel in the Gulf where he figured the best fishing would be on that particular day. Like many veteran fishermen, Captain Plensky has lots of technical savvy, and he is also equipped with a sort of sixth sense that tells him where the fish are likely to be.

Sailing out of the slip at Nanaimo, the writer -- an east coaster making his first trip to the Pacific -- was intrigued by the colorful names of many of the fishing vessels clustered together and bobbing gently in the light seawash slapping against the docks. There was *Whispering Wave* and alongside her, *Sundance* and *Gibson Girl* Then there was *Stranger* and *Lil' Abner*. Tied-up beside *Kid Brother* was *Ten Grand* sharing a berth with the larger, offshore fishing vessel *North Pacific*.

Capt. Ted Plensky operates trolling gear aboard the Hub City during chinook-tagging operations in the Gulf of Georgia.

MULTI-PURPOSE VESSEL

Hub City is a multi-purpose vessel. In addition to trolling, she is equipped for gill-netting and also herring seining. To keep fish alive -- mainly ling cod -- her hold can be flooded. Watertight compartments forward and at the stern provide the necessary buoyancy to keep the craft afloat when her holds are filled with water.

In the chinook-tagging operation, the trolling technique was used aboard *Hub City*. The equipment consists of two tall poles rising above the mast and two more lying back from the bow. When

the boat is fishing the two poles are dropped out and downward, carrying stainless steel lines straight into the depths thirty fathoms or more. Forty-pound chunks of lead -- known to most fishermen as "pigs" -- keep the lines down.

In the tagging trip in question only two poles were used, those from the wheelhouse. Four lines were used, with three "flashers" and hooks on each line. These flashing spoons taunt the salmon into striking the hook. When a fish hits a line, a small bell with a melodious tinkle almost like that of an Indian elephant bell advertises the fact. The bells are located on each line hanging from the poles lying almost horizontally to the sea.

Not many minutes after reaching Northumberland Channel, Captain Plensky set his gear. Then in about five minutes a bell tinkled. A line was winched in, and there struggling on the hook was a fifteen-pound chinook -- as plump and healthy as a fall pheasant. With a paddle-shaped instrument on which was attached a blunt, hook-shaped piece of iron, Captain Plensky deftly removed the hook from the chinook's mouth. The trick is not to injure the fish.

The captured fish was then dropped into a container containing an anesthetic which tranquilizes it for tagging and scale sampling. Within seconds the tag is in place, a scale removed and the fish is put into another water-filled container -- a sort of recovery tank. Within a minute or two, the tagged fish is thrashing about. It is then returned to the sea as healthy and vigorous as before, except that it now carries a fishes' version of an ID card.

SCALE REMOVED

To the trained biologist, the scale from a fish pretty well tells its whole life story. That was why Bob Armstrong removed a scale from each salmon, and catalogued it along with the length measurement, and approximate weight of the fish, and the tag number. The scales will be studied later under the microscope in the fisheries department's Resource Development Branch biological laboratory in Vancouver. Fishermen capturing tagged fish are paid a fee by the department for returning the tag with information as to when and where it was caught. The information will allow department biologists to determine migration routes, feeding movements, growth rates and rate of exploitation of these valuable salmon by commercial and sport fishermen.

The hours spent that day in the Gulf of Georgia yielded 40 chinooks. With few exceptions they were medium-sized fish weighing from 8 to 15 pounds. The tagging operation was concluded a few days later toward the end of November and had lasted 40 days. More than 1, 000 chinooks were tagged in that period.

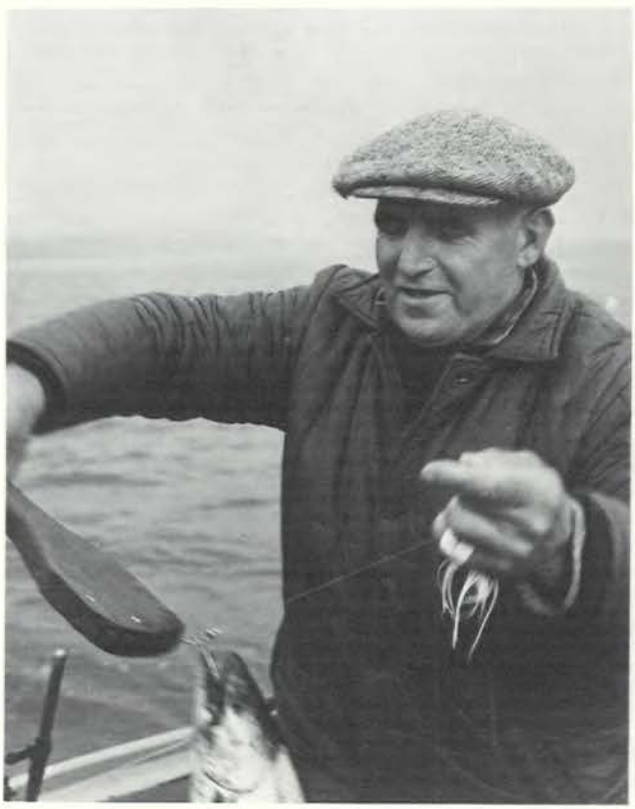
The chinook holds its reputation as monarch of Pacific salmon because of its size and its beauty. Its life provides one of nature's most wonderful cycles. One of its common names, "spring" salmon, arises from the fact that some runs arrive in springtime, ahead of all the other salmons. There is also a summer run in June and July and a fall run in August and September.

When chinooks are hatched from the eggs in the spawning beds in inland streams, most of them head for the salt water quite soon after hatching. However, a small number may spend up to a full year in the river of their birth before swimming downstream to the briny waters. While six-year-old spring salmon are not uncommon, they usually return to their native streams as four or five-year-olds.

VORACIOUS EATERS

While in the salt water, chinooks are voracious eaters. King Neptune's menu offers an enticing variety of foods, but chinooks settle mainly for herring and needlefish. However, shrimp also tempts their palates and they devour large quantities of these crustaceans during their free-running days in ocean depths.

Chinooks are not concerned about calories, and they put on a lot of weight in the years dividing



Capt. Plensky deftly removes the hook from the mouth of a chinook prior to tagging.

them from their fresh water homes. Chinooks running in from sea to spawn after four years may weigh from 20 to 25 pounds. Those staying at sea for five years may reach 40 pounds in weight, with some rocking the scales at 60 pounds. Authentic records show chinooks weighing well over 100 pounds, including one jumbo at 125 pounds.

At the end of their long odyssey in Pacific waters, the chinooks are gripped with the urge to spawn and, guided by a mysterious homing instinct, they head back for the rivers where they were born. In prime physical condition, they are now full-grown and heavy with layers of fat, ready to fight homeward up river through a gauntlet of nets, rapids and dams and the lures dangling from the lines of sport fisherman. Those who have survived the natural and man-made hazards finally reach the spawning beds. The female digs her nests to lay the eggs, the male joins her to complete the spawning act and, then exhausted, their lives at a logical end, the chinooks die.

KNOWS MOODS, HABITS

While not a biologist, Captain Plensky knows the salmon as a farmer knows the moods and the habits of his livestock. He rates the chinooks as top on the list of the fish he catches. First of all they bring the highest price, and, as he adds, "they're a beautiful fish".

Sign on the troller Hub City identifies the vessel as being engaged in research on behalf of the Department of Fisheries.

Federal Department of Fisheries' technician Bob Armstrong removes a scale from a captive chinook for later study in the Vancouver biological laboratory.

Captain Plensky has been fishing steadily since his teen-age years. He is the son of a Nanaimo coal miner and a native of that community prettily lodged on the gulf shore of Vancouver Island.

His fishing operation is a one-man activity. However, sometimes when the weather is fine, Mrs. Plensky leaves the dishes stacked in the sink and joins her husband for a day's trolling in the gulf. "She's almost as good a fisherman as I am," grins the genial skipper of *Hub City*.

While chinooks are Captain Plensky's most important game, he also trolls for cohoe and pink salmon. Once in awhile he also nabs a steelhead or two, but they are not plentiful. Like their cousins the Atlantic salmon, steelheads may live to spawn more than once. Many of them return to sea after spawning is over, while all the other Pacific salmon species die.

Trolling is successful in catching chinooks, but not so with chum and sockeye salmon. "They don't seem to be educated to take a hook," said

Captain Plensky. "Gill-netting is by far the best method for them."

The captain has grudging admiration for the sockeyes. "They're pretty wily, you know. They seem to know you're out to get them. You've got to round them up like cattle at the mouth of a river. If you can do that then you can make your sockeye fishing pay. You're pretty well wasting your time trying to catch them by trolling."

After being out in the Gulf for four or five hours, the chinooks stopped biting. "They've quit feeding," the captain abruptly observed, "we'll be wasting our time from now to nightfall. They'll be feeding again after dark."

With that the gear was hauled in. Captain Plensky veered his vessel's stubby prow toward Nanaimo and a day of fish tagging was at an end. In the meantime, Bob Armstrong's log contained another batch of information to add to the fattening file on chinook salmon being studied by the scientists of the Resource Development Branch of the federal Department of Fisheries in British Columbia.

Study Shrimps, Prawns

Scientists and experts from all over the world will probe the mysteries of shrimps and prawns at a conference in Mexico City, June 12-24.

The conference has been organized by the Food and Agriculture Organization as part of its work of assessing world resources of various types of fish and seafood. The aim is to piece together existing knowledge of shrimps and prawns, and then to recommend what work is needed in biology and culture.

As with other recent meetings on the biology of sardines and related species and on the biology of tunas and bonitos, the end result hoped for is a level of exploitation which will ensure continued supplies of protein-rich food for future generations.

FAO officials point out that shrimps and prawns, once considered merely a delicacy, have recently become a popular fish in many parts of the world. They are important both on the local market and as a profitable export.

A view of the popular exhibit arranged by the federal Department of Fisheries at the 1966 Pacific National Exhibition. The display, which featured a replica of a salmon spawning stream, attracted an estimated 200,000 visitors during the run of the exhibition.

Fisheries Minister Issues Statement on Canadian Sealing Operations

The following statement on action taken by the Department of Fisheries on the sealing operation in the Gulf of St. Lawrence has been issued by federal Fisheries Minister H.J. Robichaud.

DURING THE last two years, 1965 and 1966, the Department of Fisheries has been directly and keenly interested in the introduction of measures which would prevent any occurrence of cruelty in Canadian sealing operations in the Gulf of St. Lawrence and off the coasts of northern Newfoundland and Labrador. This is additional to the important matter of conservation.

Conservation measures, laws included in the Seal Protection Regulations made under Section 34 of the Fisheries Act, are based on conclusive scientific evidence resulting from more than 20 years' work by the Fisheries Research Board, and preclude the possibility of decimating Atlantic seal herds migrating to the Gulf of St. Lawrence each year. In fact, the regulations there are designed to increase the herds.

The sealing operations first came under general public observation with the introduction of aircraft into the activities in the Gulf of St. Lawrence. Ships with their large crews of sealers have been operating for years from Newfoundland and the Maritimes. The men on these vessels were, of course, experienced sealers. Sealers who were engaged by aircraft operators for the Gulf of St. Lawrence were, for the most part, inexperienced. Through lack of knowledge of the operation and careless attitudes, there was certainly much activity of a nature which left a great deal to be desired.

UNSUPERVISED

The sealing operations in the Gulf and elsewhere in the Atlantic were unsupervised over all the years until these undesirable occurrences took place in the Gulf. Lack of supervision in those days is explained by the fact that until recent years the ship operations by our nationals did not present an acute problem. Even when it became apparent that conservation regulations should be introduced, we were not in a position to make restrictions on Canadian sealers which would not apply to sealers of other nations operating on the high seas. Informal agreements were made with Norway about opening and closing dates of sealing seasons. In time the conservation need became apparent through research conducted by the Fisheries Research Board of Canada.

Canada proposed to the International Commission for the Northwest Atlantic Fisheries that a protocol to the Convention be introduced relating to harp and hood seals in order to bring the operation under international control. The resolution was adopted by the Commission in 1961 and the protocol opened for signature to the member nations in 1963. It was finally ratified by all member nations by the spring of 1966, in time to be included in the agenda for the Annual Meeting of this Commission in Madrid, Spain, in June, 1966. A panel with membership from interested nations was established, and there has been a further meeting of this panel in Copenhagen, Denmark. These discussions will lead to international conservation measures in areas outside the Gulf of St. Lawrence. Inside the Gulf, the fishery in 1965 and 1966 was exclusively Canadian.

In 1964, as a preliminary control measure, sealing vessels and aircraft engaged in sealing were licensed by the Department of Fisheries. There was very little supervision of their activities but a number of observations were made.

Consultations with the industry and with humane society representatives followed and a new set of sealing regulations governing sealing off the Atlantic Coast was developed in the fall of 1964 to apply in 1965. Open and closed seasons for operations from ships and aircraft were retained as before, but a number of control measures were introduced in addition.

For conservation purposes a quota was applied to a large area of the Gulf of St. Lawrence limiting the kill of harp seals of less than a year in age by sealers operating from ships and aircraft to 50,000. There was a new prohibition against the killing of hood seals in this same part of the Gulf. The killing of adult seals in breeding patches was prohibited. Aircraft were permitted in the area of the Gulf of St. Lawrence where they had already established an operation but not elsewhere. The Norwe-

gians also agreed not to use aircraft in the actual sealing operation off Newfoundland and Labrador.

In addition to these conservation regulations, new regulations came into force defining minimum weight and length of a club for killing seals, prohibiting the taking of seals by longline, and prohibiting the skinning of a seal until it is dead. There was a new regulation limiting the time that sealskins could be left on the ice before removal to a base of operations.

FURTHER MEETINGS

After experience in enforcement of these new regulations in 1965, there were further meetings with industry and with representatives of the conservation and humane societies with a view to regulation improvement.

Amendments were introduced to include an extension of the area to which the quota applies to cover waters some distance to the east of the Gulf of St. Lawrence. There is a prohibition against moving a live seal from where it is found except with the permission of the Minister. Killing methods have been rigidly defined and the regulations prohibit the use of other methods. The approved methods specify lengths and weights of gaffs and clubs; they define the ballistics of acceptable rifle calibres and the types of cartridge that may be used for killing the older seals.

Every person engaged in sealing must now obtain a licence, including those operating from shore or from small boats.

During the 1965 and 1966 operations every sealing ship has had aboard a Fishery Officer to see that the regulations are carried out. In addition, Fishery Officers patrolled the ice where operations were being carried out by sealers both from ships and aircraft. Officers were also available to check on quotas at aircraft landing points. These officers worked long hours at all times of the day and from all reports have been dedicated to their task.

Observations have been carried out with assistance from the Department by representatives of conservation and humane societies during the sealing seasons in 1965 and 1966. Their recommendations have been taken into account in drawing up amendments to the regulations in recent years.

KILLING METHODS

During the 1966 operations the Ontario Humane Society representative and others working with him experimented under special permit in an evaluation of killing methods other than those stipulated by regulation, using such implements as the captive bolt pistol and plastic filled cartridges fired from standard weapons. Under the weather and other conditions prevailing none of these was found to be satisfactory. In their report they stated the view that a suitable club, properly handled, remains the most effective and humane way of killing the young seals. Experiments will continue, but in the meantime a new regulation is proposed stipulating that young seals may be killed only with a heavy hardwood club of specified dimensions. The long and unwieldy gaff is to be prohibited as a killing instrument, although of course sealers will be permitted to carry such an implement for personal safety. The new amendments proposed for next season will prohibit the killing of young seals by any method other than with the specified club.

Indeed the proposed regulations go farther, in that they will prohibit the striking of any live seal with any implement other than the approved club. They will also prohibit the commencement of any operation toward skinning the seal until there is no doubt that it is dead.

Other regulations proposed will stipulate that the master of a ship or pilot of an aircraft is responsible for ensuring that every person engaged in sealing from the ship or aircraft concerned is in possession of a licence, the proper means of identification issued with the licence, and is in possession of a proper killing weapon as described in the appropriate section of the regulations.

BAN DURING DARKNESS

A prohibition on sealing during darkness is proposed, between 6:00 p.m. and 6:00 a.m. We are also considering a regulation which will give any Fishery Officer authority to suspend the licence of any licensee and require him to return to his ship or aircraft, or to shore, when the licensee is found to be contravening the provisions of the Seal Protection Regulations.

We are studying a means of identifying licensed sealers on the ice more readily, by use of a disc or arm band which will include the licence or identification number.

There are of course factions among the S. P. C. A. movements who are now advocating total abolition of sealing by Canadians. Among these is the New Brunswick S. P. C. A., represented by Brian Davies. The Canadian S. P. C. A. of Montreal has officially called for cessation of the killing of baby seals, although its representative on the ice this year, Mr. J. J. Vallee, does not suggest this in his report which, by and large, shows up the Department of Fisheries' operations in a favourable light. The remaining humane society and conservation society representatives in their preliminary report expressed satisfaction with the progress being made.

On October 21, I stated in the House of Commons that I could not accept the recommendation of

the small number of members of the S. P. C. A. who have advocated total abolition of sealing by Canadians. I have the responsibility for management of fisheries generally, and seals, by definition in the Fisheries Act, are included. I regard the seal hunt, properly conducted, as a necessary part of the overall management program

'STAGED' SCENES IN FILM

The publicity given the sealing operations has been unfortunate. Much of it has been exaggerated; much of it has been incorrect. It has been determined, for example, that films shown on television here and abroad included lurid scenes staged for the purpose, some by persons who were not sealers at all, and all this was done before the season opened in 1964.

I met with representatives of the conservation and humane societies as well as members of the sealing industry on June 1, 1966. For the occasion I invited also a number of the Fishery Officers who had taken part in the enforcement program on the ice in the spring. In drafting the proposed amendments the reports and recommendations made by the humane and conservation society representatives were given all possible consideration. The Fishery Officers' views and recommendations from our Regional Directors for the Atlantic were also studied. The proposed regulation amendments were sent out to the representatives who attended the June 1 meeting, and each was asked to comment by mid-November.

It is our intention too to deploy a larger force of Fishery Officers on the sealing grounds with more equipment for supervision of the sealing operations. ✔

Fish Consumption

In answer to a recent question in the House of Commons, Trade Minister R. H. Winters said Canadians consumed an estimated 137,127 tons of fish in 1963. This compared with 112,711 tons in 1960. He said there are no statistics available on the total consumption of fish in Canada.

Fish and fish products used in the manufacture of foods for domestic animals, including pets, amounted to 49,823 tons in 1963 and 38,144 tons in 1960. As many of these food contain not only fish but also animal and grain products and as substantial quantities are exported, it is not possible to determine what portion of the fish and fish products used is retained for domestic consumption.

Announce Amendments to the Seal Protection Regulations

Further steps to ensure that humane methods are used by Canadian seal hunters operating in the Gulf of St. Lawrence and off the coasts of northern Newfoundland and Labrador were announced this month by federal Fisheries Minister H. J. Robichaud in the form of amendments to the Seal Protection Regulations.

Under the new regulations, seals may only be killed by (a) a hardwood club of between 24 and 30 inches in length that is not less than two inches in diameter for at least half its length; (b) a rifle firing only centre fire cartridges, not made with metal cased hard point bullets, with a muzzle velocity of not less than 1800 feet per second and a muzzle energy of not less than 1100 foot pounds; or (c) a shotgun of not less than 20 gauge firing rifled or 'Polykor' slug shotshells.

When using a club, sealers may not strike a seal anywhere except on the forehead. The regulations emphasize that skinning must not start until there is no doubt that the seal is dead.

In the event of contraventions of the regulations, a fishery officer now has the authority to suspend the licence of offenders for a period of up to 30 days. It is also the responsibility of the master of a ship or pilot of a helicopter or other aircraft to ensure that all those engaged in sealing operations possess a sealer's licence, are wearing the plastic identification button issued with the licence and that they comply with the regulations as to methods of killing seals.

Another change in the regulations stipulates that sealing in the Gulf Area may only take place during the daylight hours of 6 a. m. to 6 p. m.

The new amendments are the result of consultations between the Department of Fisheries and representatives of conservation and humane societies and the sealing industry.

Fisheries Minister Robichaud pointed out that it was the Department's intention to enforce the new regulations to the letter.

BLUEFIN TUNA

By S.N. Tibbo, Fisheries Research Board of Canada, St. Andrews, N.B.

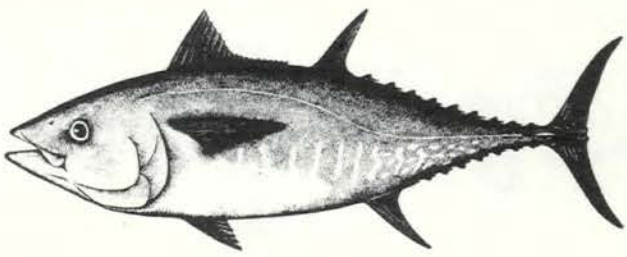
THE BLUEFIN TUNA *(Thunnus thynnus L.)* is also called horse-mackerel, great albacore or tunny. It is the largest member of the mackerel family and among the largest of all fishes. It is almost world-wide in occurrence being found on both sides of the Atlantic and Pacific Oceans. In the eastern Atlantic, it ranges from Norway to the Mediterranean Sea and southward off the African coast to the Cape of Good Hope. In the western Atlantic, it is found from Newfoundland southward at least as far as the West Indies and probably to Brazil. Very few small bluefin have been taken south of Cape Hatteras, although large fish are abundant throughout the Caribbean Sea and Gulf of Mexico.

DESCRIPTION

The bluefin is a beautifully streamlined fish with a bluntly pointed nose and a robust body that tapers evenly from the shoulder region to a long, slim tail region. The head has tightly closing jaws, flat gill-covers and eyes set flush with the surrounding surfaces. The body is completely covered with scales, including a corselet of large scales in the shoulder region. The fins fold into grooves or depressions thus giving a smooth contour to the body. With such a shape, it is not surprising that the bluefin is one of the swiftest (and widest ranging) fish in the sea.

Like all tunas, the two dorsal (back) fins of the bluefin are set close together. The trailing edge of the first dorsal is almost straight whereas that of the second dorsal is deeply concave. The pectoral (shoulder) fins are short and extend backward only as far as the rear of the first dorsal fin. In all other tunas this fin extends to the region of the second dorsal. The tail is deeply forked, much broader than long and both lobes are sharply pointed. As with all the mackerel tribe, there are small fins (finlets) between the second dorsal fin and the tail and between the anal fin and the tail. In the bluefin these finlets are yellow with black edges and there are 8 to 10 in each row.

The adult bluefin is a dark metallic blue with a greenish sheen on the back shading through silver on the sides to white on the belly. There are no dark bars, stripes or streaks like those on the skipjack, common bonito and false albacore. In contrast with adults, young bluefin have conspicuous white vertical bars and spots along the sides, but these disappear gradually as the fish grows.



Bluefin Tuna *(Thunnus thynnus L.)*

DISTRIBUTION AND IMPORTANCE

During the warm months of the year, the Atlantic bluefin are found over the continental shelf at depths of 15 to 100 fathoms from Cape Hatteras to Newfoundland. The smaller individuals are found towards the south, the larger ones towards the north. In winter they leave the continental shelf and are widely dispersed in the Atlantic.

Bluefin are gregarious fish and usually travel in schools. The number in a school rarely exceeds 20 for large bluefin (over 300 lb), but may reach 1000 or more for medium-size fish (80-300 lb) and several thousand for small fish (to 80 lb).

In Canadian waters there seem to be two distinct sizes of fish: the giants (over 300 lb) which appear in June and the jumpers (50-150 lb) which usually do not arrive until late August or early September.

Each year in April and May schools of large bluefin are seen swimming northward past Bimini Islands off the coast of Florida. It is presumed that these are the same fish which appear off the Canadian coast in late June and early July. The areas where bluefin schools appear may change considerably from year to year. Because of erratic and so far unpredictable occurrence, there has been no well organized and continuous commercial fishery. For the same reason sport fishing is also sporadic and may not occur in the same places in succeeding years.

BEHAVIOUR

When schools of bluefin are swimming at the surface they have three typical behaviour patterns: "pushing", "milling" (breezing) and "smashing".

When "pushing" the fish all swim in the same direction at 3 to 8 knots and push a wave before them like a small motor boat. When "milling" the school is more or less stationary, but the individual fish move in circles or at random and cause a rippling at the surface. When "smashing" the school is also more or less stationary, but individuals are feeding voraciously, driving schools of forage fish to the surface, splashing and whirling and often leaping clear of the water altogether.

LIFE HISTORY AND HABITS

Spawning: The life history of bluefin is still incompletely known. It is known, however, that large fish spawn between Cuba and the Bahamas, near the edge of the Florida current, during April and May. At this time, schools of bluefin are frequently seen swimming northward at nearly 3 knots in the shallow water near the islands. This migration is frequently interrupted as the fish mill around for short periods. Available evidence indicates that during these "milling" sessions, the eggs are released and fertilized. The eggs are about 1/25 inch in diameter and contain a small oil globule. They float at the surface and hatch in a few days.

Growth: Young bluefin grow so rapidly that fish hatched in June weigh more than a pound by September and 8 pounds at the end of their first full year of life. A two-year old bluefin weighs about 15 pounds and a ten-year old about 350 pounds. A 700-pound fish is 14 or 15 years old. Bluefin may grow to over 1200 pounds, but fish over 900 pounds are seldom landed, probably because of their immense power. The world record for bluefin taken on rod and reel is 977 pounds. This fish was taken in St. Ann's Bay, Nova Scotia.

Weighing a sportsman's catch at Wedgeport, Nova Scotia.

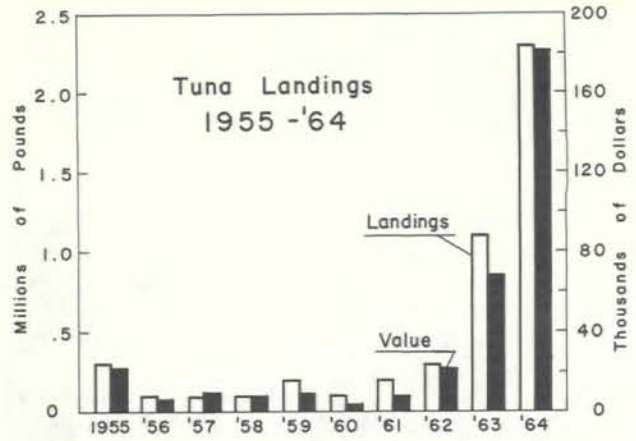
Purse seine caught tuna are discharged from the M.V. Blue Waters at Campobello, N.B.

Food: Bluefin are very active predators, hunting squid and a wide variety of fishes. They eat both surface-dwelling forms, such as herring, mackerel and younger tuna, and deep-living fishes such as the lanternfishes and barracudinas which occur in waters down to about 100 fathoms.

Factors controlling abundance: Fish which eat the same food as bluefin are competitors. However, competition has little effect on abundance since, if one feeding area should become exhausted, the bluefin can search for another more quickly than most of its competitors. Eggs and the very young stages of bluefin are an easy prey for predators, including larger bluefin and other tunas. Intermediate sizes are eaten by large fish and marine mammals. The toothed whales and some large sharks are the only predators that are big enough to deal with the giants. Parasites can cause considerable damage, especially to gill tissues, but it is unlikely that they have any serious effect on the abundance of bluefin. Man is taking an increasing toll of bluefin, and fishing mortality in some areas may be as high as 20-25 per cent of the available stock.

Migrations: The bluefin is a fish of the open sea wandering far and wide in search of food. Its migrations have been a subject of interest and speculation for centuries and although much work has been done these migrations cannot yet be described in detail.

In April, May and June, eastern Atlantic bluefin congregate for spawning in the Mediterranean Sea



Canadian tuna landings and values 1955-64.

and in the Atlantic just outside the Strait of Gibraltar. Immediately after spawning they embark on a northward feeding migration and from July to October are found in the North Sea and off the Norwegian coast. The approach of winter brings about a reverse migration.

The migrations in the western Atlantic are undoubtedly similar, but are less completely understood. In April and May bluefin congregate for spawning in the West Indies area and then set out on a northward migration as far as Newfoundland. There are, however, a number of contingents that have their own patterns for time and place of occurrence. The largest fish lead the way, to be followed some weeks later by small fish and finally by intermediate sizes. The smallest commercial sizes are seldom found north of Cape Cod whereas intermediate sizes occur regularly along the Nova Scotia coast and giants as far north as Newfoundland. There are several records of trans-Atlantic migrants and it has been suggested that such migrations are part of a regular pattern.

Setting longlines for tuna from the research vessel A.T. Cameron.

THE FISHERY

The Canadian bluefin fishery is small with landings in the 1953-62 period varying from 40 to 100 tons annually. In 1963 and 1964 landings increased to 570 and 1160 tons respectively, mainly as a result of the introduction of two purse seiners that exploited the stocks of small bluefin and skipjack in the Cape Cod to Cape Hatteras region.

Trapping, harpooning, and longlining with baited hooks are the main methods of the commercial inshore bluefin fishery. Baited hooks are also used in sport fishing. Commercial fishing with purse seines became profitable about 1958 with the adoption of synthetic materials for making nets and the use of "power blocks" for hauling them. Longlining for swordfish on the high seas, particularly during June and July, accounts for substantial incidental catches of bluefin.

It is difficult to predict what the future holds for the bluefin fishery. Landings throughout the world are small by comparison with landings of other tunas such as yellowfin and albacore. However, in many countries bluefin are the most highly regarded of the tunas and hence command the best prices. Commercial fisheries interests in the tunas are expanding rapidly in the western Atlantic and increasing fishing pressure on the stocks of bluefin is inevitable.

Extensive studies of the biology of bluefin are needed to determine the size of the stock and the amount of fishing it can withstand in perpetuity.

The M.V. Beinir -- a commercial longliner.

Canadian Group Impressed

Study Training Methods in Russia

A CANADIAN party recently completed a tour of Russia, Norway and Britain where it had an on-the-spot look at the methods those countries use in training recruits to the fishing industry. The Canadian group included federal and provincial officials involved with fisheries training and administration on Canada's Atlantic coast. A reciprocal visit will be made this winter or spring by a Russian team of experts who will visit east coast fisheries training centres.

The leader of the Canadian party, L. J. Crabbe, vocational training administrator of the federal Department of Fisheries, Ottawa, said the stay in the port of Murmansk was a highlight of the Russian tour. Situated on a natural harbor off the Barents Sea, Murmansk with its population of 600, 000 people is the most northerly industrial centre in the world.

This Arctic port -- familiar to Canadian sailors who ran the gauntlet of hostile submarines and aircraft in the last war to bring supplies to the beleaguered Russians -- is the home base of Russia's north Atlantic fishing fleet. About 200 vessels sail from Murmansk to exploit the fishing grounds off the Canadian and American coasts. Vessels in this fleet range from the conventional-sized trawler to the large Pushkin-type ship which is a combined fishing craft and floating fish factory.

IMPRESSED BY FACILITIES

Mr. Crabbe said the Canadians were impressed by the training facilities at Murmansk. It has two fisheries training schools. One provides training for students at the high school level, while the other school teaches a curriculum geared to the university level. Russia has 24 schools engaged exclusively in fisheries training. The total student enrolment is 56, 000.

Murmansk has a large fish processing plant, and Mr. Crabbe said the Canadian team was impressed by the high quality standards of the products. Practically all the fish harvested by Russia's enormous fleet in various fishing waters is consumed within the Soviet Union.

Astrakhan, situated on the Volga River delta, is the centre for production of caviar, Russia's luxury seafood. Last year more than 1, 300 metric tons of this sea delicacy were exported. There are about 100 fishing communities situated in the general Astrakhan area, and about 70, 000 persons are engaged in the fishing industry there. Astrakhan has five institutions devoted to fisheries training.

The Russian trip revealed some interesting sidelights on Soviet fishing operations. For instance, the Russian fleet involved directly or indirectly with fishing totals 18, 000 vessels. In addition to fishing vessels, the fleet includes various types of craft such as research vessels, supply ships, etc.

Russian crews fishing the western Atlantic are a long way from home and this entails long spells at sea. To relieve the boredom and provide opportunities for relaxation Russia has seaborne recreation facilities. These are provided by ships which have extra amenities aboard. From time to time, fishermen from other vessels are taken aboard to enjoy extra comforts and recreation.

VISIT TO NORWAY

The visit of the Canadian team to Norway was mainly centred in the Bergen area which is the centre of that country's fishing industry. Norway has eight fisheries training schools. They train recruits in fish canning techniques, fish processing, engineering and refrigeration, and, of course, gear techniques and navigation are also taught. Before entering a fisheries training school, the candidate must have nine years general education and two years practical experience. The schools provide free accommodation to students as well as travelling expenses to and from home. Students must pay for their own textbooks.

While in the United Kingdom, the Canadian group visited Aberdeen and Britain's ancient and famed fishing port of Grimsby. Some of the party

also visited the college of navigation at the University of Southampton.

During the trip the Canadians were forced by weather to make a stopover in Copenhagen. There they had an opportunity to visit a school sponsored jointly by government and industry to train waiters and cooks for the restaurant trade. It also trains cooks for the merchant fleet and fishing vessels. While in England a couple of members of the Canadian party also visited Ealing Technical School in London where training is given people engaged in the food catering industry.

In addition to Mr. Crabbe, the Canadian group included: E. H. Collins, head of the Training and Industry Section of the Manpower Training Branch of the Department of Manpower and Immigration, Ottawa; Dr. Yves Jean, Director of Fisheries, Quebec Department of Trade and Industry, Quebec; Cyril Banikhin, Administrator of the College of Fisheries, St. John's; Guy Emond, Principal of the School of Fisheries, Grand Rivière, Quebec; Gerard St. Cyr, Director of the School of Fisheries, Caraquet; Rupert Prince, Department of Fisheries, St. John's, ; G. F. Vail, Chief, Manpower Training Service, Department of Manpower and Immigration, Halifax, and Capt. J. H. Hansen, Director of Training, Nova Scotia Department of Fisheries, Wolfville.

Admin. Director John Lamb Ends 49 Years' Service

John J. Lamb, who retired in January as Director of the Administrative Service of the Federal Department of Fisheries. can claim the distinction of having served under eighteen Cabinet ministers, six prime ministers and seven deputy ministers during his 49 years of Government service.

A native of Ottawa, Mr. Lamb entered the Fisheries Service--then part of the Department of Naval Service--in 1918 as a 15-year-old junior clerk. In 1930, he became private secretary to the Hon. E. N. Rhodes, Canada's first Minister of Fisheries, following establishment of a separate department in that year. Later, he served as executive assistant and assistant to the Deputy Minister of Fisheries.

Mr. Lamb was appointed Director of the Administrative Service of the Department in 1952. During his time with the Department Mr. Lamb has seen the annual expenditure on fisheries expand from $1 million in 1918 to $43 million in 1966-67 and the total department staff grow to 2000 across Canada.

Referring to the Department's move into the then new Hunter Building in 1919, Mr. Lamb recalled that the site was previously occupied by an old fisheries building of dark-grey stone called "The Canadian Fisheries Museum." The museum contained various examples of stuffed fish and fishing vessel models. In the basement was a fish hatchery. "In the annual departmental report for the year 1916-17, it was stated that 'the building is open Saturdays and Sundays for visitors.'" The hatchery went out of existence after the typhoid epidemic of 1911 - 1912 at which time Ottawa water was chlorinated.

Mr. and Mrs. Lamb have seven children; two are in the Montreal area, two in the Toronto area, and one son works in Kingston. In addition, they have eight grand-children. They plan to do a good deal of visiting with their children during retirement.

In a tribute to Mr. Lamb, Fisheries Minister Robichaud said, "The management of Fisheries expenditures has required the services of dedicated and highly capable personnel, and none has been more faithful nor more capable than Mr. Lamb who has directed the Administrative Service for the past 15 years."

Among the gifts presented to John J. Lamb on his retirement recently as Director of Administration for the Department of Fisheries was a miniature totem pole from departmental employees in British Columbia. Making the presentation is Fisheries Minister H.J. Robichaud as Mrs. Lamb looks on.

News Roundup

Fills New Post

G. Lorne Grant, 46, of Winnipeg has been appointed Director of Federal-Provincial Fisheries Arrangements with the federal Department of Fisheries at Ottawa.

G. Lorne Grant

In this newly-established position, he will act as the principal representative of the federal department in maintaining liaison with provincial fisheries departments and agencies. He will serve as co-ordinator of federal activities in connection with federal-provincial committees which meet regularly to discuss co-operative action to further fisheries development. Comprised of senior officers of federal and provincial departments and agencies, the committees are concerned with fisheries of the Atlantic, Ontario, Prairie and British Columbia regions.

Mr. Grant, a native of Lower Newcastle, N. B., brings to his new post wide experience as an administrator with the Department of Fisheries. Educated in New Brunswick, he received a B. A. degree from St. Thomas University in Chatham, N. B., and following wartime service overseas with the Canadian Army, joined the Department of Fisheries at Fredericton in 1947. He was later transferred to Halifax where he was attached to the Economics Service, and in 1954 was appointed Maritimes Area Administrator of the Fishermen's Indemnity Plan.

He transferred to St. John's, Nfld. in 1958 as Assistant Area Director, and in 1960 was appointed Director for the Central Region at Winnipeg.

Completes Trials

Fishing trials of the new fisheries research vessel *E.E. Prince* have demonstrated that the ship is ideally suited to its role, reports the Fisheries Research Board of Canada.

The *E.E. Prince* a mobile laboratory equipped to perform a variety of fishing and research functions, was recently added to FRB's Atlantic fleet.

Fishing trials were completed in mid-December to test the efficiency of the ship using otter trawls, long lines and scallop drags. Excellent performance was achieved with each of these gears. Advantage was taken of the test run to check out a variety of scientific equipment used in hydrographic and plankton studies.

Observers from the Fisheries Research Board, Department of Transport and Port Weller Dry Docks Ltd. (the builders) were on hand during sea and fishing trials. They reported that the ship provided a very stable working platform in seas described as "fairly heavy". The *E.E. Prince* is equipped with a flume stabilization system which greatly reduces the rolling action of vessels of its size.

Several short research cruises are planned before the *E.E. Prince* undertakes long-range high seas investigations for which the ship is specially-designed and equipped. The new research vessel has a primary role in pelagic fish studies. She operates under the direction of FRB Biological Station, St. Andrews, N. B.

Appointment

E. Blyth Young, 47, of Ottawa has been appointed Associate Director of the International Fisheries Service of the Department of Fisheries. In this position he will be involved in matters concerning the international fishery conservation treaties to which Canada is a signatory.

E.B. Young

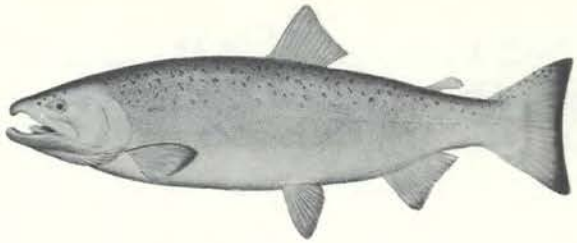
Mr. Young is a native of Ottawa. He was educated there and at the University of Toronto, where he received his Bachelor of Arts degree in 1942.

After service with the Royal Canadian Navy in World War II, Mr. Young joined the Civil Service Commission in 1946. While with the Commission he worked with various Federal Departments in the field of personnel selection.

Mr. Young joined the Department of Fisheries in 1951 as Assistant Chief of Protection in the former Conservation and Development Service, becoming chief in 1954. In 1958, he assumed the duties of Assistant Director of the Conservation and Development Service under Dr. A. L. Pritchard.

Early in 1966, on the re-organization of the Department, Mr. Young became Assistant Director of the Conservation and Protection Service.

Coho Salmon



COHO SALMON *(Oncorhynchus kisutch)*

THE COHO SALMON, whose scientific name is *Oncorhynchus kisutch*, is abundant in British Columbia. and is produced in numerous small coastal streams and in tributaries of the larger rivers. It supports an important and valuable commercial fishery, and is also eagerly sought by sport fishermen. Because of its coloring, it is commonly known as the "blueback" in British Columbia, when it is late in its first year of ocean life and weighs from four to eight pounds. In parts of the United States coho salmon are known as "silvers". In North America this species occurs from Monterey Bay, California, to northwestern Alaska, and it is also fairly abundant in northeast Asia.

DESCRIPTION

The coho salmon has the typical body shape and fins of all the Pacific salmon. Irregular black spots are usually apparent over most of the back of the coho, and on the upper lobe of the caudal fin. The young have strongly developed parr marks that extend almost completely across the side of the body. The adult coho salmon can generally be distinguished from the adult chinook by the absence of black pigment along the bases of the lower teeth. In the coho salmon the lower gums are usually pale, whereas in the chinook salmon they are usually dark or even quite black. The appearance of the adipose fin in the young of the chinook and coho salmon is a very useful means of telling them apart - in the coho salmon this fin is almost always completely mottled, giving it an overall dark-grey appearance, whereas in the chinook salmon the mottling is not complete and the fin has a clear forward area.

The average weight of commercially caught coho salmon is about eight pounds, but fish up to 31 pounds have been taken. Coho "grilse" are the small, immature fish of both sexes which are frequently caught by ocean sport fishermen. These fish weight up to 3 pounds.

The food of the coho salmon is quite varied. It is a very active predator, even as a juvenile in fresh water. In the sea, herring, sandlance and other small fishes make up its principal diet, but squid and crustaceans are also important.

MIGRATION AND REPRODUCTION

Most coho salmon in British Columbia spend a year in fresh water before they migrate to sea, and most mature and return to the rivers to spawn after a further year and some months in the ocean. Their growth in the ocean is very rapid, comparable to that of pink salmon which spend a similar time at sea before they mature. Further north on this continent proportionately more coho salmon mature in their fourth year of life, having spent two years rather than one in fresh water before going to sea, and a similar situation occurs among Russian coho.

The principal commercial fisheries for coho salmon occur at the time and places where they intercept the returning spawning runs, but important catches of still immature fish are also made in inside waters such as Georgia Strait. Appreciable catches in our British Columbia fisheries are made from July to September, with the peaks usually occurring around mid-August.

The tagging of coho salmon has shown that fish from many, and often widely separated, rivers intermingle at sea during the course of their feeding migrations. Washington, British Columbia and southeast Alaska coho have been taken at widely scattered points in the Gulf of Alaska, but as yet none of these areas has been identified westward of the Gulf.

Much of the life history of the coho salmon is similar to that of the other species of Pacific salmon.

METHODS OF CATCHING

Trolling is the principal means of taking coho salmon in British Columbia, but gill-netting and purse-seining are also important, both when fishing specifically for this species, and when fishing primarily for sockeye, pinks or chums. In the sea the feeding coho are frequently taken by sportsmen casting a "buck-tail" fly, although the more common method is by trolling with rod and line, with lures similar to, but usually smaller, than those used by commercial fishermen.

In recent years the great bulk of our coho salmon catch has been sold as canned and fresh frozen (mainly dressed), and a small proportion as mild-cured fish. These products are choice items in many world markets, but particularly in the United States and Canada. (Prepared by the Nanaimo Biological Station of the Fisheries Research Board of Canada).

Fishery Figures For November

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May - November 1965		May - November 1966	
	'000 lbs	$'000	'000 lbs	$'000
CANADA - TOTAL	1,650,113	112,429	1,847,993	124,479
ATLANTIC COAST - Total	1,356,306	72,488	1,480,798	71,293
Cod	468,082	19,222	444,523	19,251
Haddock	54,281	3,539	63,070	4,450
Pollock, Hake, Cusk, etc.	59,523	1,983	51,822	1,847
Rosefish	101,380	2,683	153,425	4,292
Catfish	3,729	122	3,789	126
Halibut	3,010	949	2,791	969
Plaice & Other Flatfish	175,373	5,525	204,961	6,659
Herring & Sardines	355,264	3,648	436,087	4,951
Mackerel	24,767	814	25,483	889
Alewives	12,084	202	8,068	141
Salmon	4,606	2,213	5,123	2,664
Smelts	1,261	93	1,518	127
Swordfish	7,394	3,030	6,269	2,667
Other Fish	14,229	563	13,439	455
Lobsters	31,991	19,032	28,469	15,619
Clams & Quahaugs	3,310	193	4,007	230
Scallops	14,364	7,864	12,752	5,131
Other Shellfish	21,658	813	15,202	825
PACIFIC COAST - Total	293,807	39,941	367,195	53,186
Pacific Cods	17,884	1,336	18,707	1,689
Halibut (1)	31,343	10,615	30,829	11,046
Soles & Other Flatfish	5,089	325	8,563	541
Herring	138,790	1,821	137,456	2,281
Salmon	85,711	24,762	152,557	36,242
Other Fish	6,374	214	9,587	417
Shellfish	8,616	868	9,496	970
BY PROVINCES				
British Columbia	293,807	39,941	367,195	53,186
Nova Scotia	444,469	30,998	521,092	29,011
New Brunswick	256,380	9,288	280,970	9,577
Prince Edward Island	43,677	6,704	55,200	5,858
Quebec	134,058	6,030	123,426	6,189
Newfoundland	477,722	19,468	500,110	20,658

(1) - Includes halibut landed in U.S. ports by Canadian fishermen.

MID-MONTH WHOLESALE PRICES - November 1966

		Montreal $	Toronto $
Cod fillets, Atl, fresh, unwrapped	lb.	.386	.453
Cod fillets, Atl, frozen, cello 5's	lb.	.365	.397
Cod fillets, smoked	lb.	.422	.473
Haddock fillets, fresh, unwrapped	lb.	.468	.580
Herring, kippered, Atl.	lb.	.258	.307
Mackerel, frozen, round	lb.	.198	.243
Lobsters, canned, Fancy	Case 48-1/2s	60.493	61.367
Sardines, canned	Case 100-1/4s	9.693	9.567
Halibut, frozen, dressed	lb.	.570	.620
Silverbright, frozen, dressed	lb.	.620	.650
Coho, frozen, dressed	lb.	.764	.803
Sockeye, canned, grade A	Case 48-1/2s	27.427	28.640
Pink, canned, grade A	Case 48-1/2s	16.497	17.067
Whitefish, fresh	lb.	.483(1)	.417
Lake trout, frozen	lb.	.446	.530

(1) - Dressed

PRICES PER CWT. PAID TO FISHERMEN (WEEK ENDING NOVEMBER 19th)

	$ 1965	$ 1966
Halifax		
Cod Steak	4.75	5.25
Cod Market	4.5	5
Haddock	7.5	8.5
Plaice	4	5
Yarmouth		
Haddock	-	-
Black's Harbour		
Sardines	-	-
St. John's Nfld.		
Cod	4	-
Haddock	-	-
Rosefish	2.5	-
Vancouver		
Ling Cod	12-15	12-16
Gray Cod	5-7	7.5
Soles	7-9	6-9.5
Salmon (Rdspg)	-	-

Fishery Figures For November

FROZEN FISH STOCKS AS AT END OF OCTOBER

	1965	1966
	'000 lbs	'000 lbs
TOTAL - Frozen Fish, Canada	90,239	114,197
Frozen - Fresh, Sea Fish - Total	61,233	84,461
Cod, Atlantic, Fillets & Blocks	7,662	21,920
Haddock, fillets & blocks	2,338	4,551
Rosefish, fillets & blocks	5,476	8,245
Flatfish, (excl. halibut), fillets & blocks	6,836	6,255
Halibut, Pacific, dressed & steaks	8,792	9,510
Other Groundfish, dressed & steaks	1,507	2,609
Other Groundfish, fillets & blocks	5,732	9,177
Salmon, Pacific, dressed & steaks	10,693	10,544
Herring, Atlantic & Pacific	512	319
All Other Sea Fish, all forms	6,775	7,706
Shellfish	4,910	3,625
Frozen - Fresh, Inland Fish - Total	8,715	8,982
Perch, round or dressed	456	480
Pickerel, (Yellow & Blue) fillets	404	937
Sauger, round or dressed	528	(1)
Tullibee, round or dressed	159	259
Whitefish, round or dressed	2,387	2,197
Whitefish, fillets	439	381
Other, all forms	4,342	4,728
Frozen - Smoked Fish - Total	1,672	1,599
Cod Atlantic	604	895
Sea Herring, kippers	733	442
Other, all forms	335	262
Frozen for Bait and Animal Feed	18,619	19,155

(1) Confidential, included with "Other"

SALTED FISH STOCKS AS AT END OF NOV.

		1965	1966
Salted and Pickled Fish, Atlantic Coast			
Wet-salted - Total		26,692	23,178
Cod		23,271	20,221
Other		3,421	2,957
Dried - salted - Total		18,502	17,774
Cod		17,340	16,665
Other		1,162	1,109
Boneless - Total		982	626
Cod		883	549
Other		99	77
Pickled - Total	(barrels)	19,782	16,967
Herring	"	10,293	6,645
Mackerel	"	5,082	5,529
Alewives	"	4,407	4,793
Turbot	"	-	-
Bloaters	(18 lb. boxes)	175,911	127,210
Boneless Herring	(10 lb. boxes)	3,434	4,717

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS, MAY - AUGUST

(Value in Thousands of Dollars)

		1965		1966
Total Exports		78,636		78,542
By Markets:				
United States		62,597		61,001
Caribbean Area		6,368		6,185
Europe		7,878		9,719
Other Countries		1,793		1,637
By Forms:				
Fresh and Frozen		60,559		59,772
Whole or Dressed	16,669		18,258	
Salmon, Pacific	3,968		6,028	
Halibut, Pacific	3,348		2,963	
Cod, Haddock, Pollock, etc.	163		169	
Swordfish	2,140		2,050	
Other Seafish	2,426		2,907	
Whitefish	1,686		1,466	
Pickerel	1,238		992	
Other Freshwater Fish, n.o.p.	1,700		1,683	
Fillets	25,554		25,888	
Cod, Atlantic	10,958		8,038	
Haddock	2,114		2,516	
Rosefish, Hake, Pollock, etc.	1,674		3,431	
Flatfish	3,603		5,500	
Pickerel	828		1,107	
Other	6,377		5,296	
Shellfish	18,336		15,626	
Lobster (Alive & Meat)	14,084		12,132	
Other	4,252		3,494	
Cured		6,971		6,916
Smoked	765		794	
Herring	519		554	
Other	246		240	
Salted, Wet & Dried	5,281		5,442	
Cod	4,440		4,562	
Other	841		880	
Pickled	925		680	
Herring	638		497	
Mackerel	170		69	
Other	117		114	
Canned		5,352		5,346
Salmon	2,077		1,725	
Sardines	1,431		1,630	
Lobsters	1,349		1,371	
Other	495		620	
Miscellaneous		5,754		6,508
Meal	3,478		4,001	
Oil	355		143	
Other	1,921		2,364	

The Pacific Blackcod

(Prepared by the Nanaimo Biological Station of the
Fisheries Research Board of Canada.)

THE blackcod(*Anoplopoma fimbria*)like several other species of Pacific coast fish is misnamed in that it is not a true cod. Active fisheries for this species occur from California to Alaska. The total annual production for the Pacific coast has been maintained at a level of 14 to 18 million pounds in recent years, with Alaska taking between 40 and 50 percent. The Canadian catch, which has averaged over two million pounds per year, has had an average landed value of over a quarter of a million dollars. Over 60 percent of this catch comes from the waters off the Queen Charlotte Islands and off the coast of Alaska during the summer months.

BLACKCOD *(Anoplopoma fimbria)*

DESCRIPTION

The blackcod or sablefish is a member of the skilfish family. It is distinguished by its green to bluish black colour, two widely separated dorsal fins, a slender caudal peduncle and a smooth, streamlined body.

HABITS

The adults of this species inhabit much greater depths than most other groundfish species, being commonly taken in waters of 70 to 250 fathoms. Spawning takes place in the late winter months and is believed to occur in deep water off the west coast of Vancouver Island and off the Queen Charlotte Islands. The eggs are pelagic. Very young stages have been captured near the surface several hundred miles off the continental shelf. Large schools of immature fish between one and two feet in length are frequently seen in the surface waters close to land in the straits and inlets. On the fishing banks the smaller fish are encountered at shallower depths than the larger fish.

The food of the blackcod consists mainly of herring, sand lance and crustaceans.

Almost all of the Canadian catch of blackcod is landed by longline vessels. The main landings usually occur after the halibut season has closed. Since otter-trawlers usually do not fish as deep as the longliners they seldom encounter fish which are much over the legal size.

HANDLING

The major part of the catch is put through the smoking process, the finished product often appearing on the market as "smoked Alaska cod". Small quantities are dry-salted. Because of the high oil content in the flesh, blackcod is seldom marketed fresh.

The liver oil, like that of the lingcod, halibut and dogfish, is high in vitamins A and D. The heavy demand for this product during the war years contributed greatly to the expansion of the fishery.

AGE AND GROWTH

From a study of the rings on the scales of the blackcod it has been found that commercial size is reached at an age of approximately five years and maturity is reached at about six to eight years. At that age the fish are about 28 inches in length. Very old fish may reach a length of three and a half feet and a weight of forty pounds.

If undelivered return to:
Department of Fisheries of Canada
OTTAWA

CANADA
POSTAGE PAID
PORT PAYÉ

OUR DESIGNERS ARE BUSY ON TIME, LABOUR AND COST-SAVING DEVELOPMENTS FOR THE FISHING INDUSTRY.

Throughout the year, the Industrial Development Service of the Department of Fisheries undertakes many projects in an effort to improve and modernize the catching and processing of fish. During the past year, for example, the Department has played an important role in developing the Atlantic herring fishery, the Pacific offshore groundfish fishery, designs of fishing vessels, more efficient catching gear, and a Canadian tuna industry. Currently the Department is investigating such things as the underwater exploration of marine resources by divers, electrical devices for catching fish, automation and mechanization on board fishing vessels and in fish processing plants. In almost every instance the Federal Department co-operates closely with the Provincial fishery departments and the fishing industry in a continuing effort to improve the working conditions and financial returns to the fisherman.

DEPARTMENT OF FISHERIES
Hon. H. J. Robichaud, M.P., Minister — Dr. A. W. H. Needler, Deputy Minister

Ottawa, Canada

ROGER DUHAMEL, F.R.S.C., Queen's Printer and Controller of Stationery, Ottawa, 1967

FISHERIES

(formerly Trade News) OF CANADA

Vol. 19 No. 9 March, 1967

In This Issue

Department of Fisheries of Canada, Ottawa

FISHERIES OF CANADA

(formerly Trade News)

Editor

E. H. HEARNDEN

Vol. 19 No. 9 March, 1967

CONTENTS

FEATURES

COVER PHOTOGRAPH - Students at the College of Fisheries, Navigation, Marine Engineering and Electronics at St. John's, Nfld. watch intently as an instructor demonstrates with a model fishing net.

Newfoundland's College of Fisheries Reviews Two Years of Vigorous Growth

THE COLLEGE of Fisheries, Navigation, Marine Engineering and Electronics in St. John's, Nfld., has entered its third year of training young Newfoundlanders for the fishing and marine industries.

It is still a young academic institution by some standards, but it is a strong, growing and determined seat of learning with an exciting, promising adulthood. Some of the milestones of growth in 1966:

- Many new courses were started.

- The college now proudly flies its flag from its own two training ships.

- A record number of students are attending from every point of the compass in Newfoundland and Labrador.

- And the "twain" has met at the college with students in attendance from the eastern and western hemispheres.

At the end of the fall semester in December, 1966, the total overall registration at the college was about 800, up considerably from the same period the previous year. Current registration includes about 550 in day classes and 250 in the evening classes and extension service.

Among the students are tomorrow's skippers and mates of the streamlined and efficient sea-going fishing vessels; the marine engineers who will operate engine rooms grown highly sophisticated in a world of advancing technology. Here, in the college's student body, are tomorrow's naval architects and shipbuilders; the marine electronics experts and the professionals who will operate fish plants and do other specialized work in the seafoods industry.

President of the college is Dr. William F. Hampton, a renowned fishery scientist. He said that while the college acknowledges the gratifying growth and development over the past three years,

Main building of the College of Fisheries, Navigation, Marine Engineering and Electronics at St. John's, Nfld.

it realizes that there is still much to be accomplished. The institution, he said, will continue in serious determination to gear itself to meet the challenges of the future.

VOCATIONAL COURSES

There are now more than 35 vocational courses offered by the college as well as career courses in five distinctive fields: Electrical Engineering Technology, (electronics in industry); Food Technology (marine products and by-products; Mechanical Engineering Technology (marine products and by-products); Mechanical Engineering Technology (marine engineers and fish plant engineers); Naval Architecture and Shipbuilding (careers in the design and construction of all types of marine craft); Nautical Science (potential captains and mates and fishing gear technologists).

These career courses which lead to a diploma in technology range from two to three and a half years and, in the case of some departments, sea-time is included.

The college maintains a Department of Basic Training to upgrade students, where necessary, to educational levels required by diploma courses.

Vocational courses range from three months to $11\frac{1}{2}$ months. Among the new vocational courses added in 1966 are: basic electrotechnology, fish plant processing operations, freezing and cold storage operations, by-product production, quality control of marine products, refrigeration mechanics, emergency duty at sea.

A course for women in net braiding was started in conjunction with the Great Grimsby Coal, Salt and Tanning Company, the English parent company of Grimsby Colonial in St. John's. After training at the college, the women work at the company's plant making gear for the local fishing fleet.

TRAINING SHIPS

The college now operates its own training ships. The 120-foot, 200-ton longliner, *Beinir*, was acquired early in 1966 from the Newfoundland Fisheries Development Authority. The 83-foot, 97-ton dragger, *Zilek* was earlier presented to the College by Fishery Products Ltd.

The vessels are being used to give students practical experience at sea in such fields as navigation, marine engineering, electronics and general fishery work. The vessels are equipped with Decca radar, Loran, echo sounders, water thermometer, electronic fish detection device and other modern equipment.

The *Beinir* and *Zilek* are also used in connection with the college's Extension Service - the "travelling schools."

This unique and popular service offers training to fishermen in their own home communities.

Since their start in 1954 by the provincial government, these itinerant schools have trained over 4,000 fishermen, working an average of 30 communities each fall and winter.

This season, however, the Extension Service will visit about 62 coastal villages and about 1,000 fishermen-students will receive the benefit of training by the college's team of skilled instructors. Fishermen are taught navigation and pilotage, maintenance and repair of marine engines, fish processing, gear and equipment.

INTERNATIONAL REPUTATION

Students from scores of Newfoundland and Labrador communities are now registered at the college in vocational and technical courses. But in addition, the growing international reputation of the college has brought enquiries and students to the institution from around the globe.

Among those currently studying at the college are three Egyptians who will put their knowledge gained here to work at a new fisheries school in Alexandria. They are at the College of Fisheries under the auspices of the Ford Foundation.

Two young men from the Maldive Islands, off the coast of India, will continue their studies this year in the Department of Nautical Science. Upon completion of their diploma course they will return home to apply new techniques and ideas to their islands' fishing fleet. These Maldivians and other foreign students are attending the college under the Colombo Plan, one of several arrangements in which the federal government, through the External Aid Office, offers economic, technical and educational assistance to developing countries. Other Colombo Plan students at the college come from Ghana, Pakistan, Singapore and Malaysia. In addition there are students from Japan and England.

MANPOWER TRAINING PROGRAM

The College of Fisheries is a focal point of a massive and emergency manpower training program.

The provincial government assigned the college the job of training large numbers of men to meet

This article was written by Mr. Don Morris, Industrial Relations Officer with the College of Fisheries, Navigation, Marine Engineering and Electronics. Photos by the National Film Board.

Laboratory work in food technology

Instruction in the catering department

Instructor in naval architecture and shipbuilding uses ship model during marine drafting class.

Theory of engines being taught in the mechanical engineering technology department.

A Colombo Plan student from the Maldive Islands gets a lesson in net making.

the needs of a fisheries development program which the federal government is initiating in association with the province's fishing industry. A special Committee on Manpower Development has produced a report recommending the training of some 7,000 people over the next five years at a cost of $8 million to be shared jointly by the federal and provincial governments.

Information supplied by the committee indicates that the fleet of Newfoundland trawlers should reach 140 new ships within the next decade. The older fleet now numbers about 40 vessels. Besides the growth of the fleet, there will also be a tremendous increase in shore installations to process the catch. In addition, new shipbuilding facilities are being established in the province.

The training of men under this crash program has started at the college and each department is involved.

The College of Fisheries, officially opened by Premier J. R. Smallwood Jan. 14, 1964, was founded to be a composite of formal education and technical training in all aspects of fisheries, navigation, marine engineering and electronics. Capital and operating costs of the college are shared jointly by the Government of Newfoundland and Labrador and the Government of Canada through the Federal Technical and Vocational Training Assistance Act.

The business of the college, stresses President Hampton, is manpower development - technical and vocational education in the marine, fisheries and seafoods industries. He said there are many needs in these industries which have resulted from technological changes.

To meet the challenge of these developing industries, said Dr. Hampton, the objectives of the college are: to upgrade and retrain people in industry, prepare new people for jobs and careers in the industry, train our manpower to its maximum potential and create a new image for the industry that will be in accord with a new era ✔

Students visit a fishing vessel in St. John's harbor to inspect fishing gear.

Trade Views Thawing Demonstration

Thawed flounder being conveyed up the discharge ramp of the water thawer located at the Catalina plant of Fishery Products Limited.

A TEAM effort on the part of the fishing industry, Fisheries Research Board of Canada and the Industrial Development Service of the federal Department of Fisheries culminated in a successful demonstration-discussion on water and dielectric thawing at the Catalina, Nfld., plant of Fishery Products Ltd. recently.

The guests, who included trade representatives from widely-separated points in the Atlantic provinces, were shown the dielectric thawer which was placed in operation at the plant during the past summer. The dielectric thawer was observed in operation as a pre-thawer for the water thawer, while in a second demonstration the water thawer was used alone.

The demonstration showed that there are no technical difficulties in completely thawing 100-lb blocks of fish in water. By regulating the speed of the belt in the 60-foot long thawer it is possible to have the fish separate without hand labour during transfer to the holding area or tanks (after partial thawing) or to the filleting line (after complete thawing).

For fish ready for filleting the production of the water thawer is 2000 lb/hr and for fish partly thawed 3600 lb/hr. In the latter case the fish, upon discharge from the thawer, carry sufficient heat to complete the thaw under ice in a shed at above freezing temperature.

Both partially and completely thawed flounder, prepared in the water thawer, were examined. The partially thawed fish, iced overnight, are suitable for filleting next day while the fish thawed upon leaving the water, are ready for immediate filleting. The trade representatives commented favourably on the appearance and texture of the thawed material and discussed possible applications in various segments of the East Coast fishery.

W. A. MacCallum, Chief of the Newfoundland Technological Unit of the Fisheries Research Board, led a discussion on the possibilities of utilizing thawed fish and on the equipment and handling associated with a successful operation. A resume was presented of a cost study dealing with frozen-at-sea fish.

A professional analyst employed by the Board has shown that for a mean catching rate of 35,000 lb/day and 3 days total steaming time and 2 days port time it may be slightly more profitable to freeze part of the catch at sea (and to thaw it ashore) than it is to land all the fish in ice.

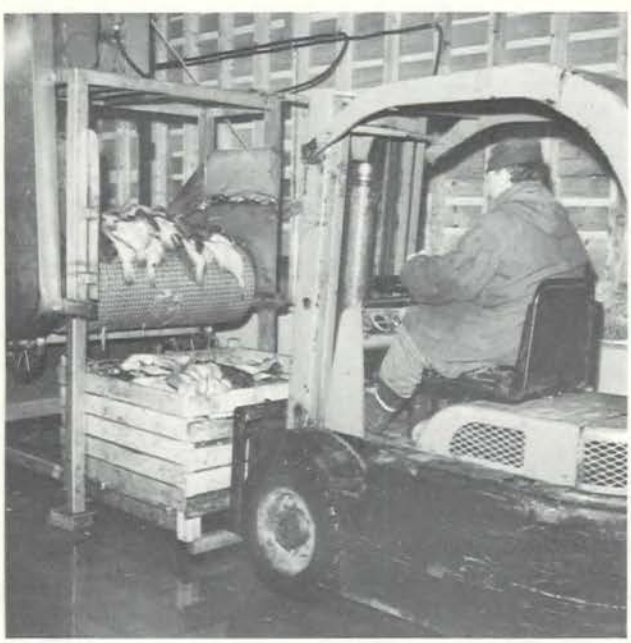
The preference for freezing part of the catch increases with the value of fish per pound, with lower rates of catching and with an increase in steaming time. The balance tips even more strongly in favour of freezing part of the catch when water thawing, rather than the relatively more expensive tandem dielectric-water method, is employed.

The difference in the appearance of thawed and iced landings was discussed in some detail. The thawed material carries no spoilage odours. Tastings of refrozen fish conducted during a continuing program at the St. John's (an on-the-job laboratory has been operated at Catalina as well) and Halifax Laboratories of the Fisheries Research Board over a period of several years had demonstrated that the freeze-thaw-refreeze process has no marked effect on cold storage changes normally detected in fillets processed from iced landings.

Some lots of thawed cod do not have the 'bloom' of fresh iced cod, while other thawed cod have excellent bloom. The bloom on thawed flounder and redfish is excellent. The latter have much better pigmentation and, on the whole, better appearance than iced landings. On filleting, the skin side of cod and flounder fillets can be darker than that of iced fish but the difference in colour is not always noted.

There is probably no significant difference in colour of single and double-frozen fillets in cold storage. Taste panels demonstrated no difference in the flavour of dark and light coloured flounder. The latter were all on a par with better quality iced fish.

The characteristics required of a thawer for handling Newfoundland produced blocks of unfilleted fish were listed as flexibility (ability, as required, to provide various degrees of thawing up to and including complete thawing); simplicity; low initial and operating costs (commensurate with the use of materials and design to permit ease in clean-up -- the Catalina thawer is constructed in stainless steel); high production in relation to the floor space occupied; and ability to deliver fish, ready for filleting, in the shortest possible time after the blocks enter the thawer.



Block frozen flounder, thawed in the water thawer and collected at the discharge end of the conveyor belt, being removed by forklift for processing.

Fisheries Research Board of Canada personnel, from left, W.A. MacCallum, George J. Biggs, and M.S. McDonald, at work in the on-the-job laboratory at Catalina.

The water thawer had been found to be clearly superior to the dielectric machine on all these points. The comparison did not favour the water thawer on the last point because of any particular virtue in the water method (block-frozen cod and flounder are partially thawed in water in $2\frac{1}{2}$ hours and completely thawed in $4\frac{1}{2}$-4 3/4 hours) but because the blocks, while immersed in water in trays carried through the dielectric thawer, could not be completely thawed without overheating.

The dielectric and water thawers, used in tandem, proved to have the flexibility of the water thawer alone and were found to complete the thaw in about 95 minutes.

This provides a distinct advantage over the simple water thawing process. But against this one advantage of the combination method one might list the following major disadvantages: the water and space requirements of the tandem dielectric thawer are over twice those for the water thawer alone and the capital cost of the thawers used in tandem is about three times that of the water thawer while the ratio of fully thawed fish from these units is not greater than 3:2; the labour costs (per pound of fish thawed) associated with tandem thawing are much higher than those for water thawing. ✔

Conduct Manpower Survey of Deepsea Fishery

The federal Department of Fisheries is undertaking a manpower survey of the deepsea fishery off Canada's Atlantic coast. Conducted by the department's Economic Services, the purpose of the study is to obtain essential information about offshore fishermen, their training for their occupation, and to determine the general attitude of fishermen toward their livelihood. The survey also covers the manpower situation of vessel owners and fish processing companies. The study focuses on Canadian vessels of 100 gross tons and over fishing in Atlantic waters.

This confidential survey -- it may be described as an economic and sociological study -- is aimed to help the industry. Many questions have been directed to the department from industry, the Federal-Provincial Atlantic Fisheries Committee and other agencies, concerning offshore fishermen and the offshore fleet. To provide the answers, a major survey was necessary.

The study will find out about the categories of labor employed on the offshore boats and shore plants, their skills and how they were acquired, the future requirements for numbers of fishermen and plant workers, and the training they will need. The purpose of the survey is to provide adequate information to project requirements through to 1975.

The survey is being conducted by means of two questionnaires. One is for vessel (or plant) owners and operators, and the other is for individual fishermen.

Questions vary with the two questionnaires. For instance, fishermen aboard the boats are asked a series of questions dealing with work and life at sea, their preferences with respect to types of boats or jobs, their years of experience, the skills they have acquired through training or experience, their earnings, educational background, and other information pertinent to their life afloat and ashore.

Vessel and plant operators will be asked questions of a more technical nature dealing with requirements both at sea and ashore. For example, one section of the questionnaire deals specifically with incentive measures to encourage recruitment and to hold good crews. They also have the opportunity to comment on the offshore fisheries generally and problems relating to it.

The Department of Fisheries emphasizes that the survey is being conducted solely to assess properly the needs of the offshore fishing industry. In the interest of those engaged in the industry it is necessary for the department to know the manpower and training requirements for the present and for the future. The data will be processed under the same confidential procedures that have been applied by the Economic Services in past fisheries studies.

Small Bluefin Tuna Cross Atlantic

The recovery, in the Bay of Biscay, of a fish tagged in the western Atlantic provides new evidence of transatlantic migration by small bluefin tuna.

A bluefin tuna tagged and released from the purse seiner *Blue Waters* July 22, 1965, 46 miles E. S. E. of Atlantic City, N. J. was recaptured by the tuna vessel *Ederra* from St. Jean de Luz, France, in the Bay of Biscay, August 3, 1966.

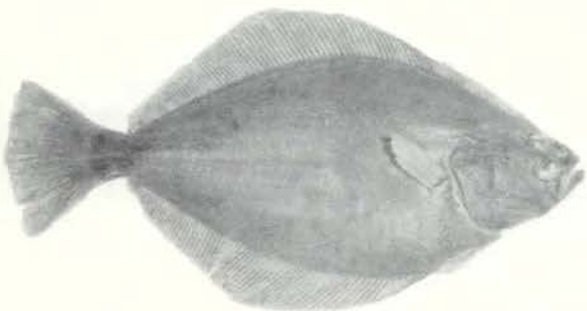
The fish was one of 11 marked with dart and spaghetti tags by J. Mercer for the Fisheries Research Board's Biological Station at St. Andrews, N. B., as part of a study of tuna movement and growth. At release, the fish was about 30 inches in fork length and weighed approximately 18-24 lb. At recapture, the weight was reported as approximately 29 lb. It had travelled a minimum of 3, 100 miles in a maximum of 377 days.

Prior to 1966, the transatlantic migrations of seven bluefin had been reported. Five of these were giants of over 350 lb and were recaptured in the North Sea off Norway, two after more than two years and three of them within four months of release. The other two were under 20 lb at release, and were recovered in the Bay of Biscay after five years. Recaptures of four additional tuna with release and recovery data very similar to those for the *Blue Waters* specimen have been reported. These fish were tagged by the Woods Hole Oceanographic Institution.

Recaptures of small bluefin only 12 months after release indicate that the previous recoveries in the Bay of Biscay may have crossed the Atlantic in the first year after tagging and that such migration by small fish may not be unusual. --J. C. Beckett, Fisheries Research Board of Canada.

Soles and Flounders of the Pacific

THERE ARE nineteen species of flatfish, exclusive of halibut, which inhabit the waters of the British Columbia coast. Most of them are popularly termed "soles", although they belong not to the sole family but to the flounder and dab families. Four of the nineteen species have risen to moderate importance in the economy of British Columbia fisheries in the past two decades. Three of these, brill, lemon sole and rock sole, are in demand for the fresh and frozen fillet trade. The fourth, the turbot or arrowtooth flounder, is an important component of landings for animal food (mink food).



Brill or Petrale sole (Eopsetta jordani)

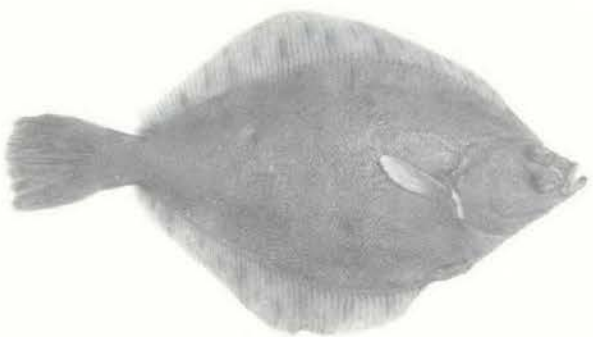
The brill or Petrale sole *(Eopsetta jordani)* inhabits the open coastal waters and has been fished for extensively off the west coast of Vancouver Island, in Queen Charlotte Sound and in lower Hecate Strait. During the late 1940's the brill was the most important flatfish species landed in British Columbia and average annual production for 1946-49 was just over 3.3 million pounds. Subsequently, abundance declined largely as a result of environmental conditions. During the years 1960-65 annual production averaged one million pounds. Ages up to 25 years and lengths up to 25 inches have been recorded but the average age is about six or seven years and the average length about 16 inches. The brill spends the summer on shallow coastal banks and moves into deep water for spawning during the winter months. A major spawning ground is located in 180-200 fathoms off Esteban Point on the west coast of Vancouver Island. It is believed that the eggs are free floating and that they are carried by currents to the inshore banks where they settle to the bottom and complete their growth to the adult form. The brill (like the turbot) has a large, strongly-toothed mouth and feeds voraciously on herring and red feed.

Lemon or English sole (Parophrys vetulus)

The lemon sole *(Parophrys vetulus)* gains its name more from its delicate lemon flavour than from any resemblance to the true lemon sole of Europe. It is sometimes referred to as the English sole and is distinguished by its slender shape and pointed head. It is most abundant in Hecate Strait, Queen Charlotte Sound and the Strait of Georgia on grounds where the bottom is composed of soft sand or mud. The average annual catch by Canadian boats during the period 1960-65 was just over 1.6 million pounds. Fish of commercial size average 14 inches in length and five or six years of age. The male grows much more slowly than the female. While the female may reach lengths over 22 inches the male seldom exceeds 16 inches. Spawning occurs during the winter months at depths between 30 and 40 fathoms. Females of average size produce about 1,000,000 eggs while very large fish will produce in excess of 2,000,000 eggs. The eggs when spawned are free-floating and are carried by currents into shallow water along sandy beaches, where within a month or two the young transform into side-swimming, bottom dwelling creatures like their parents. The lemon sole feeds almost exclusively on clams, worms and brittle stars.

The rock sole *(Lepidopsetta bilineata)* is one of the most abundant flatfish in shallow water on the British Columbia coast. It has a rough scaly

skin and inhabits hard sandy bottoms in shallow depths down to 25 or 30 fathoms. The average annual Canadian catch during the years 1960-65 was just over 3 million pounds and the main fisheries took place in Hecate Strait and Queen Charlotte Sound. Sizes and ages are very much the same as in the lemon sole, the average length being about 14 inches and the average age being about five or six years. Main spawning grounds have not been located but the adults are believed to spawn in the late winter or early spring months. The egg of the rock sole is apparently heavier than sea water and for a short while at least adheres to the bottom. Young rock sole (less than 12 inches in length) favour a diet composed mainly of sea worms while adults feed chiefly on sand lance.



Rock sole (Lepidopsetta bilineata)

The turbot or arrowtooth flounder *(Atheresthes stomias)* is the largest of the four main species.

Turbot or Arrowtooth flounder (Atheresthes stomias)

Like the brill it is a large-mouthed fish eater once it has grown past the juvenile stage. Individuals as large as 32 inches in length have been captured but average length in catches is considerably less and varies depending on area of capture. Nothing is known of the spawning habits but it does inhabit water deeper than the rock or lemon sole. This species is commonly encountered by trawl fishermen but appears most abundant on grounds off the lower west coast and the northern tip of Vancouver Island. The turbot is found in greatest abundance in water deeper than 50 fathoms. Annual landings which are used exclusively for animal food have reached 7 million pounds and in the period 1960-64 averaged 2.9 million pounds.

All four species are common along the British Columbia coast and range from California to Alaska.

Canadian and United States fishermen take these species with otter trawl nets at depths of 15 to 200 fathoms on sandy to muddy bottoms. (Prepared by the Nanaimo Biological Station of the Fisheries Research Board of Canada).

Discuss Textile Products for Fish Nets

The fourth meeting of the Sub-committee on "Textile Products for Fishing Nets" of the International Standards Organization was held in Paris, France. Attending were 33 delegates from Belgium, Canada, Denmark, France, Germany, the Netherlands, Norway, Spain, and the United Kingdom. Canada was represented by P. J. G. Carrothers, P. Eng., Fisheries Research Board of Canada, St. Andrews, N. B.

Basic terms relative to knotted netting were defined, and characteristics required for a comprehensive designation of netting for fishing purposes were agreed upon in principle. A draft standard for designating the hanging of netting to lines was also agreed upon and was referred to the Secretariat for editorial revision and submission for official recognition.

A basic document on the shaping of pieces of netting by taper cuts was referred to the Secretariat members before final submission. Also, the outline for a new document on the determination of taper ratio and cutting rate was developed.

A standing working group was established to consider methods of test for fishing twines and netting. Initially attention is to be given to tests for knot strength, extension of twine at knot break, mesh size, mesh strength, and change in mesh length due to repeated wetting. Later, tests for stiffness, stretch under load, and recovery are to be considered.

The Netherlands undertook to draft a method for drawing nets so that specifications for fishing structures can be understood without ambiguity.

News Roundup

Lobster Trap Limit

Requests from a large majority of lobster fishermen on the north shore of Prince Edward Island have led to a lobster trap limit of 500 per boat for this year in a portion of District 7B. This covers the area between East Point and North Cape on Prince Edward Island. It will be effective for the season from May 1 to June 30 of this year.

The high limit is set in view of the short notice being given and must be regarded as a first step towards a trap limit in subsequent years which will probably be established at a lower level on the basis of further experience. This is an area where fishermen use an unusually large number of small traps.

In announcing the limit for this part of District 7B, Fisheries Minister H. J. Robichaud said fishermen in many areas in the Maritimes had asked for the imposition of trap limits. A limit was set in District 8 in 1966 as an experimental measure for protection of lobster stocks and to ensure better economic returns to fishermen. The results are now being analyzed and will determine future policy. Mr. Robichaud added that the Department was also planning to make surveys in 1967 of lobster fishing areas throughout the Maritime Provinces as a basis for possible further trap limitation and possible other control measures in 1968.

The Minister also announced a further interim measure on the shore of Prince Edward Island. Operators' licences in this part of District 7B will be issued in 1967 only to those who held such licences in 1966 in that district, except where there are extenuating circumstances which will be examined in co-operation with representatives of fishermen. Some other method of limiting participation in the lobster fishery may be introduced in the future.

It is also planned this year to register all fishing boats in the Maritime Provinces. The Minister feels that further measures may have to be introduced in the future to protect this valuable industry threatened by too much fishing effort for the resource to support.

New Counting Fence

A new salmon counting fence spanning Babine River, B. C., is to be built this winter by the Fisheries Research Board of Canada. The 270-foot structure, which will cost approximately $130, 000, will replace one that has been in position for 21 years.

The Babine counting fence is 270 miles from the sea and about seven miles downstream of Fort Babine. Counts of spawning salmon are vital to proper management of the commercial fisheries and provide the annual census needed for research projects on the Skeena system. Future counts will have the added importance of contributing to an evaluation of the relatively new salmon spawning channels on Fulton River and Pinkut Creek.

The new counting fence was designed by engineers of the Resource Development Service of the federal Department of Fisheries who will also supervise construction.

Director Named

K. Radway Allen, 56, has been named Director of the Fisheries Research Board of Canada Biological Station, Nanaimo, B.C. He is currently Program Head of Anadromous Fish Investigations at FRB Biological Station, St. Andrews, N. B.

K.R. Allen

A native of London, England, Mr. Allen is a graduate of Cambridge University, from which he obtained an honors degree in zoology in 1933. From 1933 to 1938 he was employed by the Freshwater Biological Association, Ambleside, England, where he undertook research on Atlantic salmon and trout.

In 1938 Mr. Allen accepted a post as biologist with the New Zealand Marine Department. Except for four years' service with the New Zealand Army during the war, he remained with the Marine Department until 1964, being appointed to the senior post of Director of Fisheries Research in 1959.

Mr. Allen joined the Fisheries Research Board of Canada in June 1964 when he was appointed to carry on investigations on population theory and on stock assessment and population dynamics of marine mammals at the Nanaimo Biological Sta-

tion. In November 1965 he transferred to St. Andrews to assume responsibility for anadromous fish studies.

Mr. Allen's world reputation in aquatic science is based on a publication record that emphasizes his versatility. He is a member of several professional societies, and was elected to Fellowship of the Royal Society of New Zealand in 1961.

Dr. W. E. Ricker will continue as Acting Director of the Nanaimo Station until Mr. Allen assumes his new duties about June, 1967.

Retirement

Ian S. McArthur of Ottawa, who retired in February as Director-General of Economics Services with the Federal Department of Fisheries, played an influential role in shaping the policies and programs for the development of Canada's valuable fisheries resources.

The son of a distinguished Canadian writer, Peter McArthur, he was born in New York City. He was raised and received his early education in Glencoe, Ont. attending the Ontario Agricultural College and the University of Saskatchewan, where he received the degree of Bachelor and Master of Science. He was employed for a time following graduation on the staff of the Financial Post, and in 1935 entered the Economics Service of the federal Department of Agriculture in Ottawa. Five years later he transferred to the Dominion Bureau of Statistics as Chief of the Agricultural Statistics Branch.

Ian S. McArthur receives a retiring gift from S.V. Ozere, Assistant Deputy Minister (International and Jurisdictional).

Mr. McArthur joined the Department of Fisheries in 1945 when he commenced the organization of the department's Economic Service. He went on to expand the work of this division into the fields of marketing and production economics.

In 1949, he became Acting Chairman of the Fisheries Prices Support Board, a body which is authorized to implement price support measures in any branch of the fisheries affected by severe price declines. He was appointed Chairman four years later, and continued in that office until 1966. During this period, he was instrumental in initiating a number of measures for providing financial assistance to fishermen. He administered several of these programs, including the Fishermen's Indemnity Plan and the Salt Assistance Program.

Fisheries Minister H. J. Robichaud lauded Mr. McArthur for his "outstanding service", particularly for his work in establishing assistance programs for fishermen and for the "keen sympathy" which he had at all times displayed toward their problems. Deputy Minister A. W. H. Needler described Mr. McArthur as "an invaluable source of advice and assistance".

Appointments

Appointment of two Public Information Officers with the federal Department of Fisheries in the Maritimes and Central Regions was announced recently.

Wilfred J. (Bill) Lever, of Dartmouth, N. S., has been appointed chief of the Information Branch, Maritimes Region, with headquarters at Halifax. A newsman of many years experience, Mr. Lever is a native of Waltham, Mass., but has lived in Nova Scotia since an early age.

After completing his education in Halifax, he joined the Canadian Army in 1940 and served in the United Kingdom, Italy, France, Belgium, Holland and Germany. After the war he joined the staff of the Maritime Broadcasting Company (CHNS) as an announcer and later joined the Canadian Broadcasting Corporation in Halifax as a radio and TV news editor. Subsequently he was associated with the Nova Scotia Information Service.

Mr. Lever replaces G. J. Gillespie who has joined the Department's Information Service at Ottawa.

J. G. K. Barrie has been appointed to a new position as chief of the Information Branch, Central Region, with headquarters at Winnipeg, Man. Educated in Davidson, Saskatchewan and Edmonton,

Alberta, he was formerly employed on the editorial staffs of the North Battleford News and the Edmonton Journal.

Following wartime service as an R. C. A. F. pilot with No. 14 Fighter Squadron, Mr. Barrie joined the public relations staff of B. C. Electric Company. Prior to his appointment with the Department of Fisheries he was employed with a Winnipeg advertising agency.

Marine Supervisor

Captain Earle S. Wagner, 43, of West LaHave, Lunenburg County, has been appointed Marine Supervisor for the Maritimes Region with the federal Department of Fisheries. He succeeds Capt. John A. MacLeod, of Goldboro, Guysborough Co., who retired recently.

Capt. Wagner will be responsible for supervising the operation, maintenance, repair and manning of all Department vessels in the Maritimes Region, as well as advising on many aspects pertaining to these vessels and the construction of future vessels for the Protection Service.

Born in West LaHave, Capt. Wagner completed his education in the Bridgewater area and followed in his father's footsteps by going to sea at an early age. During the early years of the Second World War he joined the Imperial Oil Company's Marine Division as an ordinary seaman and obtained his mate's certificate (home trade) by the age of 19. Following the war he qualified as mate, foreign-going, and received his Master's foreign-going ticket in 1951.

In 1958 Capt. Wagner worked with the Northern Transportation Company, commanding vessels engaged in supplying the DEW sites in the western Arctic. He joined the Department of Transport as Port Warden and Ship's Pilot at Churchill, Man. in 1962.

Prior to joining the Department of Fisheries, Capt. Wagner conducted navigation courses for fishermen throughout Nova Scotia and also served as navigation instructor at the Nova Scotia Marine Navigation School.

The increasing interest in sports fishing in the Northwest Territories and the rising production of commercial fishing in the Northern lakes was a topic for discussion at special meeting at Winnipeg, Jan. 31-Feb. 1, 2. Representatives from the federal Department of Fisheries and the Fisheries Research Board reviewed the present conservation and protection policies, together with research developments affecting this growth in the Northern areas. Attending the meeting were, from left: M.B. Howe, A/District Officer, Hay River, N.W.T.; J.G. Hutchison, Chief, Protection Branch, Ottawa; J.G. Hunter, Chief Biologist, Arctic Biological Station, F.R.B.; D.H. Dowler, Protection Officer, Hay River; K.C. Lucas, Director Resource Development Service, Ottawa; C.R. Levelton, Director, Conservation & Protection Service; J.A. Albert, Chief, Purchasing Branch, Ottawa; Dr. C.J. Kerswill, Director, Arctic Biological Station, F.R.B.; M.E. Bogart, Protection Officer, Lynn Lake, Man.; Dr. Lionel Johnson, Scientific Leader, Fish Population Dynamics Section, Freshwater Institute, F.R.B., Winnipeg; J.H. Hitchcock, Fisheries Superintendent, Industrial Division, Dept. of Indian Affairs & Northern Development, Ottawa; and G.L. Grant, Regional Director, Winnipeg. Absent when the photo was taken was Dr. W.E. Johnson, Director, Freshwater Institute, F.R.B., Winnipeg.

The Lingcod

THE lingcod is one of the larger commercial fish of British Columbia. It is notable for its large mouth, large pectoral fins, smooth body, and long continuous dorsal fin divided by a notch into spiny and soft parts. Young individuals are slender throughout, but larger specimens are moderately robust forward with large heads and fearsome jaws. The colour is very variable, usually darkly mottled, on backgrounds ranging from dark gray to fawn. Fish taken from the same reef are frequently coloured alike with the result that some experienced fishermen claim the ability to tell the origin of fish by their appearance. The sexes can be distinguished externally by the presence in the males of an anal papilla.

LINGCOD *(Ophiodon elongatus)*

Lingcod are found in the coastwise waters of North America from California to Alaska. In British Columbia they occur at a considerable range of depths- from very shallow to more than 70 fathoms. The lingcod has no very close relatives among other fish species. The closest are the so-called greenlings and sculpins, which are familiar but have no commercial value.

Lingcod spawn in the winter from December to February. The eggs are deposited in porous pearly masses stuck to the rocks, usually, in crevices or beneath overhanging boulders. Egg masses may be two feet in length, weigh as much as thirty pounds, and contain more than half a million eggs. A considerable number of egg masses are found in the intertidal zone. Some evidently occur below low tide mark but what proportion, or how deep, is not known. The egg masses are tended by the males, who drive away potential predators.

The eggs hatch in one or two months to produce larvae about half-an-inch long. At this stage they have small yolk sacs on the abdomen with a ten-day supply of food and noticeably blue eyes. The young apparently move around near the surface until they are three or four months old, when they are found near the bottom in shallow water. Many of them gradually work down to take up more or less permanent positions in deep water. In general, the larger lingcod are found on "hard bottom" or rock or gravel.

Lingcod reach large size. The largest specimen recorded is 105-pounds and 50-60 pounders are frequently caught by commercial gear. Maximum length is between 4 and 4-1/2 feet. Males are much smaller than females and it is doubtful that they exceed three feet in length or a weight of 25 pounds. As might be expected from their larger size, female lingcod grow about 1-1/2 times as fast as males. On the average, female lingcod grow about 2-3/4 pounds per year, and males 1-3/4 pounds. The rate of growth is not constant throughout life, so that at eight years of age a male lingcod will weigh about 9-3/4 pounds and a female 14-3/4 pounds. The age of the 60-pound monsters can be only a guess but it seems likely that they are not only old but have grown faster than average too.

The data obtained by tagging nearly 2,000 lingcod in the Strait of Georgia with strap tags on the gills, or celluloid spirals rolled on the upper jaws, have shown that many of them are very sedentary, as they are recaptured years later in the same place as tagged. Others show considerable movement and the evidence of the fishery on the west coast of Vancouver Island is that lingcod appear on fishing grounds as though they were taking part in a mass migration.

Lingcod are caught commercially on several types of gear. These are, in order of importance, trawls, hand lines, trolls, and long lines.

Hand lining or jigging with live bait is carried out from small or medium-sized vessels fitted with live wells in which the water is continually changing. The live wells hold living herring for bait and also keep the catches so that they can be brought into harbour alive and retained in floating, slat boxes for sale as the market requires. Lingcod handled in this

way are regarded as a superior product and usually command better prices than when handled in other ways. The gear is designed to bring the hooks baited with live herring close to the lingcod on the bottom without disturbing the lingcod or damaging the precious bait. On the ends of the main lines are heavy weights (2 to 5 pounds) and spreader bars of heavy wire or light rod. The live herring on hooks are attached to short lines on the ends of the spreader bars which keep them from damage or fouling when the weights touch the bottom in the fishermen's constant efforts to follow the contour. Usually the bait is fished a few feet (3 to 6) off the bottom. There are different methods of rigging the gear. By some fishermen the main line and weight is attached to one end of the spreader bar and by others to the centre. Lingcod occur in quantity only in very limited areas which are known and thoroughly studied by the fisherman. In some of these areas dead bait is found to be reasonably effective so live wells are dispensed with and the fishing methods are modified accordingly.

OTHER FISHING METHODS

Additional lingcod landings are made by gears used chiefly for other species although fishing methods with them are occasionally modified to concentrate on lingcod. For example, modern trolling gear, in which the lures are streamed on short leads from an almost vertical wire held down by a 20- to 35-pound cast iron or lead "cannon ball", is sometimes used as an effective method of fishing near known lingcod reefs by working large lures or dead herring bait close to the bottom. The main wires pass over sheaves supported by large springs so that fisherman has warning of when his gear hits bottom by the action of the springs. Trolling and hand-lining methods grade into one another and are frequently carried on by the same boats so they are not always distinguishable.

Otter trawls, in which open cones of net are dragged along the bottom, take travelling lingcod in some areas and seasons. When fished with special precautions to avoid catching the net on rocks, more sedentary lingcod are occasionally taken on the reefs in great quantities.

Where lingcod are abundant so that competition for food is keen, they are often taken on long-line gear set for halibut or dogfish. Long lines are made by attaching hooks on short (5 feet) side lines from heavier main lines held in place on the fishing banks by anchors at either end.

Fishing methods differ with season and locality. Trollers and hand liners provide practically all of the highly productive fishery during the spring and early summer in the sheltered waters between Victoria and Discovery Passage. Trawlers contribute about 90 per cent of the most important fishery, which is off the west coast of Vancouver Island during the summer, and trawlers also take the greater part of the catch in the northern part of British Columbia.

The primitive method of fishing by Indians was ingenious. A wooden shuttlecock-like lure or hee-hee made of wood and fibres was pushed down toward the reef with a long 3-tined spear. When the spear was sharply withdrawn, the hee-hee spun slowly toward the surface followed by the curious or hungry lingcod. When the fish came close to the surface it was deftly speared and landed.

Lingcod is marketed either fresh or frozen, and may be whole or filleted. In 1965, 60% of the total catch was taken by trawlers. The earlier markets for oil and Vitamin A derived from lingcod livers and viscera has now almost completely vanished. In 1966, landings of about five million pounds were worth $602,000. ✔

New FRB Members

Two recently-appointed members of the Fisheries Research Board of Canada, Dr. Robert D. Connor, Associate Dean of the Faculty of Arts and Science, University of Manitoba, and David F. Corney, general manager of Acadia Fisheries Ltd., Mulgrave, N.S., were welcomed at the Board's annual meeting in January by FRB Chairman Dr. F.R. Hayes. Pictured above are, from left, Dr. A.W.H. Needler, Deputy Minister of Fisheries, Dr. Connor, Dr. Hayes and Mr. Corney.

Fishery Figures For December

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May-December 1965		May-December 1966	
	'000 lb	$'000	'000 lbs	$'000
CANADA - TOTAL	1,843,760	124,158	2,022,543	133,817
ATLANTIC COAST - Total	1,435,346	80,903	1,603,195	79,648
Cod	488,105	20,122	459,618	20,007
Haddock	58,845	3,857	66,729	4,720
Pollock, Hake, Cusk, etc.	64,352	2,160	56,215	2,007
Rosefish	107,845	2,855	166,138	4,635
Catfish	3,855	127	3,899	130
Halibut	3,129	995	2,888	1,014
Plaice & Other Flatfish	190,235	5,991	225,795	7,349
Herring & Sardines	373,916	3,803	491,399	5,523
Mackerel	24,846	817	25,741	902
Alewives	12,084	202	8,067	140
Salmon	4,625	2,222	5,176	2,671
Smelts	2,158	159	1,983	175
Swordfish	7,628	3,144	7,260	3,108
Other Fish	14,752	593	14,010	486
Lobsters	37,297	23,880	34,693	19,892
Clams & Quahaugs	3,388	200	4,132	240
Scallops	16,448	8,941	14,101	5,802
Other Shellfish	21,838	835	15,351	847
PACIFIC COAST - Total	408,414	43,255	419,348	54,169
Pacific Cods	18,582	1,386	18,951	1,709
Halibut (1)	31,946	10,813	30,829	11,046
Soles & Other Flatfish	5,368	345	8,701	550
Herring	244,644	3,633	187,194	3,102
Salmon	89,811	25,760	152,569	36,244
Other Fish	7,054	266	10,083	432
Shellfish	11,009	1,052	11,021	1,086
BY PROVINCES				
British Columbia	408,414	43,255	419,348	54,169
Nova Scotia	478,663	38,088	560,113	35,441
New Brunswick	266,207	9,720	313,323	10,166
Prince Edward Island	45,829	6,811	57,135	5,955
Quebec	137,315	6,172	128,345	6,391
Newfoundland	507,332	20,112	544,279	21,695

(1) - Includes halibut landed in U.S. ports by Canadian fishermen.

MID-MONTH WHOLESALE PRICES - Dec. 1966

	Montreal $	Toronto $
Cod fillets, Atl, fresh, unwrapped lb.	.386	.453
Cod fillets, Atl, frozen, cello 5's lb.	.362	.397
Cod fillets, smoked lb.	.422	.473
Haddock fillets, fresh, unwrapped lb.	.468	.580
Herring, kippered, Atl. lb.	.258	.307
Mackerel, frozen, round lb.	.195	.243
Lobsters, canned, Fancy case 48-½s	60.493	62.233
Sardines, canned case 100-¼s	9.693	9.567
Halibut, frozen, dressed lb.	.568	.620
Silverbright, frozen, dressed lb.	.620	.650
Coho, frozen, dressed lb.	.764	.803
Sockeye, canned, grade A case 48-½s	27.427	28.640
Pink, canned, grade A case 48-½s	16.497	17.067
Whitefish, fresh lb.	.483(1)	.417
Lake trout, frozen lb.	.452	.530

(1) - Dressed

PRICES PER CWT. PAID TO FISHERMEN

(Week ending Dec. 17)	1965 $	1966 $
Halifax		
Cod Steak	5.25	5.25
Cod Market	5	5
Haddock	8.5	8.5
Plaice	4.5	5
Yarmouth		
Haddock	6	7.5
St. John's Nfld	4	-
Cod	-	-
Haddock	-	-
Rosefish	-	-
Vancouver		
Ling Cod	12-15	10-16
Gray Cod	5-7	7-7.5
Soles	6-9	6-7.5

Fishery Figures For December

FROZEN FISH STOCKS AS AT END OF NOV.

	1965 '000 lbs	1966 '000 lbs
TOTAL - Frozen Fish, Canada	80,184	109,077
Frozen - Fresh, Sea Fish - Total	53,705	81,586
Cod, Atlantic, Fillets & Blocks	4,525	20,287
Haddock, fillets & blocks	1,887	3,791
Rosefish, fillets & blocks	5,072	9,001
Flatfish, (excl. halibut), fillets & blocks	6,745	8,137
Halibut, Pacific, dressed & steaks	7,553	9,680
Other Groundfish, dressed & steaks	1,458	2,830
Other Groundfish, fillets & blocks	6,124	7,992
Salmon, Pacific, dressed & steaks	9,713	9,355
Herring, Atlantic & Pacific	505	456
All Other Sea Fish, all forms	4,855	6,725
Shellfish	5,268	3,332
Frozen - Fresh, Inland Fish - Total	7,899	8,975
Perch, round or dressed	411	318
Pickerel, (Yellow & Blue) fillets	378	1,068
Sauger, round or dressed	417	799
Tullibee, round or dressed	97	219
Whitefish, round or dressed	2,075	1,998
Whitefish, fillets	404	361
Other, all forms	4,117	4,212
Frozen - Smoked Fish - Total	1,561	1,463
Cod Atlantic	509	751
Sea Herring, kippers	726	423
Other, all forms	326	289
Frozen for Bait and Animal Feed	17,019	17,053

SALTED FISH STOCKS AS AT END OF DEC.

Salted and Pickled Fish, Atlantic Coast		1965 '000 lbs	1966 '000 lbs
Wet-salted - Total		21,940	17,286
Cod		19,477	15,163
Other		2,463	2,123
Dried - salted - Total		16,693	14,859
Cod		15,694	13,728
Other		999	1,131
Boneless - Total		1,073	598
Cod		963	526
Other		110	72
Pickled - Total	(barrels)	19,261	22,924
Herring	"	12,549	17,470
Mackerel	"	1,929	2,987
Alewives	"	4,783	2,467
Turbot	"	-	-
Bloaters	(18 lb. boxes)	135,565	72,814
Boneless Herring	(10 lb. boxes)	4,812	217

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS, MAY - SEPT.

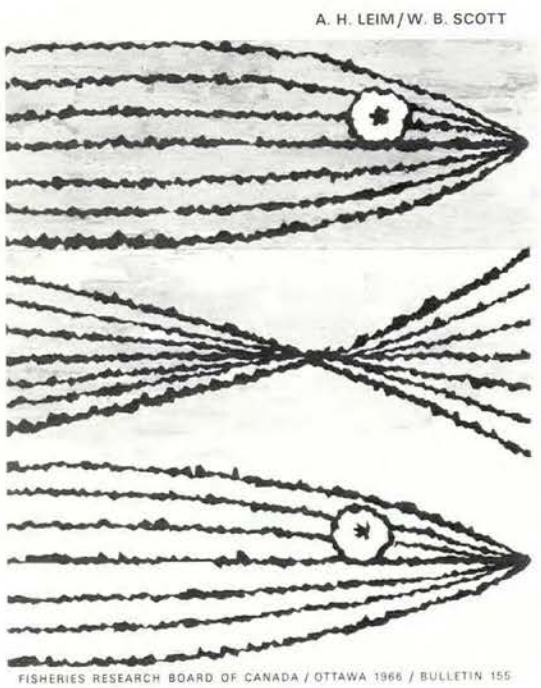
(Value in Thousands of Dollars)

	1965		1966
Total Exports	100,570		98,995
By Markets:			
United States	77,819		73,749
Caribbean Area	7,682		7,680
Europe	12,624		14,640
Other Countries	2,445		2,926
By Forms:			
Fresh and Frozen	75,660		72,894
Whole or Dressed	22,060	23,865	
Salmon, Pacific	5,666	7,630	
Halibut, Pacific	3,962	3,714	
Cod, Haddock, Pollock, etc.	186	188	
Swordfish	2,814	2,756	
Other Seafish	3,132	3,687	
Whitefish	2,385	2,109	
Pickerel	1,677	1,449	
Other Freshwater Fish, n.o.p.	2,238	2,332	
Fillets	32,905	31,582	
Cod, Atlantic	13,523	9,544	
Haddock	2,667	3,252	
Rosefish, Hake, Pollock, etc.	2,626	4,389	
Flatfish	4,732	6,289	
Pickerel	1,201	1,521	
Other	8,156	6,587	
Shellfish	20,695	17,447	
Lobster (Alive & Meat)	15,241	13,212	
Other	5,454	4,235	
Cured	8,954		8,450
Smoked	888	875	
Herring	558	587	
Other	330	288	
Salted, Wet & Dried	6,731	6,458	
Cod	5,499	5,336	
Other	1,232	1,122	
Pickled	1,335	1,117	
Herring	978	767	
Mackerel	215	211	
Other	142	139	
Canned	8,257		8,958
Salmon	4,202	4,352	
Sardines	1,878	2,135	
Lobsters	1,577	1,666	
Other	600	805	
Miscellaneous	7,699		8,693
Meal	4,271	4,868	
Oil	836	268	
Other	2,592	3,557	

Current Reading

FISHES OF THE ATLANTIC COAST OF CANADA by A. H. Leim and W. B. Scott (Bulletin 155 of the Fisheries Research Board of Canada. Available from the Queen's Printer, Ottawa. Price $8.50).

The need for a comprehensive book on Canadian Atlantic fishes has been recognized for many years. In 1956, Dr. A. H. Leim, a former director of the Fisheries Research Board's Biological Station at St. Andrews, began preparing such a book, drawing on his lifetime interest in the natural history of the region. He died before it was completed. At the time of his death in 1960, draft accounts of most species had been prepared. They supplied the basis on which Dr. W. B. Scott, Curator of Ichthyology and Herpetology at the Royal Ontario Museum, has completed this volume.



"Fishes of the Atlantic Coast of Canada" attempts the initial step in filling the need for an authoritative reference book on the fishes taken off the 21,000 miles of Canadian Atlantic coastline from Grand Manan to Cape Chidley.

The 485-page volume contains descriptions of nearly 300 species, including information on size, colouration, range, biology, and economic importance. Most species are illustrated in black and white and in addition there are four handsome colour plates. Numerous keys are included for identifying individual species. Also included are a glossary of technical terms, over 500 references to pertinent literature, and a comprehensive index.

This attractively dust-jacketed book will be a welcome addition to the bookshelves of scientist and student alike and is a worthy companion to "Fishes of the Pacific Coast of Canada" issued by the Fisheries Research Board in 1961.

The LAURA SECORD CANADIAN COOK BOOK. Produced by the Canadian Home Economics Association and published by McClelland and Stewart. Price $3.95.

Here is a book which proves conclusively that there is a Canadian cuisine. A Centennial project of the Canadian Home Economics Association, sponsored by the Laura Secord Candy Company, it contains around 360 authentic Canadian recipes. Each recipe is prefaced by a story telling something of its origin. As a result, the book presents a kaleidoscopic view of our country's culinary past.

Members of the Canadian Home Economics Association from every province gathered the recipes, choosing especially those of regional interest. Then, teams of professional home economists spent almost a year testing, selecting, and perfecting the best for publication.

The chapter on fish contains 36 recipes, and as well there is a dozen more fish recipes scattered throughout other chapters of the book. Among the fish recipes are time-honoured favourites such as fish and brewis, soused mackerel, gibelotte sorelaise, and salmon loaf. Following the recipes, there is a section on Canadian menus, and one on cooking terminology.

The book, which is available in English and French, is delightfully illustrated.

If undelivered return to:
Department of Fisheries of Canada
OTTAWA

CANADA
POSTAGE PAID
PORT PAYÉ

March Days are Chowder Days

WHEN a chill wind whistles through the rigging or down the chimney, a bowl of piping hot fish chowder is a welcome sight for fisherman or landlubber. It fairly breathes comfort and steams enjoyment.

Though classed as a soup, fish chowder contains nourishing solids and is usually served as the main dish for lunch or supper accompanied by crackers or crusty rolls. A crisp salad may also be served and a simple fruit dessert and beverage can complete the meal.

Almost any variety of fish may be used to make chowder. However, on the Atlantic seabord and in other parts of the country, cod and haddock are favoured choices. The following recipe, kitchen-tested by the home economists of the Department of Fisheries of Canada, makes a creamy dish, brimful of good flavour. Try it soon and transport the tang of the great open sea, with salt spray running high, to your table.

Fish Chowder Deluxe

2 pounds cod, haddock, or other fish fillets
2 cups water
1 bay leaf
2 cups diced potatoes
2½ teaspoons salt
1/4 teaspoon pepper
1/2 teaspoon monosodium glutamate (optional)
1/3 cup butter
1 cup chopped celery
2 cups thinly sliced onions
2 tablespoons flour
4 cups milk
1 cup table cream
1 cup commercial sour cream
Parsley, finely chopped

Combine fish, water, and bay leaf. Heat to simmering temperature. Simmer, uncovered, for about 5 minutes, or until fish will flake when tested with a fork. Carefully lift fish from stock with broad, slotted lifter. Remove and discard skin, if necessary.

Add potatoes and seasoning to fish stock. Cover and cook until potatoes are tender. Meanwhile melt butter in frying pan. Add celery and onion. Saute until tender, about 5 minutes. Stir in flour. Cook and stir over low heat for 1 to 2 minutes. Combine sauteed vegetables with cooked potatoes and fish stock. Cook, stirring gently, until thickened. Remove bay leaf.

Scald milk, using large double boiler if available. Remove from heat. Stir in cream and sour cream until mixture is well blended. Reheat. Add vegetable mixture and fish, broken in large pieces. Heat gently about 5 minutes longer, taking care not to let boil. Serve garnished with chopped parsley.
Makes about 12 cups.

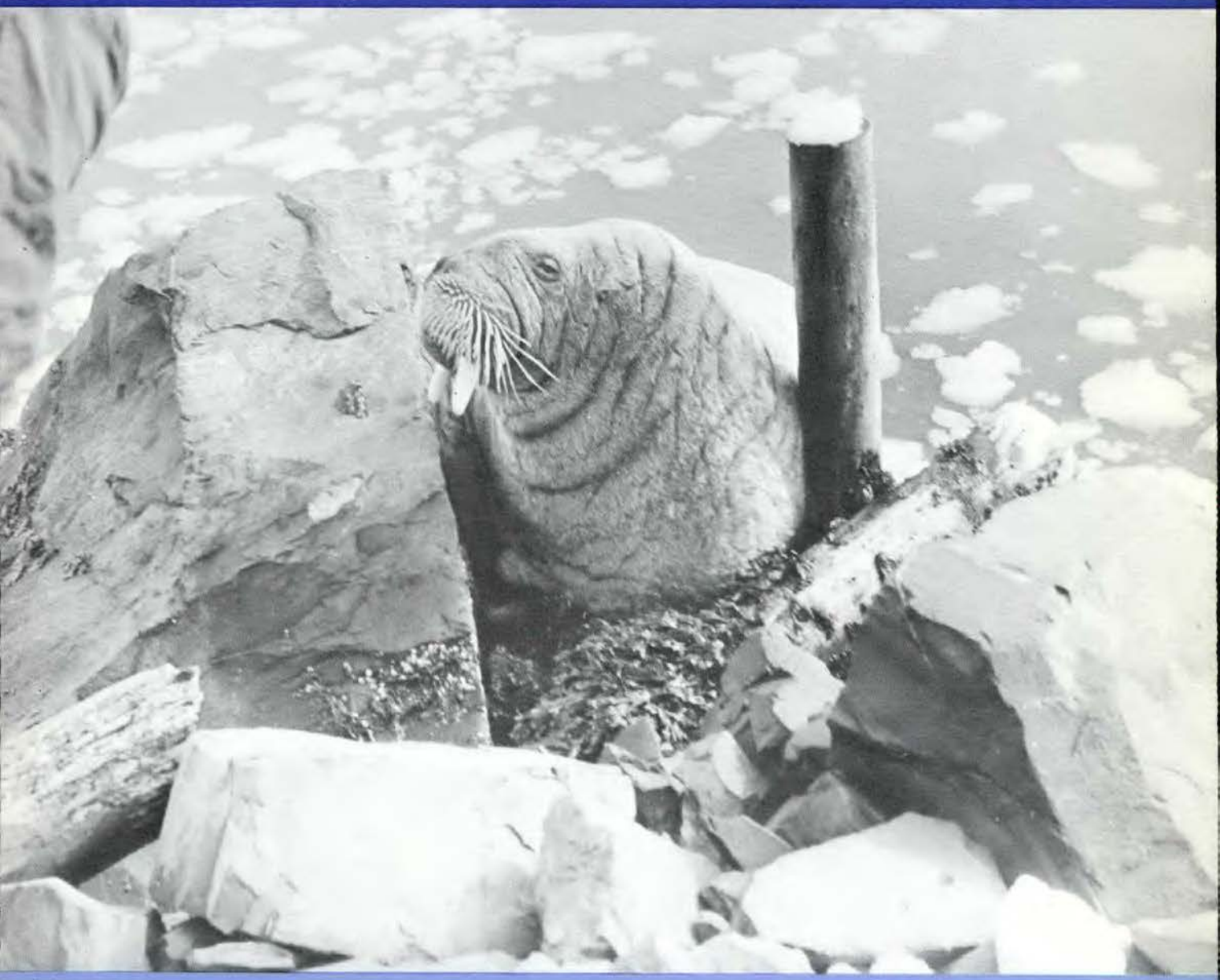
DEPARTMENT OF FISHERIES
Hon. H. J. Robichaud, M.P., Minister — Dr. A. W. H. Needler, Deputy Minister
Ottawa, Canada

ROGER DUHAMEL, F.R.S.C., Queen's Printer and Controller of Stationery, Ottawa, 1967

FISHERIES

(formerly Trade News) OF CANADA

Vol. 19 No. 10 April, 1967



In This Issue

Department of Fisheries of Canada, Ottawa

FISHERIES
OF CANADA
(formerly Trade News)

Editor
E. H. HEARNDEN

Vol. 19 No. 10 April, 1967

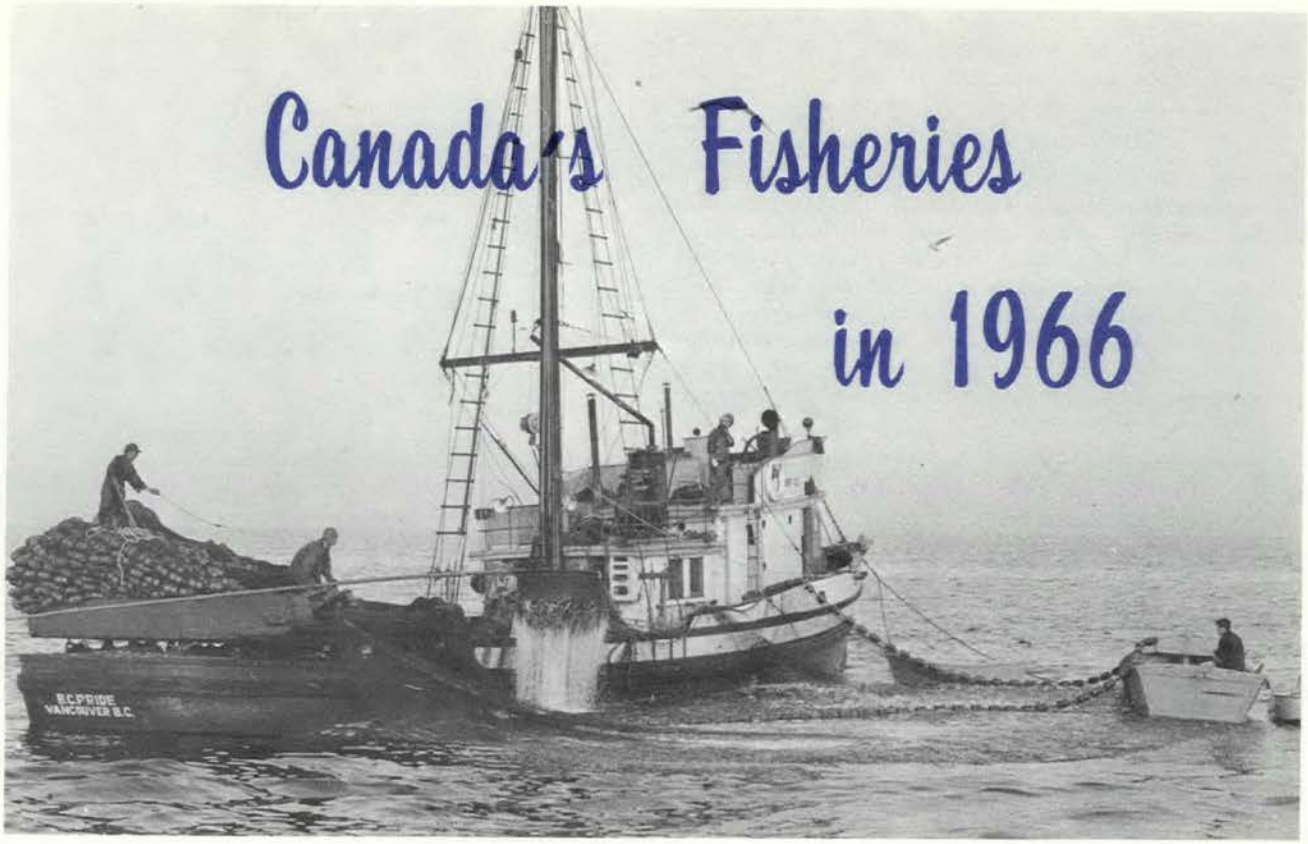
CONTENTS

FEATURES

Cover Photograph

Perched on crib work in Bay Bulls harbour on Newfoundland's southeast coast, this 1,000 pound bull walrus ventured far beyond its normal range in the eastern Canadian Arctic and in Western Greenland. Protected by federal fisheries regulations from killing except by native northern residents, and then only for food and in restricted numbers, walrus herds are nowadays normally confined to northern Hudson Bay, Northern Foxe Basin and Baffin Island.

Canada's Fisheries in 1966



LANDINGS of fish and shellfish by Canadian fishermen increased for the sixth straight year in 1966, setting a record of close to 2.6 billion pounds. This catch, the first by Canada to exceed 2.5 billion pounds, represented gross earnings to fishermen of an estimated $165 million, also a record. In 1965, Canada's next best year for fisheries, total landings of fish and shellfish amounted to 2.4 billion pounds, worth $158 million.

As in other years, more of Canada's fishery products were shipped to export markets than were consumed at home, and indications are that the markets generally will continue to be good. In 1965, Canada's fishery exports had a record value of $212.9 million. The value of exports shipped by September 1966 is slightly higher than that of Jan.- Sept. 65. The United States remained the biggest customer for Canadian fishery products, purchasing in the order of 70 per cent of the total. Markets in Europe and the Caribbean accounted for the bulk of the remaining sales.

The substantial climb in total landings in 1966 as compared to the previous year was largely the result of heavier Atlantic coast catches, particularly of herring and groundfish. The five Atlantic provinces landed a combined total of 1,900 million pounds of fish and shellfish - almost 75 per cent of Canada's total catch.

Substantial investment went into the expansion of processing plants and the construction of new plants during the year, and a number of these will be going into production in 1967. Industry in the Maritimes provinces invested an estimated $18 million during 1966 in the construction of trawlers and other large fishing craft. Indications are that the amount of this investment in 1967 will increase to $25 million.

Heavier landings of Pacific salmon in British Columbia in 1966 restored for that species its normal distinction as the most valuable of all Canadian fishery products. Atlantic lobster captured this honour in 1965 when salmon landings were at a low ebb. In the past year, lobster landings declined, and with prices holding at satisfactory levels, the Pacific salmon was worth approximately $37 million to fishermen.

Atlantic cod took over second spot with an estimated value of $25 million, while lobster followed

with $24 million. Other valuable species included Pacific halibut, $11 million; Atlantic scallops, Atlantic haddock and Atlantic flatfishes, each worth $8 million; Atlantic herring, $6 million; and Pacific herring $5 million.

In quantity of landings, cod was tops with 564 million pounds, a slight decline from the 570 million pounds in 1965. Cod was followed closely by Atlantic herring (550 million). In fact, herring emerges as Canada's most abundant single species if Atlantic and Pacific catches are combined. In 1966, the combined herring catch amounted to 856 million pounds, roughly one-third of Canada's total landings.

Nova Scotia, which in 1965 displaced Newfoundland for the first time as producer of the heaviest Atlantic coast landings, climbed into first place among all provinces for landings in 1966. To do so, Nova Scotia's fast-growing fleet of trawlers, draggers and seiners boosted its previous year's output by approximately 15 per cent to a record of almost 700 million pounds. Herring and groundfish catches accounted for most of this increase, but shellfish landings declined to 47 million pounds from 48 million.

Newfoundland's catch increased to an estimated 665 million pounds, up nearly 75 million pounds from 1965, and bringing returns to fishermen of $25.4 million as compared to $23.7 million in 1965. The province's expanding trawler fleet accounted for 18 per cent of total cod landings. The number of trawlers of 100 feet or more increased by seven to a total of 52 during 1966. Forty new longliners also went into operation, bringing their total number to 201. Herring and turbot landings were nearly doubled.

In the Maritimes region, taking in Nova Scotia, New Brunswick and Prince Edward Island, the combined catches surpassed one billion pounds for the first time, although the returns to fishermen declined by almost two million dollars. The most significant feature of the Maritimes fisheries was the herring catch which totalled 450 million pounds, as compared to 330 million pounds in the previous year. Forty-two seiners contributed to this heavy catch, reflecting the growing concentration on these fisheries in such areas as the Bay of Fundy, southern Nova Scotia and the Gulf of St. Lawrence.

PACIFIC COAST LANDINGS

On the Pacific coast, the estimated value of all fish and shellfish landed by British Columbia fishermen reached an all-time high of $60 million, eclipsing the previous record of $52 million established in 1958. This was accomplished even though the quantity of landings fell below 600 million pounds for the first time since 1960. The drop in overall landings, down nearly 70 million pounds from 1965, was due to a decline of about 140 million pounds in herring landings. This was only partly offset by salmon catches which rose from 90 million pounds in 1965 to approximately 153 million pounds in 1966. Fishermen tripled their catch of pinks, more than doubled chum landings and boosted the sockeye catch by 50 per cent. The value of the salmon output of the province rose by approximately $14 million to $39 million. The 1966 salmon pack of more than 1.8 million cases doubled the 1965 production and was the greatest since 1958.

Catches made in July and August, the peak months of the year in British Columbia, were the highest ever reported for that period. The marketed value of B.C. fishery products in 1966 will probably exceed $115 million as compared to $90 million in 1965. With record returns of $60 million, British Columbia regained its accustomed leadership among the provinces in the landed value of fishery products, a position it yielded to Nova Scotia in 1965. However, British Columbia slipped from first to third place among the provinces in the quantity of fish and shellfish landings. ✔

Urge Assessment of Fish Resources

Fifteen fisheries experts from all parts of the world stressed the urgency of an assessment of the world's fish resources so that through better management, increased supplies of this protein food may be available to consumers, particularly in the developing countries.

This recommendation was made at a session of the FAO Advisory Committee on Marine Resources Research (ACMRR) held recently at the headquarters of FAO's Department of Fisheries in Rome. Experts from Argentina, Brazil, Canada, Ghana, India, Japan, the Netherlands, the Union of Soviet Socialist Republics, the United Kingdom, the United Arab Republic and the United States, as well as observers from specialised agencies and international organizations such as UNESCO, the Intergovernmental Oceanographic Commission, the World Meteorological Organization and the Scientific Committee on Oceanic Research took part in the discussions.

One of the ACMRR Working Parties agreed that acoustic fish detection was of primary importance to reach a speedy assessment of the world's fish stocks. A manual on training centres which, the experts said, would be of value to all fisheries workers, is in preparation. They also agreed that systems of utilization of synoptic data that could be made avilable to fishermen of all nations should be improved along lines set out by the group. ✔

'Guiding Star' Shows the Way

ONE OF the current projects of the Industrial Development Service of the federal Department of Fisheries involves a study and practical demonstration of Scottish seine-netting.

The Scots have lent many of their talents to the development of Canadian industry over the past century and a half -- talents in fields such as shipbuilding, sheep and cattle raising, business and fishing.

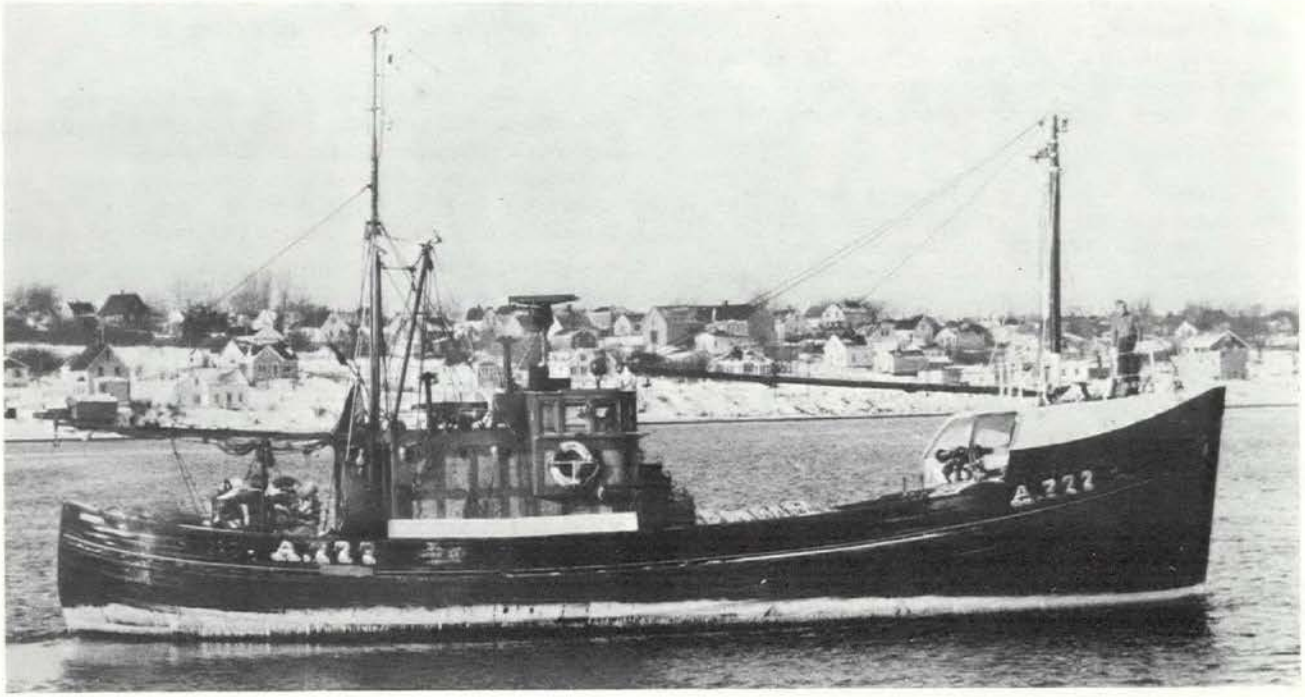
Since October, 1966, fishermen of Newfoundland and Nova Scotia have seen an unfamiliar vessel from time to time -- the Scottish seine netter *Guiding Star* -- move from port to port demonstrating her method of catching fish.

The 73-foot vessel is under charter to the Industrial Development Service and her chief objective is to determine whether Scottish seine-netting can be adopted profitably by the Canadian fishing industry.

The terms of the charter require the *Guiding Star* to engage in full-scale commercial fishing operations which will enable fisheries authorities to assess the potential of the Scottish technique of seine-netting in Canada and to demonstrate the technique and equipment to Atlantic Coast fishermen.

So far this operation met with what has been termed "phenomenal" success particularly in waters off Nova Scotia. While fishing on the same grounds as Danish-type Nova Scotia seiners off Cape Breton, the *Guiding Star* has tow for tow, often doubled and even tripled the catch; while the Nova Scotia seiners were netting hundreds of pounds a tow, the *Guiding Star* hauled in thousands. On one good day, for example, the Scottish seiner landed in five tows off Cheticamp, almost 19,000 pounds of fish. The catches involved mostly cod, haddock and flounder. During one tow off Newfoundland the net had so many fish that it burst!

Cape Breton and mainland fishermen have travelled hundreds of miles to inspect the gear and watch



The Scottish seine-netter Guiding Star off the coast of Nova Scotia.

this Scottish vessel in action. Many Nova Scotia fishermen now want to know all about Scottish seine-netting, and how they can convert to this method.

The main advantage of this type of fishing for bottom species is the relatively low vessel horse power requirement. This will allow many boats such as longliners which have insufficient power for trawling to participate effectively and economically in this lucrative fishery.

The *Guiding Star* carries two nets -- 420 and 520 Vinge trawls -- which have a far higher vertical opening than conventional nets in present use in Canada but are no harder to tow. The high vertical opening is the main reason for the large hauls of high swimming demersal species. Deck layout and machinery allows much faster hauling and shooting. Sophisticated electronic equipment is used to locate and remain with schools of fish on suitable bottom.

The *Guiding Star* is now working her way along the Nova Scotia coast, from Cheticamp to western Nova Scotia, demonstrating this successful method of fishing. Later in the year she will visit New Brunswick, Prince Edward Island and Quebec, and revisit Newfoundland.

CONVINCED BY DEMONSTRATIONS

So far her demonstrations have convinced many fishermen that this is the method to adopt. At Port Mouton, Queens County, for example, fisherman Wayne Wagner is constructing the first vessel in Canada designed exclusively for Scottish seine netting -- the 93-foot *Sea Urchin* -- which is scheduled to be in operation this summer. Mr. Wagner has been aboard the *Guiding Star* since October as an observer for the Industrial Development Service and says he is convinced that Scottish seine-netting is the best method for fishing in many Atlantic areas.

The *Guiding Star* is leased from fishing interests in Aberdeen and carries a crew of five. She is powered by a 150 B. H. P. Gardner diesel engine; is equipped with radar, radio-telephone, sounder and Decca navigator, and is capable of carrying 90, 000 pounds of iced fish. She has a Sutherland seine net winch and a Beccles coiler.

The decision to charter the *Guiding Star* was made following a study conducted during the last two years by Scottish captains under contract to the federal Department of Fisheries, to determine the possibilities for the development of Scottish method seining in the Atlantic Coast provinces.

Officials of the Industrial Development Service will evaluate the performance of the *Guiding Star* later this year and make recommendations to the industry concerning her method of fishing. ✔

Scallop Resources Assessed off P.E.I.

A 1966 survey of scallop resources in the inshore waters on the Gulf of St. Lawrence side of Prince Edward Island did not indicate any prospect for their exploitation as a commercial fishery. Although scallops were found in the area surveyed, they were not present in commercial quantities.

The survey was sponsored by the Department of Fisheries of Prince Edward Island in conjunction with the Resource Development Service of the federal Department of Fisheries. It was carried out from aboard a chartered scallop dragger.

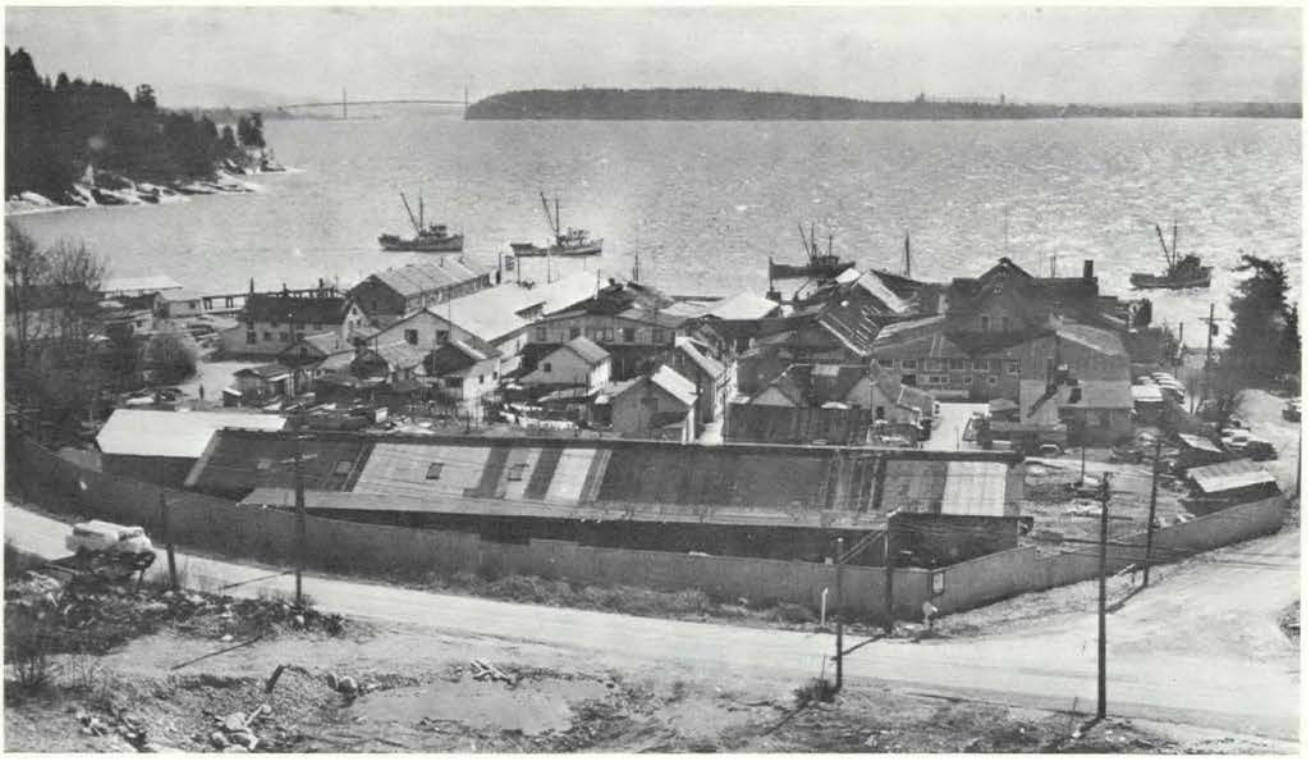
The project had a dual purpose. First, it was to explore the area as fully as possible, and secondly, to re-assess scallop populations of known beds and compare present populations with the results of previous surveys. The last survey prior to 1966 was made in 1961.

The area surveyed extended from North Point to French River on the north side of the province. For the purpose of the study the area was divided into four districts. Each of the sub-districts was thoroughly investigated, and records kept of catches, water depths and types of sea bottom.

At the northern end of the island the many tows yielded some scallops but not in sufficient quantity to support a commercial scallop fishery. Nor was there any degree of scallop concentration in the Alberton area. Tows yielded anywhere from nil to 90 scallops. A former scallop bed in the area was investigated but it proved to be virtually non-existent. The tows there gave no more than a half-bushel per tow.

In Malpeque Bay district dozens of tows were made but no concentrations of scallops were revealed. Several tows yielded nothing but a few starfish, mussels and sea urchins. A rocky sea-bottom made towing difficult in the waters in the French River area, and few scallops were found.

The survey team concluded that "it is obvious that there is no region along the north coast of Prince Edward Island (from North Point to French River) which will support even a small boat in commercial scallop fishing."



This is the Francis Millerd and Co. Ltd. cannery on Marine Drive, West Vancouver, recently purchased by the federal Government as a site for a Fisheries Research Board of Canada's water laboratory. The site will be developed as a research centre over the next 10 years.

Plan New Research Centre in B.C.

The initial step in implementation of a long-range plan to establish a new Fisheries Research Board water laboratory in British Columbia has been taken with the purchase of 4.8-acre waterfront site in West Vancouver.

Fisheries Minister H. J. Robichaud announced in February that the federal Government had acquired the waterfront cannery of Francis Millerd and Co. Ltd. on Marine Drive, West Vancouver.

Mr. Robichaud described the plans of the Fisheries Research Board for the new area as "long-range" with an orderly development in the next decade of one of the finest water laboratories in all of Canada. Facilities will be made available for research on live fish in fresh and salt water.

"It is hoped", Mr. Robichaud said, "that these facilities will enable the Fisheries Research Board to continue to attract top aquatic scientists to maintain our world leadership in the field."

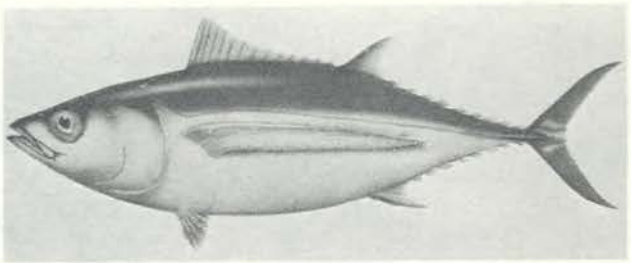
Mr. Robichaud expressed his personal pleasure that the area would continue its historic association with the fisheries. "Under the ownership of the Millerd family, the property made a significant contribution to the commercial fisheries of British Columbia", he said. "Now, as a government-owned research centre, we expect it to make a further contribution whose impact in fisheries research may be world-wide."

The new research laboratory will operate as part of the Fisheries Research Board's Vancouver Laboratory under the direction of Dr. H. L. A. Tarr.

Under a lease-back arrangement, the Millerd company will continue certain canning operations at the plant until later this year. ✔

The Albacore

THE ALBACORE *(Thunnus alalunga)* is one of the tunas and belongs to the mackerel family, a group of fishes which by virtue of their streamlined bodies are very rapid swimmers. Albacore are readily distinguished from other members of the family by their long sabre-like pectoral fins, a feature which has earned the species an alternative common name - longfin tuna. In color, its back and sides are metallic steely-blue and its under surface is silvery.



Albacore *(Thunnus alalunga)*

Albacore are pelagic, that is, they live freely in open waters, and occur throughout all warm and temperate seas. Those in the North Pacific are now considered to belong to a single population which is believed to spawn in subtropical waters west of the Hawaiian Islands. Commercial catches indicate that the largest individuals are most abundant in these waters, medium sized individuals are found in coastal waters off Japan and adjacent offshore waters, while the smallest individuals occur in the eastern Pacific. Those occurring off British Columbia, usually in July, August and September, range from 21 to 33 inches in length and from 7. 5 to 23. 6 pounds in weight.

The food of albacore in the eastern Pacific varies with locality, but in general consists of small fish which swim in schools such as anchovies, pilchards, herring, sauries, lanternfishes, as well as squid and zoo-plankton.

The first commercial catch of albacore in the eastern Pacific Ocean by Canadian fishermen was made in 1939. In that year and until 1960 fishing was done entirely by trolling. The fleet operated off British Columbia in some years but more often southward to the Columbia River and on occasion to northern California. During this period the catch averaged 0. 5 million pounds per year, with a high of 2. 2 million pounds in 1949. In 1960, as a result of the successful use of purse-seines by United States fishermen, a small number of Canadian purse-seine vessels entered the tuna fishery. By 1962, with the arrival of improved shipboard methods of freezing fish, which increased the range and time over which vessels could operate, Canadian seiners ventured as far south as Mexico, and were responsible for catching the bulk of the albacore landed in British Columbia.

The catch upon landing is customarily frozen for later processing. Upon removal from cold storage the fish are thawed, dressed and washed. They are then graded according to size, and pre-cooked in retorts under steam pressure. The cooked fish are then skinned and boned, and the dark meat is removed. The white meat is packed as solid or flaked tuna and the dark meat is used in the preparation of pet food.

(Prepared by the Nanaimo Biological Station of the Fisheries Research Board of Canada).

Indemnity Plan Extended to Ontario

A federal program providing low cost insurance for fishing vessels, fixed gear and shore installations is to be extended to the province of Ontario. A formal agreement to this effect was reached in an exchange of correspondence between Hon. H. J. Robichaud, federal Minister of Fisheries, and Hon. Rene Brunelle, Ontario Minister of Lands and Forests.

The program known as the Fishermen's Indemnity Plan offers protection to fishermen for partial or total loss of vessels, fixed gear and shore installations. Already covering the fishing industry in the Maritimes, Newfoundland, Quebec and British Columbia, the plan becomes effective in Ontario April 1, 1967.

Under the plan, Ontario fishermen owning vessels having an appraised value of up to $15, 000 may obtain insurance coverage with a premium of one per cent of the appraised value. The vessel is insured against loss or damage caused by "collision,

foundering, storm, stranding, tidal wave, fire, thieves or any other recognized peril." In the case of partial loss or damage, the vessel is covered for claims exceeding a standard deductible of 30 per cent of the appraised value. For total loss, the owner recovers 60 per cent of the appraised value.

The Indemnity Plan also covers fixed fishing gear, shore installations and miscellaneous equipment having a maximum appraised value of $15,000. The annual premium is one per cent of the appraised value. Coverage is provided for loss or damage caused by storm, fire, hurricane, ice conditions or other natural perils. Claims for partial loss are payable for damage exceeding a standard deductible of 25 per cent of the appraised value; 60 per cent of the appraised value is paid in the case of total loss. Miscellaneous equipment is covered when loss or damage occurs while it is stored in an insured shore installation.

Seafood Aplenty at Expo 67

WHETHER your palate tickles to salt codfish pie or turban of sole carmelite, you can enjoy a seafood meal at any of the dozens of restaurants at Expo '67 with the assurance that the fish you are eating has met with the rigid quality standards demanded by the Inspection Service of the Department of Fisheries of Canada.

The department's role in the maintenance of fish quality is one part of the Canadian Government's food control program at Expo. Other agencies involved are the federal Department of Agriculture and the Food and Drug Division of the Department of National Health and Welfare. Representatives of the three government departments form an interdepartmental committee which works in conjunction with the Canadian Corporation for Expo.

With nearly 150 restaurants and smaller eating places catering to Expo visitors, fish inspection officers anticipate heavy demands for their services. They will operate from an office on the exhibition grounds and will make "spot" checks on fish being delivered to the Expo site.

FISH FROM ABROAD

Departmental officials expect a heavy influx of imported fish for the Expo trade. At the national pavilions, the restaurants will serve seafoods traditional to their respective countries. Most of the imported fish will be inspected at the Montreal fish inspection laboratory. That includes all kinds of fish in cans, packaged or in the fresh and frozen state.

The Department of Fisheries is making certain concessions for canned fish imported to Expo. The normal regulations regarding weights, quality, etc., on labels will be waived because these products will not be moving through regular trade channels. Fisheries products to be displayed in boutiques -- there will be 150 such shops -- are for display purposes only and cannot be sold. At the close of Expo unused seafoods will be returned to the countries of their origin unless other arrangements can be made for their disposition without interfering with normal trade practices.

H. V. Dempsey, Director of the Department's Inspection Service, explained that the inspection of seafoods to be eaten or displayed at Expo follows the normal inspection procedure. Products that do not meet with the high standards demanded by the Service will not be permitted to enter the country. The "spot" checks at Expo will be just an extra precaution, Mr. Dempsey said.

Probably the most impressive of Canadian seafood menus will be presented in the Atlantic Provinces pavilion. Oysters, lobsters, shrimps, crabs, clams and scallops will be featured as will also haddock, salmon, cod, sole and halibut served in almost countless delectable ways.

While eating at Expo will not be all framboises vosgienne and caviar, the exotic foods at the national pavilions will provide a gastronomic elysium for the gourmets. However, for those with less fastidious tastes there will be all manner of food from plain hot dogs to salt herring and corned beef and cabbage.

U.S. Fish Imports

United States fish imports were valued at $469 million in 1965, up $43 million from 1964, according to statistics issued by the Department of the Interior's Bureau of Commercial Fisheries.

Imports from Canada, valued at $139 million, topped the list. Japan supplied $66 million in fishery products. Other Western hemisphere nations accounted for $96 million. Imports from Western Europe were valued at $58 million.

Tenacity is Rewarded for Fisheries Scientist

By Bruce Woodland

Fisheries Research Board of Canada

SEPTEMBER 1939. A young Polish marine scientist sat in his laboratory at Gdynia Marine Station on the Gulf of Danzig, contemplating the tragic events unfolding before him. A few days earlier, Nazi tanks, aircraft and troops had hurled themselves across the border into Poland.

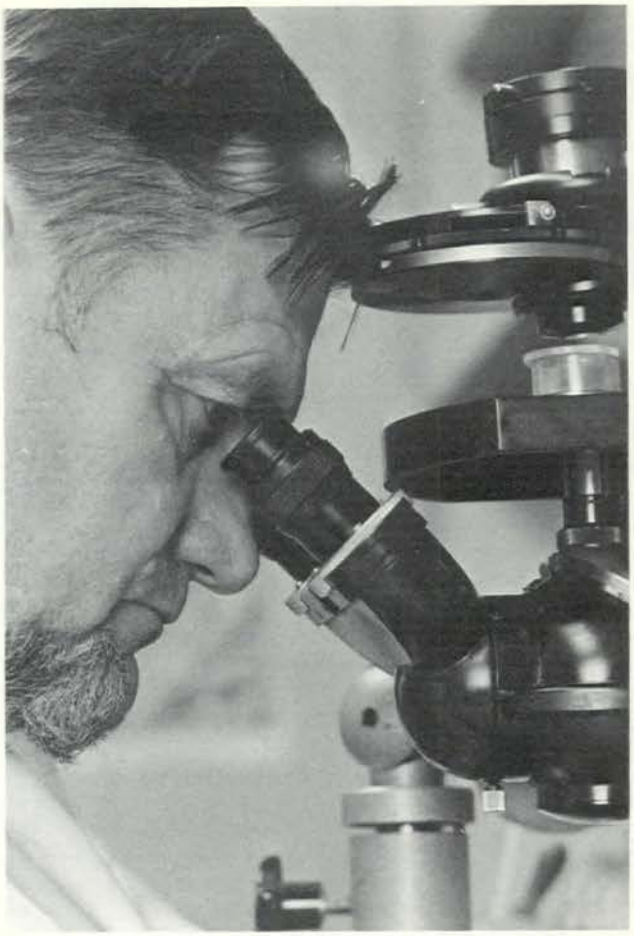
Like other young Poles, Adam Bursa had been called to the colours in a brief, but futile show of patriotism. He had joined farmers, students, clerks and fellow scientists in an Alice-in-Wonderland army whose most fearsome weapons were scythes and crudely-fashioned spears. It seemed, Adam now recalls, the only positive thing to do.

But now the Germans had reached Gdynia and had seized control of the Marine Station. The staff had been told they could continue their studies, but, for the time being, in the confines of the laboratory. The Polish scientists knew only too well that more restrictions would follow.

At Gdynia, Adam Bursa had worked for five years on a doctoral thesis which he planned to submit to Jagiellonian University in Krakow, where he had received his Master's degree in science in 1934. The finished thesis was his most treasured possession representing as it did the major step toward the most coveted of academic degrees. This he desired above all else, except freedom.

FIGHT FOR FREEDOM

As Adam Bursa reviewed the dramatic changes around him, he had fashioned a new goal. It was an objective that might forever prevent him from realizing his ambitions as a scientist. For, in the solitude of his laboratory, he had decided to leave Poland to fight for the freedom he cherished.



Scientist Adam Bursa at work at the Fisheries Research Board of Canada's Arctic Biological Station.

A series of daring and dangerous contacts with the Gestapo and other occupation authorities followed swiftly upon the decision to escape. Legal and forged travel permits were secured for a variety of places, setting up a confused pattern of movement that for some time successfully covered his tracks. In the meantime, he had banded together a small group of young professionals who were to join him in the flight.

When Adam Bursa left Gdynia, he carried with him 18 scientific papers that he had authored in four languages, and his precious thesis. The thesis, he decided, would be safer left behind in Poland. Accordingly, he called at his sister's home and hid the manuscript with her co-operation.

The remaining scientific papers, which he planned to use as evidence of his professional status in the world outside, were carried in a battered

brief-case, sharing available space with a redolent supply of Polish sausage and chocolate.

Southward the small group moved, through Poland; Czechoslovakia, across the border into Hungary, travelling mostly at night. At one point, police dogs were used to track down the fugitives, but morsels of sausage, taken from the brief-case and strewn along the trail, delayed the dogs long enough to get away.

In Hungary, the long weeks of hunger, exposure and exhaustion caught up with Adam Bursa, and he became seriously ill with a lung infection. Confined to a refugee camp in Budapest, he finally recovered enough to escape again and once more he headed for Jugoslavia.

HID IN A SWAMP

On the way, he and a group of fellow escapees hid from pursuing police in a swamp, where he lay across his brief-case to keep from sinking into the oozing mud. In the excitement of the escape, the brief-case and its all-important contents were left behind.

Reaching Zagreb, Jugoslavia, the refugees heard that the ship that was to take them to France had been torpedoed. Hard on this disappointing news came word that France had fallen.

The tattered refugees changed course and moved eastward across Jugoslavia, then south through Bulgaria and Greece to Turkey. The goal was Egypt where, they had heard, a Polish Brigade was being organized.

From Turkey, the Poles secured passage on a boat to Haifa, Palestine, where they found the Polish government-in-exile had set up an office to recruit refugees to the Polish Brigade. Then it was on to Egypt and action in the desert where fierce fighting had started. But Adam Bursa again became desperatily ill and he was returned to Tel-Aviv in Palestine where he was on sick leave from the army.

From 1944 to 1947, he was employed as a teacher in a Polish school in Palestine. He then moved with the army to England where he taught biology at Hampton Grammar School, Middlesex, until 1951.

MIGRATED TO U. S. A.

In December 1951, Adam migrated to the U. S. A. where he found work as a labourer in a factory in New York. It was during this period that he wrote a scientific paper from memory of investigations he had carried out years earlier. This work led to new contacts with scientists and, in 1953, to employment on an Arctic scientific expedition out of Point Barrow, Alaska. In 1954, he acquired a Carnegie Arctic Grant to carry out studies at McGill University, Montreal.

Adam Bursa receives his doctorate in traditional manner at the 600-year-old Jagiellonian University at Gdynia, Poland.

His work at McGill attracted the attention of Dr. M. J. Dunbar, then in charge of the Arctic investigations of the Fisheries Research Board of Canada. Subsequently, in 1955, he was offered and accepted employment with the Board. Adam Bursa's return to full employment as a fisheries research scientist, seemed a final and fitting triumph against the odds. It was fitting, but not final.

In the summer of 1965, Canadian citizen Adam Bursa returned to his native Poland as a delegate to the International Limnological Congress in Warsaw. The opportunity was taken to see old friends -- and to visit his sister's home where the yellowed pages of his doctor's thesis were removed from their hiding place.

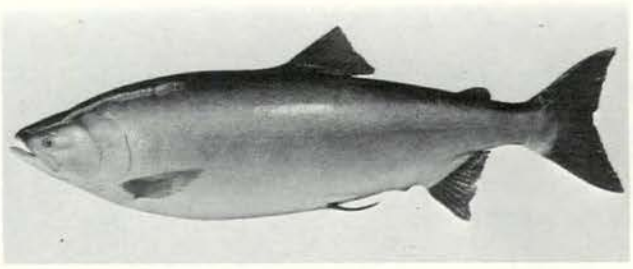
Contact was established with his university where, to his surprise, one of his old professors was still active at the age of 80. With his assistance, Adam Bursa obtained agreement from the university authorities to assess the 26-year-old thesis, on the basis of which his qualifications for a doctor's degree would be determined.

In November, 1966, Adam Bursa once again returned to Poland and to his alma mater, the 600-year old Jagiellonian University. There, in traditional ceremonies dating back to medieval times, Adam Bursa received the degree of Doctor of Biological Science.

People who knew him realized that this was recognition not only of academic and scientific achievement, but of tenacity of spirit and dedication to science in much more than usual measure. ✔

Sockeye Salmon

THE PACIFIC sockeye salmon, with the scientific name *Oncorhynchus nerka* is the most highly prized of the five species found in British Columbia waters because its rich, red flesh coloring and the firmness of its tissues give it a greater market value. The other species of Pacific salmon are coho, pink, chum and chinook (or spring). The sockeye is found in abundance along the entire coast of British Columbia. Its complete range is from Oregon westward along the North Pacific Ocean and Bering Sea coast of North America to the northern Kuril Islands and along the northern and northeastern shores of the Sea of Okhotsk.



Sockeye Salmon *(Oncorhynchus nerka)*

DESCRIPTION

The body of the sockeye is elongate, the head is conical, and the teeth are small and weak. The average life span is four years, although it sometimes goes to five or six. The length at maturity averages about two feet, and the weight runs at about five pounds. Occasionally sockeye have been caught weighing up to 15 pounds. The scales are cycloid. The color is greenish-blue on the dorsal surface, which has a silvery sheen and is marked by fine black specklings. The head is metallic-green. The body of the male turns brilliant red towards the end of its life, and that of the female dark red with green and yellow blotches, and while on its way to the spawning grounds, the characteristic hook appears above the upper jaw of the male fish. The sockeye is third among the five salmon species in protein content and second in fat content.

MIGRATION AND REPRODUCTION

After hatching in tributary streams in the interior of British Columbia, the young sockeye descends to lakes where it spends one, often two and sometimes three years before migrating to the ocean from March to July, when huge schools of small fish leave the river mouths. Some go to sea as fry, including a race of sockeye which spawns in Weaver Creek, a tributary of the Harrison River, B. C.

In certain localities the sockeye has become "lake-locked", and spends its entire life in fresh water. In such cases it is known as kokanee, kickaninny, redfish or Kennerly's salmon.

In returning from the ocean to the inland areas where it was born, there to spawn and die, the sockeye's experience is the same as that of the other species.

METHODS OF CATCHING

The use of gillnets at the mouths of rivers is the most common method of taking sockeye, although a proportion of the annual catch is made in purse seines at the southern end of Vancouver Island. Relatively few sockeye are taken by trolling.

Nearly all the sockeye caught in British Columbia is canned, as it is best suited for this type of processing. The markets are worldwide, although the largest are on the North American continent. (A quantity of other kinds of salmon goes to the fresh and frozen fish markets, and some are mild cured, smoked, dry salted or pickled). Fishmeal and oil are made from the waste.

(Prepared by the Nanaimo Biological Station of the Fisheries Research Board of Canada).

Indian Fishermen Attend Course on Quality Control

The first course to be sponsored by the Nakina Indian Agency for Indian fishermen, was held recently in Geraldton, Ontario. The objective was to encourage groups of fishermen of the Objibway tribe to adopt improved methods of fishing and keep accurate records of their operations.

Experienced instructors of the federal Department of Fisheries used demonstrations and visual aids to present the importance of quality control of fish. A. D. Cameron, Geraldton Indian Agent, introduced C. D. Barrett, Senior Officer, and J. M. Cullen, Inspector for the Department of Fisheries.

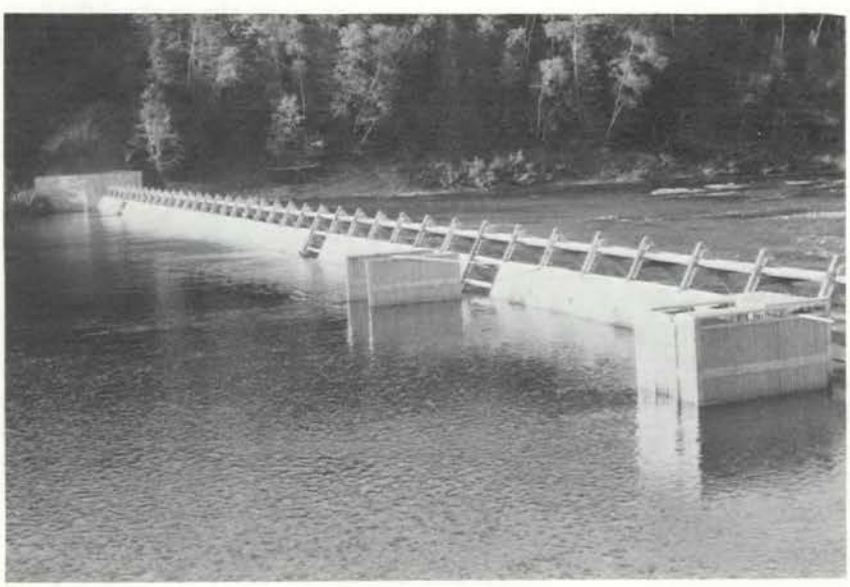
The class was composed of Indian fishery supervisors who represented the tribe of 3,500 Objibway Indians from the Central Patricia area of Ontario. In his opening remarks, Mr. Barrett said, "We want you to look upon the Department of Fisheries of Canada as a ready source of helpful information. To establish and maintain careful handling, processing and shipping of your fish, is vital to you and important to those who will buy your products. Quality control can mean the difference between a successful business or an expensive disappointment."

The group of Indian Fishery Supervisors represented 107 active fishermen who, in 1966, landed 185,000 lbs. of fish of which 110,000 lbs. were whitefish and 75,000 lbs. pickerel. This realized a gross of $28,500 for these fishermen. The fish from the area are sold to fish companies through tenders called on behalf of the group by the Department of Indian Affairs and Northern Development.

A group of the Objibway Indians who attended a fishery course at Geraldton, Ont., recently.

C. R. Scharf, Regional Superintendent of the Fort William Indian Affairs Education Division, said the course had created so much genuine interest among the participants that next year they hoped to extend it to a two-week period.

A similar course is planned for early presentation to the Cree, Objibway and Saulteaux tribes living around Big Trout Lake, 300 miles north of Sioux Lookout. The Department of Fisheries has again been asked to supply instructors to demonstrate and talk on quality control and the proper handling of fish.



Salmon Counting Fence

Photo at left shows a salmon counting fence at Indian River, Newfoundland, recently completed by the Resource Development Service of the federal Department of Fisheries. The 330 ft. structure can accommodate a 6 to 7 ft. rise in water levels. Provision has been made for installation of four counting traps to enumerate adult salmon as they migrate upstream. The fence will also be adapted to count downstream migrant smolts.

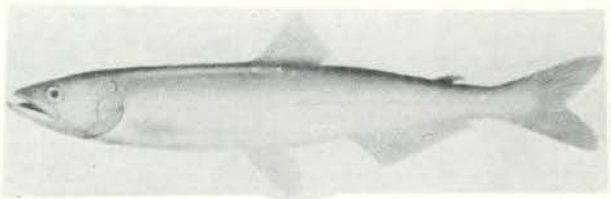
Eulachon, Anchovy and Pilchard

Eulachon

THE EULACHON *(Thaleichthys pacificus)* is a small delicate fish of the smelt family and supports one of the oldest fisheries in British Columbia. Eulachons are rich in oil and have been used by Indians for centuries either as food, or when dried and fitted with a wick of the inner bark of the cedar tree, as candles. The eulachon also forms an important source of food for birds, mammals and other fish.

Eulachons are bluish-brown in color, about 8 inches long and weigh only a few ounces. They have an adipose fin and fine parallel lines on the gill cover. The mouth is relatively large and during their marine existence it contains pointed teeth. These teeth are lost later during spawning runs into fresh water. The males do not attain as great a size as the females.

Although the eulachon is essentally a marine species it reproduces in fresh water, ascending the larger rivers (particularly the Nass and Fraser) during March-May to spawn. The male fish exhibit special breeding characteristics: lengthening of the fins, thickening of the bodywall muscles and growth of small, round swellings on the head and some scales. Most eulachons spawn towards the end of their second year, usually spawning but once and dying soon after. An average-sized female spawns about 25,000 eggs. The adhesive eggs are anchored to sand grains on the river bottom. The eggs hatch in 2-3 weeks and the infant fish drift down to the sea where they develop to maturity.



Eulachon *(Thaleichthys pacificus)*

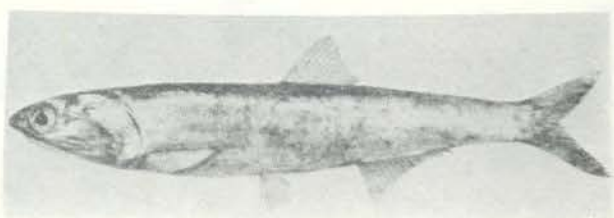
The present-day commercial fishery is of only minor importance and is limited to the Fraser River where eulachons are taken with drifting gill nets. The catch is used fresh or smoked and as food for fur-bearing animals. From 1958-62 the annual catch averaged 150 tons, worth about $26,000. The largest annual catch was in 1906 when 603 tons were taken. The coastal Indians have always placed a high value on eulachons as food, a source of light, medicine and for barter.

The name "eulachon" comes from the Chinook language of British Columbia's coastal Indians. Spellings that have appeared in print over the years include: hoolakan, hooligan, hoolikan, olachan, ollachan, oolachon, ollichan, oulachan, oulachon, oulacon, ulchen, ulichan, uthlecan and yshuh. Such variety is believed due to the difficulty the white settlers of different nationalities had in pronouncing the name. Eulachon are also known as candlefish.

Anchovy

The northern anchovy *(Engraulis mordax)* ranges from California to British Columbia. It is found in southern British Columbia inlets in limited numbers only and is of no great importance commercially. It is a pelagic fish, typically moving in schools and feeding largely on plankton.

The anchovy belongs to the *Engraulidae* family and is characterized by a very large mouth and large eyes near the tip of the snout. The 5-6 inch long body is spindle-shaped with metallic blue color-



Northern Anchovy *(Engraulis mordax)*

ing on the back shading into silvery sides. The anchovy was first recorded in British Columbia waters in 1866.

During the 1940's anchovies were quite abundant in the Strait of Georgia. Five million pounds of anchovies were taken annually from this region during World War II. The marketed value of anchovy products (mainly canned) in 1946 reached $600,000. After the war the inshore stocks of this species dwindled and no anchovies have been landed in British Columbia since 1954. Today, anchovy stocks are present in offshore waters but they are not particularly large. Reduction of anchovies to meal and oil is not profitable because of the low oil content.

Most of the anchovies taken in the fisheries during the 1940's were 3 to 4 years of age. Very few were older than 7 years or larger than 7 inches. The inshore stocks exploited in the 1940's appear to be distinct from offshore spawning populations. The latter stocks spawn many miles out to sea. Young anchovies have been found in the stomachs of tuna 200 miles offshore.

Anchovies mature in their third year and by June the females have ripened three batches of eggs. Multiple spawnings occur and about 150,000 eggs are liberated in 3 or more batches each year. The eggs are colorless and hatch near the surface about 62 hours after fertilization.

Little information exists on the size and distribution of present anchovy stocks in British Columbia, but it would appear very unlikely that catches as large as those made during the 1940's would be possible today.

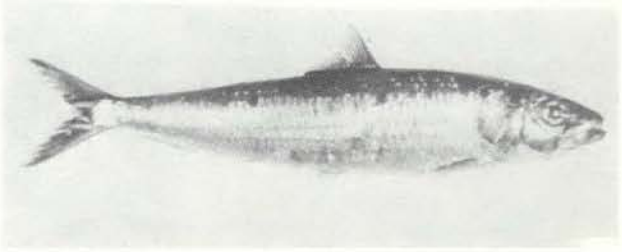
Pilchard

The pilchard or Pacific sardine *(Sardinops sagax)* formerly supported a fishery averaging 62,000 tons annually on the west coast of Vancouver Island. Since 1947, however, there have been only scattered reports of the presence of this species off the British Columbia coast.

The pilchard is a moderate-sized fish 9 to 10 inches long, of the herring family. The body is round in cross-section with black spots on the back and sides of a steel-blue upper body. The young of the pilchard is regarded in some countries as the true sardine, as the latter name was first applied to the young of the Mediterranean pilchard caught off the Island of Sardinia.

Pilchards are highly migratory. Tagging experiments along the west coast of the United States showed a definite north-south migration pattern with older fish reaching British Columbia waters. The centre of pilchard abundance lay off southern California, but in the 1920's and 1930's, when stocks were plentiful, adult pilchards migrated northward each year in sufficient numbers to provide a summer, purse-seine fishery off the British Columbia coast.

In the 1940's a southward shift in the centre of the spawning population to off Baja California, apparently occurred. This shift coupled with heavy exploitation and poor spawning seasons reduced the pilchard stocks to the point where by 1947 few fish reached the British Columbia coast, and the pilchard eventually disappeared from Canadian waters. Between 1927 and 1947 the Canadian



Pilchard *(Sardinops sagax)*

pilchard landings exceeded 80,000 tons three times and three times they were less than 5,000 tons. Nearly all of the catch was reduced to fishmeal and oil.

Spawning takes place in a large area within 100 miles of the coast off southern California and off Baja California, from March to May. The eggs float freely near the surface. Each female spawns several times in one season liberating 50,000 eggs per season.

The pilchards may return to Canadian waters if the centre of spawning shifts northward and if the stocks regain some of their former abundance.

(Prepared by the Nanaimo Biological Station of the Fisheries Research Board of Canada).

News Roundup

Mollusca Symposium

Scientists from all over the world have been invited to submit background papers and contributions for presentation at a Symposium on Mullusca, to be held January 12-16, 1968, at Cochin/Ernakulum, India.

In announcing the symposium, the Marine Biological Association of India points out that recent studies on various aspects of taxonomy and bionomics have helped enhance understanding of the mollusca group. However, to review the work done so far, to discuss present problems and plan for future programs on a global basis it has been considered useful to hold a symposium on various aspects of systematics, biology and fishery of molluscs.

Papers are invited on the following subjects: taxonomy, phylogeny and evolution, distribution, morphology and anatomy, general biology, reproduction, early development, ecology and behaviour, physiology, boring and fouling molluscs, parasitism and commensalism, culture, economics and fishery, and review.

All correspondence should be addressed to: The Convenor, Symposium on Molluscs, Marine Biological Association of India, Mandapam Camp, Ramanathapuram District, South India.

A fully-equipped demonstration kitchen was recently opened at the federal Department of Fisheries regional headquarters building at St. John's, Nfld. Miss Catherine O'Brien, consumer consultant, is shown preparing for a cooking demonstration.

Fish Culture Pioneer

James A. Rodd, one of the pioneers of fish culture in Canada, died at Charlottetown, P. E. I., recently at the age of 87.

James Rodd

Mr. Rodd, a native of Milton, P. E. I., joined the federal Department of Fisheries (then the Department of Marine and Fisheries) in 1901 and was appointed Director of Fish Culture in 1914 -- a position he held until his retirement in 1947.

He was the first Canadian to be elected president of the American Fisheries Society, was a member of the Fisheries Research Board of Canada, and a fellow of the Canadian Geographical Society. He was awarded the Imperial Service Order in the 1946 King's Honour List.

Lobster Licensing

Licences to engage in the lobster fishery in the southern Prince Edward Island portion of District 7B, extending from East Point to Victoria Harbour, will be limited this year to persons who held such licences in 1966, federal Fisheries Minister H. J. Robichaud has announced.

Exceptions to this limitation may be made where there are extenuating circumstances which will be examined in co-operation with representatives of fishermen. The lobster fishing season in that district extends from May 1 to June 30.

This action follows the imposition of both licence and trap limitations announced recently by the Minister for the northern P. E. I. portion of District 7B, which extends from North Cape to East Point. However, after careful consideration it has been decided not to impose a limit on traps, for this year at least, in the above mentioned southern portion of 7B.

The action to impose the lobster fishing limitations is being taken at the request of a large majority of lobster fishermen and in consultation with the Fisheries Department of Prince Edward Island.

Mr. Robichaud also announced that no interchange of operations between the two areas will be permitted; that is, operators licenced for the north-P. E. I. portion of District 7B will not be permitted to fish lobsters in the southern portion and vice versa.

Fishery Figures For January

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May 1965 - Jan. 1966 '000 lbs	May 1965 - Jan. 1966 $'000	May 1966 - Jan. 1967 '000 lbs	May 1966 - Jan. 1967 $'000
CANADA - TOTAL	1,925,987	125,723	2,141,225	137,390
ATLANTIC COAST - Total	1,478,262	83,004	1,681,945	82,423
Cod	504,306	20,840	476,160	20,771
Haddock	63,037	4,150	71,056	5,036
Pollock, Hake, Cusk, etc.	65,898	2,213	58,291	2,083
Rosefish	112,143	2,967	168,559	4,697
Catfish	3,927	129	4,010	133
Halibut	3,260	1,062	3.130	1,148
Plaice & Other Flatfish	196,138	6,198	234,153	7,643
Herring & Sardines	382,427	3,899	534,103	5,983
Mackerel	24,846	817	25,741	902
Alewives	12,084	202	8,068	141
Salmon	4,625	2,222	5,176	2,671
Smelts	3,229	235	2,730	238
Swordfish	7,628	3,144	7,260	3,109
Other Fish	15,007	603	14,191	496
Lobsters	37,642	24,210	35,114	20,221
Clams & Quahaugs	3,449	206	4,236	248
Scallops	16,772	9,071	14,580	6,051
Other Shellfish	21,844	836	15,387	852
PACIFIC COAST - Total	447,725	42,719	459,280	54,967
Pacific Cods	18,772	1,391	19,511	1,750
Halibut (1)	31,343	10,615	30,829	11,046
Soles & Other Flatfish	5,322	341	9,178	579
Herring	287,674	4,277	224,333	3,715
Salmon	85,717	24,764	152,569	36,244
Other Fish	6,774	225	10,586	446
Shellfish	12,173	1,106	12,274	1,187
BY PROVINCES				
British Columbia	447,725	42,719	459,280	54,967
Nova Scotia	498,105	39,523	583,910	37,293
New Brunswick	268,048	9,819	317,800	10,304
Prince Edward Island	45,997	6,819	57,716	5,983
Quebec	137,490	6,186	132,244	6,437
Newfoundland	528,622	20,657	590,275	22,406

(1) - Includes halibut landed in U.S. ports by Canadian fishermen.

MID-MONTH WHOLESALE PRICES - January 1967

		Montreal $	Toronto $
Cod fillets, Atl, fresh, unwrapped	lb.	.376	.447
Cod fillets, Atl, frozen, cello 5's	lb.	.340	.397
Cod fillets, smoked	lb.	.408	.473
Haddock fillets, fresh, unwrapped	lb.	.484	.580
Herring, kippered, Atl.	lb.	.258	.333
Mackerel, frozen, round	lb.	.192	.260
Lobsters, canned, Fancy	case 48-½s	60.927	62.233
Sardines, canned	case 100-¼s	9.695	9.567
Halibut, frozen, dressed	lb.	.566	.620
Silverbright, frozen, dressed	lb.	.595	.633
Coho, frozen, dressed	lb.	.766	.813
Sockeye, canned, grade A	case 48-½s	27.430	28.640
Pink, canned, grade A	case 48-½s	16.497	17.067
Whitefish, fresh	lb.	.460 1/	.423
Lake trout, frozen	lb.	.444	.513

1/ - Dressed.

PRICES PER CWT. PAID TO FISHERMEN

	1966 $	1967 $
Halifax		
Cod Steak	5.25	5.25
Cod Market	5	5
Haddock	8.5	8.5
Plaice	4.5	5
Yarmouth		
Haddock	-	-
Black's Harbour		
Sardines	-	2
St. John's Nfld.		
Cod	-	-
Haddock	-	-
Rosefish	2.5	-
Vancouver		
Ling Cod	-	12
Gray Cod	-	7.5
Soles	-	8.5
Salmon (Rdspg)	-	5

Fishery Figures For January

FROZEN FISH STOCKS AS AT END OF DECEMBER

	1965	1966
	'000 lbs	'000 lbs
TOTAL - Frozen Fish, Canada	70,495	93,938
Frozen - Fresh, Sea Fish - Total	46,559	68,415
Cod, Atlantic, Fillets & Blocks	3,744	13,062
Haddock, fillets & blocks	2,002	3,812
Rosefish, fillets & blocks	3,603	7,464
Flatfish, (excl. halibut), fillets & blocks	5,493	8,327
Halibut, Pacific, dressed & steaks	6,812	8,502
Other Groundfish, dressed & steaks	1,106	2,427
Other Groundfish, fillets & blocks	4,226	6,729
Salmon, Pacific, dressed & steaks	7,545	8,509
Herring, Atlantic & Pacific	412	536
All Other Sea Fish, all forms	5,760	5,695
Shellfish	5,856	3,352
Frozen - Fresh, Inland Fish - Total	7,852	8,669
Perch, round or dressed	521	285
Pickerel, (Yellow & Blue) fillets	343	1,373
Sauger, round or dressed	420	1/
Tullibee, round or dressed	112	288
Whitefish, round or dressed	2,035	1,794
Whitefish, fillets	512	314
Other, all forms	3,909	4,615
Frozen - Smoked Fish - Total	1,423	1,376
Cod Atlantic	529	689
Sea Herring, kippers	625	380
Other, all forms	269	307
Frozen for Bait and Animal Feed	14,661	15,478

1/ Confidential, incl. with "Other"

SALTED FISH STOCKS AS AT END OF JANUARY

Salted and Pickled Fish, Atlantic Coast		1966 '000 lb.	1967 '000 lb.
Wet-salted - Total		16,820	14,036
Cod		15,232	12,993
Other		1,588	1,043
Dried - salted - Total		11,622	15,847
Cod		10,759	14,422
Other		863	1,425
Boneless - Total		907	467
Cod		804	453
Other		103	14
Pickled - Total	(barrels)	17,020	12,751
Herring	"	12,277	6,436
Mackerel	"	1,329	3,433
Alewives	"	3,414	2,745
Turbot	"	-	137
Bloaters	(18 lb. boxes)	90,712	51,423
Boneless Herring	(10 lb. boxes)	811	380

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS, MAY-OCTOBER

(Value in Thousands of Dollars)

	1965		1966	
Total Exports		118,896		127,919
By Markets:				
United States		89,054		89,422
Caribbean Area		8,998		9,563
Europe		17,463		24,385
Other Countries		3,381		4,549
By Forms:				
Fresh and Frozen		86,710		88,701
Whole or Dressed	25,484		29,706	
Salmon, Pacific	6,417		9,812	
Halibut, Pacific	4,403		4,186	
Cod, Haddock, Pollock, etc.	211		266	
Swordfish	3,360		3,460	
Other Seafish	3,597		4,750	
Whitefish	2,771		2,636	
Pickerel	1,948		1,730	
Other Freshwater Fish, n.o.p.	2,777		2,866	
Fillets	38,898		39,761	
Cod, Atlantic	15,527		11,507	
Haddock	3,094		4,081	
Rosefish, Hake, Pollock, etc.	3,037		5,530	
Flatfish	5,734		8,096	
Pickerel	1,646		2,104	
Other	9,860		8,443	
Shellfish	22,328		19,234	
Lobster (Alive & Meat)	16,092		14,178	
Other	6,236		5,056	
Cured		10,882		11,547
Smoked	1,007		1,084	
Herring	618		690	
Other	389		394	
Salted, Wet & Dried	8,247		8,912	
Cod	6,852		7,473	
Other	1,395		1,439	
Pickled	1,628		1,551	
Herring	1,079		966	
Mackerel	301		330	
Other	248		255	
Canned		11,807		16,471
Salmon	6,880		10,973	
Sardines	2,431		2,552	
Lobsters	1,773		1,947	
Other	723		999	
Miscellaneous		9,497		11,200
Meal	5,085		5,558	
Oil	1,276		496	
Other	3,136		5,146	

Australia Searches for More Prawns

Giant prawns caught around the Australian coast are becoming one of Australia's most profitable exports. Here part of the night's catch is being inspected before weighing at a fishing co-operative in New South Wales.

An electronically-equipped fishing research vessel to explore prawn beds off the Australian continental shelf is being designed in Australia. The vessel will also test equipment for fishing at depths not previously worked in Australian waters.

The search for prawns around Australia has intensified during the past few years as king prawns particularly have become an important export item. In 1961, the nation's total prawn exports amounted to a little more than 127,000 pounds valued at about $A82,000.

The main buyers were the U. S. A., France and Japan. However, in 1964, Japan alone imported just over one million pounds of Australian prawns at a cost of more than $A800,000. Today, Japanese gourmets are enjoying nearly $A1,000,000 worth of prawns a year.

Several years ago a university biologist, Dr. A. A. Racek of Sydney, discovered evidence of untapped prawning grounds several miles off the New South Wales coastline at a depth of 130 fathoms. With primitive gear he took up to 500 pounds weight of prawns in a single haul.

The New South Wales State Government now wants its scientists to determine the extent of these beds -- how many prawns they are likely to yield and the techniques necessary for the work.

The new research vessel is being designed with these factors in view and also to search for any species of prawn not yet exploited commercially. Its electronic equipment will be of a type similar to that employed by the naval services during the Second World War and will search below and in front of the vessel.

The vessel also will have the most modern hydraulic trawling winches and derricks. There will be purse seining and mid-water trawling facilities not yet used by any Australian fishery, and exploratory work will be carried out with otter trawls, gill netting, line fishing and trap fishing in deep water.

The vessel will be 80 feet long and of 170 tons displacement, and it is being designed by Sydney consultatnts in naval architecture and marine engineering. A world authority on fishing and research, Mr. Jan Olaf, who is with the United Nations in Rome, also is being consulted.

The area in which this search for prawns will take place is virtually unknown as far as the Australian industry is concerned. It is part of the continental shelf and extends from 10 to 20 miles off the New South Wales coast and to a depth of about 100 fathoms. It then dips sharply to an average depth of 2,500 fathoms between Australia and New Zealand, reaching a maximum of 3,250 fathoms. ✔

If undelivered return to:
Department of Fisheries of Canada
OTTAWA

CANADA
POSTAGE PAID
PORT PAYÉ

DEVELOPMENT OF SPAWNING CHANNELS HELPS MAINTAIN SALMON RUNS. On both coasts the Federal Department of Fisheries is vitally concerned with the maintenance of salmon stocks. One of the most important activities is the construction and supervision of spawning channels. In addition, the Department is engaged in construction of "fishways" and the clearing of obstructions to allow salmon access to headwater spawning grounds. Investigation and correction of pollution problems is also a continuing activity.

DEPARTMENT OF FISHERIES
Hon. H. J. Robichaud, M.P., Minister — Dr. A. W. H. Needler, Deputy Minister — Ottawa, Canada

ROGER DUHAMEL, F.R.S.C., Queen's Printer and Controller of Stationery, Ottawa, 1967

FISHERIES

(formerly Trade News) OF CANADA

Vol. 19 No. 11 May, 1967

In This Issue

- Potential of Seaweeds Under Study
- Fisheries Developments in N.E. Pacific
- 'Fish Flour' Possible New Industry

Department of Fisheries of Canada, Ottawa

FISHERIES OF CANADA

(formerly Trade News)

Editor

E. H. HEARNDEN

May, 1967

CONTENTS

FEATURES

COVER PHOTOGRAPH - Shown docked at Port Dover, Ont, the 75-ft. "G.W. Jackson" is an example of the latest type of fishing vessel in use on Lake Erie. Built at Dunnville, Ont. in 1963, the "G.W. Jackson" is powered by two 200 h.p. diesel motors and is equipped with radar and depthsounder. Last year the vessel landed about 262 tons of perch out of gill nets as well as close to half a million pounds of smelt in trawling operations.

Government, Industry & Science Study Potential of Seaweeds

THE MARINE plants of Canada's tidal waters, which already provide dozens of different ingredients used in the food, pharmaceutical and textile industries and in agriculture, are undergoing intensive study by both government and industry to determine their further possibilities.

The extent of the seaweed resource, its potential and its possible cultivation were considered at a meeting held in Halifax, April 5-6, of representatives of federal and provincial governments and of processors from Canada, the United States and Europe.

At the present time the seaweeds of Canada's Atlantic coast are worth about $1 million a year in supplemental income to commercial fishermen and farmers. However, it was agreed at the meeting that the resource is under-utilized and that it has extremely valuable possibilities as a cash crop.

Marine plants play an important part in the manufacture of toothpaste, jellies and milk products -- carrageenin produced from Irish moss is a stabilizer that can keep the chocolate in chocolate milk from sinking to the bottom, and it produces a smooth, creamy mixture in ice cream by preventing the formation of ice crystals during the freezing process.

Extracts from seaweeds are also used in puddings, gravies, laxatives and for clarifying beer. Cake flour, wall paint and sizing, laundry starch and hairdressing materials are some of the other products in the manufacture of which seaweeds play a part.

HIGH PROTEIN CONTENT

Certain plants have a high protein content and provide valuable additives to animal feed. In Japan, seaweeds provide an important part of the diet of the human population. More than 100 species of marine and fresh water algae may be purchased there plain dried, dried after special processing with seasonings, or canned. They are eaten in soup or with rice and sometimes with fish.

Scuba divers obtain seaweed for research project.

The chairman, L. S. Bradbury, Ottawa, Director of the Industrial Development Service of the federal Department of Fisheries, which sponsored the meeting, said that surveys of some of the marine plant resources have been undertaken under federal-provincial cost-sharing programs, and others are planned. He said that the Department has also initiated special studies to find out what progress other countries are making in the development of the marine plants industry. He pointed out that modern technology is finding more and more ways to utilize the products and by-products of seaweeds. The purpose of the meeting was to consider further steps which might be taken to encourage and make possible the maximum and orderly development of the industry.

Representatives of all five Atlantic coast provinces and British Columbia reported on the surveys

that have been made or are planned to estimate the possibilities of the marine plants resource, and on methods of harvesting, drying and other preparatory processes carried out before the product is sold for extraction or other purposes.

Scientists of the Fisheries Research Board of Canada, the Nova Scotia Research Foundation and the National Research Council discussed the various species of plants which have commercial possibilities.

EXPERIMENTAL STATION

Federal representatives reviewed the activities and outlined the program for the new marine plants experimental station at Miminegash, P. E. I. which is operated by the Fisheries Department's Industrial Development Service and which, it is hoped, will be of much value in furthering the development of the industry.

Standard methods and techniques for carrying out and reporting on surveys of marine plants should be developed, in the opinion of the representatives of industry at the meeting. This group also suggested that a central agency or service should provide the marine plants industry and other interested agencies with copies of all current studies and surveys relating to the resources and its industrial development, as well as a bibliography relating to all research and development work undertaken.

The industrialists asked that the federal station at Miminegash pursue the development of new and the improvement of existing harvesting equipment, methods and techniques. Industry also favoured the improvement of the quality of dried material at point of first sale, and indicated the willingness of various companies to work with each other in this matter.

The scientists present agreed that a greatly expanded research effort in the "fascinating and important field" of marine plants was desirable. They recommended that biological studies basic to the understanding of the possible sustained use of an algal resource should be conducted -- when to harvest, how much, how often and where permissible. They also suggested that survey methods and sampling techniques should be standardized.

The research group at the meeting further recommended that the studies undertaken should provide information for each separate species now exploited commercially and any exploratory work should provide information on potentially usuable new species. A detailed knowledge of the distribution of ages of plants and their abundance should be sought, and reproduction of the species must be understood both in respect of possible life history, actual sporic or sexual reproduction and, most important in many species, reproduction by perennation from holdfasts.

Another field for study, said the scientists, was the effect of harvesting methods on persistence, reproduction, possible succession and re-establishment of the species harvested, as well as the effect of harvesting methods on other species of algae and on animal life.

Biochemistry and related disciplines should be applied to further research to provide information in connection with marine plants, on halogenated organic compounds, sterols and other lipids, proteins, carbohydrates, antifouling agents, pharmaceutically active compounds, chitia and vitamins. Nutritional studies were recommended to investigate the possible use of different species and the products therefrom in animal nutrition and in food products for human consumption, also for the effect of secretion of algae in the food chain, algae for inclusion in diets of fish and shellfish to produce pigmentation, and certain algae as sources of flavours and odours in fish and shellfish.

USE AS FERTILIZERS

The evaluation of marine plant products as fertilizers was also recommended as a scientific project, as was the culture of seaweeds under controlled conditions. Control methods for certain species in some areas, such as eel grass in oyster beds, and a search for methods of encouraging the growth of more desirable species were also suggested, as were pollution studies to determine the concentration of pollutants in plants and the deleterious effects of pollution on the growth of plants. Oceanographic effects, like the change in currents due to man-made objects such as causeways, and natural changes on oceanographic conditions were also proposed as a field for study.

Miss Constance MacFarlane, of the Nova Scotia Research Foundation, Halifax, and a leading authority on marine plants, dealt with many problems associated with survey and research activities for the benefit of the meeting. She also gave a preliminary report, illustrating her talk with colour slides, on a recent visit she made to Japan for the federal Department of Fisheries to study the development of the seaweeds industry in that country.

Miss McFarlane said that in Japan seaweeds are used both as staple articles of food and as raw material for various extracts, which include agar, non-jelling colloids, alginates, carrageenin, mannitol and iodine. About 30 species of seaweeds are used in the manufacture of agar, which was a cottage industry for 300 years and is now partly factory based.

The Japanese have also cultivated marine plants for three centuries, and Miss MacFarlane described the methods she had seen. Some of these utilized concrete structures to extend natural beds, while others used seashells, ropes or nets to which spores can attach themselves. ✔

Recent Developments in Fisheries for Groundfish in N. E. Pacific *

By K.S. Ketchen

Fisheries Research Board of Canada, Nanaimo, B.C.

AS RECENTLY as 1953, the total annual production of groundfish (including halibut) from the northeastern Pacific (eastern Bering Sea to southern California) amounted to little more than 180 million lb. Canada's share that year was 25% or 45 million lb. Twelve years later, in 1965, Canadian production had increased to 76 million lb, but our share had fallen to a meagre 2.5%. In that year the total yield of groundfish reached a staggering 3,000 million lb or 1.4 million metric tons.

This report summarizes trends in the Canadian groundfish fisheries the past two decades, and reviews the recent explosive development of fisheries by other nations in the northeast Pacific.

Canada conducts two main kinds of fisheries for groundfish. The hook and line fishery accounts for all landings of halibut in British Columbia and some of the landings of blackcod, lingcod and assorted rockfishes. The trawl-net fishery exploits several species of flounders, Pacific (grey) cod, lingcod, rockfishes and a few others. (In accordance with one of the terms of a convention between the governments of Canada and the United States, trawlers are forbidden to land catches of halibut.)

The Canadian trawl fishery operates along the open coast of British Columbia from Juan de Fuca Strait to Dixon Entrance, as well as in adjacent sheltered waters. It came into prominence in the early 1940's in response to a strong demand for dogfish liver (vitamin A) and improved markets for foodfish. By 1950 the fishery for dogfish had declined to an insignificant role. However, the fishery for foodfish continued to grow, though rather slowly. During the decade ending in 1963, production varied around 20 million lb annually (Fig. 1). Then came a rapid expansion, with particular interest in Pacific cod (also called grey cod, a close relative of the Atlantic cod). By 1966, the total landings of cod and other foodfish had more than doubled, reaching about 50 million lb.

In the line fishery, where the principal attraction is halibut, Canadian set-line vessels range over a much longer extent of the coast-all the way from southern Vancouver Island to the Bering Sea. Since 1945, landings of line-caught fish have followed an upward trend (Fig. 2). Increased landings of halibut have more than offset decreased production of blackcod and others including lingcod which is caught mainly with hand-line gear. The annual catch of halibut in waters of the east of Bering Sea is closely controlled by the International Pacific Halibut Commission. During the past two decades there has been a general increase in catch limits for North American fishermen and at the same time Canada has taken an increasing share of the total production. For example, in the years 1945 to 1947, the total catch of halibut averaged 57 million lb annually, 34% of which was landed by Canadian vessels. In contrast, the average catch between 1964 and 1966 was 62 million lb and Canada accounted for 53%.

In summary, the Canadian fishery for groundfish has increased substantially during the past two decades. Production of foodfish by trawl and line vessels stood at an all-time record of 85 million lb in 1966, or more than double that in 1945 (35 million lb). Much of the increase has occurred since 1963 and largely as a result of the expanded trawl fishery for Pacific cod. An increased Canadian share of the annual halibut catch has also been a contributing factor.

The principal United States fisheries for groundfish are conducted by trawl and line vessels. Their trawl fisheries extend from southern Cali-

*This report is issued as Circular No. 79 by the FRB Biological Station, Nanaimo.

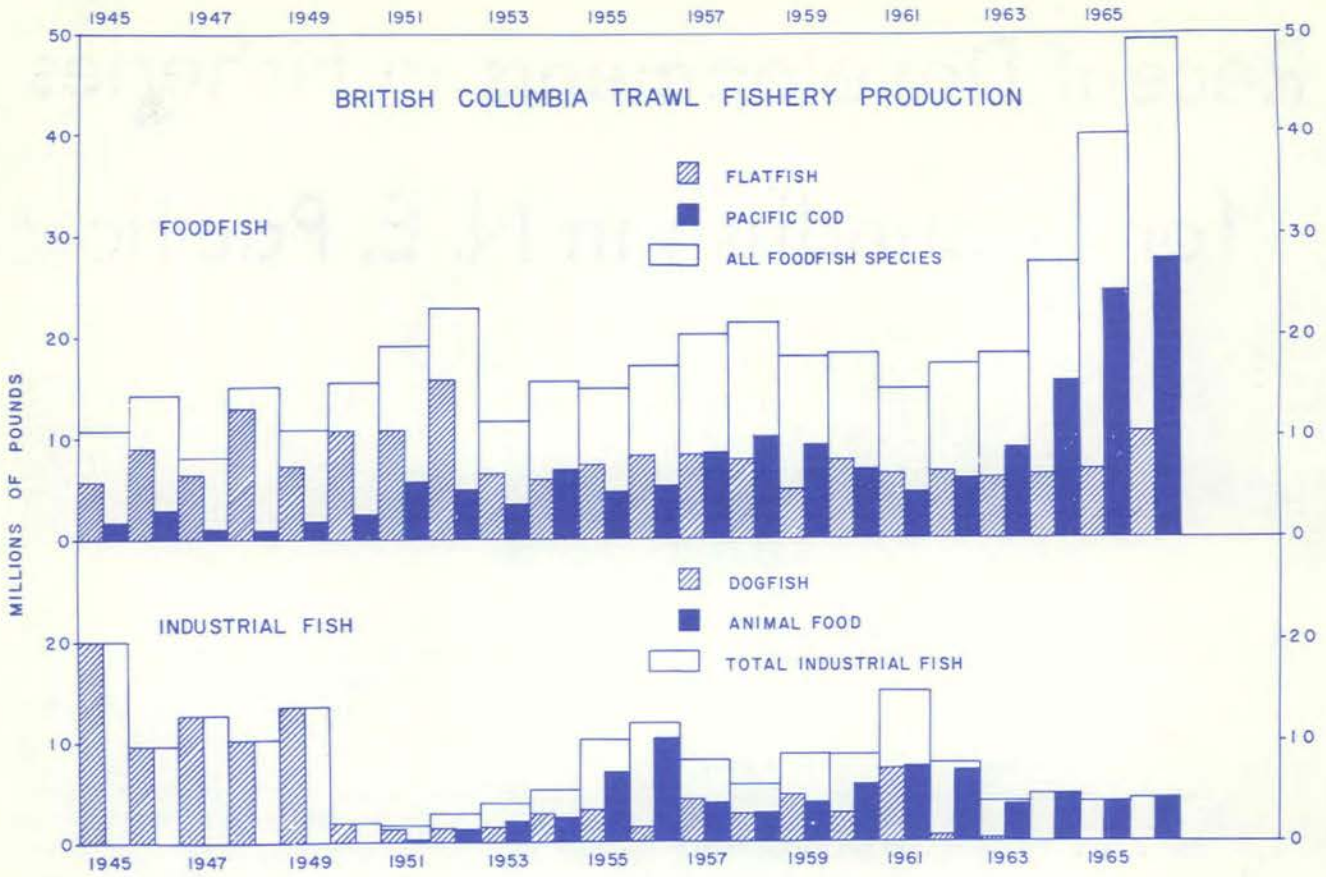


Figure 1

fornia to Dixon Entrance. The major catch by line gear consists of halibut, taken mainly from waters adjacent to British Columbia and northwestward to Bering Sea. There is also a modest line fishery for blackcod from California to southeastern Alaska.

Total production by the United States trawl and line fisheries has shown some increase since 1945 from about 140 to 160 million lb per year (Fig. 3). Although landings by trawlers reached an all-time high of 121 million lb in 1965, the increase in recent years has not been as spectacular as in Canada. Lower-than-average production by the line fishery (particularly of halibut) kept the 1965 total slightly below the record of 160 million lb achieved in 1957.

For the past two decades trawlers from the State of Washington have been actively engaged in fishing along the British Columbia coast. They tend to operate in deeper waters than are fished by Canadian vessels, and the bulk of their catch now consists of rockfishes, amongst which the Pacific ocean perch plays a dominant role.

Since 1956 the catch by United States trawlers operating off British Columbia has averaged about 26 million lb per year, representing 53% of the total trawl production from that region. In 1965, the latest year for which there are comparable figures, United States production rose to a new high of 36 million lb, parallelling the expansion of the Canadian trawl fishery, but with emphasis still on the deepwater species of rockfish. Thus, the total landings of trawl-caught groundfish (by North American fishermen) from waters off British Columbia reached a record 80 million lb. Preliminary information suggests that this record was broken again in 1966.

To summarize developments in the trawl and line fisheries conducted by North American nationals, production of halibut and other groundfish destined for foodfish markets reached an all-time high of about 230 million lb in 1965 -- 30% more than in 1945. Substantial though this yield may appear to North American eyes, it pales in comparison with developments in the fisheries by Japan and the USSR.

JAPANESE AND SOVIET FISHERIES

As of 1953, there remained in the Northern Hemisphere only one major region in which the resources of groundfish (other than halibut) were essentially untapped. This involved the continental shelf around the great arc of the North Pacific from Dixon Entrance to the northwestern shores of Bering

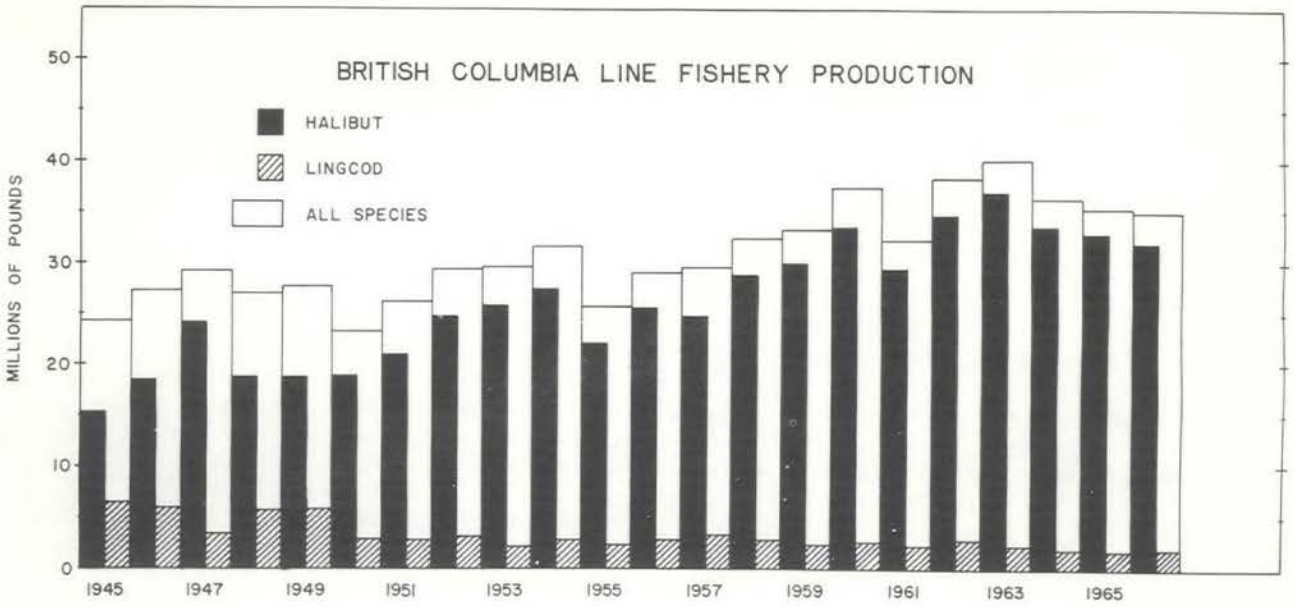


Figure 2

Sea. Although a North American based fishery for cod flourished for several decades around the turn of the century in western Alaska, Japan was the first nation to launch a major trawling operation. Her fishery began in 1954 and expanded rapidly on the rich fishing grounds of eastern Bering Sea. She was joined by the USSR in 1959, and by 1961 the groundfish production of these two nations in Bering Sea had reached an estimated 2,000 million lb (944,000 metric tons). In that year nearly 60% of the world catch of flounders came from the northeast Pacific and the bulk of this was yellowfin sole from eastern Bering Sea.

As a result of heavy exploitation during the late 1950's and early 1960's, the yellowfin sole stock declined rapidly. By 1963 Japan's catch of that species was only 20% of the record achieved in 1961. The decline of this fishery caused a temporary recession in total production in 1963 (as indicated in Fig. 4), and stimulated a shift to alternative fish supplies.

Japan turned to other previously unutilized species in Bering Sea (e.g., Alaska pollock) and at the same time launched a comparatively small commercial operation south of the Alaska Peninsula and in the Gulf of Alaska (Table I). Although the USSR continued to fish heavily in Bering Sea, she engaged in a major expansion eastward in 1963 into the Gulf of Alaska, with further build-up of her fleet through 1965.

Unfortunately, details of the Soviet groundfish catch in the separate regions of the North Pacific are not available. However, it is believed that much of the increase in production in 1964 and 1965 was due to the eastward expansion into the Gulf of Alaska. In 1965 the Soviet plus Japanese catch in the whole North Pacific was 2,834 million lb while the production by all four countries reached an estimated 3,070 million lb (or 1.4 million tons) (Fig. 4).

About 1,200 million lb or 40% of the USSR-Japan total in 1965 consisted of Alaska pollock (whiting). Nearly half of this was taken by Japan in

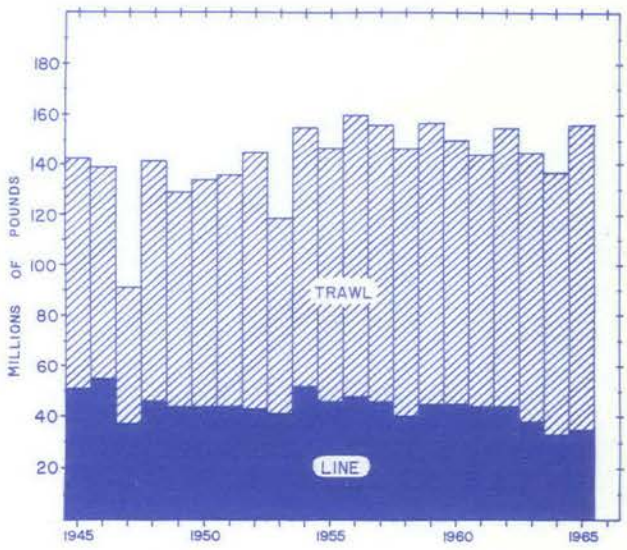


Figure 3. Production of groundfish by the trawl and line fisheries of the United States (California, Oregon, Washington and Alaska.)

eastern Bering Sea. About 1,050 million lb or 34% consisted of Pacific ocean perch and other rockfishes. Japan produced 102 million lb of rockfishes in Bering Sea and another 87 million lb in the Gulf of Alaska (the latter with a fleet of only 13 vessels). A large part of the remaining 860 million lb of rockfish reported by the USSR presumably was taken in waters along the Alaskan coast from Unimak Pass to Dixon Entrance. During the peak of activity in 1965, more than 150 Soviet vessels of various types were observed in that region.

SOVIET AND JAPANESE OPERATIONS OFF B. C.

The vanguard of the Soviet fishing fleet conducted scouting operations off the British Columbia coast as early as 1964. However, it was not until 1966 that a major segment of the fleet moved southward from Alaskan waters.

In addition to support vessels and freezer ships of various sizes, the Soviet fleet consists of three principal classes of fishing vessels:

large stern trawlers	:	BMRT class - 280 feet and 2470 gross tons
medium trawlers	:	SRTM class - 170 feet and 500 gross tons
small trawlers	:	SRT class - 130 feet and 260 gross tons

These are illustrated in Fig. 5.

The numbers of vessels engaged in fishing off British Columbia have varied from month to month but on occasion as many as 45 have been observed. Vessels of the SRT class are those most frequently sighted.

By way of comparison, there were 79 Canadian trawlers in operation during 1966, but only 39 fished for as long as 8 months. The average length of vessels in our fleet was 57 feet (52 gross tons); only 10 vessels exceeded 100 tons and none was as large as the smallest of the Soviet vessels.

Most of the Soviet activity is taking place along the outer edge of the continental shelf and interest appears to be focussed on the resources of Pacific ocean perch and other deep-water rockfishes. From January to March, 1966, a fleet of 38 to 45 vessel operated fairly steadily on previously unfished grounds off Dixon Entrance and the outer coast of Graham Island (Queen Charlotte group). From April to late autumn, some vessels

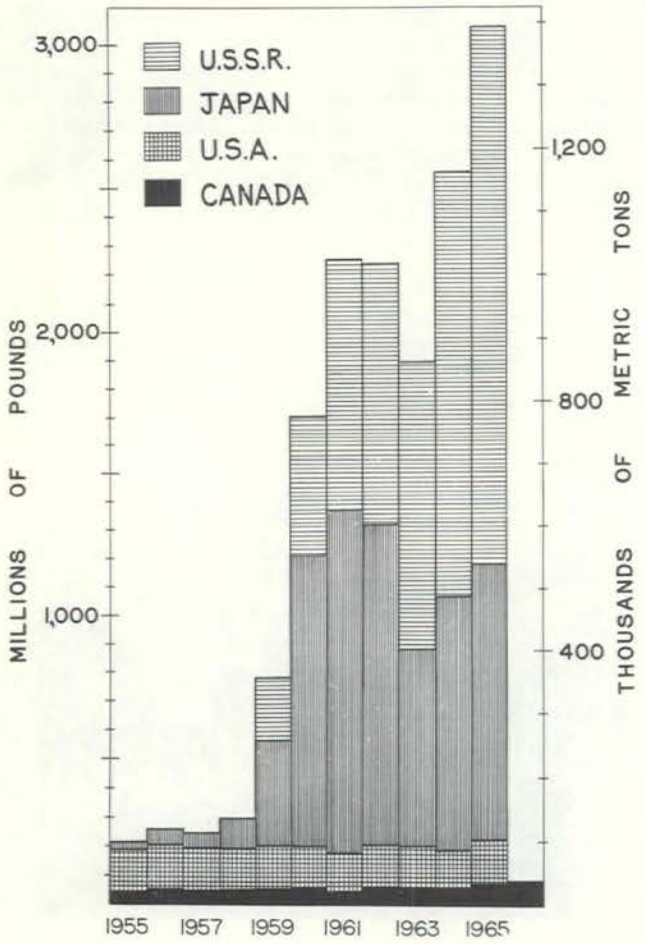


Figure 4. Estimated total production of groundfish by nations fishing in the northeastern Pacific Ocean including Bering Sea (see Appendix Note No. 4).

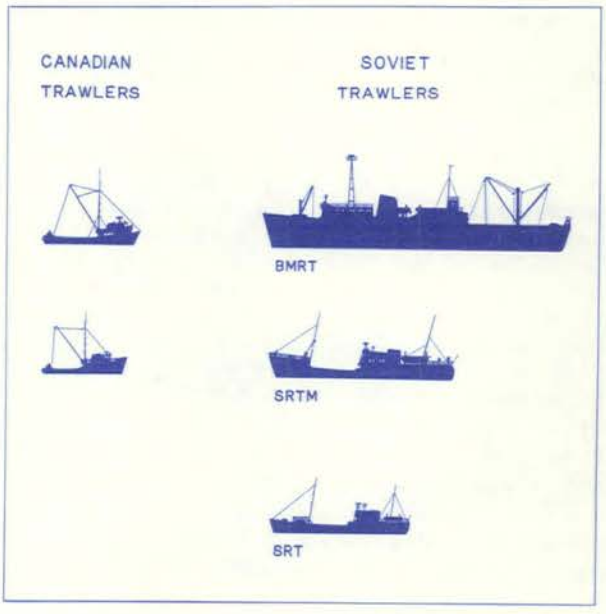


Figure 5. Three classes of Soviet trawlers operating off British Columbia compared with examples of the newest and largest Canadian trawlers.

operated in Queen Charlotte Sound and along the Vancouver Island coast. However, most of the fleet went south of British Columbia, off Oregon and Washington, apparently seeking rockfishes and hake (by August there were more than 100 vessels in that region). In December a fleet of about 40 trawlers turned northward again and concentrated in the vicinity of Queen Charlotte Sound. Subsequently, the main fleet moved still farther northward, but 4 to 12 vessels continued to operate in the approaches to Queen Charlotte Sound and on other grounds throughout the winter.

During 1966 several Japanese trawlers conducted commercial fishing operations for the first time off the British Columbia coast. However, the majority of the Japanese vessels licensed to fish south and east of the Alaska Peninsula (about 17) remained in the Gulf of Alaska.

FUTURE PROSPECTS

Canadian trawl fishermen understandably are concerned about prospects for further expansion of their operation. The marketing picture of the past two years has not lacked encouraging signs. The export market (to the United States) for cod and sole fillets improved greatly for a number of reasons, including the decreasing reliability of sources of supply in the North Atlantic. Though economic factors still prevented any really large expansion of the fishery for ocean perch and other rockfishes, Canada's competitive position in this field was improving steadily. Thus, the Canadian industry could have looked forward to even higher levels of production than that achieved in 1966. The untimely arrival of large fleets of foreign vessels, however, now makes the prospect for expansion less promising than they were, particularly with respect to ocean perch.

The rapid growth of the Soviet trawl fishery appears to have been accomplished largely by an eastward and southward expansion of operations along the North American coast. No information is available on possible changes in the yield from grounds in the Gulf of Alaska which have been heavily fished during the past three years. However, there is a suggestion that their fleet is finding it increasingly difficult to maintain its production without moving to new, previously unfished grounds. In other words, the appearance of the Soviet fleet off British Columbia may reflect declining fishing success on grounds off Alaska.

Of course decreased fishing success, of itself, does not necessarily mean that the resource is already being overfished. Normally, when a stock is first subjected to exploitation, fishing success is good because the fishery operates on accumulations of old fish. The initial catch per unit of fishing effort is high, and cannot possibly be maintained. Whether the initial annual yield can be sustained over the long term depends on the intensity of the early fishery and on the level of sustained yield of the stock, which has yet to be determined. Whether or not a nation can afford to continue fishing once the big accumulations have been removed depends on its economic costs of fishing.

The amount of fish removed by the Soviet

Year	Region	Flounders	Turbot	Pollock	Ocean perch	Shrimp	Other species	All species
1963	Bering Sea	94.6	63.8	250.0	41.8	64.8	83.1	598.1
	Gulf of Alaska	+	+	+	13.3	1.4	9.3	24.0
	Total	94.6	63.8	250.0	55.1	66.2	92.4	622.1
1964	Bering Sea	153.5	75.8	385.7	98.2	45.1	59.8	818.1
	Gulf of Alaska	+	+	+	29.4	5.2	8.9	43.5
	Total	153.5	75.8	385.7	127.6	50.3	68.7	861.6
1965	Bering Sea	79.0	16.7	501.1	101.5	19.4	45.2	762.9
	Gulf of Alaska	7.1	1.8	4.8	86.9	0.2	6.7	107.5
	Total	86.1	18.5	505.9	188.4	19.6	51.9	870.4
1966*	Bering Sea	88.8	22.6	510.3	74.1	6.5	61.6	763.9
	Gulf of Alaska	1.0	7.5	12.6	100.3	1.0	8.3	130.7
	Total	89.8	30.1	522.9	174.4	7.5	69.9	894.6

*To end of August, 1966 + Included under "other species"

Table I. Statistics of the Japanese fishery for groundfish in Bering Sea and the Gulf of Alaska (Figures in millions of lb).

fleet from waters off British Columbia during its major effort in 1966 may not be known for some years to come. Quite possibly it equalled or exceeded the combined total removals of groundfish by Canada and the United States from the same general region. Anyway, it is still too early to say what impact the Soviet operation has had on the fish resources along our coast. The pressure to date has been on stocks of ocean perch and other rockfishes--species which so far have played a minor role in the Canadian fishery, but a major one in that of the United States.

In 1966 the Canadian fleet landed more ocean perch than in any previous year (about 5 million lb from Queen Charlotte Sound) and fishing success seemed to be as good as in earlier years. However, it will not be until mid-1967 that we shall have some indication of the effect of the additional pressures which have been brought to bear by the Soviet operation.

Pacific cod, the current mainstay of the Canadian trawl fishery, occurs on shallower grounds than those where most of the foreign fishing effort is taking place. This species is being heavily exploited, but it is subject to sharp year-to-year variations in abundance due to natural causes. To maintain the present level of total groundfish production during lean years for cod, the fleet will have to turn to other resources of the continental shelf, such as rock sole, lemon sole and lingcod, which could provide somewhat greater yields than they do at present. There is a large potential in the resources of dogfish and turbot, but this will not be realized without a major breakthrough in technology and marketing.

So far as prospects for ocean perch and other deep-water species are concerned, the immediate future will depend a great deal on the intensity and duration of foreign fishing operations off the British Columbia coast. If the abundance of these species is reduced to what is for us an uneconomic level, there will be little incentive for Canadian expansion to deep-water fishing grounds. Under the same circumstances, however, the United States might be forced to vacate the deep water and compete more heavily with the Canadian fleet on inshore banks. This would add to the difficulties of maintaining or expanding Canadian production.

On the other hand, the Soviet and Japanese fleets, faced as they are with large capital investments and high costs of operating at great distances from home ports, may have to press onwards to other resources from which the "cream" has yet to be skimmed. The Soviet fishery for hake is in an early stage of development, and interest is evident in such species as saury and anchovy. Possibly the potential of these pelagic fisheries will deflect attention from the continental shelf region and allow for further growth of the Canadian fishery.

The alternatives facing the Canadian fishery, namely (i) to diversify and increase production of species which for one reason or another are not likely to be utilized by other nations, or (ii) to expand into the deep water in competition with foreign fleets, have been mentioned without reference to the possibility of some kind of international agreement. Although there are several fishery conventions applying to the North Pacific, there is none which includes all of the four nations currently engaged in the fishery for groundfish. If some forum were arranged, all four would presumably subscribe to the principle that the fishery should be regulated on the basis of maximum sustainable yield. It would be much more difficult, however, to reach agreement on an estimate of that yield and on how it should be shared amongst the competing nations. The basis for such sharing presumably would have to include some recognition of the special interests of the coastal state and of the need for an arrangement which would permit the fishery of the coastal state to operate within prevailing cost structures. These problems are not insurmountable, but at the same time they are unlikely to be solved very quickly. For this reason it is difficult to predict what the near future has in store for the Canadian fishery.

Certainly over the long term, prospects favour the country which is closest to the resource and in this we may take heart. Nevertheless, it would seem to be important that the Canadian industry, assisted where necessary by government, should give careful consideration to ways and means of making best use of resources which are likely to remain available in years to come. Development of a reputation for high quality at all levels of production is one approach. Another is the development of new products from species already utilized or from those which currently hold no attraction. In short, attention to quality and variety of production, as opposed to sheer volume, would seem to offer significant opportunity for continued growth of the Canadian fishery.

SOURCES OF STATISTICAL INFORMATION

Canadian Fishery (Fig. 1 and 2): Statistical circulars of the Fisheries Research Board (Nanaimo), the Department of Fisheries "blue book" and annual reports of the International Pacific Halibut Commission.

United States fishery (Fig. 3): Reports of the Pacific Marine Fisheries Commission, annual reports of the International Pacific Halibut Commission, annual reports of the Washington State Department of Fisheries and Fishery Statistics of the United States.

Japan (Fig. 4): The International North Pacific Fisheries Commission's Statistical Yearbook and

various unpublished documents submitted to that Commission by the Fisheries Agency of Japan.

USSR (Fig. 4): Food and Agriculture Organization of the United Nations: yearbooks of fishery statistics, bulletins of fishery statistics, and personal communications with officials of the Fisheries Division of FAO. Statistics of the USSR fisheries in the North Pacific, as published by FAO for the years 1961 to 1965, are totals for the entire region north of 40° north latitude. Thus, the data presented in Figure 4 for these years are known to include some production from waters of the western Pacific between Kamchatka and the north part of the Japan Sea. It is believed, however, that most of the production originated from Bering Sea and the northeastern Pacific. Figures for 1959, the first year of Soviet operations in Bering Sea, and for 1960 are approximations based on information obtained from scientists of the Fisheries Agency of Japan. ✔

Clarify Department's Position on Salmon Fishing in Strait of Juan de Fuca

Clarification of the position of the federal Department of Fisheries with regard to salmon angling and commercial fishing on the Canadian side of the Strait of Juan de Fuca was made recently by Deputy Minister of Fisheries Dr. A. W. H. Needler. Discussions on fishing in the area concerned took place on February 27 with the Amalgamated Conservation Society of Victoria, and in mid-March with representatives of the British Columbia Wildlife Federation and the United Fishermen and Allied Workers Union in Vancouver.

Dr. Needler emphasized that the Department recognized the importance of salmon angling in the Victoria area, and of the commercial enterprises associated with it. He also noted the downward trend of salmon catches by anglers while the commercial catches of coho were increasing in the Strait area.

The Amalgamated Conservation Society, and a number of its affiliated associations, strongly advocated a two-mile net-free corridor, exclusively for angling, along the Strait of Juan de Fuca. Dr. Needler pointed out that this would not produce the desired benefits for the following reasons:

1. Much of the angling in the early part of the year in the area of concern is based on resident stocks of salmon not seriously affected by the commercial fishery.

2. Net fishing is responsible for only one-quarter of the commercial coho catch in the approaches to Juan de Fuca Strait. The troll fishery is the major factor as it takes three-quarters of the coho catch. While both the troll and gill-net catches had shown sharp upward trends, this had not been the case with the purse seiners. The emphasis being placed by anglers on the net fishery is misleading, and holding the seiners responsible for the drop in angling catches is particularly unrealistic.

3. While there is no thorough detailed knowledge of coho movements in the Strait of Juan de Fuca, there is every reason to believe that there is considerable cross-Strait movement, and that coho do not move along parallel courses. This means that the proposed net-free corridor, if coupled with a compensatory increase in commercial fishing time (which some spokesmen for anglers suggested) gives no assurance of increased availability of fish for anglers in the Victoria area.

Dr. Needler pointed out that the stocks of coho in the area had never been higher than in recent years. It is clear, however, that commercial fishing in the immediate vicinity of angling does decrease the anglers' opportunity to catch fish, and the Department is giving careful consideration to closing in the near future Area 19, and possibly a small part of the eastern section of Area 20, to all commercial salmon fishing. Area 19 covers the Canadian part of the Strait of Juan de Fuca lying east from William Head on Vancouver Island to Curteis Point on Saanich Peninsula. Area 20 lies west of William Head. There are already similar restrictions in other British Columbia waters.

"Better knowledge of the movement of coho and their availability to the hook and line sports fisherman is an important requirement" said Dr. Needler, "and plans are being made to investigate the situation thoroughly in the hope that a solution can be found for the anglers' difficulty, which will not interfere with the important opportunity of commercial fishermen to catch all species of salmon in the strait".

"Anglers, commercial fishermen and the Department are all unanimous in wanting to keep incidental catches of immature salmon by the herring fishery at a minimum," said the Deputy Minister. He drew attention to the fact that when "pit-lamps" were in use it made it difficult to control the intensity of fishing for herring as the lamps were effective even when the herring stocks were at a low level. The incidental catches of salmon also increased when the lights were on. Now that there is a restriction in the use of these lights the catches of salmon, which were incidental to the main catches of herring, are being reduced.

Fish Protein Concentrate Seen Possible New Industry

By C.L. Mitchell *

IN MARCH 1967, the United States Food and Drug Administration approved regulations governing the inter-state sale of fish protein concentrate or "fish flour" as a food additive. Prior to this, the non-acceptance of this product for human consumption by the FDA was the main factor hindering the development of fish protein concentrate industries in many countries despite the great shortage of animal protein foods in the world. The new regulations by the FDA should therefore have world-wide repercussions especially for countries which at present are large fish meal producers since these probably have the greatest potential for fish protein concentrate production.

This article endeavours to look into some of the implications of these new regulations for Canada's fisheries in particular. In doing so, however, a short analysis will be made of the economic factors governing the production of fish protein concentrate; methods of production, the prospects for Canada's fisheries, and obstacles to its development.

It is reasonable to assume that the economic factors governing the market for fish protein concentrate will be similar to those of fish meal since it will be used in small quantities as an additive to a variety of foods which will enrich the protein content. It is estimated that two ounces of fish protein concentrate equals the protein content of a twelve ounce steak. (Tests conducted in the United States indicate that fish protein concentrate should not exceed 10% of the dried solid weight of prepared foods. The FDA regulations specify that when consumed by children up to 8 years, the amount of additive in their total diet shall not exceed 20 grams per day. See Federal Register Vol. 32, Number 22, p. 2.)

*Mr. Mitchell is with the Economic Research Branch of the Department of Fisheries, Ottawa.

As an additive, the demand for fish protein concentrate will depend on the demand for food in general especially in the underdeveloped countries with low-protein intake populations. It is reported that "about 2 billion of the 3 billion people on earth, including 50-70 per cent pre-school children, suffer from protein malnutrition. This type of malnutrition can produce mental retardation in children; even ordinary childhood diseases may be fatal to them. And about the year 2,000 the 3 billion people will be about 7 billion". (See Commercial Fisheries Review, Feb. 1967, Vol. 29, No. 2 Bureau of Commercial Fisheries, Dept. of the Interior, pp 1-3.) But demands for fish protein concentrate can also be high in the wealthier and more developed countries where such demands can emanate from food companies which could use fish protein concentrate in cereals, soup, bread, ice cream and desserts and in the whole gambit of low-cholesterol content foods.

The supply of fish protein concentrate will depend on (a) the volume of fish landings (b) the prices for the various fish species and (c) the competing demands for different uses of these species. For example, the fish protein concentrate industry will compete quite strongly with the fish meal industry for the use of large quantities of low-priced fish species. Fish protein concentrate can, in fact, be produced from fish meal derived from raw material by-products of the processing industry. This concentrate, however, will be lower in protein content than if whole fish were used. It would be expected that fish protein concentrate will be valued on the market, like fish meal, according to protein content.

The United States Department of the Interior plans to build two fish protein concentrate plants (one of which will be leased to a private company) to conduct necessary research on methods of production. The production method to be used in these plants is basically a method developed by the Hali-

fax Laboratory of the Fisheries Research Board of Canada. The big problem in the production of fish protein concentrate is the removal of fat which is done by isopropyl alcohol. The process involves the grinding of fish and treatment with the alcohol solvent to remove fats and moisture; separation of solids from liquids; distillation of the solvent which can be used again (this is the most difficult operation technically in the process); and the drying and grinding of the solid residue into fish flour. In this process fish oil can be recovered, as it is in fish meal production, as a by-product. It is estimated that six tons of fish are required to produce one ton of fish protein concentrate by this process.

The technical process for fish protein concentrate is not the same as the process for fish meal production. It is a more sophisticated operation requiring specialized equipment and therefore a more costly one. This implies that the establishment of fish protein concentrate processing plants will require heavy capital outlays and will be affected to a great extent by technological improvements which will increase efficiency and reduce production costs. There is no reason, however, why equipment for both fish meal and fish protein concentrate cannot be combined within one plant and we can expect to see combination plants being established in many countries.

PROSPECTS FOR CANADA'S FISHERIES

There are good prospects for the establishment of a fish protein concentrate industry in Canada's fisheries. These are based on the availability of technical knowledge on processing as a result of research work done by the Fisheries Research Board of Canada; the availability of adequate supplies of low-priced fish to be used as raw materials, and the likelihood that good returns will be attained, despite the initial high cost of plant and relatively high operating costs. This latter factor depends a great deal on how soon processing plants for commercial operations can be established in Canada to exploit Canada's initial advantages of technology and supply of raw materials. As is generally the case with the introduction of a new product, the first firms in the market usually profit most and this can also apply in the international market to countries. Commercial production of fish protein concentrate in the United States may be expected in about a year or so. Some countries such as the Union of South Africa, Chile and Sweden already have plants in operation and other countries such as Peru, Japan and other large fish meal producing countries are likely to establish plants quite soon.

In light of recent increases in herring landings in particular and the prospects for the herring fishery, it seems that Canada's fisheries should be able to provide adequate supplies of fish for processing into fish protein concentrate. Other species, of course, can be used such as hake (which the Americans are going to use) and probably other relatively low value and abundant species such as capelin, and mackerel. Landings of these species in Canada from 1964 to 1966 are shown in the following table:

Table I - Landings of Low Value Fish Species of Canada 1964 to 1966

	1964	1965 ('000 lb.)	1966
Atlantic Coast			
Herring	312,605	403,972	550,835
Hake	18,611	12,759	16,764
Capelin	11,034	10,505	10,937
Mackerel	23,908	24,855	25,718
Pacific Coast			
Herring	505,286	443,555	305,783
Canada Total	871,444	895,646	910,037

(Source: D. B. S. Fisheries Statistics.)

Although landings of other species have been relatively small in comparison with those of herring, this has been caused, to some extent, by the inability to utilize larger landings of these species economically. It is therefore believed that increased demands emanating from a new use would make greater exploitation of these species economically feasible. Fish protein concentrate production can provide this new use. Besides these species, there are also various small fish species which at present are not even landed but which might be adequate for the production of fish protein concentrate. The use of herring, however, as the main fish species in Canada would ensure that Canadian produced fish protein concentrate would be of high quality; besides this, the oil recovery would be great.

An advantage which Canada will have over the United States in the production of fish protein concentrate is that production costs should be lower since prices paid for fish by processors are generally lower in Canada than in the United States. A rough approximation or guesstimate of the production cost in Canada for producing one ton of fish protein concentrate is given in Table 2. This is based on the following assumptions: six tons of herring are required to produce one ton of fish protein concentrate; that herring for fish protein concentrate will be slightly higher in price than

Grinding fish in preparation for making fish protein concentrate.

Measuring pH of alcohol-fish mixture before extracting fat and water.

The fish-alcohol mixture is put in steam heated extraction kettle.

Stages in the Manufacture of Fish Protein Concentrate at the Halifax Laboratory of the Fisheries Research Board of Canada

Basket centrifuge is used to separate fish from alcohol-water-fat mixture.

Cake from centrifuge is broken up in hammer mill.

Drying the defatted cake on trays in dryer.

Table 2 - Production Costs per Ton, Canada: Fish Protein Concentrate

	Cost		Production
Cost of Raw Materials			
6 Tons herring at $25 per ton	$150	)	
		)	One Ton of
Processing Cost		)	Fish Protein Concentrate
$25 per ton of herring*	$150	)	
		)	
Production Cost	$300		per ton of fish protein concentrate
	15 cents a lb.		

* It is estimated that the processing cost of fish for fish meal production was $13 a ton. See Dr. B. Weinberg "Effects of Various Reduction Processes on Quality of Herring Meal & Oil," Canadian Atlantic Herring Fishery Conference. Fredericton, N. B. May 5-7, 1966. P. 15.

herring for fish meal production; and that processing costs per ton of herring for fish protein concentrate will be almost twice the price per ton for herring for fish meal production.

The Americans estimate that the market price for two ounces of fish protein concentrate would be about three cents. (Commercial Fisheries Review, op. cit. p. 1.) This indicates that the expected market price in the United States would be over $400 a ton. At this level, even making allowances for transportation costs and tariffs, Canadian producers should have little difficulty in catering to the United States market or in competing with United States producers on the world market.

OBSTACLES TO DEVELOPMENT

There are, however, certain obstacles which might affect the development of a fish protein concentrate industry in Canada's fisheries. Being a new product, the acceptance of fish protein concentrate by consumers might take some time and might involve promotional and advertising activities in the initial stages which would increase production costs. More important, regulations governing the marketing of this product might vary from country to country. These regulations could affect production methods and species of fish used which could further increase production costs. For example, the FDA regulations specify that the fish species to be used for fish protein concentrate should be hake or hake-like species which might rule out the marketing of fish protein concentrate from herring in the United States.

The blandness of fish protein concentrate might, however, be one of the most serious obstacles to its marketability in many of the less developed countries. A product which has a more distinctive flavour and which could act as a condiment would probably be far more acceptable to the majority of people in these countries. This indicates that it might be necessary to produce a flavoured fish protein concentrate for these markets. In fact, a high quality fish meal, fit for human consumption, would be cheaper and would probably be more suited to the needs of peoples in less developed countries than fish protein concentrate. This factor should not be overlooked at this stage.

There are also some problems of a technological nature which could affect fish protein concentrate production in Canada. These are to a extent interrelated with some of the economic problems mentioned in the previous paragraph. Technological knowledge on fish protein concentrate in Canada is confined mainly to small-scale production. The introduction of large-scale production will pose problems as regards size and capacity of plant, and the level of operation which will keep production cost per unit at a minimum thus ensuring best economic returns with the resources available.

In conclusion, it seems that Canada has the potential to become an important producer of fish protein concentrate. The realization of this potential, in view of certain problems which have to be surmounted, will depend on the overall demand for fish protein concentrate and market prices. It seems likely that this demand will be favourable since fish protein concentrate can be marketed in both the developed countries of the world and those less developed countries having substantial low-protein intake populations. ✔

News Roundup

Herring Bait Price Raised

The selling price of herring bait supplied to Newfoundland fishermen by the federal Department of Fisheries has been increased by one cent a pound, effective April 1, 1967. Herring bait, used largely in the lobster and halibut fisheries, will now be sold to fishermen at $3\frac{1}{2}$ cents a pound.

Under present conditions, no change is to be made in selling prices of squid and caplin used as bait in the Newfoundland fisheries for cod and other groundfish. Current prices charged by the bait service for squid (three cents a pound) and caplin ($1\frac{1}{2}$ cents a pound) will be reviewed in the light of market conditions in the late spring.

These price policies were based upon recommendations by a special committee established to make a thorough study of the Newfoundland Bait Service. Under terms of Newfoundland's 1949 union with Canada, the Federal Government is required to supply bait to fishermen in that province who are not adequately served by private enterprise. The service supplies approximately 5,000,000 pounds of bait to fishermen annually through 21 depots and 37 holding units. A specially designed vessel and refrigerated trucks deliver bait supplies from depots to the units located in fishing areas.

Bait stored in the federal depots is purchased from fishermen and frozen for later use as required. Following recommendations of the special committee, purchase prices for squid and caplin were established last summer, but the buying price for herring was maintained on a competitive basis.

Back to School

It was back to school for 24 Manitoba fishermen when they attended the annual short courses sponsored by the Department of Natural Resources of Manitoba.

Each year, an increasing number of fishermen make application to attend and it has become necessary to limit the two week instruction to those who have not taken the course previously. The class this year was selected from over 70 eligible applicants.

Manitoba fishermen being instructed in fish net maintenance.

The phases covered by lectures, visual and practical demonstrations included fish net care and maintenance; navigation; fire fighting; marketing; plant sanitation; fish quality and grading; fishing regulations and marketing.

Assisting the instructors and course leaders were federal Department of Fisheries Officers A.M. Walters and C. D. Barrett of the Central Region. L. Proctor, of the Department's Industrial Development Service, Ottawa, spoke on "Echo Sounders and Fish Finders for Inland Fishing Boats".

Financial Management Post

Gordon M. Sinclair, 35, has been appointed Director of Financial Management with the federal Department of Fisheries. In this newly-created position, Mr. Sinclair, will be responsible for directing the implementation by the Department of the financial and management control techniques recommended by the Royal Commission on Government Organization.

His duties will include supervising the programs of the Financial and Management Services branches of the Department, and advising senior officers on all staff matters of a financial nature.

Born and educated in Ottawa, Mr. Sinclair

graduated from Carleton University in 1952 with a bachelor of commerce degree. He received his diploma as a chartered accountant while with Price Waterhouse in Ottawa three years later. He moved to Toronto in 1958 to join Massey-Ferguson Limited.

In 1961, he joined Canadian Pargas Limited as executive vice-president in charge of Canadian operations, and two years later was transferred to the headquarters of the parent company, Pargas Inc., in Waldorf, Maryland. He was treasurer and controller with the company on receiving his present appointment.

Guest from India

V. N. Kagwade, 27, of India, has been a guest investigator at the Fisheries Research Board's Biological Station at St. Andrews, N. B., since January.

Mr. Kagwade, who comes from Bombay, India, holds an MSc. from the University of Bombay, and has worked for the Central Marine Fisheries Research Institute at Calicut. He came to Canada in 1964 and is a Ph. D. candidate at Carleton University, studying under Dr. John M. Anderson, Associate Professor in the Department of Biology. Mr. Kagwade holds a research grant from the National Research Council as well as a teaching grant from the University.

While in St. Andrews, Mr. Kagwade has studied the ability of fingerling Atlantic salmon to withstand changes in temperature after being exposed to minute quantities of DDT. There has been some indication that salmon in DDT sprayed areas may be dying when coming in contact with changing water temperatures. This work has been carried out in the laboratory of Dr. John Sprague, who heads the pollution studies at St. Andrews.

Aid to Uganda

Further Canadian aid for Uganda's fishing industry was announced recently. Under the External Aid program for East Africa's economic development, Canada has agreed to add a $25, 000 flake ice plant to the facilities already provided to the Lake Victoria industry. The plant will enable Uganda's fishermen to transport their catch to distant markets.

Canada's association with the tropical fishery began five years ago when fishing specialist Walter Steen, of Vancouver, B. C., was sent to Uganda by the External Aid Office to suggest ways of improving local techniques. Following his report, which recommended the purse seine method of catching fish, Canada gave a specially-designed $22, 000 boat and nets.

In 1963 a further survey was made by Dr. S. A. Beatty, retired director of the Fisheries Research Board laboratory in Halifax, N. S., who is now living in Madoc, Ontario. He discovered a way of turning a liability into a profit. A sardine-sized fish constituted 90 per cent of the catch from the lake but was too small and difficult to clean to be of any commercial value. Dr. Beatty devised a simple wire drum machine that would scale the fish automatically and then trained Ugandans to operate the equipment and assisted them in setting up a cannery.

The new ice plant will produce five tons of flake ice a day and despite tropical temperatures, will keep fish fresh up to six days.

Appointment

John P. Parkinson, 38, of Halifax, has been appointed Chief, Resource Development Branch, for the Maritime Region of the federal Department of Fisheries. He has been acting chief of the Branch since September, 1965.

J.P. PARKINSON

A native of Olds. Alberta, Mr. Parkinson graduated with a B. Sc. degree in Civil Engineering from the University of Alberta and in 1957 joined the Department's Fish Culture Development branch in Vancouver as an engineer. He was associated with the design and construction of such projects as the Robertson Creek salmon spawning channel and experimental flume, and the Big Qualicum River fisheries development program where flow control, temperature modification and spawning channels were built to enhance production of Pacific salmon.

In 1962 Mr. Parkinson transferred to the Department's regional headquarters in Halifax as Chief Engineer of the fish culture branch and has been closely associated with the Department's responsibility in connection with the province of New Brunswick's Mactaquac power development on the St. John River, the experimental oyster hatchery at Ellerslie, P. E. I., and the general problems of pollution throughout the Maritimes.

Mr. Parkinson is a member of the Association of Professional Engineers of Nova Scotia; a director of the Society of Northeast Conservation Engineers and a director of the Halifax Flying Club.

Fishery Statistics

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May-February 1965-1966		May-February 1966-1967	
	'000 lbs	$'000	'000 lbs	$'000
CANADA - TOTAL	2,042,209	129,807	2,257,544	140,885
ATLANTIC COAST - Total	1,532,490	85,837	1,762,149	85,073
Cod	529,980	21,999	488,672	21,347
Haddock	69,798	4,679	78,646	5,594
Pollock, Hake, Cusk, etc.	68,515	2,311	61,556	2,202
Rosefish	116,580	3,081	170,997	4,757
Catfish	4,074	134	4,108	137
Halibut	3,767	1,284	3,432	1,268
Plaice & Other Flatfish	200,220	6,348	248,098	8,092
Herring & Sardines	390,262	3,999	572,122	6,442
Mackerel	24,846	817	25,741	902
Alewives	12,084	202	8,073	141
Salmon	4,625	2,222	5,176	2,671
Smelts	4,451	321	4,071	347
Swordfish	7,665	3,173	7,260	3,109
Other Fish	15,157	611	14,498	505
Lobsters	37,722	24,297	35,185	20,287
Clams & Quahaugs	3,526	213	4,307	254
Scallops	17,367	9,310	14,796	6,164
Other Shellfish	21,851	836	15,411	854
PACIFIC COAST - Total	509,719	43,970	495,395	55,812
Pacific Cods	20,345	1,500	20,653	1,830
Halibut (1)	31,344	10,615	30,830	11,046
Soles & Other Flatfish	5,906	380	10,377	643
Herring	344,754	5,219	255,232	4,225
Salmon	85,738	24,773	152,587	36,253
Other Fish	7,874	252	11,696	477
Shellfish	13,758	1,231	14,020	1,338
BY PROVINCES				
British Columbia	509,719	43,970	495,395	55,812
Nova Scotia	522,473	41,372	605,274	38,738
New Brunswick	269,889	9,938	330,478	10,578
Prince Edward Island	46,141	6,827	57,801	5,989
Quebec	137,691	6,203	132,551	6,462
Newfoundland	556,296	21,497	636,045	23,306

(1) - Includes halibut landed in U.S. ports by Canadian fishermen.

MID-MONTH WHOLESALE PRICES -FEB. 1967

		Montreal $	Toronto $
Cod fillets, Atl, fresh, unwrapped	lb.	.378	.447
Cod fillets, Atl, frozen, cello 5's	lb.	.335	.390
Cod fillets, smoked	lb.	.422	.473
Haddock fillets, fresh, unwrapped	lb.	.486	.580
Herring, kippered, Atl.	lb.	.258	.333
Mackerel, frozen, round	lb.	.192	.260
Lobsters, canned, Fancy	case 48-½s	61.293	63.887
Sardines, canned	case 100-¼s	9.695	9.600
Halibut, frozen, dressed	lb.	.566	.620
Silverbright, frozen, dressed	lb.	.600	.633
Coho, frozen, dressed	lb.	.774	.813
Sockeye, canned, grade A	case 48-½s	27.430	28.400
Pink, canned, grade A	case 48-½s	16.497	17.123
Whitefish, fresh	lb.	.460(1)	.417
Lake trout, frozen	lb.	.448	.523

PRICES PER CWT. PAID TO FISHERMEN

(Week ending Feb. 18)	1966 $	1967 $
Halifax		
Cod Steak	5.25	5.25
Cod Market	5	5
Haddock	8.5	8.5
Plaice	4.5	5
Yarmouth		
Haddock	9.5	7.5
Black's Harbour		
Sardines	-	-
St. John's Nfld.		
Cod	-	-
Haddock	2.75	-
Rosefish	2.5	-
Vancouver		
Ling Cod	14-17	12
Gray Cod	7-7.5	5-7.5
Soles	6-9	2.5-9
Salmon (Rdspg)	-	-

Fishery Statistics

FROZEN FISH STOCKS AS AT END OF JAN.

	1966 '000 lbs	1967 '000 lbs
TOTAL - Frozen Fish, Canada	60,703	83,990
Frozen - Fresh, Sea Fish - Total	38,919	59,993
Cod, Atlantic, Fillets & Blocks	3,827	10,078
Haddock, fillets & blocks	1,465	3,626
Rosefish, fillets & blocks	2,924	6,129
Flatfish, (excl. halibut), fillets & blocks	4,830	6,578
Halibut, Pacific, dressed & steaks	5,968	7,634
Other Groundfish, dressed & steaks	961	1,905
Other Groundfish, fillets & blocks	3,801	5,559
Salmon, Pacific, dressed & steaks	5,807	6,441
Herring, Atlantic & Pacific	339	532
All Other Sea Fish, all forms	4,735	8,661
Shellfish	4,262	2,850
Frozen - Fresh, Inland Fish - Total	6,249	8,132
Perch, round or dressed	361	251
Pickerel, (Yellow & Blue) fillets	237	1,339
Sauger, round or dressed	382	(1)
Tullibee, round or dressed	139	457
Whitefish, round or dressed	1,793	1,550
Whitefish, fillets	401	372
Other, all forms	2,936	4,163
Frozen - Smoked Fish - Total	1,259	1,336
Cod Atlantic	438	686
Sea Herring, kippers	606	380
Other, all forms	215	270
Frozen for Bait and Animal Feed	14,276	14,529

(1) - Confidential, included with "Other"

SALTED FISH STOCKS AS AT END OF FEB.

Salted and Pickled Fish, Atlantic Coast			
Wet-salted - Total		9,657	10,471
Cod		9,057	9,742
Other		600	729
Dried - salted - Total		7,188	12,563
Cod		6,505	11,438
Other		683	1,125
Boneless - Total		758	575
Cod		702	553
Other		56	22
Pickled - Total	(barrels)	7,909	10,911
Herring	"	5,808	6,315
Mackerel	"	330	2,715
Alewives	"	1,771	1,881
Turbot	"	-	-
Bloaters	(18 lb. boxes)	79,492	29,302
Boneless Herring	(10 lb. boxes)	11	280

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS, MAY-NOVEMBER

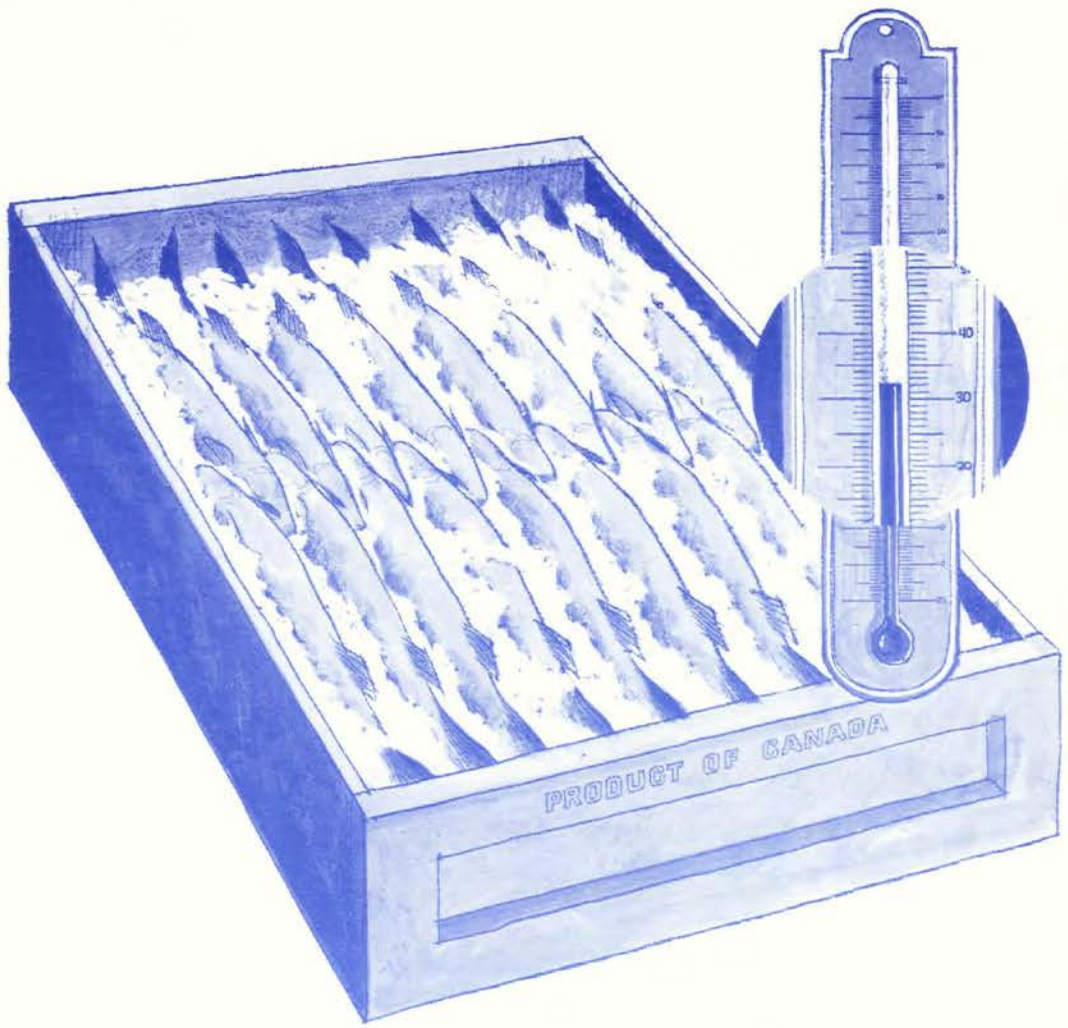
(Value in Thousands of Dollars)

	1965		1966	
Total Exports		140,480		145,917
By Markets:				
United States		101,724		100,490
Caribbean Area		10,447		11,768
Europe		24,228		28,558
Other Countries		4,081		5,101
By Forms:				
Fresh and Frozen		99,166		99,657
Whole or Dressed	29,172		33,133	
Salmon, Pacific	7,350		10,874	
Halibut, Pacific	5,114		4,640	
Cod, Haddock, Pollock, etc.	239		325	
Swordfish	3,714		3,646	
Other Seafish	4,300		5,449	
Whitefish	3,136		3,033	
Pickerel	2,155		1,920	
Other Freshwater Fish, n.o.p.	3,164		3,246	
Fillets	46,055		45,907	
Cod, Atlantic	17,392		13,274	
Haddock	3,364		4,537	
Rosefish, Hake, Pollock, etc.	3,928		6,388	
Flatfish	7,388		9,626	
Pickerel	2,108		2,423	
Other	11,875		9,659	
Shellfish	23,939		20,617	
Lobster (Alive & Meat)	16,737		14,625	
Other	7,202		5,992	
Cured		13,987		14,121
Smoked	1,168		1,387	
Herring	711		913	
Other	457		474	
Salted, Wet & Dried	10,769		10,885	
Cod	9,237		9,122	
Other	1,559		1,763	
Pickled	2,023		1,849	
Herring	1,226		1,089	
Mackerel	491		461	
Other	306		299	
Canned		16,105		19,615
Salmon	10,285		13,045	
Sardines	2,953		3,212	
Lobsters	2,014		2,159	
Other	853		1,199	
Miscellaneous		11,222		12,524
Meal	6,064		6,055	
Oil	1,420		528	
Other	3,738		5,941	

If undelivered return to:
Department of Fisheries of Canada
OTTAWA

CANADA
POSTAGE PAID
PORT PAYÉ

"GOOD FISH HANDLING PRACTICES GUARANTEE HIGHER PROFITS". That statement is equally true for the fisherman, the processor or wholesaler and for the retail trade. A highly perishable product, fish can continue to be profitable, only if the consumer is able to obtain top quality. Beginning immediately the fish is taken from sea or lake, a constant temperature of 32°F is recommended for fresh fish. Speed of handling is an important factor for all concerned. Fish, as soon as they are caught, should be stored at not more than 32°F in a freshly-cleaned hold, and should be delivered to the processor or wholesaler as soon as possible.



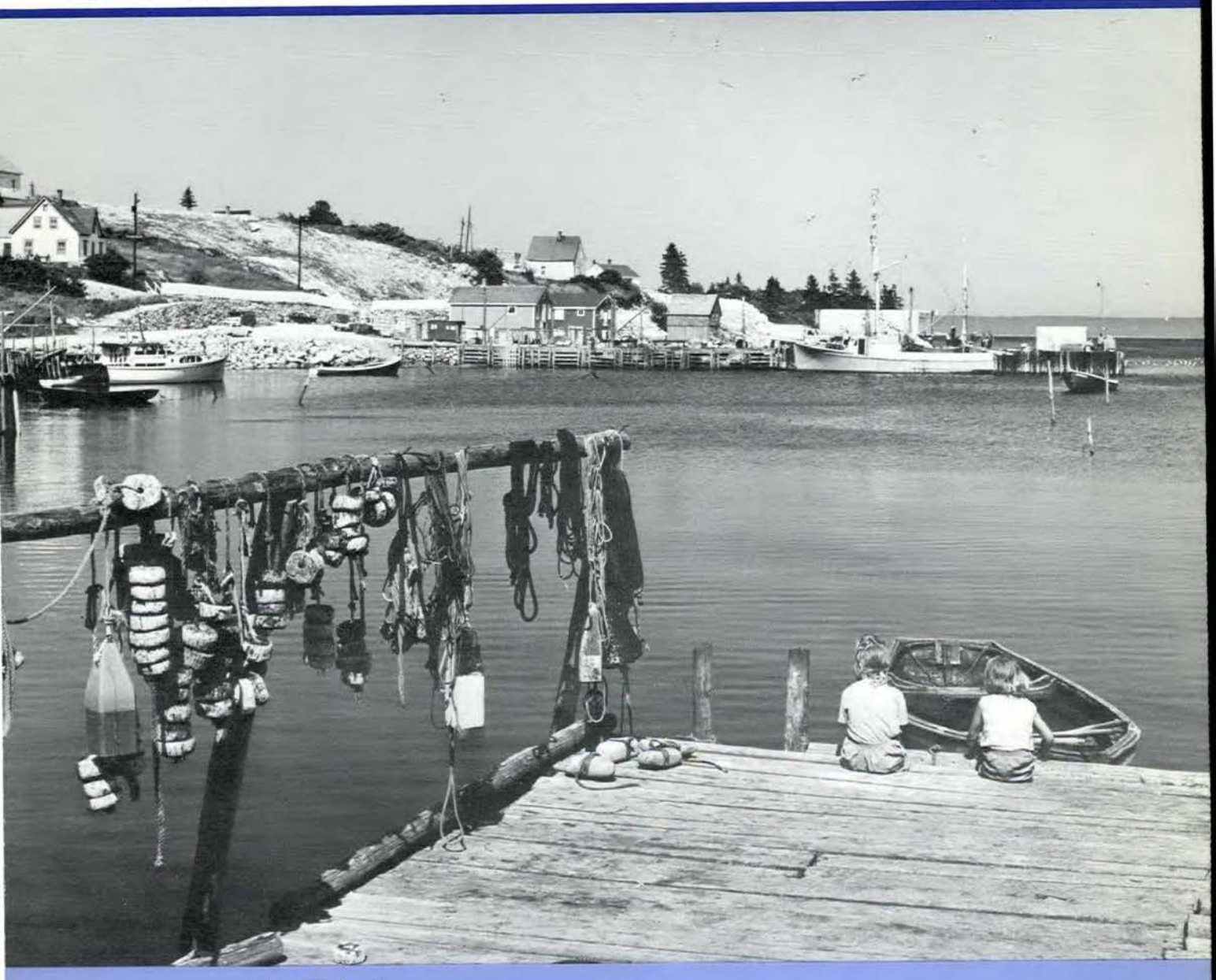
DEPARTMENT OF FISHERIES
Hon. H. J. Robichaud, M.P., Minister
Dr. A. W. H. Needler, Deputy Minister
Ottawa, Canada

ROGER DUHAMEL, F.R.S.C., Queen's Printer and Controller of Stationery, Ottawa, 1967

FISHERIES

(formerly Trade News) OF CANADA

Vol. 19 No. 12 June, 1967



In This Issue

Department of Fisheries of Canada, Ottawa

FISHERIES OF CANADA

(formerly Trade News)

Editor

E. H. HEARNDEN

June, 1967

CONTENTS

FEATURES

COVER PHOTOGRAPH - A tranquil scene at Northwest Cove, Nova Scotia.

Sees Marketing Challenge in Canada To Increase Consumption of Fish

A CALL FOR greater efforts to increase the consumption of fish in Canada was made by J. H. G. LeBlanc in his presidential address to the Fisheries Council of Canada's 22nd annual meeting held in Montreal, May 7-10.

"Fish consumption in both Canada and the United States remains relatively stable on a per capita basis" he said. "This is the real challenge in the marketing field."

Pointing out that more Canadian fish is eaten by people in other countries than by Canadians themselves, Mr. LeBlanc said two-thirds of Canada's production went into export markets. Market value of Canadian fish exports in 1965 amounted to $212, 900, 000.

Canada's commercial fishing industry has shown a growth in production of 25 per cent in less than a decade. The industry represents an investment of more than $205, 000, 000 in vessels and gear and provides employment for 80, 000 fishermen (both part- and full-time) and 20, 000 others in processing plants, the Council president said. He estimated the number of full-time fishermen at about 30, 000.

Mr. LeBlanc said he felt Canada had a 10-year lead on the United States in fisheries' inspection. Rigid standards under the federal government's Fish Inspection Act apply to all fish products in inter-provincial trade and for export. Equally stringent regulations apply to imported fish products in Canada.

MINISTER'S ADDRESS

The need for more caution in any investment program related to the frozen groundfish industry in order to prevent production outpacing the growth in demand, fresh emphasis on market development, and the possibility of channelling production into forms other than fresh and frozen, were some of the key points made by federal Fisheries Minister H. J. Robichaud in his address to the Council.

Mrs. Marie S. Penny, president of the Fisheries Council of Canada for 1967-68, presents a gavel to the retiring president Guy LeBlanc. Mrs. Penny is the Council's first woman president.

In reviewing the marketing situation in 1966, Mr. Robichaud noted that exports continued to expand, but there was a slowdown in growth in value terms. The long-standing sellers' market in frozen fishery products in U. S. came to a halt when record prices in the early part of the year attracted heavy imports of frozen fillets and blocks (for fish sticks) from European and African sources.

By the end of 1966 many of the Canadian products sold frozen in the U. S. experienced serious

declines in prices, and there was a rapid expansion in cold storage inventories.

It may well be, the Minister added, that 1966, like 1953 and 1959, was a year of adjustment between supply and demand for fishery products in North America. "If this is so, both industry and government can look forward to the prospect that frozen fish will pick up from the market adjustment of 1966-67". Referring to the new fish inspection regulations, Mr. Robichaud said these extend to canneries and salt fish plants, standards of plant construction, equipment and sanitation. Since 1965 registration requirements had been applied to plants processing fresh and frozen fish. The new regulations call for compulsory registration of processing plants and canneries which prepare fish and shellfish for sale outside the province of origin.

Inspection at the retail level was inaugurated in Montreal last year on an experimental basis and the response was so favorable this type of inspection is being extended to other cities.

Mr. Robichaud also referred to grants now available under the Fishery Products Storage Regulations to assist in construction of new cold storage facilities and installation of refrigeration equipment, as well as modification of existing premises. Grants may be made to cover up to one-third of the cost of building and equipment, with a top limit of $150, 000.

The Minister stressed that every application would be considered on its merits and it would have to be clearly demonstrated that there is a need for any proposed new facility.

INTERNATIONAL CONVENTIONS

Already a signatory to seven international fisheries conventions, Canada has taken steps to participate in two others, the minister said. Canada was one of 18 nations at the Policing Conference--to increase safety at sea - held recently in London, Eng., and the Government will be asked to sign this new convention shortly. Application has also been made for membership in the Inter-American Tropical Tuna Commission.

Mr. Robichaud also described the work of the department in seeking to improve and diversify fishing gear, and methods, in fish culture projects, and in provision of new research facilities.

In British Columbia, for example, a mammoth project for enhancing the salmons' environment was being carried out on the Big Qualicum River. On Babine Lake, B. C., spawning channels when completed are expected to increase the sockeye fry in the Babine system by 100 million.

Steady progress was being made towards the goal of producing large quantities of seed oysters under controlled conditions at the experimental oyster hatchery at Ellerslie, Prince Edward Island.

CENTENNIAL AWARD SPEAKER

The Fisheries Council's Centennial Award guest address was delivered by Dr. J. P. Tully, of Ottawa, consultant in oceanography to the Chairman of the Fisheries Research Board of Canada.

Entitling his address "Water, the Producer", Dr. Tully said one of the problems in fisheries was

Dr. J.P. Tully

to locate the fish with minimum hunting time so that they could be caught economically. This required two pieces of information--a forecast of the oceanographic conditions and a knowledge of the fishes reaction to these conditions.

Dr. Tully suggested Canadian fishermen could increase their hunting efficiency by making use of oceanographic services to correlate the occurrence of fish with ocean conditions. This technique had been used by Japan since the 1930's with considerable success. It is also used by the Norwegian herring fishery, the U. S. tuna fishery in the eastern Pacific and by Russian trawlers.

Production of life--one of the most important uses of water--must rank very high in considerations of national water use, policy which are now being developed federally and provincially, Dr. Tully said. The Ministry of Fisheries was the only federal ministry with the jurisdiction and competence to preserve "our fresh and sea waters as producers of life".

PREDICTS UN CONTROL

Bringing the high seas' fisheries under the jurisdiction of the United Nations to deal with world fisheries' problems on a long-term basis was envisaged by Dr. W. M. Chapman, of Port of Long Beach, California.

Dr. Chapman, who is director of the division

The 1967-68 board of directors of the Fisheries Council of Canada.

of resources of Van Camp Sea Food Company, said: "I am certain that before we get through with the present ad hoc activities we are taking with respect to Asiatic and European fishermen off our coasts, out juridical actions will require to be fitted into a world-wide pattern".

He outlined three general solutions suggested to solve the problem of far-ranging foreign fishing fleets. One was to extend exclusive jurisdiction by the coastal nation out as far to sea as required. The second was to give the UN exclusive jurisdiction over the resources of the high seas, and the third was to continue operating under existing rules of international law.

At present, the capability for dealing with fisheries' problems on a world wide basis rested with the FAO Department of Fisheries which had become "a powerful factor in international fisheries matters" with the elevation of the fisheries division to the status of a department in 1965.

While the FAO department was "increasing in competence and scope of work as rapidly as the member nations would permit", events might cause a shift to some other part of the international governmental structure.

Dr. Chapman stressed that fishing effort would continue to increase rapidly throughout the world because of the growing need for animal protein which could be obtained more cheaply and abundantly from the sea than from the land.

The nations would continue to "mine the ocean" rather than husband it because it belonged to everyone and therefore to nobody.

Atlantic herring reduction facilities--for production of oil and meal--are expected to reach 7,000 tons a day during 1967 and 10, 000 tons a day by 1970, the meeting was told.

H. E. Power of the Fisheries Research Board of Canada, Halifax, said that between 1963 and 1965 herring oil production increased from 1, 400, 000 pounds to 7, 140, 000 pounds and meal increased from 4, 667 tons to 12, 783 tons. He was speaking at a workshop session on "industrial products".

Since 1964, Mr. Power said, some 15 fish meal plants, capable of producing herring meal had been built or are in the planning stage on the Atlantic coast.

Speaking at the same session, M. S. Strong of the Department of Trade and Commerce, Ottawa, noted that world fishmeal production of 4, 186, 500 tons represented an increase of 200 per cent over 1958. He said some predictions were that 1967 production would reach 4. 5 million tons.

Production of fish oils had also shown a considerable advance and the 732, 100 metric tons produced in 1966 was an increase of 156 per cent over production in 1958.

For almost a decade Peru had been the world's

largest producer of fishmeal accounting for approximately 36 per cent of world production since 1962. Canada ranked eighth as a producer in 1966, with Norway, Japan, Chile and the U. S. coming after Peru.

In fish body oil last year, Canada placed seventh. Main producers were Norway, Peru, Iceland, the United States and South Africa and Southwest Africa (combined).

WOMAN PRESIDENT

Mrs. Marie S. Penny, of Ramea, Newfoundland, was elected president of the Fisheries Council of Canada for 1967-8. Mrs. Penny is head of the fishing firm of John Penny & Sons, Ltd., and is the first woman president in the council's 22-year history.

Other officers are: R. I. Nelson, Nelson Bros. Fisheries, Vancouver; national vice-president; Guy LeBlanc, Quebec United Fishermen, Montreal, past president. Other vice-presidents are: Ontario, L. Omstead, Jr., Omstead Fisheries 1961 Ltd.; Quebec, Guy Bernier, Quebec United Fishermen, Montreal; Newfoundland, D. W. Monroe, Fishery Products Ltd., St. John's; PEI, S. H. Burhoe, The J. W. Windsor Co. Ltd., Charlottetown; Nova Scotia, W. O. Morrow, National Sea Products, Halifax; wholesalers, Ontario, Gordon Mooney, Gordon H. Mooney Ltd., Toronto. ✔

Salt Codfish Program Expanded

A program designed to assist salt codfish producers in Newfoundland and Labrador to improve the quality of their product introduced last year by the federal Department of Fisheries is to be continued and expanded this year.

Six men with lengthy experience in salt fish processing were recruited last year and stationed in main areas of production around the coasts of Newfoundland and Labrador. They remained in these areas throughout the fishing season and worked continually with fishermen operating in privately owned as well as community stages and commercial salt fish plant operators. Technical assistance was provided by way of practical demonstrations and general advice with the hope that the quality of the product could be improved.

Excellent co-operation was received from fishermen as well as officials of the Newfoundland Federation of Fishermen and members of the Fish Trades Association.

An improvement in the quality of salted fish was reported from a number of areas of the province last year.

The program is being continued this year with plans to cover a larger area of Newfoundland and Labrador. Two boats are being chartered to provide accommodation and transportation for officers who will be working along the coast of Labrador providing technical assistance to livyers and stationers as well as floaters who will be engaged in the salt cod fishery.

Again this year these specialists will carry out their duties under the supervision of Marvin Barnes, an officer of the Industrial Development Service of the Department, who has had lengthy experience in salt fish processing activities.

BCF Appointments

The U. S. Department of the Interior announced recently that H. E. Crowther of West Hyattsville, Md., has been named director and Dr. J. L. McHugh of Arlington, Va., deputy director of the Bureau of Commercial Fisheries.

Mr. Crowther has been a U. S. commissioner on the International Pacific Halibut Commission since 1961. He has participated in several international fishery conferences and is a member of the Committee on Fisheries of the Food Scientific organizations.

Dr. McHugh joined BCF in 1959 as an assistant director. Previously he spent 8 years as director of the Virginia Fisheries Laboratory and professor of marine biology at William and Mary.

The 55-year-old scientist was born in Vancouver, B. C., and received his bachelor of science and master of science degrees from the University of British Columbia. He took part in salmon, herring, and pilchard research at the Pacific Biological Station, Nanaimo, B. C., during his undergraduate years. Dr. McHugh joined the biological staff of Canada's Fisheries Research Board in 1938, serving until 1941. ✔

A Report on Costs and Earnings of P.E.I. Dragger Fishing Enterprises

A preliminary report on costs and earnings of dragger fishing enterprises in Prince Edward Island over the period 1952-1966 has been issued by the Economic Services of the federal Department of Fisheries.

The report, prepared by John Proskie, contains brief operational and financial summaries of 60 and 65-foot wooden side draggers, 93-foot steel side draggers and 93-foot steel stern draggers.

There was considerable increase in volume and value of landings in 1966 when compared with 1965, mainly due to the addition of steel trawlers,

Table 1 - Trends in Landings and Landed Values

Year	Draggers	Landings	Landed Value
	no.	lb.	$
1966	22	27,039,353	1,062,371
1965	23	20,472,708	730,296
1952-1965 Average	17	10,273,088	335,279

the report states. However, the full impact of these vessels on landings has not been felt yet, as six of the ten trawlers fished for a very limited time in 1966. The ten steel draggers landed a total of 17,215,927 lb. valued at $735,409 for an average price of 4.27 cents per pound. The twelve wooden draggers landed a total of 9,823,427 lb. valued at $326,961 for an average landed price of 3.33 cents per pound.

Taking into account days at sea per vessel, (see Table 2) the output per man is quite favourable for the 60 and 65-foot draggers. However, the average landed value per man was highest for the 93-foot steel stern draggers. This is due to a better species-mix of higher priced species and to winter fishing outside the Gulf with higher average prices paid in Nova Scotia. It should be noted that the average landings and landed values per trip are favourable for the 93-foot steel side draggers.

A more detailed comparison of operational efficiency may be made by examining the output in volume and value per man-day at sea. (Table 4).

In the Table 4 comparison the 60 and 65-foot wooden side draggers make a good showing in terms of landings and landed values per man-day at sea. The lower average landings by the steel stern draggers is accounted in part by the landings of higher-priced species, however, the landed value per man-day at sea was $47 and for the 93-foot steel side draggers it was $49. This may suggest a more efficient use of the smaller crew -- 9.1 men for the steel side draggers when compared to the larger crew, 9.9 men for the steel stern draggers.

The report states that if the net investment is

Table 2 - Operational Performance of P.E.I. Draggers

Type of Dragger	All Vessels	1966 Averages per Vessel LOA	Men in Crew	Trips	Days at Sea	Hours Fished	Landings	Landed Value
	no.	ft.	no.	no.	no.	no.	lb.	$
Wooden side	5	60	3.7	15	92	781	450,999	14,857
Wooden side	7	65	4.2	25	179	1,508	1,081,204	36,096
Steel Stern	5	93	9.9	28	225	2,138	2,186,499	104,700
Steel side	4	93	9.1	8	67	531	928,296	29,842

In the above comparison it should be noted that the steel side draggers went into production late in the 1966 season. The average vessel in this class made eight trips with 67 days at sea and an average landing of 928,296 pounds of fish.

Table 3 - Operational Efficiency of P. E. I. Draggers

1966 Averages

Type of Dragger	All Boats	LOA	Landings per			Landed Values per		
			Man	Trip	Day at Sea	Man	Trip	Day at Sea
	no.	ft.	lb.	lb.	lb.	$	$	$
Wooden side	5	60	121, 892	30, 067	4, 902	4, 015	990	161
Wooden side	7	65	257, 430	43, 248	6, 040	8, 594	1, 444	202
Steel stern	5	93	220, 858	78, 089	9, 718	10, 576	3, 739	465
Steel side	4	93	(1)	116, 037	13, 855	(1)	3, 730	445

Note: (1) Fishing for 67 days only, therefore this comparison would have no significance.

related to output, the relationships are more pronounced. This is demonstrated in Table 5.

The ratio of average landed value per man to average net investment per man in 1966 (ratios for 1965 in brackets) shows that for every $100 invested, the 60-footers produced $61 ($72) of fish, the 65-footers $70($68) and the steel stern 93-footers $50($41). The decline in the ratio for the 1966 season when compared with the 1965 season for the

Table 4 - Average Output Per Man-Day at Sea

Type of Dragger	LOA	Size of Crew	Average output per man-day at sea	
	ft.	no.	lb.	$
Wooden side	60	3. 7	1, 325	44
Wooden side	65	4. 2	1, 438	48
Steel stern	93	9. 9	982	47
Steel side	93	9. 1	1, 523	49

average 60-footer is mainly due to the fact that in 1966 the average days at sea per 60-foot dragger was 92 and in 1965 it was 105. The report adds that the improved ratios in 1966 when compared with 1965 for the 65-footers and the 93-foot steel stern draggers is due mainly to a more efficient use of the vessels. In 1966 the average days at sea for the 65-footer was 179 and in 1965 it was 134. Corresponding figures for the steel stern draggers were 225 and 188.

The 1966 performance of the 60-footers was below that of 1965 and well below the 1952-1965 average, but for the 65-footers the performance in 1966 was well above the 1965 season and the 1959-1965 average. For the 93-foot steel stern draggers the average landings per vessel in 1966 and 1965 were almost equal: however, the average landed value in 1966 was $104, 700 and in 1965 it was $104, 700 and in 1965 it was $81, 710. This is due mainly to a better species-mix of higher-priced species.

The average net earnings per man per season was higher for all crew categories for 65-footers when compared with 60-footers and the returns were still higher on the average for the steel stern draggers. The results are also recorded for the steel side draggers, but these are not significant since the average vessel put in only 67 days at sea. For the other three classes of vessels, the differences in the main are due to greater fishing effort (as measured by days at sea) for the larger vessels. Also higher investment per man

Table 5 - Relationship Between Net Investment and Output

	LOA	Average Net Investment per Dragger	Averages per man			Ratio of Landed Value to Net Investment
			Net Investment	Landings	Landed Value	
	ft.	$	$	lb.	$	%
Wooden side	60	24, 293	6, 566	121, 892	4, 105	61. 1
Wooden side	65	51, 268	12, 207	257, 430	8, 594	70. 4
Steel stern	93	209, 183	21, 130	220, 859	10, 576	50. 1
Steel side	93	175, 424	19, 277	(1)	(1)	(1)

Note: (1) Fishing for 67 days, only, therefore this comparison would have no significance.

increased "labour-productivity" partly by enabling crew to put in more fishing days in the year.

The steel draggers ranked highest for the average daily net earnings for the specialized members of the crews. Also, the highest average daily net earnings for the deckhands was recorded by the 93-foot steel stern draggers -- $14.62 per day at sea. This results from a better sharing arrangement; as was noted previously, the output per man-day at sea was $47 for the steel stern draggers, $48

Table 6 - Average Net Returns to Labour

Item	Wooden Side	Wooden Side	Steel Stern	Steel Side
LOA in feet	60	65	93	93
Men in crew	3.7	4.2	9.9	9.1
Days at sea	92	179	225	67
Crew Category	**Average Net Earnings Per Man Per Season**			
	$	$	$	$
Captain	1,858	4,188	8,532	2,373
Mate	1,264	2,987	5,385	1,488
Boatswain			3,820	1,113
First engineer	1,406	2,730	4,140	1,331
Second engineer			3,891	1,070
Cook	1,255	2,851	4,103	1,110
First Icer		2,434	3,994	1,114
Second icer			3,614	
Tallyman			3,296	
Deckhand	1,105	2,375	3,290	886

for the 65-footers, and $49 for the 93-foot steel side draggers. However, these figures were computed by use of the average size of crew, which was 9.9 men for the steel stern draggers. However, the first engineer is on a fixed wage and does not participate in the crew share. Therefore for this class of vessel the shares are calculated on 8.9 men, i.e. excluding the first engineer.

The report points out that there was a decline in the 1966 average net earnings of the boat (profit per enterprise after depreciation) for the 60-foot draggers when compared with 1965. However, the 65-foot draggers showed an improvement in the 1966 average profit, $845 per vessel when compared with the 1965 average of $383 per vessel. The average net profit for the 93-foot steel stern draggers was negative, the result being a calculated average loss of -$16,918 in 1966 and -$11,942 in 1965. For the 93-foot steel side draggers which on the average made eight trips with a total of 67 days at sea per vessel, the average loss was -$8,821. The latter results are given for information, as the calculation on a very short operating season (due to late launching of new vessels) cannot be considered to be conclusive.

Table 7 - Average Net Returns per Man per Day at Sea

Item	Wooden Side	Wooden Side	Steel Stern	Steel Side
LOA in feet	60	65	93	93
Men in crew	3.7	4.2	9.9	9.1
Days at sea	92	179	225	67
Crew Category	**Average Net Earnings per Man per Day at Sea**			
	$	$	$	$
Captain	20.20	23.40	37.92	35.42
Mate	13.74	16.69	23.93	22.21
Boatswain			16.98	16.61
First engineer	15.28	15.25	18.40	19.87
Second engineer			17.29	15.97
Cook	13.64	15.93	18.24	16.57
First icer		13.60	17.75	16.63
Second icer				
Tallyman				
Deckhand	12.01	13.27	14.62	13.22

Higher operating costs, crew shares, and fixed costs in relation to the volume and value of landings resulted in an average loss on 1966 operations for the steel stern draggers. This is readily seen from a tabulation (Table 9) of the distribution of gross receipts to cash expenditures, crew shares and boat shares:

As shown, it costs more to operate the larger vessels. For example, the total cash expenditures for the 93-foot steel stern draggers accounted for 59.9 per cent of the gross landed value, crew earnings (including commissions and fixed wages) accounted for 41.7 per cent, leaving a deficit of 1.6 per cent or $1.638 per dragger and nothing was left to cover depreciation. The report states that this situation can only be offset by greater fishing effort and larger landings. The alternatives are greater economy in expenditures and higher prices for landed fish.

Table 8 - Average Net Returns to Capital

Type of Dragger	LOA	Average net profit per vessel 1966	1965	1959-65	1952-65
	ft.	$	$	$	$
Wooden side	60	847	1,134		1,002
Wooden side	65	845	383	-869	
Steel stern	93	-16,918	-11,942		
Steel side	93	-8,821			

Table 9 - Distribution of Average Gross Receipts

Type & size of dragger	Wooden 60-foot	Wooden 64-foot	Steel Stern 93-foot
Number of boats	5	7	5
	$	$	$
Average Gross Cash Receipts	15,487	36,144	104,700
Applied to:			
(1) Total Cash Expenditures	7,366	18,379	62,717
(2) Net Cash Crew Share	5,493	13,289	43,621
(3) Net Cash Boat Share	2,628	4,476	-1,638
	%	%	%
Average Gross Cash Receipts	100.0	100.0	100.0
Applied to:			
(1) Total Cash Expenditures	47.6	50.8	59.9
(2) Net Cash Crew Share	35.4	36.8	41.7
(3) Net Cash Boat Share	17.0	12.4	-1.6

Fisheries Research Board News

Dr. B. E. Barrett of St. Andrews Biological Station recently returned from a three-week trip to Norway. The purpose of his tour in Norway was to study the use of sonar in the Norwegian herring fleet and research vessels and to discuss herring research with the Norwegian scientists. Included in his agenda was a highly intensified course in the use of sonar and its interpretation.

Dr. Barrett spent one week aboard Norway's research vessel *Johan Hjort*. This vessel is equipped with sonar and is used to plot the position of the Atlanto-Scandian herring during its spawning migration to Norway. He observed that the herring purse seiners did not venture forth from their ports until they were called by the *Johan Hjort*. At that time the herring were within an economic range and depth for fishing.

It is Dr. Barrett's hope that with the new Canadian research vessel *E.E. Prince*, which is equipped with sonar, Canadians will be able to learn more about the migration of herring in the offshore waters of our coast.

Dr. Jeffrey Watson, 26, a native of Woodbridge, England, has joined the lobster investigation of the FRB Biological Station at St. Andrews. Dr. Watson earned his Ph. D. in ecological energetics from the University of Durham in 1966. At St. Andrews he will be concerned with studies on lobster mortalities in commercial handling, storage, and shipment.

Dr. J. S. Scott, 43, formerly of St. Andrews, Scotland, has joined the groundfish investigation of the Fisheries Research Board's Biological Station at St. Andrews, N. B.

Dr. Scott, who had worked in administration and development of fisheries of Malaya for ten years, received his Ph. D. in parasitology from St. Andrews University in 1963. He then spent over three years in fisheries surveys and planning development with the British Ministry of Overseas Development in Nigeria.

In his new duties, Dr. Scott will plan and carry out studies on the distribution, movements, life histories and potential importance of underexploited species of fish.

Sydney R. Wyman, 48, of Edmonton, Alberta, has been appointed Personnel Administrator for the FRB Biological Station at St. Andrews, N. B.

A native of Hebron, Nova Scotia, he received his Bachelor of Arts in History and Economics from Acadia University in 1939. He served as Squadron Leader with the RCAF in World War II and later had two Army appointments as Coordinating Officer. Retiring from the Army with the rank of Major in 1964, Mr. Wyman joined the Edmonton Public School Board as Director of Personnel-Business.

Mr. Wyman's new duties include all phases of personnel practices, as well as participation in recruiting and selection of staff.

Dr. A.W.H. Needler, Deputy Minister, presides over a meeting of the Committee on Fisheries of the Food and Agriculture Organization in Rome.

FAO Committee on Fisheries Meets in Rome

Education and training in the field of fisheries, utilization of fishery resources, the economic aspects of fishery management, world appraisal of fishery resources, and marine pollution were subjects of high priority at the second session of the Committee on Fisheries of the Food and Agriculture Organization of the United Nations, held in Rome, Italy, April 24-29.

Dr. A. W. H. Needler, Deputy Minister of Fisheries of Canada, Ottawa, Chairman of the Committee, presided at the six-day meeting and, as well as heading the Canadian delegation, represented the International Commission for the Northwest Atlantic Fisheries. Other Canadian participants were L. S. Bradbury, Director of the Industrial Development Service and Dr. W. M. Sprules, Director of International Fisheries, both of the Department of Fisheries of Canada, Ottawa, and P. A. Freyseng, Commercial Secretary and FAO Liaison Officer at the Canadian Embassy in Rome.

The activities of FAO's Department of Fisheries and reports of sub-committees and working parties were considered. These included proposals for the development of co-operation with international organizations concerned with fisheries, rational utilization of the fishery resources of the Indian Ocean, a world fishery conference, and the development and co-ordination of regional fishery statistics.

Shown in the above photograph at one of the meetings are, left to right, S. J. Holt, Director, Fishery Resources and Exploitation Division, FAO; R. W. Harrison, Director, Fishery Economic and Products Division, FAO, Dr. W. M. Chapman, Van Camp Sea Food Company, San Diego, California; Roy I. Jackson, FAO Department of Fisheries; Dr. Needler, Chairman, and F. E. Popper, Director of Program Co-ordination and Operations, FAO, secretary of the session. ✔

United States, Australian and Canadian participants at the FAO Committee on Fisheries meeting. Left to right: W.M. Terry, Assistant Director for International Affairs, Bureau of Commercial Fisheries Washington, D.C.; C.G. Setter, Assistant Secretary, Department of Primary Industry, Canberra; Dr. W.M. Sprules and L.S. Bradbury, of the federal Department of Fisheries, Ottawa.

Canadian Delegation Pays Visit to Russia

At the invitation of the USSR Government, a Canadian delegation headed by Federal Fisheries Minister H. J. Robichaud recently paid a 12-day visit to Russia.

After meeting the USSR Minister of Fisheries, Alexander Ishkov, in Moscow, the Canadian party visited fishery administrations, training and research establishments, as well as some of Russia's modern fishing vessels and processing plants. Areas visited included Murmansk, Leningrad, Riga and the Black Sea.

Accompanying Mr. Robichaud were the Deputy Minister of Fisheries, Dr. A. W. H. Needler; Dr. W. E. Ricker, Chief Scientist of the Fisheries Research Board of Canada, Nanaimo, B. C.; Guy LeBlanc, Montreal, President of the Fisheries Council of Canada; W. R. Morrow, Vice-president, National Sea Products Ltd., Halifax, N. S.; and Richard Nelson, Chairman, Nelson Brothers Fisheries Ltd., Vancouver, B. C.

Federal Fisheries Minister H.J. Robichaud and Soviet Minister of Fisheries Alexander Ishkov during their recent talks in Moscow.

RIGHT - During their Russian visit, members of the Canadian delegation inspected the May 9 Fishery Co-operative, the third largest of 16 fishery co-operatives in the Latvian Soviet Republic. Organised in 1947, the co-operative has 800 members and owns 45 vessels, 38 of which operate in the Gulf of Riga and seven engage in ocean fishing.

Fisheries Minister Robichaud is an interested spectator in the fillet shop of a Murmansk fish processing factory. One of the largest in the USSR, the plant produces 25-35 tons of fish products per day. Employees total about 4,500.

A first-year student at the Murmansk Higher Marine School chats with Mr. Robichaud during the Canadian delegation's visit to the training establishment in the Arctic port. (Photos by the Novosti Agency).

Continue Training Program In Scottish Seine-Netting

FURTHER training for Atlantic coast fishermen in Scottish seine-netting is now being continued with the arrival from Scotland of two fishing instructors. They are Captain James C. Thomson and John J. McKenzie, both of Lossiemouth, Scotland.

In co-operation with provincial fisheries agencies on the east coast and Newfoundland, the Industrial Development Service of the federal Department of Fisheries inaugurated the Scottish seine-netting program in 1965. In 1966 Captain Thomson and two other Scottish instructors gave demonstrations in various parts of the Maritimes and Newfoundland. This year Captain Thomson has been joined by Captain McKenzie who will do similar work.

Although the method is not entirely new in the Atlantic Provinces and Newfoundland, there appears to be a growing trend among commercial fishermen to adopt the special Scottish techniques and gear, both of which are particularly effective for catching high swimming species of groundfish such as cod, haddock, pollock, hake, etc. in addition to sedentary species such as flounder. The net used is called a Wing Trawl although this should not be confused with conventional otter trawls.

As part of the overall program, the federal agency has chartered for one year an Aberdeen fishing vessel *Guiding Star* to use this type of gear on Canadian fishing grounds. This vessel made several successful trips out of Nova Scotia ports last fall and winter.

Seine-netting is carried out by vessels ranging from 40 to 80 feet and engine power requirements are low in comparison to bottom trawling. This fishing method can be carried out by any type of boat which has enough deck space to stow the very long ropes which are an important part of the gear. On the larger seine-netters, these ropes may exceed three-and-a-half miles.

The boat first sets out a buoy with a flag, to which is attached one end of the rope. One half of the rope is then set out in a semi-circle. The funnel-shaped net is attached and the circle completed back to pick up the buoy, while setting out the second half of the ropes. With the ropes now being hauled in by a winch, the boat tows slowly away from the net thus closing the circle of ropes which stir up a wall of mud and sand as they are dragged over the sea bottom, scaring fish into the path of the net. The net then moves forward and scoops them up. A specially designed mechanical rope coiler, attached to the winch makes the work of hauling back the gear much simpler.

Scottish seining is similar to Danish seining, but with one basic difference. With the former technique, the vessel tows the net, while in Danish seining the boat is anchored and the net is set in motion by a winch alone. The Danish seining method was designed specifically to catch flounders or flatfish.

INSTRUCTION COURSE

Captain Thomson opened last year's program by giving instruction to fishermen at the School of Fisheries in Caraquet, N. B. There he taught net construction and advised on the rigging of vessels. He supervised fishing operations out of Caraquet aboard *Gloucester II* and successfully experimented with seining gear on four different types of bottom. During this period he supervised the rigging up of 35 seine-nets.

His work in Nova Scotia was mainly confined to the Shelburne County on the open coast. Again he sailed to the fishing grounds, this time aboard the dragger *Acadian Pal* skippered by Captain Clifford Swim. They fished Brown's, Georges and LaHave banks. Tides in the areas tried on the offshore banks were found to be too strong for practical operations with seine-net gear at that time.

The same general program of operations is being followed this spring by Captains Thomson and McKenzie. The Caraquet fisheries school, northern New Brunswick fishing ports, the south shore of Nova Scotia, Cheticamp on Cape Breton Island and Newfoundland are included in the busy itinerary.

"There is no doubt that interest is growing in Scottish seining," said Captain Thomson. "Our 80-boat fleet at Lossiemouth fishes this way exclusively, and both Captain McKenzie and myself know that this type of fishing can be profitable if properly carried out. We hope to train more Canadian fishermen in the techniques used by our fishmen at home."

Both captains are enthusiastic about their mission to the Maritimes and agreed that young men entering the fishing industry can have a rewarding career "if they are properly trained." ✔

Herring Spawning in B.C. in 1966 Reported the Lowest on Record

By D.N. Outram
Fisheries Research Board of Canada, Nanaimo, B.C.

HERRING deposit adhesive eggs in clumps on seaweeds and sea grasses growing mainly between low and high tide marks. The intensity, length and width of individual spawnings can be readily measured - a routine procedure undertaken annually by officers of the federal Department of Fisheries. The results are submitted to the Fisheries Research Board of Canada Biological Station, Nanaimo, B. C. for analysis.

During a 25-year period (1940-64) herring spawning along the British Columbia coast has averaged 199 statute miles. In 1966 only 85 miles of spawn were deposited. This represents a reduction of 58% from the 25-year average, of 32% from the 1965 level (126 miles) and of 61% from the 1964 level (218 miles). The 1966 deposition was the smallest on record; the previous low occurred in 1958 when 114 miles were recorded.

This article is based on Circular No. 77 of the Fisheries Research Board of Canada Biological Station, Nanaimo, B.C.

The length, measured in yards for each spawning site, is expressed at an equivalent length in statute miles after adjustments have been made for very wide (greater than 100 yards) widths and for varying intensities of deposition. By summing

During the brief, two week incubation period while attached to moist seaweeds countless thousands of herring eggs are destroyed by storms. Violent surf action can annihilate whole spawnings by up-rooting and piling spawn-laden vegetation along the high-tide mark. Investigator is shown here almost knee-deep in spawn a few miles south of Nanaimo near Dodd's Narrows.

the equivalent lengths, a measurement is obtained for each population which can be compared to similar measurements in other years.

In the 3 Queen Charlotte Islands sub-districts little more than 5 miles of spawn were found. Less than one-half mile of spawn was deposited in the upper east coast and west coast sub-districts. In the former sub-district spawning has been almost non-existent in the past few years, whereas in the latter sub-district during the period 1959-64 deposition has ranged from 8 to 12 miles. In the lower east coast Queen Charlotte Islands sub-district spawn abundance showed an increase from 3 miles in 1965 to 5 miles in 1966, but remained well below the 25-year (1940-64) average of 14 miles.

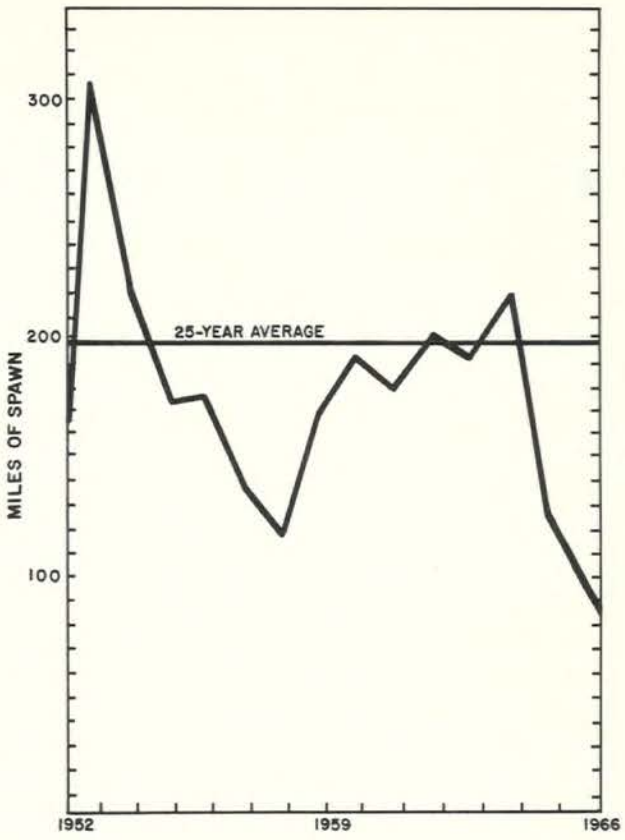
In northern British Columbia, reductions in the extent of spawn were generally not as pronounced as in southern British Columbia. In the northern sub-district herring deposited 22 miles of spawn, about the same as in 1965, but somewhat below the 25-year average of 26 miles. Although an increase in spawn abundance was recorded in the upper central sub-district (from 1 to 4 miles), spawning remained well below the 25-year average of 17 miles. Spawning has been at a very low level in this sub-district since 1962. In the lower central sub-district the extent of spawn was sharply reduced from 25 miles in 1965 to 10 miles in 1966. This decrease produced the smallest deposition on record for this region; well below the 25-year average of 33 miles.

Of the 5 southern British Columbia stocks only the upper east coast of Vancouver Island sub-district showed no decrease in spawning from the 1965 level. The 15 miles of spawn located there represented a 200% increase over 1965 and brought the extent of spawn to an above-average level for this sub-district. Both west coast of Vancouver Island populations showed marked reductions in 1966, from 11 to 5 miles in the lower west coast and from 17 to 5 miles in the upper west coast. The 25-year averages in both populations were 16 miles. The 5 miles of spawn found in the lower east coast of Vancouver Island sub-district was about the same as 1965's record low level. Since 1962 spawn abundance in this region has been well below the 25-year average of 25 miles. In the middle east coast of Vancouver Island there were only about 9 miles of spawn recorded in 1966, a reduction of 72% from the 1965 level and the smallest deposition on record. The 25-year average for this sub-district is 29 miles.

A summary of the results of the 1966 spawn survey is given below.

Upper east coast Queen Charlotte Islands sub-district

The amount of spawn deposited in this sub-district in 1966 was almost negligible. Two small spawnings were located in Skidegate Inlet in mid-



Miles of herring spawn recorded between 1952-66 as set against the 25-year period average (1940-64).

May, one of 400 yards, the other 100 yards. In the previous season only one spawning was found. Except in 1961, spawning has been well below the 25-year average of 2 miles since 1962.

Lower east coast Queen Charlotte Island sub-district

The 5 miles of spawn located in this region in 1966 represented a 66% increase from the 1965 level. However, spawning was well below the 25-year average of 14 miles. The re-appearance of several large spawnings in Burnaby Strait was primarily responsible for the increased 1966 mileage. Most of the Burnaby Strait spawnings were deposited during high tides on bare rock, resulting in an estimated 90-100% mortality from desiccation during low tides.

West coast Queen Charlotte Islands sub-district

Only 3 spawnings totalling 600 yards were located along this exposed shoreline in 1966. Very light depositions on kelp and eelgrass occurred on regular spawning sites at Port Louis, Shields Bay and McKenzie Cove. Spawning herring failed to ap-

pear in Louscoone Inlet for the first time in many years. In 1965 two miles of spawn were found in this sub-district and in 1964, 8 miles. From 1957 to 1966 spawning in this region has ranged from less than one-half to 12 miles.

Northern sub-district

A fairly complete coverage of this region by air and vessel patrols located only 6 spawnings. The mileage of spawn found (22 miles) was about the same as that recorded in 1965. Only one minor deposition of 22 yards was found at Port Simpson with an 80% (at least) loss through bird predation. In the usually productive Kitkatla Inlet region spawning was almost negligible. Only one minor deposition of 300 yards was recorded in Serpentine Inlet. A very extensive deposition in Big Bay resulted in an above-average spawning of 22 miles. Some herring eggs were removed by natives from Duncan Bay for food purposes. The total amount of spawn located in this sub-district was below the 25-year average of 26 miles for the second consecutive year.

Upper central sub-district

In 1966 the extent of spawn (4 miles) was again well below the 25-year average of 17 miles. Since 1962 spawn abundance has been at very low levels, ranging from one mile in 1963 to 4 miles in 1966. The major herring stocks in this sub-district spawned in only one locality, Kitasu Bay, in early April. Minor, semi-resident stocks found in the channels and mainland inlets spawned only at the head of Kitimat Arm, producing less than one mile of spawn.

Lower central sub-district

Although a comprehensive coverage with aircraft and vessel was undertaken in this vast region only 10 miles of spawn were found, the smallest deposition on record and a 60% reduction from the 1965 level. During the 25-year period, 1940-64 spawning had averaged 33 miles in this region. The major stock in Areas 7A-8A produced only 3 miles of spawn as compared to 9 miles in 1965 and 19 miles in 1964. Many historic spawning localities such as Fish Egg Inlet, Troup Pass, Thompson Bay and Brydon Channel were not seeded in 1966. The loss of spawn through the depredations of ducks (scoters) was severe in Area 7A. Local stocks found in the remainder of the sub-district produced 7 miles of spawn due principally to fairly large depositions of 2-3 miles towards the head of Rivers Inlet.

Upper east coast Vancouver Island sub-district

The extent of spawn in this region showed no decrease from the 1965 level. A total of over 15 miles of spawn were found in 1966, an increase of 200% over 1965 and about average for the sub-district. Extensive depositions were located in Beaver Harbour (3 mi), Knight Inlet (4 mi) and Wakeman Sound (3 mi). No spawnings were reported from Seymour Inlet due partially to incomplete coverage.

Middle east coast Vancouver Island sub-district

The amount of spawn recorded in this region in 1966 was the smallest on record. Only 9 miles of spawn were found. Prior to this, spawning had equalled or exceeded the 25-year average of 29 miles annually since 1960. The sharp reduction in spawn abundance was due to the lack of spawnings along the Comox Harbour--Deep Bay coastline. Less than one mile of spawn was located in Area 14, the 25-year average for this area is over 15 miles. Over two-thirds of the total spawning in this sub-district occurred in the Pender Harbour--Jervis Inlet region. The 6 miles of spawn found here was the second successive above-average deposition in Area 16.

Lower east coast Vancouver Island sub-district

The 5 miles of spawn found in this sub-district in 1966 was about the same as 1965's record low level. Spawning has not been up to average (25 mi) in this region since 1960. Herring spawned in only 11 localities in the sub-district. In the Ladysmith Harbour area it was noted that predation by sea gulls was unusually heavy (estimated 80-90% mortality) on 3 spawning grounds along the Kulleet Bay--Boat Harbour shoreline. The usually productive Area 17B recorded less than 4 miles of spawn, well below the 25-year average of 17 miles. The Nanoose Bay--Departure Bay area recorded less than one mile of spawn.

Lower west coast of Vancouver Island sub-district

In 1966 spawning (5 mi) decreased from the 1965 level by 54%, producing the smallest deposition on record since 1942. During the 25-year period 1940-64 the extent of spawn has averaged 16 miles. In Barkley Sound herring spawned in only 3 historic localities (Banfield Inlet, Toquart Bay and Macoah Pass), producing little more than one mile of spawn. In Clayoquot Sound spawn was more abundant; 10 seedings, including depositions over one mile in length in Bawden Bay and Matilda Inlet, produced 4 miles of spawn.

Upper west coast of Vancouver Island sub-district

The 5 miles of spawn found in this region in 1966 was a sharp reduction (by 71%) from 1965's average-sized deposition of 17 miles. In Kyuoquot Sound only one spawning at Dutchie's Cove was reported, while in Quatsino Sound 3 spawnings produced less than one mile of spawn. Although spawn was more abundant in Nootka Sound all 11 depositions were of a light intensity. It was reported that 50% of

the eggs deposited at Burdwood Point, an exposed locality, were lost as a result of heavy surf action.

Lower mainland

In this region, where only a minor gillnet fishery takes place, 2 spawnings totalling less than one mile and one spawning of 3 1/2 miles were recorded in Howe Sound and Boundary Bay, respectively. The 1966 spawn mileage (4 mi) was 30% greater than that of 1965. Spawn abundance has ranged from 2 to 7 miles since 1957 in this region.

Considering the herring population of British Columbia as a whole, the data showed that both the catch and spawning decreased in the 1965-66 season. The reduction in catch from the 1964-65 level was 23% (from 241, 000 tons to 181, 000) while spawning was 32% (from 126 miles to 85 miles). The spawning escapement was the smallest on record. Thus, there have been 2 years of record low spawnings in succession.

Of the 5 southern British Columbia populations only the upper east coast of Vancouver Island spawn-stocks showed no decrease from 1965's level of 15 miles. In the remaining sub-districts spawn abundance is at very low levels, particularly in the lower east coast of Vancouver Island population.

In northern British Columbia and Queen Charlotte Islands sub-districts, although spawn abundance was below average in all populations, reductions from the 1965 level were not as large as in southern British Columbia. The extent of spawn increased in the lower east coast of the Queen Charlotte Islands sub-district by 66% (from 3 to 5 miles), while in the lower central sub-district spawning decreased by 60% (from 25 to 10 miles). ✔

Irradiation Extends Storage Life of Whitefish

EXPERIMENTS with low level gamma radiation at the Winnipeg fish inspection laboratory of the federal Department of Fisheries, in co-operation with Atomic Energy of Canada Limited and the University of Manitoba, have demonstrated that the storage life of fresh whitefish can be extended considerably by irradiation.

This development could be of considerable value to fish plants processing products for distant markets which at present are limited to frozen or processed forms. Results of the experiments were reported to the 10th Annual Conference of the Canadian Institute of Food Technology in Montreal last month by Kurosh Ostovar, chief of the Department's Central Region fish inspection laboratory.

Kurosh Ostovar

Mr. Ostovar reported that by placing the dressed whitefish in a sealed plastic bag and exposing it to a low level of gamma irradiation for a short period of time, 99. 9 per cent of the bacteria, which greatly contribute to spoilage of fish, was destroyed. The package thus treated could be kept on ice, in a fresh condition, for a period of up to 29 days.

Equipment used for the irradiation of samples was a mobile Cobalt-60 gamma irradiation unit designed and constructed by Atomic Energy of Canada Limited.

Mr. Ostovar became interested in preserving the freshness of fish in the course of his duties in the quality testing and control laboratory in Winnipeg. "The science of preservation by radiation is a new concept for the food industry, especially the fish industry" said Mr. Ostovar. "While the process we used in our research is too costly for the average fish packer and processor, no doubt engineering in the field of radiation will substantially reduce this cost in years to come." ✔

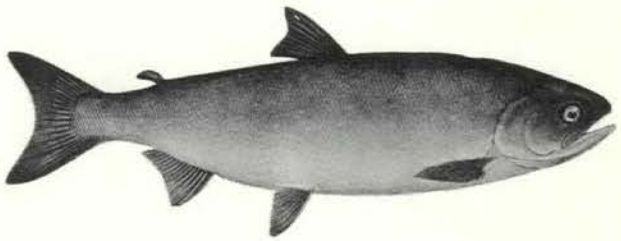
Tuna Plant in Operation

The Chairman of Atlantic Sugar Refineries Co., J. A. Gairdner, announced at the annual meeting in May that the company's modern tuna-canning plant at St. Andrews, N. B., is now in operation. When their Maine plant is completed shortly the two plants will have a combined capacity of 1 million cases of tuna per year.

Their processing plant at Marystown, Newfoundland, which has a capacity of 6 million lb., is also now in operation with two trawlers. The remaining eight trawlers will arrive at various intervals throughout the year.

Chum Salmon

FORMERLY KNOWN as dog salmon, the chum, with the scientific name *Oncorhynchus keta*, has also been called the qualla, keta and calico salmon. Its geographic range in North America extends from northern California into the Arctic as far east as the Mackenzie River. In British Columbia it is caught all along the coast and ascends practically all streams. The catch in British Columbia which during 1951 an 1963 averaged 2. 8 million fish per year and had an average landed value of 2 million dollars is widely marketed in several forms.



Chum Salmon
(Oncorhynchus keta)

DESCRIPTION

Like other Pacific salmon (sockeye, pink, spring and coho), the body of the chum is elongate and the head is conical. The teeth are strongly developed, and in the mature male resemble fangs. The parr marks on the young are slender bars, and the back has a green iridescence. The back of the adult fish is a metallic blue with occasional black specklings. There are black tinges at the tips of the pectoral, anal and caudal fins, especially marked in the male.

When the adult chum returns to fresh water to spawn and die, it changes color, becoming almost black with irregular reddish, dusky streaks across the sides of its body, and the tips of the pelvic and anal fins turn white. Chums grow to about three feet in length and an average weight of about eight pounds, although some frequently weigh as much as 18 pounds and in rare instances as much as 30 pounds.

The life span is four years, sometimes three or five. During the spawning season chums develop a characteristic hook over the upper jaw. The flesh of the chum is white, with a creamy tinge. It lives on small crustaceans, and its own food value is similar to that of others of the species. Of the five the chum is fourth in protein content and fifth in fat content.

MIGRATION AND REPRODUCTION

In British Columbia each spring in many different kinds of streams, chums, as fry measuring about 1 1/2 inches in length, emerge from the gravel and immediately migrate seaward. Some are still present in coastal waters as late as November but others are considerably farther offshore. At sea, chums grow rapidly and conduct seasonal movements, moving northward in the spring and summer and southward in the fall and winter. Stocks originating in British Columbia spend most if not all of their life in the Gulf of Alaska and in their final year as 3, 4 or 5-year-olds return, mainly in the fall, to streams where they were born. Many stocks enter streams emptying directly into open coastal waters but others are bound for mainland areas of southern British Columbia and the east coast of Vancouver Island, and reach these areas by migrating through Johnstone Strait as well as the Strait of Juan de Fuca.

METHODS OF CATCHING

Chums are caught by purse-seines, gill-nets and, to a limited extent, by trolling.

A variety of methods is employed to prepare the chum for market. A large quantity is sold fresh, other portions of the catch are frozen, canned, or dry-salted. Indians produce smoked chum, but for their own use. As is the case with all British Columbia salmon, the markets are world-wide but largest in the United States.

(Prepared by the Nanaimo Biological Station of the Fisheries Research Board of Canada).

News Roundup

Central Region Director

Robert Neil Gordon, 41, of Vancouver, has been appointed Regional Director of the federal Department of Fisheries Central Region with headquarters at Winnipeg.

R.N. Gordon

Mr. Gordon will be responsible for the administration of federal fisheries operations in the three prairie provinces, Ontario and the Northwest Territories. He succeeds G. Lorne Grant who was appointed in January as Director of Federal-Provincial Fisheries Arrangements at Ottawa.

Mr. Gordon was born in Los Angeles, California, but moved with his family to Vancouver at an early age. He was educated in Vancouver schools and graduated from the University of British Columbia in 1948 with a Bachelor of Science degree in civil engineering. He joined the Department of Fisheries the following year as an engineer.

He was transferred to Ottawa in 1954 as Headquarters Engineer and Supervisor of engineering programs in the Atlantic provinces. He returned to Vancouver in the following year to rejoin the expanding Fish Culture Development branch. As Senior Engineer with the branch during the past several years, his duties have been increasingly of an administrative nature. He has been concerned particularly with fisheries problems arising from industrial projects, hydro-electrical developments, pollution, and the construction of fish culture facilities.

Drift Net Fishing

A system of licence limitation in the drift net fishery for Atlantic salmon is being imposed in Newfoundland this year, Fisheries Minister H. J. Robichaud announced recently. This fishery is carried on mainly between Port aux Basques and Rose Blanche.

Under the new policy only persons who received licences to operate drift nets in 1966 will be eligible to obtain them this year. A special committee will be set up to deal with applications from other persons where there are extenuating circumstances involved.

Mr. Robichaud said that this action was being taken because of the rapid expansion in the drift net fishery in the past few years. During that period the number of vessels engaged in this activity has almost doubled and the catch of the salmon by drift nets has increased ten-fold.

The proposed new regulations will also impose a limit of 650 fathoms on the amount of drift net gear that may be fished by a single vessel. Moreover, the mesh used in drift nets may not be less than five inches, a measure which is designed to allow for the escapement of smaller salmon.

Former Minister Dies

Hon. J. E. Michaud, a former federal Minister of Fisheries and retired Chief Justice of the New Brunswick Supreme Court, died at his home at Edmundston, N. B., May 23. He was 78.

A member of the New Brunswick legislature for 16 years, Judge Michaud was first elected to the federal Parliament as Member for Restigouche-Madawaska in 1933. He was appointed Fisheries Minister in October, 1935, under Prime Minister MacKenzie King and continued in the portfolio until October, 1942, when he took over as Transport Minister. His term of office as Fisheries Minister was the longest since Confederation.

He also served temporarily as Minister of Public Works and Minister of Justice. He was appointed Chief Justice of the New Brunswick Supreme Court in 1945 and held the post until his retirement in September, 1963.

Harbor Improvement

O. J. Gaffney Limited, of Stratford, Ont., has been awarded a $596,070 government contract for harbor improvements at Port Dover, Ont.

Port Dover, on the north shore of Lake Erie at the mouth of the Lynn River, is reputed to have the largest freshwater fishing fleet in the world. A new east basin will be created by this project, immediately adjacent and to the east of the present east pier.

Construction of the new basin will serve initially to accommodate a major part of the fishing fleet now mooring in the Lynn River, on either side of the lift bridge. Land vacated by these moorings will be used as sites for commercial fishing facilities.

Fishery Statistics

SEAFISH: LANDED WEIGHT AND LANDED VALUE

	May-March 1965-1966		May-March 1966-1967	
	'000 lbs	$'000	'000 lbs	$'000
CANADA - TOTAL	2,151,300	135,080	2,337,772	144,687
ATLANTIC COAST - Total	1,618,859	90,431	1,826,974	88,308
Cod	560,060	23,439	500,861	21,921
Haddock	89,877	6,059	92,379	6,602
Pollock, Hake, Cusk, etc.	72,418	2,446	67,912	2,430
Rosefish	122,313	3,223	174,334	4,837
Catfish	4,228	139	4,271	142
Halibut	4,401	1,487	3,805	1,430
Plaice & Other Flatfish	208,724	6,432	257,203	8,445
Herring & Sardines	405,522	4,183	591,243	6,640
Mackerel	24,846	817	25,741	902
Alewives	12,088	202	8,074	141
Salmon	4,625	2,222	5,176	2,671
Smelts	4,589	334	4,227	361
Swordfish	7,687	3,190	7,290	3,134
Other Fish	14,879	609	13,619	487
Lobsters	38,155	24,720	35,315	20,415
Clams & Quahaugs	3,807	231	4,406	263
Scallops	18,746	9,858	15,641	6,625
Other Shellfish	21,894	840	15,477	862
PACIFIC COAST - Total	532,441	44,649	510,798	56,379
Pacific Cods	22,612	1,674	22,927	2,010
Halibut (1)	31,343	10,615	30,829	11,046
Soles & Other Flatfish	6,507	424	11,013	684
Herring	362,203	5,507	265,252	4,390
Salmon	85,778	24,792	152,610	36,264
Other Fish	8,574	269	12,380	496
Shellfish	15,424	1,368	15,787	1,489
BY PROVINCES				
British Columbia	532,441	44,649	510,798	56,379
Nova Scotia	563,871	44,816	636,797	41,268
New Brunswick	274,828	10,075	331,015	10,602
Prince Edward Island	46,149	6,827	57,812	5,990
Quebec	137,915	6,218	132,642	6,470
Newfoundland	596,096	22,495	668,708	23,978

(1) - Includes halibut landed in U.S. ports by Canadian fishermen.

MID-MONTH WHOLESALE PRICES - MARCH 1967

		Montreal $	Toronto $
Cod fillets, Atl, fresh, unwrapped	lb.	.375	.447
Cod fillets, Atl, frozen, cello 5's	lb.	.325	.383
Cod fillets, smoked	lb.	.422	.473
Haddock fillets, fresh, unwrapped	lb.	.483	.580
Herring, kippered, Atl.	lb.	.253	.337
Mackerel, frozen, round	lb.	.192	.260
Lobsters, canned, Fancy	case 48-$\frac{1}{2}$s	61.667	63.887
Sardines, canned	case 100-$\frac{1}{4}$s	9.695	9.600
Halibut, frozen, dressed	lb.	.558	.620
Silverbright, frozen, dressed	lb.	.602	.627
Coho, frozen, dressed	lb.	.792	.807
Sockeye, canned, grade A	case 48-$\frac{1}{2}$s	27.430	28.400
Pink, canned, grade A	case 48-$\frac{1}{2}$s	16.497	17.123
Whitefish, fresh	lb.	.455(1)	.450
Lake trout, frozen	lb.	.446	.523

(1) - Dressed

PRICES PER CWT. PAID TO FISHERMEN (WEEK ENDING MARCH 11th)

	1966 $	1967 $
Halifax		
Cod Steak	5.25	5.25
Cod Market	5	5
Haddock	8.5	8.5
Plaice	4.5	5
Yarmouth		
Haddock	-	-
Black's Harbour		
Sardines	-	-
St. John's Nfld.		
Cod	-	-
Haddock	2.75-4	-
Rosefish	2.5	-
Vancouver		
Ling Cod	14-17	12-16
Gray Cod	7.5	6-7.5
Soles	8.5	8.5-12
Salmon (Rdspg)	-	-

Fishery Statistics

FROZEN FISH STOCKS AS AT END OF FEBRUARY

	1966 '000 lbs	1967 '000 lbs
TOTAL - Frozen Fish, Canada	52,171	70,404
Frozen - Fresh, Sea Fish - Total	29,960	47,367
Cod, Atlantic, Fillets & Blocks	3,170	7,703
Haddock, fillets & blocks	1,232	3,709
Rosefish, fillets & blocks	1,698	5,051
Flatfish, (excl. halibut), fillets & blocks	3,073	5,750
Halibut, Pacific, dressed & steaks	3,986	6,006
Other Groundfish, dressed & steaks	834	744
Other Groundfish, fillets & blocks	3,487	4,173
Salmon, Pacific, dressed & steaks	4,553	4,800
Herring, Atlantic & Pacific	379	494
All Other Sea Fish, all forms	4,026	6,659
Shellfish	3,522	2,278
Frozen - Fresh, Inland Fish - Total	5,029	6,912
Perch, round or dressed	255	62
Pickerel, (Yellow & Blue) fillets	150	1,291
Sauger, round or dressed	(1)	863
Tullibee, round or dressed	131	426
Whitefish, round or dressed	1,667	1,274
Whitefish, fillets	361	214
Other, all forms	2,465	2,782
Frozen - Smoked Fish - Total	1,239	1,161
Cod Atlantic	541	606
Sea Herring, kippers	466	240
Other, all forms	232	315
Frozen for Bait and Animal Feed	15,943	14,964

(1) - Confidential, included with "other".

SALTED FISH STOCKS AS AT END OF MARCH

		1966	1967
Salted and Pickled Fish, Atlantic Coast			
Wet-salted - Total		5,818	7,201
Cod		5,346	5,901
Other		472	1,291
Dried - salted - Total		4,576	10,718
Cod		4,171	9,837
Other		405	881
Boneless - Total		543	516
Cod		492	501
Other		51	15
Pickled - Total	(barrels)	5,704	7,110
Herring	"	4,650	3,265
Mackerel	"	15	2,509
Alewives	"	1,039	1,336
Turbot	"	-	-
Bloaters	(18 lb. boxes)	39,486	8,908
Boneless Herring	(10 lb. boxes)	11	376

CANADIAN EXPORT VALUE OF FISHERY PRODUCTS, MAY - DECEMBER

(Value in Thousands of Dollars)

	1965		1966	
Total Exports		158,698		162,665
By Markets:				
United States		113,967		111,950
Caribbean Area		11,883		13,477
Europe		28,008		31,521
Other Countries		4,840		5,717
By Forms:				
Fresh and Frozen		111,327		111,125
Whole or Dressed	32,639		35,698	
Salmon, Pacific	8,567		11,517	
Halibut, Pacific	5,454		4,938	
Cod, Haddock, Pollock, etc.	275		348	
Swordfish	3,873		3,859	
Other Seafish	4,883		6,068	
Whitefish	3,616		3,366	
Pickerel	2,405		2,071	
Other Freshwater Fish, n.o.p.	3,566		3,531	
Fillets	51,016		52,222	
Cod, Atlantic	18,521		15,474	
Haddock	3,529		4,821	
Rosefish, Hake, Pollock, etc.	4,831		7,725	
Flatfish	8,324		10,807	
Pickerel	2,305		2,501	
Other	13,506		10,894	
Shellfish	27,672		23,205	
Lobster (Alive & Meat)	19,426		16,560	
Other	8,246		6,645	
Cured		16,146		16,287
Smoked	1,338		1,601	
Herring	830		1,073	
Other	508		528	
Salted, Wet & Dried	12,449		12,523	
Cod	10,668		10,585	
Other	1,781		1,938	
Pickled	2,359		2,163	
Herring	1,404		1,283	
Mackerel	579		538	
Other	376		342	
Canned		18,293		21,689
Salmon	11,876		14,464	
Sardines	3,279		3,613	
Lobsters	2,170		2,282	
Other	968		1,330	
Miscellaneous		12,932		13,564
Meal	7,102		6,640	
Oil	1,508		550	
Other	4,322		6,374	

Current Reading

MARINE RESOURCES OF NEWFOUNDLAND by Wilfred Templeman (Bulletin No. 154 of the Fisheries Research Board of Canada. Price $3. 50 from the Queen's Printer.)

Dr. Templeman, who is director of the Fisheries Research Board's Biological Station at St. John's, Nfld., has drawn upon his extensive knowledge of the Newfoundland area fisheries in preparing this bulletin.

After briefly reviewing the history of marine fisheries research in Newfoundland, together with current research trends and aims, Dr. Templeman gives catch statistics for the area, outlines hydrographic conditions and then deals with individual fish species. Most attention is devoted to the Atlantic cod fishery which represented 90 per cent of all landings by Newfoundland fishermen in 1964 and is by far the greatest commercial fishery in the area. Haddock, redfish, halibut, herring, mackerel, tuna, swordfish, salmon, capelin and smelt are among other species discussed and there are sections devoted to shellfish, seals, whales and seaweeds. There are numerous reference sources for those who wish to pursue particular subjects in greater depth.

In 1964 the total landed value of Newfoundland's fisheries was $23 million and the marketed value $47 million. More than 21, 000 men were either fully or partly employed in fishing and all except 700 of these were engaged in the inshore fishery. Although up to the early part of the 20th century the fishery was by far the greatest factor in the economy, other industries such as mining and forestry have now superseded it in economic value.

Dr. Templeman says that although some species are being heavily exploited, especially cod, haddock, redfish, American plaice and the harp seal, much less than the maximum sustainable yield is being harvested from various others, including herring, capelin, squid and swordfish. He also feels that species not being utilized now, such as launce and shrimp, may well be worth fishing at once or in a few years' time.

The author concludes with the statement: "For any large plan of fisheries development to increase Newfoundland landings markedly, great attention should be paid to the possibilities of the offshore fisheries, especially for cod and redfish as these are the most abundant fishes that can be marketed now. If her fishing is efficient, Newfoundland should be able to compete favourable with nations which must cross the Atlantic, use much larger ships, and process fish at sea.

"Clearly, the future of the Newfoundland fisheries will call for deep thinking, long-term planning, and increasing co-operation between the federal and provincial governments, the fishing industry, fishermen and scientists."

SEALS OF ARCTIC AND EASTERN CANADA by A. W. Mansfield. (Bulletin No. 137 of the Fisheries Research Board of Canada. Second edition - revised. Price $1. 50 from the Queen's Printer).

This informative booklet by Dr. A. W. Mansfield of the Fishery Research Board's Arctic Biological Station, was first published in 1963 to provide a means of identifying the seals of arctic and eastern Canada and also to give the more important facts of the seals' life histories. As such, it has proved very useful to fishermen and fishery officers on Canada's east coast and to government administrators and teachers in the arctic.

In this revised edition much new information on the habits of seals, particularly the harp seal, has been added. Recent changes in nomenclature have been included, as well as a list of scientific names of all the fishes mentioned and a bibliography of the more useful publications on seals.

PRICE SYSTEMS IN THE FISHING INDUSTRY Published by the Organization for Economic Co-operation and Development, Paris, France.

The special nature of fish supply and demand is responsible for a variety of price systems designed to ensure the coherent marketing of fishery products. An analysis of these systems as practised by OECD-member countries is provided in this publication.

The study attempts to assess the influence of price stabilization measures on international trade in fish, and answers the question of how far these measures conform with the principle of international co-operation and free development of trade between member countries.

OUR DESIGNERS ARE BUSY ON TIME, LABOUR AND COST-SAVING DEVELOPMENTS FOR THE FISHING INDUSTRY.

Throughout the year, the Industrial Development Service of the Department of Fisheries undertakes many projects in an effort to improve and modernize the catching and processing of fish. During the past year, for example, the Department has played an important role in developing the Atlantic herring fishery, the Pacific offshore groundfish fishery, designs of fishing vessels, more efficient catching gear, and a Canadian tuna industry. Currently the Department is investigating such things as the underwater exploration of marine resources by divers, electrical devices for catching fish, automation and mechanization on board fishing vessels and in fish processing plants. In almost every instance the Federal Department co-operates closely with the Provincial fishery departments and the fishing industry in a continuing effort to improve the working conditions and financial returns to the fisherman.

DEPARTMENT OF FISHERIES
Hon. H. J. Robichaud, M.P., Minister — Dr. A. W. H. Needler, Deputy Minister — Ottawa, Canada

ROGER DUHAMEL, F.R.S.C., Queen's Printer and Controller of Stationery, Ottawa, 1967