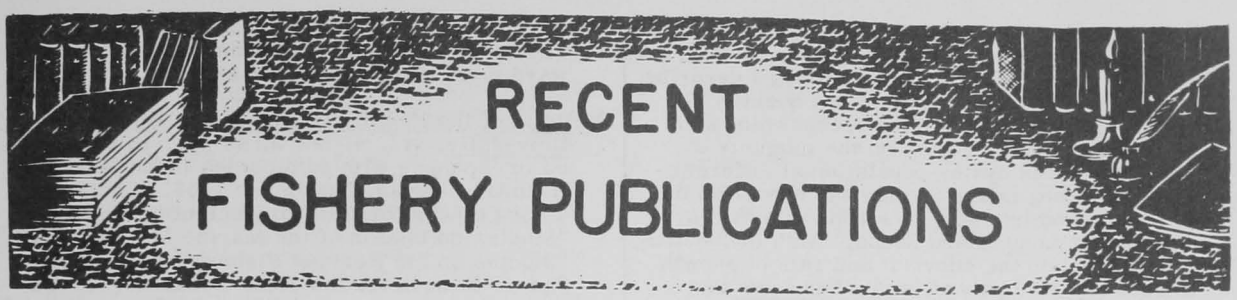

FISH AND WILDLIFE SERVICE PUBLICATIONS

THESE PROCESSED PUBLICATIONS ARE AVAILABLE FREE FROM THE DIVISION OF INFORMATION, U. S. FISH AND WILDLIFE SERVICE, WASHINGTON 25, D. C. TYPES OF PUBLICATIONS ARE DESIGNATED AS FOLLOWS:

CFS - CURRENT FISHERY STATISTICS OF THE UNITED STATES AND ALASKA.
FL - FISHERY LEAFLETS.
SL - STATISTICAL SECTION LISTS OF DEALERS IN AND PRODUCERS OF FISHERY PRODUCTS AND BYPRODUCTS.
SSR.- FISH. - SPECIAL SCIENTIFIC REPORTS--FISHERIES (LIMITED DISTRIBUTION).
SEP.- SEPARATES (REPRINTS) FROM COMMERCIAL FISHERIES REVIEW.

Number Title

CFS- 966 - New England Fisheries, 1952, Annual Summary (revised), 7 pp.
CFS- 990 - Florida Landings, February 1954, 6 pp.
CFS- 997 - New Jersey Landings, April 1954, 2 pp.
CFS- 999 - Florida Landings, March 1954, 6 pp.
CFS-1004 - Canned Fish & Byproducts, 1953 Annual Summary, 20 pp.
CFS-1007 - Frozen Fish Report, May 1954, 8 pp.
CFS-1008 - Maine Landings, May 1954, 4 pp.
CFS-1011 - Mississippi Landings, May 1954, 2 pp.
CFS-1013 - Fish Meal and Oil, May 1954, 3 pp.
CFS-1014 - Texas Landings, May 1954, 3 pp.
CFS-1016 - Florida Landings, 1953 Annual Summary, 10 pp.
CFS-1017 - New York Landings, January 1954, 4 pp.
CFS-1018 - New York Landings, February 1954, 4 pp.
CFS-1019 - New York Landings, March 1954, 4 pp.
CFS-1020 - New York Landings, April 1954, 4 pp.
CFS-1022 - Alabama Landings, May 1954, 2 pp.
FL -336u - Quarterly Outlook for Marketing Fishery Products, July-September 1954, 29 pp.
FL - 416 - Little Tuna Recipes, 6 pp. Describes the little tuna, an Atlantic Coast member of the popular tuna family, and contains recipes developed in the Service's test kitchens for preparing this fine game fish.
SL - 152 - Firms Manufacturing Oyster Shell Products, 1953 (revised), 2 pp.
SL - 161 - Producers of Packaged Fish, 1953 (revised), 6 pp

Sep. No. 375 - Freezing Fish at Sea--New England: Part 8 - Some Factors Affecting the Salt (Sodium Chloride) Content of Haddock During Brine-Freezing and Water Thawing.

SSR-Fish. No. 118 - Variations in Zooplankton Abundance in Hawaiian Waters, 1950-52, Joseph E. King and Thomas S. Hida, 71 pp., illus., processed, March 1954.

SSR-Fish. No. 119 - Variability of Long-Line Catches of Yellowfin Tuna, by Garth I. Murphy and Keith C. Elliott, 33 pp., illus., processed, March 1954. Describes a study of the variability of long-line catches of yellowfin tuna conducted (1) to establish a means of estimating the variance of catches made with different amounts of gear in a single set or station, and (2) to suggest a method of estimating the variance of a catch rate derived from the average catches of several stations. Pursuant to this the existence of schooling was investigated and the suitability of two transformations was tested empirically.

SSR-Fish. No. 126 - Creel Census and Expenditure Study, Madison River, Mont., 1950-52, 44 pp., illus., processed, April 1954.

THE FOLLOWING SERVICE PUBLICATIONS ARE AVAILABLE ONLY FROM THE SPECIFIC OFFICE MENTIONED.

Landings and Receipts of Fishery Products at Seattle--1953, by Charles M. Reardon, 30 pp., processed, June 1954. (Available free from Market News Service, U. S. Fish and Wildlife Service, 421 Bell Street Terminal, Seattle 1, Wash.) The Pacific Northwest fisheries trends and their effect upon Seattle fishery products receipts for 1953 are discussed in the first part of this report. Discussed by the author are the factors affecting receipts of fishery products at Seattle; the sources of supply for fresh and frozen fishery products; the trends in the salmon, halibut, tuna, long-line, and otter-trawl fisheries; shellfish receipts; and receipts of livers, liver oils, herring meal and oil, and other miscellaneous fishery products. The tables present fishery landings and wholesale receipts (including approximate values) at Seattle for 1953 by species, source of origin, and by months; monthly index of receipts of certain fishery products at Seattle; carload shipments of fishery products from Seattle by months; and names, classifications, and approximate standards for fresh and frozen fishery products sold on the Seattle market.

Oyster Bulletins, processed. (Available free from the Fishery Biological Laboratory, U. S. Fish and Wildlife Service, Milford, Conn.) As in previous years, a series of bulletins are issued

during the summer with information of practical importance and interest to the oyster growers of Long Island Sound. These bulletins describe the progress of accumulation and quantity of spawn in oysters during the prespawning and spawning periods, report on the intensity of spawning of the oyster population at different depths of Long Island Sound, and report on the beginning and intensity of setting in different sections of Long Island Sound. Also included is information on the survival and rate of growth of recently set oysters, and other facts that may be of interest to oyster culturists, especially concerning the behavior of the oyster enemies, starfish, and drills.

THE FOLLOWING SERVICE PUBLICATION IS FOR SALE AND IS AVAILABLE ONLY FROM THE SUPERINTENDENT OF DOCUMENTS, WASHINGTON 25, D. C.

"New Method of Artificially Planting Salmon Eggs," by Clinton Stockley, article, The Progressive Fish-Culturist, vol. 16, no. 3 (July 1954), pp. 137-138, illus., processed (annual subscription $1.25 domestic, US$1.65 foreign).

MISCELLANEOUS PUBLICATIONS

THESE PUBLICATIONS ARE NOT AVAILABLE FROM THE FISH AND WILDLIFE SERVICE, BUT USUALLY MAY BE OBTAINED FROM THE ORGANIZATION ISSUING THEM. CORRESPONDENCE REGARDING PUBLICATIONS THAT FOLLOW SHOULD BE ADDRESSED TO THE RESPECTIVE ORGANIZATION OR PUBLISHER MENTIONED. DATA ON PRICES, IF READILY AVAILABLE, ARE SHOWN.

The Behaviour of Juvenile Pacific Salmon, with Particular Reference to the Sockeye (ONCORHYNCHUS NERKA), by William S. Hoar, 29 pp., illus., printed. (Reprinted from Journal of the Fisheries Research Board of Canada, vol. 11, no. 1, 1954). Pacific Biological Station, Fisheries Research Board of Canada, Nanaimo, B. C., Canada. Behavior patterns of juvenile sockeye salmon in fresh water are compared with those of chum and coho salmon. Both sockeye and chum fry are schooling fish, responding positively to currents and avoiding shallow waters. Of the two species, chums, however, form more active schools, travel more rapidly, have a less marked cover reaction and prefer stronger light and shallower water. Sockeye smolts, in contrast to coho smolts, are more active, show little thigmotactic and territorial behavior and a more persistent response to current. The experimental findings are discussed in relation to the migratory behavior of these fish. It is suggested that sockeye fry, emerging from cover as the light intensity falls are displaced downstream after dark. Moderate activity and a marked preference for deep water are mechanisms postulated for continued residence of sockeye fry in lakes. Further it is suggested that the smolt exodus is due to heightened general activity, both day and night, associated with strong response to current. This brings sockeye smolts into the outflow from the lake where they hold position during the day but are displaced down the river after dark. Coho smolts, responding less vigorously to currents and maintaining a measure of contact with specific objects in their environment, move seaward more slowly than sockeye.

Bulletin of the Faculty of Fisheries, Hokkaido University, vol. 4, no. 3, 46 pp., illus., printed in Japanese with summaries in English. Hakodate, Japan, November 1953. Contains among others the following scientific papers: "Studies on Insulin of the Marine Mammals (III);" "Studies on the Herring Fishery by the Use of Square Nets in the Sea Near Hokkaido. I--On the Square Nets at Yagishiri Island of Hokkaido;" and "On the Fishing Boats Prescribed in the Revised International Regulations for Preventing Collisions at Sea."

Bulletin of the Faculty of Fisheries, Hokkaido University, vol. 4, no. 4, 128 pp., illus., printed in Japanese with summaries in English. Hakodate, Japan, February 1954. In addition to many others, this bulletin contains the following articles: "On the Efficacy of Net Preservatives (5);" "Fundamental Studies on Spherical Glass Floats for Fishing Nets (II)--On Water Resistance of Glass Floats;" "Mechanical Studies of Fishing Net Materials. I--Some Information on the Tensile Strength of Netting Cord (1);" and "Mechanical Studies of Fishing Net Materials. II--A Method of Estimating the Least in the Ten Thousand Tensile Strengths of Netting Cord."

Bulletin of Hokkaido Regional Fisheries Research Laboratory, no. 10, 65 pp., illus., printed in Japanese with summaries in English. Hokkaido Regional Fisheries Research Laboratory, Yoichi, Hokkaido, Japan, March 1954. Contains the following articles: "On the Normal Development of the Fish, Theragra chalcogramma (Pallas), Alaska Pollack;" "Holding Experiments of Tagged Fishes: Common Mackerel (Scomber japonicus Houttuyn) and Anchovy (Englauris japonicus T. & S.);" "Biochemical Studies on Protein Components of Squid Muscle;" "On the Seasonal Variation of Pollack Liver Oil in Monbetsu District;" "Studies on Containing States of Vitamin A in Fish Viscera;" "A Study on the Extraction Method of the Vitamin A from Pyloric Caeca of Cod;" and "Studies on the Freshness Test of Fishes. I."

Bulletin of the Japanese Society of Scientific Fisheries, vol. 19, no. 11, 1954, 62 pp., illus., printed in Japanese with summaries in English. The Japanese Society of Scientific Fisheries, Tokyo, Japan. Contains among others the following articles: "Some Properties of Oxidizing Fish Oil Concerning to its Condition of Oxidation;" "The Behaviors of the Sardine Schools by Fish-Detector--II. Influences of the Water Temperature when Attracting the Fish Schools by Fishing Light;" "Mechanical Properties of Fish Jellies (Renseihin);" "Studies on Growth Process of Sardine, (Sardinia melanosticta (F&S.)--I. Growth of Sardine in Inlets, Yosanaikai and Kumihama Bay;" "Biochemical Studies of the Salmon, Oncorhynchus keta--II. The Changes in the Components of Depot Fats During the Spawning Migration;" "Biochemical Studies of the Salmon, Oncorhynchus keta--III. The Changes in the Components of Liver Fats During

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the Spawning Migration;" and "How do Fish Select Positions and Kind of the Bags When Entering into 'Masu-Ami'?--III. Field Tests with Flatfishes, Eels, and Other Marine Animals."

Bulletin of the Japanese Society of Scientific Fisheries, vol. 19, no. 12, 1954, 108 pp., illus., printed in Japanese with summaries in English. The Japanese Society of Scientific Fisheries, Tokyo, Japan. Contains among others the following articles: "The Behaviors of the Sardine Schools by Fish-Detector--III. Behavior of Sardines When Attacked by Dolphins;" "Studies on Electrical Sterilization--II. Electrolysis of Sodium Chloride Solution Through Alternating Current;" "Physico-Chemical Studies on the Skin and Leather of Marine Animals--IX. Swelling of Shark Skin;" " Studies on Vitamin B_{12} of Aquatic Animals--IV. The Vitamin B_{12} of the Starfish;" "On the Removing of F.F.A. of Liver Oil;" and "Studies on the Prevention of Emulsifying in Alkali-Digestion Process."

(California) Statistical Report of Fresh, Canned, Cured, and Manufactured Fishery Products (Year 1953), Circular No. 28, 15 p. (mostly tables), printed. Marine Fisheries Branch, Department of Fish and Game, San Francisco, Calif., 1954. The tables in this publication show the California commercial landings of all fish and shellfish by species and by main fishing areas; the general origin of the commercial catch (in pounds) of each species and the volume of shipments into the State; a list of canning and reduction plants; a list of plants curing and manufacturing fishery products; and the production of canned, cured, and manufactured fishery products and byproducts (including fish meal and oil). Historical data are also included for the more important species--anchovies, sardine, tuna, yellowtail, and bonito.

(Canada) Fisheries Statistics of Canada, 1952 (New Brunswick), 8 pp., printed, French and English, 25 Canadian cents. Dominion Bureau of Statistics, Ottawa, Canada, 1954. Consists of tables giving the production and landed and marketed values of the principal species of fish and shellfish landed in New Brunswick in 1950-52; quantity and value of manufactured fishery products for 1951-52; vessels used in the sea fisheries; capital equipment in the primary fisheries operations; and the number of persons engaged in the fisheries.

(Canada) Fisheries Statistics of Canada, 1952 (Nova Scotia), 8 pp., printed, French and English, 25 Canadian cents. Dominion Bureau of Statistics, Ottawa, Canada, 1954. Consists of tables giving the production and landed and marketed values of the principal species of fish and shellfish landed in Nova Scotia in 1950-52; quantity and value of manufactured fishery products for 1951-52; vessels used in the sea fisheries; capital equipment in the primary fisheries operations; and the number of persons engaged in the fisheries.

(Canada) Fisheries Statistics of Canada, 1952, (Ontario, Prairie Provinces and Northwest Territories), 8 pp., printed, French and English, 25 Canadian cents. Dominion Bureau of Statistics, Ottawa, Canada, 1954. Consists of tables giving the production and landed and marketed values of the principal species of inland fish landed in Ontario in 1950-52; capital equipment in the primary fisheries operations; and the number of persons engaged in the fisheries. Similar data are also given for the Prairie Provinces (Manitoba, Saskatchewan, and Alberta) and the Northwest Territories.

(Canada) Fisheries Statistics of Canada, 1952 (Quebec), 6 pp., printed, French and English, 25 Canadian cents. Dominion Bureau of Statistics, Ottawa, Canada, 1954. Consists of tables giving the production and landed and marketed values of the principal species of fish and shellfish landed in Quebec in 1950-52; quantity and value of manufactured fishery products for 1951-52; vessels used in the sea fisheries; capital equipment in the primary fisheries operations; and the number of persons engaged in the fisheries.

Commercial Trawling Tests in the Great Australian Bight, by T. W. Houston, Division of Fisheries Technical Paper No. 2, 18 pp., illus., printed. Commonwealth Scientific and Industrial Research Organization, Melbourne, Australia, 1954.

Effects of Compensatory Mortality Upon Population Abundance, by W. E. Ricker, F.R.B. No. 359, 7 pp., illus., printed. (Reprinted from The Journal of Wildlife Management, vol. 18, no. 1, January 1954). Pacific Biological Station, Fisheries Research Board of Canada, Nanaimo, B. C., Canada.

Food Composition Tables--Minerals and Vitamins (for International Use), by Charlotte Chatfield, FAO Nutritional Studies No. 11, 117 pp., printed, US$1. Food and Agriculture Organization of the United Nations, Rome, Italy, March 1954. (For sale by Columbia University Press, International Documents Service, 2960 Broadway, New York 27, N. Y.) This publication is in sequence with Food Composition Tables for International Use published by FAO in 1949. The earlier tables showed the calorie value and the protein, fat, and carbohydrate content of foods commonly used throughout the world. The present tables give the figures for vitamin A, ascorbic acid (vitamin C), thiamine (vitamin B_1), riboflavin and niacin, and for two minerals--calcium and iron. These are all nutrients in which human diets are often deficient. Knowledge of their distribution in foods is therefore of considerable practical value.

The relevant figures can be used in calculating the nutrient content of diets in surveys of selected groups which provide reasonably accurate information about the intake of food. The author indicates, contrary to the popular belief, that the nutrient content of foods varies widely from place to place, that "similarities have been more conspicuous than discrepancies in the values reported for a food when a sufficiently large number of observations under varying conditions have been available from several countries."

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There are three tables: 1. Food Composition in Terms of Retail Weight. 2. Composition of the Edible Portion and Refuse in the Material as Purchased. 3. Composition of the Edible Portion and Refuse in the Material as Purchased: Proximate Composition of New Items. A bibliography of 539 references is given.

--Charles Butler

Foreign Trade Practice (Reference Sources), Business Information Service World Trade Series No. 578, 22 pp., processed, 25 cents. Bureau of Foreign Commerce, U. S. Department of Commerce, Washington 25, D. C., June 1954.

The Freezing and Cold Storage of Fish, by G. A. Reay, A. Banks, and C. L. Cutting, Food Investigation Leaflet No. 11, 20 pp. printed, 6d. (7 U. S. cents). Food Investigation Organization, Department of Scientific and Industrial Research, Cambridge, England, 1952. (For sale by Her Majesty's Stationery Office, London.) The age-old practices for fish preservation by salt-curing or salt-curing coupled with drying or smoking have been superseded in some countries by an enormous expansion in the supply and distribution of fresh fish. The limitations of ice as a preservative of fresh fish are, however, a serious drawback, especially when fishing is done on banks distant from the consuming centers. Under normal commercial conditions of handling and stowage in ice, nonfat fish such as cod remain reasonably fresh for about one week. Fatty fish such as herring are usually landed in satisfactory condition even when not iced during the eight hours they are aboard the vessel. Even with adequate icing during the two or more days required for distribution, the fish frequently reach the consumer in an inferior condition.

Fresh herring and "white" fish if well smoke-cured will keep in first class condition for several days in storage at 60° F. If stale raw materials are used for these lightly-smoked products, their palatable life seldom exceeds at ordinary temperatures the two days required for distribution.

By contrast the principles of freezing and cold storage, if properly applied, afford practically perfect preservation of fresh and of lightly smoke-cured fish of all kinds for several months. This leaflet outlines the basic principles of proper freezing and cold storage of fish and then details their application to the products normally marketed in Britain.

Fish stowed with or without ice are attacked by bacteria, and by the enzymes in the meat of the fish. Most of the stale and later the putrid odors and flavors associated with spoiling and spoiled fish arise from bacterial activity. The enzymes act much more slowly to digest the protein of the meat, softening it and altering the physical characteristics; they attack the fat or oil to form substances with undesirable odors, flavors, and appearance. Commonly recognized examples are a rancid smell and flavor, a "rusty" appearance, and a gummy consistency.

The rate of bacterial activity is progressively slowed by lowering the temperature of fish. Chilling in ice affords brief protection. Fish brought to 20° F. are more effectively protected and bacterial spoilage is actually under control at 15° F. or lower. Two factors bring about this result. The fish at 15° F. have about 91 percent of the water in their cells turned into ice. Into the 9 percent of remaining liquid has been concentrated the various salts of the meat. Since bacteria require much fluid water to exert maximum destructive action, this solid state of the water slows their activity. The concentrated salt solution likewise strongly inhibits their activity.

Once bacterial activity has been checked by freezing fish to 15° F., the slower but undesirable changes attributable to enzymic action become apparent. Another deteriorative type that occurs in frozen fish includes the oxidation of oil in fat fish and of some unidentified constituent of lean fish to produce "salt-fishy," "cold storage," and rancid odors.

During the freezing of fish an important type of deterioration (denaturation) can cause changes in the texture and appearance of even the freshest fish. These changes occur most rapidly at temperatures just below the freezing point of fish, 27° F., and continue quite rapidly at 15° F. A few weeks' storage at such a high temperature can result in inferior quality. The meat becomes, on thawing, opaque and white, spongy and friable, and juice exudes freely. The cooked meat is "sloppy" at first and dry and fibrous on further chewing.

To minimize these undesirable changes the recommended procedure is that: (1) the fish be so frozen that it passes through the "zone of maximum crystallization," 30° F. to 23° F., as rapidly as possible; (2) cold storage is at temperatures of subzero levels, e.g. -5° F. to -20° F.

Even under these most favorable conditions frozen fishery products must be protected from the relatively slow deterioration from oxidation and evaporation. The use of a glaze or a moisture-vapor proof wrapping material, if properly applied and maintained, will accomplish this protective function.

In the second section dealing with the application of the information now known about the basic principles for the proper freezing and cold storage of fish, several pertinent subjects are covered.

Raw materials for freezing should be fresh. Inshore fish, as herring, must be iced aboard the vessel, and the total elapsed time from capture to freezing should not exceed 12 to 18 hours. Fish taken at greater distances from port should be promptly iced (or frozen at sea) and delivered to the freezer within 1 to 4 days.

Freezing of fish should be done immediately as they are received. Brining of white-fish fillets for 20 to 60 seconds in 40° to 60° salinity

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brine (10 to 15 percent by weight of salt) is recommended to minimize drip. Freezing rates suggested as satisfactory are approximately one inch per hour for blocks of fish of fillets up to $3\frac{1}{2}$ inches in thickness. Freezing is considered completed when the center of the fish or block is at 0° F.

Fish to be glazed should be sufficiently cold to allow for the rise in temperature during this process. For example, a 7-pound block of fillets 2 inches thick and at -15° F. in the center may rise to 8° F. in taking on a glaze of $1\frac{1}{2}$ to 2 percent by weight. Use of a precooling room is important to bring glazed fish or any frozen fish to the actual storage temperature before they are put into the cold-storage holding room.

Storage-room conditions and temperatures recommended include: (1) use of airlocks at entry points; (2) adequate and maintained glaze or wrapping material; and (3) constantly maintained low temperatures (white fish -5° F. for 4 months or -20° F. for 8 months or longer; herring -5° F. for up to 3 months and -20° F. for 6 months or longer).

Thawing should be carried out at temperatures below 60° F. The rate depends on the thickness of the fish, the temperature of the thawing agent, and the rate of movement of this agent. For example, fish 2 inches thick thaw in still air at 60° F. in 6 hours; in running tap water at 60° F. in $1\frac{1}{2}$ hours; and in running tap water at 45° F. in 3 hours. The hazard of loss in flavor from prolonged water thawing is stressed, especially for fillets. Small fish or fillets may be cooked without thawing, and even a "batter" can be added for deep fat frying. The cooking time for frozen fish must be longer than for thawed fish, but there is less loss of juiciness and full flavor using frozen fish.

The temperature of frozen fish in transport should never be allowed to rise above 0° F. If limited storage of not over a few weeks is contemplated at the retailer's or consumer's premises, a holding temperature of 5° F. or lower is satisfactory. The guiding principle throughout the distribution chain must be to insure that the initial quality of the fish at the time of freezing is not thrown away by carelessness in the final stages of distribution.

--Charles Butler

Indo-Pacific Fisheries Council--List of Scientific & Other Periodicals Published in the Indo-Pacific Area (2nd Edition, Revised), 51 pp., printed. Food and Agriculture Organization of the United Nations, Regional Office for Asia and the Far East, Bangkok, 1953.

Investigations of the Black Mullet, MUGIL CEPHALUS L., in Northwest Florida, by Gordon C. Broadhead, Technical Series No. 7, 34 pp., illus., printed. Marine Laboratory, University of Miami, Coral Gables 34, Florida, 1953. This bulletin reports results of the mullet investigation in northwest Florida undertaken by the Marine Laboratory of the University of Miami in 1948 at the request of the Florida State Board of Conservation. According to the author, "Northwest Florida produces about one-sixth of Florida's supply of mullet, with an average annual value of about $450,000. Since 1941 there has been a drop in the mullet catch in northwest Florida to 40 percent of the former level and this is thought to reflect a corresponding drop in the abundance of the fish." More details are given in the section on production trends in the fishery. The author also discusses the mullet fishery in northwest Florida in general, the general biology of the black mullet, sampling the commercial fishery, weight-length relationship, time of maturity, size at maturity, spawning, migrations, and growth of the mullet. Nets used in the commercial fishery are selective as to the size of fish taken. Gill nets are the most selective, followed by trammel nets, with seines the least selective of the three types of gear. There are discussions of net selectivity in the mullet fishery and management of the fishery.

"Lamprey Control," article, Trade News, May 1954, vol. 6, no. 11, pp. 6-7, illus., printed. Department of Fisheries, Ottawa, Canada. This article describes a Federal-provincial research program aimed at further developing the fisheries of the Canadian side of the Great Lakes. A Great Lakes Fisheries Research Committee, established by the Canadian Government and the Ontario provincial government, will coordinate all phases of Great Lakes fishery research, but lamprey control in Lake Superior has been designated as the priority project. Twenty major lamprey-control installations are expected to be completed during 1954. Field headquarters for lamprey control have been set up; electrical barriers and a physical barrier are now in operation and their efficiency in controlling lamprey will be studied. A search is being carried out to find a suitable poison and a method for its application to eliminate young lamprey and ammocoetes in the rivers. A survey to determine the size of the lamprey runs and the use made of the streams for spawning is to be made. Three million lake trout eggs from Great Slave Lake in the Northwest Territories will be obtained to insure the continued planting of lake trout in Lake Superior and these will be hatched and planted in the upper Great Lakes. Scientists will collect statistics of the existing lake trout fishery of Lake Superior. Continuation of the experimental commercial fishery operation, and other operations like the planting of fish, census of sport fishing, examination of the experimental catch, and release of marked fish will be carried out. Similar work being carried out in Lake Erie will also include a tagging program and analysis of commercial catches to provide data for population estimates and movements of fish in that lake. The Lake Ontario part of the program will have three chief projects: (1) continuation of the whitefish study, (2) lamprey observations, and (3) preliminary observations directed to eventual better fish processing.

Marine Laws--Navigation and Safety, 1954 Supplement, by Frederick K. Arzt, 40 pp., printed,

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$1.50. Equity House, Equity Publishing Corporation, Stony Brook, New York, 1954. This is a supplement to the more comprehensive volume published in April 1953 and reviewed in Commercial Fisheries Review, July 1953. It brings up to date (May 6, 1954) all amendments by Congress affecting marine matters within the scope of its chapter headings. Nineteen chapters are affected by the revisions, covering such items as inspection of vessels, documentation, federal ship mortgage insurance, radio, pilotage, rules to prevent collisions, etc. Two comprehensive notes on "Development of the International Ice Patrol" and "History and Court Constructions of Light Money" are included. Author's comments on many of the recent administrative and court decisions should be helpful to the reader. Also included are a table of contents, distribution tables, and index by means of which the reader may quickly find the latest information in the various sections.

--D. E. Powell

"Maritime Oyster Research," article, Trade News, May 1954, vol. 6, no. 11, pp. 4-5, illus., printed. Department of Fisheries, Ottawa, Canada. This article describes a joint program of the Fisheries Research Board of Canada and the Federal Department of Fisheries to develop oyster farming in Canada's Maritime provinces. This program was carefully reviewed in an attempt to assure that policies and experimental farming were both planned in the best interests of the industry. Attempts were made to find cheaper production methods and to develop cheaper and more effective means of collecting spat and rearing small oysters. Describes the construction of a tidal pool for oyster studies. Experiments are also being conducted to find the best methods for the control of eel grass, which interferes with oyster growth.

Maryland's Sunken Treasure, Conservation Series Book Two, 52 pp., illus., printed. Maryland State Department of Education, Baltimore, Md., 1953. This publication, the second of the Maryland Conservation Series, deals with the life story, the uses, and misuses of the Maryland oyster. It describes oyster farming, types of boats and gear used in catching oysters, methods of preparing oysters for market, and how to increase the oyster supply. It is presented in a graphic and readable style in response to a need for authentic, interesting, and nontechnical instructional materials on conservation in Maryland. It is intended to give a broader understanding of the problems in oyster conservation.

The New England Fishing Industry (A Study in Price and Wage Setting), by Donald J. White, 222 pp., printed, $4.00. Harvard University Press, Cambridge, Mass., 1954. The problems of the New England fishing industry are comprehensively treated in this book. Policy makers in business, unions, state and Federal government agencies, and other individuals interested in the fishing and allied industries will find the contents of inestimable value. This is a study in the interrelations of wages and prices and factor and product markets as the subtitle indicates. Specific proposals for the New England fishing industry are presented, as well as a theoretical analysis and a report on the operation of collective bargaining. A reappraisal of its techniques, methods, and organization are essential if the historic New England fishing industry is to survive, the author points out. The four major economic problems of the industry in recent years are discussed in detail: (1) "profit-sharing" controversies between the fishermen and the fish dealers, and the attempt of the fishermen's union to influence production, prices, and wages which have developed out of these controversies; (2) the effect of the decline of key species of fish, and possibilities for correctives; (3) marketing difficulties, particularly the severe competition with meat and meat products; and (4) foreign competition, particularly from the Canadian Maritime Provinces, but also on a growing scale from Iceland and other northern nations. The historical development of present-day fishing operations in the leading ports of Boston, Gloucester, New Bedford, Portland, and Rockland is adequately reviewed. The pricing mechanisms and the unique arrangement by which the fishermen share directly in both the revenues and expenses of operations under a historic pay arrangement called the "lay" are clearly analyzed. The growth of organized groups are traced and collective bargaining experience and union policies are described. Concrete recommendations are given by the author for bettering collective bargaining, union policies, production and marketing, and wage-price determination. In his preface the author points out that his study is concerned with but one of the industry's major divisions--the fresh and frozen finny fish phase concentrated in Boston, Gloucester, and New Bedford, Mass.; and in Portland and Rockland, Maine. In focusing the spotlight on operations in these ports, continues the author, we are purposely excluding from coverage such other prominent branches of the trade as sardine canning in Maine, shellfish and lobster fishing in all the coastal states (particularly in Maine and Massachusetts), and brokerage in all kinds of fish specialties, which is centered in Boston. The analysis focuses upon the union, relations between the union and vessel owners and fish buyers, and the policies these groups have developed and carried forward. The discussion is developed in the light of the basic economic characteristics and problems of the industry. Included in the study is an examination of the key problems of fish scarcity, fish marketing, and foreign competition which harass fishermen, vessel owners, and fish buyers alike. Some suggestions are offered by the author with the hope that they might help the parties minimize their internal differences and overcome their common problems. Prospects for progress are also reviewed. The material in this study runs for the most part up to 1952 when the study was finished. However, the author has added a postscript to bring the story more nearly up to date. An important part of the book is the "Theoretical Supplement" which will be of interest to economists as it constitutes a contribution in the application of theory to interrelated labor and product markets. Interesting is the author's

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finding that coordinated systematic research, market development, and improved industrial practices are the steps which should provide an answer to the industry's fish scarcity, marketing, and foreign competition problems.

--Joseph Pileggi

Oceanography--Science of the Sea, by John P. Tully, 19 pp., illus., printed. (Reprinted from the Canadian Geographical Journal.) Department of Fisheries of Canada, Ottawa, Canada, 1953. A description of oceanographic research in Canada. Briefly discussed are processes in the sea; ocean currents; coastal currents; tides; climate and temperature of the sea; taking water samples; food in the sea; salt and other chemicals in the sea; and the development of oceanography.

Our Underwater Farm, Conservation Series Book Three, 52 pp., illus., printed. Maryland State Department of Education, Baltimore, Maryland, 1953. This publication, the third of the Maryland Conservation Series, discusses fish, crabs, and oysters--three main "crops" of our "farm," the Chesapeake Bay. It describes the habits of these three "crops," their economic importance, and the conservation practices employed in Maryland and Virginia to maintain the rich resources of the Chesapeake Bay. As with the other booklets in this Series, it is written in response to a need for authentic, interesting, and nontechnical instructional materials on conservation in Maryland.

"The Preservation of 'Wet' Fish--Part I," article, FAO Fisheries Bulletin, vol. VII, no. 2, April-June 1954, pp. 49-65, printed, single copy 30 cents. Food and Agriculture Organization of the United Nations, Rome, Italy. (For sale by International Documents Service, Columbia University Press, New York 27, N. Y.) This is the first report of Working Group 3 of the FAO Interim Committee on Fish Handling and Processing (in two parts). Reviews experiments on cooling and handling of wet fish and on the use of preservatives and disinfectants. Stress has been laid on the principles of the methods of fish handling and chilling, and not on the technical details. Effects on spoilage of chilling, handling, and preservatives are discussed. The physiology of spoilage bacteria and the physiology of the fish are also mentioned. Part 2 of the Group's report will deal with the construction of fish holds.

Production of Fish in the Colonial Empire, Revised Edition-1953 (A Review by the Fisheries Adviser to the Secretary of State for the Colonies), by C. F. Hickling, Colonial No. 300, 22 pp., printed, 9d. net (10 U.S. cents net). Her Majesty's Stationery Office, London, England, 1954. A brief account of the fishery development and research in each territory of the Colonial Empire.

Research in Salmon Migration Over High Dams--The Nature of the Biological Problem, by J. R. Brett, FRB No. 356, 6 pp., printed. (Reprinted from the Sixth British Columbia Natural Resources Conference Transactions, 1953.) Pacific Biological Station, Fisheries Research Board of Canada, Nanaimo, B. C., Canada. Discusses the nature of migrating salmon, their particular responses and capabilities, and the work being done relative to safeguarding downstream migrants.

Review of Kenya Fisheries, 1952, by Hugh Copley, 117 pp., illus., printed. The Government Printer, Nairobi, Kenya, 1953. Reviews the Kenya fisheries for 1952, with special reference to the river fisheries, hatchery work, a fish-culture farm, and the marine fisheries. The report on the marine fisheries discusses production, prices, distribution and marketing, and exploratory and experimental work. It describes a study of markets; the storing and sale of fresh fish; the processing and sale of dried salted fish; the collection and disposal of shell in various forms; and the catching, preparation, and sale of turtles, crustacea, and beche-de-mer. Also includes statistical data on the yield of trout by river and area for the period 1938-52, and fish trap results.

(Scotland) Industry and Employment in Scotland, 1953, Cmd. 9102, 74 pp., printed, 2s. 6d. (35 U. S. cents). Scottish Home Department. (Available from Her Majesty's Stationery Office, Edinburgh, Scotland), 1954. Contains, among others, a chapter on the fisheries of Scotland in general. It also discusses the whitefish, shellfish, herring, salmon, and fresh-water fisheries, fishery harbors, exports, and fisheries research.

Shrimp Prospecting in Regions of the British Columbia Coast, November 1953 to March 1954, by T. H. Butler and H. E. J. Legare, Circular No. 31, 42 pp., illus., processed. Fisheries Research Board of Canada, Pacific Biological Station, Nanaimo, B. C., April 1954. A program to locate new shrimp grounds and to study effectiveness of shrimp gear was conducted by the Pacific Biological Station from November 10, 1953, to March 10, 1954. Favorable marketing conditions have occasioned an increased interest in British Columbia's unexplored shrimp resources during the past year. The Station's trawler Investigator No. 1, and a chartered vessel, the Yuri M, were employed in this survey. To increase the range of shrimp vessels, experiments were also conducted on holding shrimp in refrigerated sea water (a separate report on this phase has been released). A total of 114 exploratory tows were completed using a small otter trawl (diagram given). Tows generally lasted 15 to 20 minutes, and the shrimp catch was coverted to a pounds-per-hour basis. A catch of 25 pounds of shrimp or more was considered to be of commercial fishing value. Fishing depths ranged from 14 to 115 fathoms, with commercial quantities found between 29 and 75 fathoms. Results of the tows are listed in tables, and the locations are shown on maps of the areas covered. In the Strait of Georgia six localities yielded catches considered of commercial significance. "Smooth pink" shrimp, a new type found over a year ago, made up most of the

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catch in this region. Of 23 tows made in Chatham Sound near Prince Rupert, 16 contained commercial quantities, indicating the region will support a moderate shrimp fishery. In Queen Charlotte Strait and inlets near Johnstone Strait, the trawling area was found to be quite limited and only five tows yielded commercial quantities of shrimp. Food fish (lemon sole, starry flounder, and grey cod) were caught in commercial quantities in this area. An experiment to compare the efficiency of otter trawls and beam trawls in shrimp fishing indicated an advantage for the otter trawl in total catch, both for shrimp and fish. The beam trawl apparently fished better with increasing depth, but additional work is necessary in the comparison of the two types of gear. The cost for materials and operations is greater for the otter trawl.

--D. E. Powell

Some Aspects of the Dynamics of Populations Important to the Management of the Commercial Marine Fisheries, by Milner B. Schaefer, Bulletin, vol. 1, no. 2, 32 p., illus., printed. Inter-American Tropical Tuna Commission, La Jolla, Calif., 1954. Presents the results of investigations by the Inter-American Tropical Tuna Commission, which has the task of gathering and interpreting factual information to facilitate maintaining the populations of the tropical tunas and of the tuna-bait fishes at levels which permit maximum sustained catches year after year. Attention is directed to the collection and compilation of reliable data on the total catch and catch per unit of fishing effort of each tuna species over the period of growth and development of the fishery in the Eastern Tropical Pacific. The next step in the investigation is to employ these data together with such ancillary vital statistics as may be required and may be obtainable, to the estimation of the level of maximum sustained yield of each tuna stock and the determination of the present condition of the fishery with relation thereto. This requires the employment of a suitable mathematical model, describing the effect of fishing on tuna stocks. This paper reports the investigations undertaken to develop a suitable model, and of methods of its application to fisheries data, which can be applied to the data of the tuna fishery. This investigation attempts to indicate the manner in which the fundamental laws of population growth operate in the case of a commercial fishery and to clarify some of the important considerations basic to the management of the oceanic fisheries. This is shown by means of mathematical models. The subjects discussed in this paper are as follows: the law of population growth in populations which tend to stability; effects of fishing; catch per unit of effort; maximum equilibrium catch; determination of the status of the fish population and estimation of equilibrium yields; an application to the halibut fishery of the North Pacific; the nature of the growth of the amount of fishing; stabilization of an unregulated fishery; the course of development of an unregulated fishery and the manner of approach to stable equilibrium; examples from the commercial fisheries; Pacific halibut; California sardine (Pacific pilchard).

The South African Fishing Industry Handbook and Buyers' Guide, 1954, 244 pp., illus., printed, £2 2s. (US$6.00). South African Shipping News and Fishing Industry Review, Box 2598, Cape Town, South Africa, 1954. This is the second edition of a handbook originally issued in 1951 and designed to acquaint readers with the various aspects of the South African fishing industry. The book is divided into several sections. "Marine Resources of South Africa" discusses South Africa's fishing industry and its relation to world fisheries; the pilchard industry; the trawling industry; the rock lobster industry; snoeking; fishing in South-West Africa; and South African fish species. The list of species in this section gives the English, Afrikaans, and scientific name for each species caught in South Africa. In the section "Organizations Serving the Industry," the following are described: the Division of Fisheries, the Fishing Industry Research Institute, the Fisheries Development Corporation, the South African Food Canners' Council, the South African Bureau of Standards, and the Food and Agriculture Organization, as well as a description of the control of fisheries in South-West Africa and fishing harbors in South Africa. Brief biographical notes on the leading personalities professionally connected with the industry are to be found in the section "Who's Who in the Fishing Industry of South and South-West Africa." "Guide to Companies in the Fishing Industry" is a section which lists the names, functions, addresses, factories, capital, directors, and affiliations of companies operating in South and South-West Africa. A classified list of fish products with brand and producers' names is contained in the section "Products of the Fishing Industry." "Suppliers to the Fishing Industry and Buyers' Guide" is a classified list of products offered to the fishing industry. Details on South African motor fishing boats, motor trawlers, steam trawlers, and South-West African fishing boats, and other miscellaneous craft are given in the section "Fishing Craft Operating in South and South-West Africa." The last section--"Marine Engines"--is a detailed list of engines offered for installation in South and South-West African fishing boats.

--J. Pileggi

"Studies on the Manufacture of Canned Crab," article, Bulletin of the Faculty of Fisheries, Hokkaido University, vol. 4, no. 2, pp. 123-131, illus., printed in Japanese with summaries in English. Hakodate, Japan, August 1953. Includes the following reports under Part I--On the Manufacture of Canned Crab from Erimacrus isenbeckii (Brandt): Report 2--The Difference of Quality of Canned Crab Made From Different Parts of Crab Body; Report 3--Studies on the Influences upon the Quality of Canned Crab of the Kinds of Water used and Number of Times of Change of Water for Boiling Crab Removed from Carapace; and Report 4--Studies on B. coli in Canning Water. This Bulletin contains these articles: "Studies of Shark Muscle: Part 4--On Histamine in Shark Meat;" "On the Biochemical Changes of Fish Muscle after Death (1);" "Studies on the Manufacture of Conserva-

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tive Marine Food Products: XII--Preservation of Marine Food Products in Dupont Paper Sac;" "Studies on Coli Group Distributed in Marine Foods: I--Coli Score in Squid (Ommastrephes sloani Pacificus) Caught in the Sea near Hakodate;" and other articles.

A Survey of the Tampa Bay Area, by Charles E. Dawson, Jr., Technical Series No. 8, 40 pp., illus., printed. Board of Conservation, Division of Oyster Culture, Tallahassee, Florida, June 1953.

(Washington) State of Washington Commercial Fishing Statistics--1953, 47 pp., printed. Washington State Department of Fisheries, 4015 20th Ave. W., Fishermen's Terminal at Salmon Bay, Seattle 4, Wash. Consists almost entirely of tables showing landings of fish and shellfish in the State of Washington by districts, species, and gear. Comparative data on the catch of most items are shown for the years 1935 through 1953. The report also contains information on the value of landings, vessels, and plants; and the operating expenses of processors, boatyards, and related information. Data are shown on the Washington salmon pack from 1900 to 1953, as is information on the United States and British Columbia Fraser River sockeye pack arranged by cycle years from 1900 to 1953. Data on the canned pack of other fish and shellfish and the production of oil and meal are also shown. In addition, the report contains data on the monthly salmon escapement over Bonneville Dam during the years from 1938 to 1953; the number of commercial fishing licenses issued by districts from 1938 to 1953; and a comparative statement of receipts from licenses, taxes, fines, and other sources.

--E. A. Power

Western North Atlantic Bluefin Tuna Cooperative Research Program, (Final Report, the Charles F. Johnson Foundation), by Luis Rene Rivas, 5 pp., processed. The Marine Laboratory, University of Miami, Coral Gables, Florida, January 1953. The report summarizes results of the western North Atlantic bluefin tuna investigation for the two-year period 1952-53. Various phases of the life history are covered including systematics, anatomy and physiology, distribution, migrations, spawning grounds and season, development, behavior, and air and surface explorations for tuna. Taxonomic studies and discovery of separate breeding grounds show that bluefin tuna from the western North Atlantic are of the same species as those from the eastern North Atlantic, but that they are distinct breeding populations and there is no wholesale exchange of individuals through transoceanic migrations. Study of the stomach contents from tuna taken in the Bahamas during May and June showed that the fish feed very little if at all during spawning. New records of occurrence have extended the known range of bluefin to the north (Caribbean) coast of South America. A northward migration in summer and return to southern waters in winter is strongly indicated. Water temperatures, ocean currents, and configuration of the coastline probably affect migration habits. Tagging in the Bahamas in May and June was begun in order to definitely confirm that the tuna migrate to New England after leaving the Straits of Florida, but no tag recoveries have been made to date. Spawning tuna and eggs and larvae were found during May and June along the eastern edge of the Florida current from Cuba to the Bahamas. Age studies indicate that bluefin tuna reach a weight of about seven pounds in the first year of life. Observations on schooling behavior indicate that the schools each have a "leader," which is usually the fish taking the bait first. Two large tuna were kept alive in pens at the Lerner Marine Laboratory for about 10 days, during which time much was learned of their swimming habits. A total of 13,522 nautical miles were flown in aerial observations for tuna schools off Bermuda and over virtually the entire Bahama and Caribbean areas. Six other publications on the tuna study are listed.

--D. E. Powell

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Pp. 2 and 13--Staff of the Pacific Oceanic Fishery Investigations; p. 21--N. B. Wigutoff; p. 46--J. Pileggi; p. 73--Wm. Schmidtman.

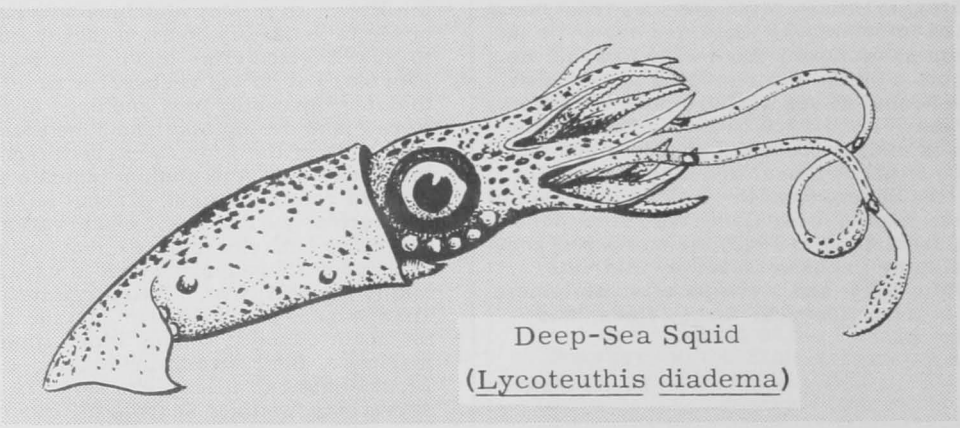
GIANT SQUIDS, AMBERGRIS, AND SEA SERPENTS

In the waters of the North Pacific Ocean is found the largest octopus in the world--a creature that may attain a spread of 25 feet from arm tip to arm tip. Much less well known is the giant squid, a true monster of the deep that reaches a total length of 50 or 60 feet.

Very few giant squids have ever been seen. They are known mostly from the occasional dead ones that are cast ashore. For some reason more have been found on the beaches of Newfoundland than any other place in the world.

The giant squid is preyed upon by the sperm whale, and some titanic struggles must occur deep below the surface when these huge animals meet. Suction cup scars as big as dinner plates have been found on the bodies of sperm whales, and the large, horny beaks of these squids have been taken from the stomachs of the whales.

Ambergris, the precious waxy substance used as a fixative in expensive perfumes, is formed in the stomach or intestines of sperm whales apparently as the result of a digestive disorder caused by these indigestible bodies. At any rate, squid beaks are sometimes found imbedded in masses of ambergris.



Deep-Sea Squid
(Lycoteuthis diadema)

Most squids and octopuses are, of course, very much smaller than these giant forms. The smallest ones measure less than two inches when they are full grown.

Many people do not have a clear idea of the difference between the octopus and the squid. Both are cephalopods (the word means "head-foot" and refers to the fact that the arms or tentacles are actually part of the head), and both belong to the group that includes clams, oysters, and snails. But octopuses have eight arms and lack any sort of internal skeleton, whereas squids have eight arms plus two longer tentacles, and possess a celluloid-like "pen" that acts as a stiffening rod in the elongate body. Octopuses are solitary bottom-living forms, but the squids are swift and active swimmers that often go in schools.

The giant squid has probably been responsible for many of the sea-serpent reports that appear in newspapers from time to time. Certainly the appearance of 35-foot tentacles writhing at the surface would be an awesome sight. It is even possible that old-time whalers may occasionally have been plucked from their small boats by long snake-like arms that rose suddenly out of the sea alongside.

--The Mariner, June 1954