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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

Fishery Publications, Calendar Year 1969: Lists and Indexes

LEE C. THORSON and MARY ELLEN ENGETT

SEATTLE, WA
April 1973

National Marine Fisheries Service, Circulars

The major responsibilities of the National Marine Fisheries Service (NMFS) are to monitor and assess the abundance and geographic distribution of fishery resources, to understand and predict fluctuations in the quantity and distribution of these resources, and to establish levels for optimum use of the resources. NMFS is also charged with the development and implementation of policies for managing national fishing grounds, development and enforcement of domestic fisheries regulations, surveillance of foreign fishing off United States coastal waters, and the development and enforcement of international fishery agreements and policies. NMFS also assists the fishing industry through marketing service and economic analysis programs, and mortgage insurance and vessel construction subsidies. It collects, analyses, and publishes statistics on various phases of the industry.

The NOAA Technical Report NMFS CIRC series continues a series that has been in existence since 1941. The Circulars are technical publications of general interest intended to aid conservation and management. Publications that review in considerable detail and at a high technical level certain broad areas of research appear in this series. Technical papers originating in economics studies and from management investigations appear in the Circular series.

NOAA Technical Reports NMFS CIRC are available free in limited numbers to governmental agencies, both Federal and State. They are also available in exchange for other scientific and technical publications in the marine sciences. Individual copies may be obtained (unless otherwise noted) from NOAA Publications Section, Rockville, Md. 20852. Recent Circulars are:

315. Synopsis of biological data on the chum salmon, *Oncorhynchus keta* (Walbaum) 1792. By Richard G. Bakkala. March 1970, iii + 89 pp., 15 figs., 51 tables.

319. Bureau of Commercial Fisheries Great Lakes Fishery Laboratory, Ann Arbor, Michigan. By Bureau of Commercial Fisheries. March 1970, 8 pp., 7 figs.

330. EASTROPAC Atlas: Vols. 4, 2. Catalog No. I 49.4:330/(vol.) 11 vols. ($4.75 each). Available from the Superintendent of Documents, Washington, D.C. 20402.

331. Guidelines for the processing of hot-smoked chub. By H. L. Seagran, J. T. Graikoski, and J. A. Emerson. January 1970, iv + 23 pp., 8 figs., 2 tables.

332. Pacific hake. (12 articles by 20 authors.) March 1970, iii + 152 pp., 72 figs., 47 tables.

333. Recommended practices for vessel sanitation and fish handling. By Edgar W. Bowman and Alfred Larsen. March 1970, iv + 27 pp., 6 figs.

335. Progress report of the Bureau of Commercial Fisheries Center for Estuarine and Menhaden Research, Pesticide Field Station, Gulf Breeze, Fla., fiscal year 1969. By the Laboratory staff. August 1970, iii + 33 pp., 29 figs., 12 tables.

336. The northern fur seal. By Ralph C. Baker, Ford Wilke, and C. Howard Baltzo. April 1970, iii + 19 pp., 13 figs.

337. Program of Division of Economic Research, Bureau of Commerecial Fisheries, fiscal year 1969. By Division of Economic Research. April 1970, iii + 29 pp., 12 figs., 7 tables.

338. Bureau of Commercial Fisheries Biological Laboratory, Auke Bay, Alaska. By Bureau of Commercial Fisheries. June 1970, 8 pp., 6 figs.

339. Salmon research at Ice Harbor Dam. By Wesley J. Ebel. April 1970, 6 pp., 4 figs.

340. Bureau of Commercial Fisheries Technological Laboratory, Gloucester, Massachusetts. By Bureau of Commercial Fisheries. June 1970, 8 pp., 8 figs.

341. Report of the Bureau of Commercial Fisheries Biological Laboratory, Beaufort, N.C., for the fiscal year ending June 30, 1968. By the Laboratory staff. August 1970, iii + 24 pp., 11 figs., 16 tables.

342. Report of the Bureau of Commercial Fisheries Biological Laboratory, St. Petersburg Beach, Florida, fiscal year 1969. By the Laboratory staff. August 1970, iii + 22 pp., 20 figs., 8 tables.

343. Report of the Bureau of Commercial Fisheries Biological Laboratory, Galveston, Texas, fiscal year 1969. By the Laboratory staff. August 1970, iii + 39 pp., 28 figs., 9 tables.

344. Bureau of Commercial Fisheries Tropical Atlantic Biological Laboratory progress in research 1965-69, Miami, Florida. By Ann Weeks. October 1970, iv + 65 pp., 53 figs.

346. Sportsman's guide to handling, smoking, and preserving Great Lakes coho salmon. By Shearon Dudley, J. T. Graikoski, H. L. Seagran, and Paul M. Earl. September 1970, iii + 28 pp., 15 figs.

347. Synopsis of biological data on Pacific ocean perch, *Sebastodes alutus*. By Richard L. Major and Herbert H. Shippen. December 1970, iii + 38 pp., 31 figs., 11 tables.

Continued on inside back cover.

U.S. DEPARTMENT OF COMMERCE
Frederick B. Dent, Secretary
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
Robert M. White, Administrator
NATIONAL MARINE FISHERIES SERVICE
Philip M. Roedel, Director

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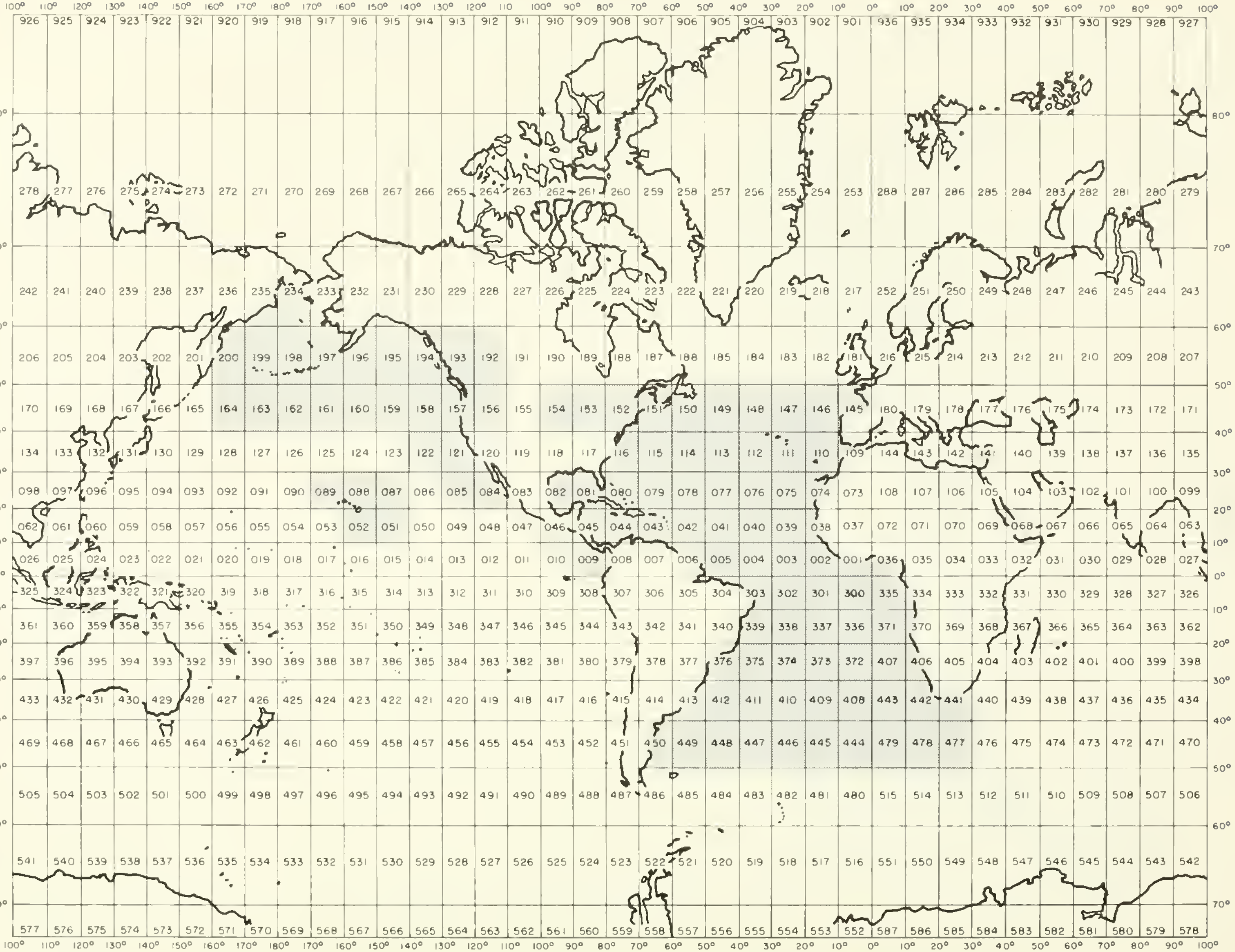

FIGURE 1.—Marsden square grid showing geographic areas (shaded) covered by fishery publications, calendar year 1969.

FISHERY PUBLICATIONS, CALENDAR YEAR 1969: LISTS AND INDEXES

By

LEE C. THORSON and MARY ELLEN ENGETT

Scientific Publications Staff
National Marine Fisheries Service

ABSTRACT

The following series of fishery publications of the National Marine Fisheries Service, National Oceanic and Atmospheric Administration (until October 1970 the Bureau of Commercial Fisheries of the U.S. Fish and Wildlife Service) in calendar year 1969 are listed numerically (with abstracts) and indexed by author, subject, and geographic area: Circular, Data Report, Fishery Industrial Research, Fishery Leaflet, and Special Scientific Report—Fisheries.

INTRODUCTION

This document provides for calendar year 1969 numerical lists (with abstracts) and indexes by author, subject, and geographical area, the following series of publications of the National Marine Fisheries Service, National Oceanic and Atmosphericc Administration, which until October 1970 was the Bureau of Commercial Fisheries of the U.S. Fish and Wildlife Service:

Circular
Data Report
Fishery Industrial Research
Fishery Leaflet
Special Scientific Report—Fisheries

The document is divided into four principal sections:

Numerical listing of series (with abstracts)
Author index
Subject index
Index by Marsden squares

The last section has been included to afford easy access to the publications for those persons interested in specific geographical areas. Figure 1 shows the Marsden squares treated in the several publications.

The series abbreviations used in the indexes are:

Circular	C
Data Report	D
Fishery Industrial Research	FIR
Fishery Leaflet	FL
Special Scientific Report—Fisheries	S

LISTS

Circular

294. Bottom trawl explorations in Lake Superior, 1963-65. By Norman J. Reigle, Jr. January 1969, 25 pp., 11 figs., 5 tables, 7 app. tables.

ABSTRACT

Six exploratory fishing cruises, totaling 122 operating days, were made by the research vessel *Kaho* from November 1963 to October 1965. Most of the exploratory operations were in the central and eastern portions of the lake; however, limited surveys were made in the western area during 1965. This study is the first attempt to assess the potential for commercial bottom trawling in Lake Superior.

Suitable bottom for trawling was found along about 65 percent of the south shore. Over 74 percent of the total catch by the *Kaho* were chubs (*Leucichthys* spp.) followed by American smelt (*Osmerus mordax*), 10 percent; suckers (*Catostomus* spp.), 6.5 percent; and lake trout (*Salvelinus namaycush*), 3 percent. Commercially significant catches, 250 pounds per one-half hour, of chubs were taken on every cruise and these fish, even if used mainly for animal food products, could apparently support a limited trawl fishery. Smelt, suckers, and common whitefish (*Coregonus clupeaformis*) were caught occasionally in commercially significant quantities and could greatly supplement production efforts. Most lake trout were caught in specific geographic areas and appeared to be segregated by size in specific depth zones. Abundant concentrations of small trout could easily be avoided after being located by fishing certain depths. With proper care, most trout were returned to the water alive. The alewife (*Alosa pseudoharengus*), which is now the basis of a growing trawl fishery in Lake Michigan, and lake herring (*Leucichthys artedi*) were not taken in significant amounts during the study.

295. Published in 1968.

296. Fishery publication index, 1955-64 — Publications of the Fish and Wildlife Service by series, authors, and subjects. Anonymous. May 1969, 240 pp.

(No abstract.)

297. Bottom trawl explorations in Green Bay of Lake Michigan, 1963-65. By Norman J. Reigle, Jr. March 1969, 14 pp., 3 figs., 6 tables, 2 app. tables.

ABSTRACT

A bottom trawling survey was made during 11 cruises operating for 36 days over the 3-year study period. Explorations were made at all possible fishing depths and during 8 months. The 179 exploratory drags made during this study represent the first attempts by the Bureau of Commercial Fisheries to determine if bottom trawling in Green Bay is commercially feasible.

The overall catch rate was at a level that would be commercially feasible for a trawl fishery based primarily on alewife (*Alosa pseudoharengus*) and smelt (*Osmerus mordax*) and supplemented by catches of suckers (*Catostomus catostomus* and *C. commersoni*), carp (*Cyprinus carpio*), and yellow perch (*Perca flavescens*). Game fish were taken infrequently in the trawl, and trawling would not jeopardize sport fishing in Green Bay.

298-300. Published in 1968.

301. Bottom trawl explorations in Southern Lake Michigan, 1962-65. By Norman J. Reigle, Jr. February 1969, 35 pp., 6 figs., 13 tables, 11 app. tables.

ABSTRACT

For 4 years the Bureau of Commercial Fisheries Exploratory Fishing and Gear Research Base at Ann Arbor, Mich., surveyed the abundance, seasonal availability, and depth distribution of various fish stocks.

The alewife (*Alosa pseudoharengus*) and chubs (*Leucichthys* spp.) were taken readily with the bottom trawl. Alewives composed 51.4 percent and chubs 44.0 percent of the trawl catch. Two other commercial species, yellow perch (*Perca flavescens*) and smelt (*Osmerus mordax*), were taken occasionally in commercial amounts.

The alewife stocks have increased tremendously in recent years. The poundage of alewives in the trawl catch increased each year from 17 percent in 1962 to 74 percent in 1965. Alewives exhibited pronounced seasonal movements and generally were available to bottom trawls only at specific depths. The trawls caught alewives at depths of less than 5 fathoms to over 50 fathoms. Alewives appeared to be distributed universally in the study area during most of the year but were found only in some sections in winter. Alewives were more difficult to catch between July and the end of December than during January through June.

Chubs were abundant all year throughout southern Lake Michigan. Chubs were caught over a wide depth range throughout the year, although bottom trawling indicated some horizontal dispersal shoreward in summer and back to deeper water in fall.

302. Synopsis of the biological data on the Pacific Mackerel, *Scomber japonicus* Houttuyn (Northeast Pacific). By David Kramer. February 1969, 18 pp., 9 figs., 4 tables.

ABSTRACT

This synopsis attempts to bring together all knowledge extant on the identity (nomenclature, taxonomy, morphology), distribution, bionomics, life history, population, fishery, and protection and management of the Pacific mackerel.

303-308. Published in 1968.

309. Progress report of the Bureau of Commercial Fisheries Radiobiological Laboratory, Beaufort, N.C., Fiscal Year 1968. By T. R. Rice. April 1969, 59 pp., 32 figs., 12 tables.

ABSTRACT

Research activities included studies in estuarine ecology, biogeochemistry, pollution, and radiation effects.

310. Japanese, Soviet, and South Korean fisheries off Alaska. Development and history through 1966. By Philip E. Chitwood. January 1969, 34 pp., 19 figs., 8 tables.

ABSTRACT

The history of fisheries off Alaska by a nation from across the Pacific Ocean dates back to 1930. In that year Japan dispatched a king crab expedition into the eastern Bering Sea. Japanese exploitation of the eastern Bering Sea fishery resources was expanded in 1933 when a groundfish fishery was initiated. By 1941, Japan's fisheries in the eastern Bering Sea had been halted because the Imperial Navy had requisitioned most of Japan's vessels for use in World War II.

In 1952, after a lapse of 11 years, Japanese fishing off Alaska resumed. In that year the Japanese began fishing for salmon along the western Aleutian Islands. In 1953, they resumed their prewar fisheries in the eastern Bering Sea.

The Japanese fleets off Alaska were joined in 1959 by U.S.S.R. fleets, which began fishing flounder and king crab in the eastern Bering Sea and whaling along the Aleutian Islands.

During the early 1960's, both the Japanese and the Soviets accelerated their exploitation of the fishery resources off Alaska, working new grounds and taking additional species. By the close of 1966, fisheries of these two nations engulfed nearly all the 550,000 square nautical miles of the Continental Shelf off Alaska. Their fleets ranged from Dixon Entrance in the south and east, to beyond Attu Island in the west, and into the Arctic Ocean in the north. Also in 1966, another Asian nation, South Korea, made preparations to enter the fisheries off Alaska.

311. Billfishes of the Central Pacific Ocean. By Donald W. Strasburg. April 1969, 11 pp., 7 figs.

ABSTRACT

The billfishes are found in all warm seas. In the central Pacific, the striped and blue marlins are common or abundant; the black marlin is uncommon; the Pacific sailfish, broadbill swordfish, and shortbill spearfish are rarely caught. These fishes feed broadly on fish, squid, crustaceans, and other foods available on the high seas. In commercial catches of blue marlin in Hawaii, males and females appear in about equal numbers; but on a short-term basis, one sex can predominate. During the Hawaiian International Billfish Tournaments, which are held during the summer, more males are usually caught than females. In the commercial catch, the heaviest blue marlin (300-500 pounds) were taken in the spring, the lightest in the summer. Striped marlin show two peaks of abundance through part of the year. Blue marlin are most abundant in the summer. Striped marlin tend to occur in large numbers just when the blue marlin are least abundant. The longest migration recorded in the central Pacific was 3,000 miles, by a striped marlin that was tagged off Baja California, Mexico, later caught near the Hawaiian Islands.

312. Gulf of Mexico Shrimp Atlas. By Kenneth W. Osborn, Bruce W. Maghan and Shelby B. Drummond. May 1969, 20 pp. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $2.25

(No abstract.)

313. Report of the Bureau of Commercial Fisheries Biological Laboratory, St. Petersburg Beach, Florida, Fiscal Year 1968. By James E. Sykes. May 1969, 25 pp., 19 figs., 8 tables.

ABSTRACT

The major goals of the Laboratory are to explore the relatively unknown scope of biological productivity in the coastal zone of the eastern Gulf of Mexico, to measure the effect of changes in that zone, and to develop methods of increasing estuarine fishery resources. The report describes current research on projects in the Estuarine, Red-Tide, and Industrial Schoolfishes Programs. The projects include studies of sediments and organisms in bay bottoms, plankton crops and fishes residing in and transferring between estuaries and the Gulf of Mexico, toxicity of the red-tide organism, and experimental rearing of pompano in an impounded lagoon. A physical, hydrological, biological, and sedimentological inventory of Florida estuaries is also in progress as part of a cooperative effort with the National Oceanographic Data Center and the States of Alabama, Mississippi, and Louisiana.

314. Bureau of Commercial Fisheries Biological Laboratory Woods Hole, Massachusetts. Anonymous. May 1969, four-fan fold.

(No abstract.)

315. Published in 1970.

316. Guide to the Bureau of Commercial Fisheries Technological Laboratory Seattle, Wash., by John A. Dassow. May 1969, 12 pp., 8 figs.

ABSTRACT

Goals of the technology program, accomplishments, current programs, organization and staff, physical facilities, and answering of inquiries are discussed. Some laboratory publications, by subject, are listed.

317. Identification of Pacific Salmon and Steelhead Trout by Scale Characteristics, by Ken-

neth H. Mosher. August 1969, iii + 17 pp., 23 figs.

ABSTRACT

Descriptions and illustrations of the scales of each species, a key to identifying species by use of scale characters, and a section on the appearance of juvenile salmon scales are presented.

318. Bottom trawl explorations in northern Lake Michigan, 1963-65, by Norman J. Reigle, Jr. September 1969. iii + 21 pp., 6 figs., 11 tables, 5 app. tables.

ABSTRACT

Over a period of 3 years the Bureau of Commercial Fisheries Exploratory Fishing Base at Ann Arbor, Mich., surveyed the relative abundance, depth distribution, and seasonal availability of various fish stocks that were fished with bottom trawls.

The alewife, *Alosa pseudoharengus*, and chubs, *Leucichthys* spp., were taken readily with the bottom trawl. Alewives composed 48 percent and chubs 42 percent of the total trawl catch. Three other fish—smelt, *Osmerus mordox*, suckers, *Catostomus commersoni* and *C. catostomus*, and common whitefish, *Coregonus clupeaformis*—were taken occasionally in commercial amounts.

Alewives have very pronounced seasonal movements, and at certain times of the year bottom trawls catch them only at specific depths. Bottom trawls did not take alewives in commercial amounts during all periods fished; there is evidence that alewives would be available commercially only in certain seasons. Chubs were caught readily throughout the study, although they too appeared to be taken in greater quantities at certain times. Bottom trawling indicated some horizontal dispersal of both alewife and chubs shoreward in summer and back to deeper water in fall. Chubs are caught over a wide depth range throughout the year.

319. Published in 1970.

320. Synopsis of biological data on the Atlantic menhaden, *Brevoortia tyrannus*, by John W. Reintjes. November 1969, iii + 30 pp., 7 figs., 12 tables.

ABSTRACT

This review of the biology of Atlantic menhaden includes taxonomy, morphology, distribution, reproduction, life history, growth, behavior, and abundance. Also included are: data on the size, age, and sex composition of the commercial catch; estimates of relative abundance; and a description of fishing methods and equipment.

321. Progress in 1967-68 at the Bureau of Commercial Fisheries Biological Laboratory, Honolulu, by Thomas A. Manar. September 1969, ii + 39 pp., 23 figs.

ABSTRACT

This report deals with research results achieved by the Bureau of Commercial Fisheries Biological Laboratory in Honolulu from January 1, 1967 to June 30, 1968. Described are projects designed to improve the efficiency of the Hawaiian fleet for skipjack tuna; work in immunogenetic analysis that is clarifying the relations of the skipjack tuna subpopulations of the Pacific Ocean; investigation of the shrimp and bottom fish resources of Hawaii; advances in oceanographic research, including discovery of a wake in the lee of Johnston Island, as predicted by theory; the effects of oil spillage on a Pacific island; and the first scientific review of the international CSK (Cooperative Study of the Kuroshio and Adjacent Regions). Publications for the period are listed.

322. Bureau of Commercial Fisheries Federal Aid Program Activities 1969, by Division of Federal Aid Staff. July 1969, iv + 76 pp.

(No abstract.)

323. Vertical sections of temperature and salinity in the trade wind zone of the central North Pacific, February 1964 to June 1965, by Gunter R. Seckel. October 1969, ii + 11 pp., 5 figs., 16 append. figs.

ABSTRACT

Temperature and salinity data obtained between lat. 10° and 26° N., along the four meridians long. 148°, 151°, 154°, and 157° W. are presented in vertical sections for 16 monthly cruises of the Trade Wind Zone Oceanography Pilot Study. The sections can be used in planning applied oceanography experiments, exploratory cruises in marine biology and fisheries, or in fishery extension work. The text will aid those who are not familiar with the central North Pacific or who are not specialists in oceanography.

324. Bureau of Commercial Fisheries Biological Laboratory Oxford, Maryland. November 1969. Four-fan fold.

(No abstract.)

325. Report of the Bureau of Commercial Fisheries Biological Laboratory, Galveston, Texas, Fiscal Year 1968, by Milton J. Lindner, Director and Robert E. Stevenson, Assistant Director. October 1969, iii + 32 pp., 20 figs., 14 tables.

ABSTRACT

Progress of research is reported. Emphasis is on shrimp, and the research involves the fields of biology, population dynamics, ecology, and oceanography.

326. Report of the Bureau of Commercial Fisheries Technological Laboratory, Seattle, Washington, for Fiscal Year Ending June 30, 1967, by Maynard A. Steinberg, Laboratory Director and John A. Dassow, Assistant Laboratory Director. December 1969, iii + 28 pp., 22 figs., 1 table.

ABSTRACT

The accomplishments of the Technological Laboratory for the fiscal year ending June 30, 1967, are described. They include work on the: protection of frozen salmon by antioxidants, development of packaging techniques for air-shipping live Dungeness crabs, use of condensed phosphates for improving the water-holding capacity of fresh fish fillets, utilization of fish oil for industrial and food products, relation of flavor to post mortem breakdown of nucleotides in fish and shellfish, and studies on the radiation preservation of fishery products.

327. Report, Bureau of Commercial Fisheries Technological Laboratory, Pascagoula, Mississippi, for fiscal years 1967 and 1968, by Travis D. Love, Laboratory Director and Mary H. Thompson, Assistant Laboratory Director. October 1969, iv + 18 pp., 8 figs., 3 tables.

(No abstract.)

328. Bureau of Commercial Fisheries Biological Laboratory Milford, Connecticut. December 1969. Four-fan fold.

(No abstract.)

329. In Sea and River—Research at the Bureau of Commercial Fisheries Biological Laboratory, Seattle, Washington, 1966-68, by Paul T. Macy and Rae R. Mitsuoka. November 1969, iii + 47 pp., 50 figs.

ABSTRACT

Primary emphasis of the research was on (1) salmon (genus *Oncorhynchus*) in the North Pacific Ocean and the Columbia River Basin and (2) groundfish on the Continental Shelf of the Pacific Northwest. Considerable progress was made toward showing how the distribution of salmon is related to the ocean environment. Biochemical techniques showed promise in pinpointing genetic and geographic differences in stocks of fish. To gather the data needed for managing the salmon stocks, integrated studies were made of ocean growth, mortality, maturation, and effects of gear on salmon. Research in the Columbia River Basin provided new information on how dams and reservoirs affect salmon and steelhead trout (*Salmo gairdneri*); studies were made to measure and to develop ways to counteract the losses of fish. Groundfish research disclosed differences in Pacific hake (*Merluccius productus*) stocks of Puget Sound and the Continental Shelf. Publications and staff of the laboratory are listed.

330-333. Published in 1970.

334. Experimental sea-water aquarium—Bureau of Commercial Fisheries Fishery-Oceanography Center La Jolla, California, by Reuben Lasker and Lillian L. Vlymen. November 1969, iv + 14 pp., 16 figs., Appendix.

ABSTRACT

This illustrated paper describes the equipment, design, and operation of the 9,300 $ft.^2$ sea-water experimental aquarium. The Appendix lists the research reports resulting from work performed since this facility began operation in 1965.

Data Reports

(Hard copies of Data Reports Nos. 31 through 39 are for sale at $3.00 and microfiche copies for 65 cents each by the U.S. Department of Commerce, National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22151.)

31. Hydrographic observations from the Galveston Bay System, Texas, 1958-67. By Edward J. Pullen and Lee Trent. 1969, 152 pp. on 3 microfiche.

ABSTRACT

Hydrographic data were collected during ecological studies made from January 1958 through December 1967. This report contains the depth, location, date, time, and sample water depth from which samples were taken and corresponding measurements of water temperature, salinity, phosphorus, nitrogen, and dissolved oxygen.

32. Oceanographic observations, 1965, East Coast of the United States. By Joseph Chase. 1969, 158 pp. on 3 microfiche.

ABSTRACT

Daily water temperature and salinity observations for 1965 from 13 locations along the Atlantic seaboard are tabulated, plotted, and discussed.

33. Oceanic conditions in the eastern Caribbean Sea and adjacent Atlantic, 6 August to 6 October 1965 (part of *Geronimo* cruise 6). By Thomas D. Leming and Merton C. Ingham. 1969, 35 pp. on 1 microfiche.

ABSTRACT

This atlas comprises a series of horizontal, isopycnic, and vertical sections. The distributions of temperature, salinity, dissolved oxygen, and dis-

solved phosphate-phosphorus are shown on the 0-, 20-, 50-, 100-, 150-, 250-, and 400-m. horizontal surfaces, on the 25.5-g./l. isopycnic surface, and in two vertical sections across the central Caribbean. The topography of the 25.5-g./l. isopycnic surface is also shown.

34. Sediments, oceanographic observations, and floristic data from Tampa Bay, Florida, and adjacent waters, 1961-65. By John L. Taylor and Carl H. Saloman. 1969, 562 pp. on 9 microfiche.

ABSTRACT

Sediment type at each of 773 stations is characterized, and isopleths of mean grain size, sorting, calcium carbonate, and organic carbon are given. Oceanographic data include water temperature, salinity, pH, and water depth. The occurrence of sea grasses and filamentous algae is noted. Methods of sampling and analyses are described.

35. Seasonal abundance and length frequency distribution of some marine fishes in coastal Georgia. By Grant L. Miller and Sherrell C. Jorgenson. 1969, 103 pp. on 2 microfiche.

ABSTRACT

Data are presented for 101 species of fishes collected from March 1953 to May 1961 on the ocean beach and in salt marshes in coastal Georgia. Length-frequency distributions are presented for 51 species of marine fishes; size, abundance, and occurrence by month and season are given. Water and weather information recorded at each station at the time of sampling is also presented.

36. Tuna larvae (Pisces, Scombridae) collected in the northwestern Gulf of Guinea, *Geronimo* cruise 3, 10 February to 26 April 1964. By William J. Richards, David C. Simmons, Ann Jensen, and Walter C. Mann. March 1969, 19 pp. on 1 microfiche.

ABSTRACT

The number of tuna larvae are given by size class, and associated station data are listed.

37. Larvae of tuna and frigate mackerel (Pisces, Scombridae) collected in the northwestern Gulf of Guinea, *Geronimo* cruise 4, 5 August to 13 October 1964. September 1969, 17 pp. on 1 microfiche.

ABSTRACT

The larvae are given by size class, by number strained per 1,000 m^3 of sea water, and by station.

38. Summer and fall thermal regime of Franklin D. Roosevelt Lake, Wash., 1964-67. By G. R. Snyder and W. D. Parente. September 1969, 39 pp. on 1 microfiche.

ABSTRACT

Presented are temperature-depth tabulations from weekly surveys made at 10 locations on Franklin D. Roosevelt Lake on upper part of the Columbia River during July through October 1964-67.

39. Temperature-depth profiles for Arrow lakes (1965-66) and temperature flow studies of the Columbia, Kootenay, and Pend Oreille Rivers (1964-66) in British Columbia. By George R. Snyder and William D. Parente. October 1969, 70 pp. on 2 microfiche.

ABSTRACT

Data for the temperature-depth profiles were collected during the summer and early fall of 1965 and 1966 at three locations in Upper Arrow Lake and three locations in Lower Arrow Lake, British Columbia. Data on surface temperatures and water flow were taken during the summer and early fall of 1964-66 in the Columbia River near Robson, in the Pend Oreille River at Waneta Dam, and in the Kootenay River at Brilliant Dam, British Columbia. Summaries of the surface and deepest soundings for the uppermost station at Upper Arrow Lake and the lowermost station at Lower Arrow Lake are tabulated for 1965 and 1966.

Fishery Industrial Research

Vol. 4, No. 6. Rapid method for the estimation of EDTA (ethylenediaminetetraacetic acid) in fish flesh and crab meat, by Herman S. Groninger and Kenneth R. Brandt. February 1969, pp. 209-212, 1 fig., 2 tables.

ABSTRACT

EDTA, a quality stabilizing additive, is usually applied to seafoods by spraying or dipping, and the amount of EDTA retained by the treated product must be determined by an analytical method. A titration method based on the chelation of EDTA with thorium ion was modified for use in the determination of EDTA in fish flesh and crab meat. The modified method is both simple and rapid and gave about 90-percent recovery of added EDTA from samples of fish flesh and crab meat.

Vol. 4, No. 6. Design, construction, and field testing of the BCF electric shrimp-trawl system, by Wilber R. Seidel. February 1969, pp. 213-231, 10 figs., 4 tables.

ABSTRACT

The system was designed and constructed so that the feasibility of using electricity to help capture brown and pink shrimps during daylight could be determined. Components of the system were designed to produce, on a full-size commercial trawl, the stimulation needed to cause shrimp to emerge from the substratum where they burrow during the daytime.

In fishing trials off the coasts of Mississippi and Texas, the prototype electric trawl caught during daylight 95 and 109 percent of the quantity of shrimp caught at night by a conventional, nonelectric trawl. In the Dry Tortugas area off Southern Florida, where the substratum is calcareous sand-shell rather than mud as in the substratum of the Northern Gulf of Mexico, the catch taken with the electric trawl during daylight was only 50 percent of that taken with the nonelectric trawl after dark.

Vol. 4, No. 6. Care of fish holds, by Wayne I. Tretsven. February 1969, pp. 233-239, 3 figs.

ABSTRACT

The stowage of iced fish in the hold of a fishing vessel causes the hold to become wet and dirty, which in turn may cause deterioration of the vessel as well as spoilage of the fish handled thereafter.

This problem was studied, and procedures for solving it were developed and used effectively on commercial vessels. The procedures involve: (1) use of better methods of cleaning and sanitizing the hold, (2) use of a solubilized, copper-8-quinolinolate to preserve the wood in wooden holds, and (3) application of plastic sheeting, 6-mils (.006-inch) thick, to line the hold in order to prevent it from becoming wet and dirty and to prevent the fish from contacting it.

Vol. 4, No. 7. Opening oysters and other bivalves using microwave energy, by Joseph M. Mendelsohn, Louis J. Ronsivalli, Frederick J. King, Joseph H. Carver, Robert J. Learson, Barry W. Spracklin, and Ernest M. Kenyon. March 1969, pp. 241-248, 5 figs., 2 tables.

ABSTRACT

A commercial process using microwave energy can save 33 percent over hand-shucking costs and has several other advantages as well.

Vol. 4, No. 7. A new approach for evaluating the quality of fishery products, by Robert J. Learson and Louis J. Ronsivalli. March 1969, pp. 249-259, 3 figs., 3 tables.

ABSTRACT

Although organoleptic panels lack precision, they are the only instrument that, at present, can integrate all the factors that affect quality. Described here is a new approach to improving panel precision. Using the approach, a panel expresses quality in terms of the estimated storage time of the sample rather than in such ambiguous terms as "excellent," "very good," and "borderline." The approach obviates the need for arbitrary terms to describe quality and assists the panelists in making his evaluations objectively. Statistical analysis of the results obtained when a panel used the method on samples of fresh cod fillets indicates that the storage age of such samples can be estimated to within ± 2.2 days with a reliability of 95 percent.

Vol. 4, No. 7. Demersal fish resources: composition, distribution, and commercial potential of the Continental Shelf stocks off Southeastern United States, by Paul Struhsaker. March 1969, pp. 261-300, 13 figs., 8 tables, Apps. A and B.

ABSTRACT

A 5-year study of the demersal fish resources of the Continental Shelf off Southeastern United States resulted in the occupation of 956 exploratory trawling stations in the 6- to 100-fathom depth range. The study showed that the region can be divided into five general habitat types — coastal, open-shelf, live-bottom, shelf-edge, and lower-shelf — each harboring a distinctive association of demersal fishes.

The coastal habitat, which has a smooth, sandy-mud bottom out to depths of 8 to 10 fathoms, has well-known and abundant resources of bottomfishes. Increased use of these stocks (mostly drums and croakers) seems to depend on market development, rather than on additional exploratory fishing.

The open-shelf habitat, which has a smooth sand bottom to depths of about 10 to 25 or 30 fathoms, has poor potential for a trawl fishery for food fishes. Occasional large catches of scup and filefish indicate, however, that these species may be abundant enough to support a small industrial fishery for bottomfish.

The live-bottom habitats, which are small areas of broken relief and a rich sessile invertebrate fauna within the open-shelf habitat, have the best food-fish potential for commercial utilization. During exploratory fishing, moderate to large catches of snappers, groupers, porgies, and ecologically associated species were taken consistently with New England-type otter trawls. The best areas were off Northeastern Florida and South Carolina, but other productive areas were found along most of the Southeastern Coast.

The shelf-edge habitat, which has a smooth to highly broken bottom and runs along the edge of the Continental Shelf at depths of about 30 to 60 fathoms, also has large concentrations of snappers, groupers, and porgies in certain localities. Although trawling was often impractical in the rougher portions of this habitat, the fishery resources of these areas can be harvested by handlines and traps.

The lower-shelf habitat has a smooth mud bottom from about 60 to at least 100 fathoms; the limited explorations indicate the presence of large concentrations of butterfish, spotted hake, and perhaps groupers in this habitat.

A fishing log and chart of 50 stations where catches of commercial size were made is provided. A list of demersal fishes taken during the explorations is given, along with notations on their occurrences in the trawl catches and habitat occupation.

Vol. 5, No. 1. Problem of "green" frozen raw breaded shrimp, by Mary H. Thompson and Robert N. Farragut. May 1969, pp. 1-10, 7 tables.

ABSTRACT

A green coloration has appeared sporadically on frozen raw breaded shrimp. Reported here are the results of a study made to determine the cause of the green coloration and to find a method of avoiding it. The study indicates that the coloration was caused by airborne metallic particles and that eliminating the particles from contact with the product would therefore solve the problem.

Vol. 5, No. 1. Improved method for producing pindang, by Sofjan Iljas and Louis J. Ronsivalli. May 1969, pp. 11-16, 1 fig.

ABSTRACT

Use of plastic pouches reduces processing time, makes possible continuous and automated production, and enhances the wholesomeness and keeping quality of pindang, a cooked salt fish.

Vol. 5, No. 1. Irradiation of Pacific coast fish and shellfish. 7-storage life at 33°F. of irradiated and repacked meat of Dungeness crab, by F. M. Teeny, D. Miyauchi, and G. Pelroy. May 1969, pp. 17-24, 7 figs., 1 table.

ABSTRACT

Fresh Dungeness crab meat, owing to its relatively short and variable shelf life, is ordinarily restricted to sale close to its area of production. To find a basis for widening the area of sale, we determined the shelf life for Dungeness crab meat irradiated in *wholesale* containers, stored 12 or 20 days at 33°F., and subsequently repacked into *retail* containers and again stored at 33° F. The repacked samples had adequate shelf life for marketing in retail stores. Thus, irradiation of Dungeness crab meat in wholesale containers would permit this product to be widely distributed in retail stores.

Vol. 5, No. 1. Fish oils—fatty acid composition, energy values, metabolism, and vitamin content, by Robert R. Kifer and David Miller. May 1969, pp. 25-37, 2 figs., 10 tables, Apps. figs. 1-3.

ABSTRACT

This article presents a general review of fish oils.

Vol. 5, No. 2. Proximate composition of commercial fishes from the Mediterranean Sea and the Red Sea, by A. Herzberg and Rachel Pasteur. July 1969, pp. 39-65, 20 figs., 12 tables.

ABSTRACT

Data are needed on the proximate composition of tropical and semitropical fishes. This paper reports, on a year-round basis, the proportions of protein, oil, ash, and water in 10 commercial species of fishes from the Eastern Mediterranean Sea and the Southern Red Sea. All species were high in protein. The demersal fishes were low in oil, whereas the pelagic fishes were relatively high. Large changes in the concentration of oil observed in the pelagic fishes were probably related to the spawning cycle.

Vol. 5, No. 2. Green algae, Chlorella, as a contributor to the food supply of man, by Norman W. Durrant and Carol Jolly. July 1969, pp. 67-83, 1 fig.

ABSTRACT

Both marine algae and fresh-water algae may help to solve the problem of world hunger. Of these two groups, the fresh-water algae show the greater promise; and of the fresh-water algae — blue green and green — the green algae show the greater promise. Accordingly, this report centers largely on green algae (*Chlorella* in particular) and discusses both their artificial production and nutritional value. By a suitable manipulation of variables, green algae containing as much as 50 percent or more protein, on a dry-weight basis, can be manufactured continuously on a large scale.

Vol. 5, No. 2. Explorations for calico scallop, *Pecten gibbus*, in the area off Cape Kennedy, Florida, 1960-66, by Shelby B. Drummond. July 1969, pp. 85-101, 14 figs., 1 table.

ABSTRACT

A bed of calico scallops 200 miles long is now known off the east coast of Florida but is little fished. This article maps the location of the bed and reports on the rates of catch that may be expected on it. Exploratory fishing indicates that, other than during February, the supply of scallops is adequate to support a year-round fishery at the more favorable locations. Explorations also show that, at depths of from 15 to 35 fathoms, the area between Fort Pierce and the southeast shoal off Cape Kennedy is consistently the most productive.

Vol. 5, No. 3. Use of sodium tripolyphosphate to control fish shrinkage during hot-smoking, by Harold J. Barnett, Richard W. Nelson, and John A. Dassow. August 1969, pp. 103-106, 3 tables.

ABSTRACT

Loss of moisture in the hot-smoking (kippering) of thawed halibut, salmon, and black cod results in an economic loss as well as in a loss of quality. Because sodium tripolyphosphate effectively reduces loss of moisture in other foods, including fresh fish, it was tried with these smoked products. Use of this substance effectively aided the retention of moisture

in halibut and salmon during smoking but was less effective in aiding the retention of moisture in black cod.

Vol. 5, No. 3. Use of electron paramagnetism in research on fish lipids, by William T. Roubal. August 1969, pp. 107-115, 3 figs.

ABSTRACT

The products of lipid oxidation cause undesirable alterations, not only in lipids themselves, but also in the quality of associated proteins, enzymes, and other biomolecules. Fundamental studies of oxidizing lipids in biochemical systems are needed if these undesirable changes are to be minimized.

Measuring the paramagnetic properties of these systems has great potential for elucidating the mechanism of the undesirable changes and thereby giving us a possible way of finding how to control them. Unfortunately, this technique of measurement is not widely understood.

This paper explains the technique and gives examples of how the measurement of paramagnetic properties can be applied in research related to fish lipids, particularly in the relation of free-radicals to the loss of nutritive value and in the study of antioxidant functions.

Vol. 5, No. 3. Evaluation of muscle hypoxanthine and volatile bases as potential quality indices for industrial bottomfishes from the Gulf of Mexico, by Enrique J. Guardia and Gerhard J. Haas. August 1969, pp. 117-120, 4 figs.

ABSTRACT

Croaker and spot are the two species found most commonly in catches of industrial bottomfishes in the Gulf of Mexico. Hypoxanthine increased linearly in both species during the first 2 weeks that these fishes were stored in ice. This test for hypoxanthine could thus indicate the quality of both croaker and spot and presumably that of the whole catch. Only after the fish had been stored 1 week in ice, however, did the total volatile bases increase. Consequently, this latter test could not be used as an index of freshness, although it might be used as an index of spoilage.

Vol. 5, No. 3. Relative chemical composition and nutritive values of king crab, *Paralithodes camtschatica*, and blue crab, *Callinectes sapidus*, by Robert R. Kifer and Paul E. Bauersfeld. August 1969, pp. 121-131, 14 tables.

ABSTRACT

Alaska king crabs are being harvested in quantity. The question has arisen as to the potential and comparative value of king crab meal in broiler diets. Accordingly, king crab meal and blue crab meal (an established product) were evaluated as to their chemical composition and nutritive value when fed to chicks. Growth rates obtained were about equal when (1) diets containing the various crab meals, (2) a commercial diet, (3) diets containing menhaden meal, or (4) a corn-soybean meal-methionine-supplemented diet were fed.

Vol. 5, No. 4. Value of menhaden, *Brevoortia tyrannus*, meal as a protein supplement to cottonseed meal-corn diets for pigs, by Robert R. Kifer and Edgar P. Young. October 1969, pp. 133-142, 2 figs., 6 tables.

ABSTRACT

Pig diets composed primarily of cottonseed meal and corn are deficient in the amino acid lysine. This study reports on whether supplementation by menhaden meal can supply the lysine needed. A significant improvement in rate of weight gain and in utilization of feed resulted when menhaden meal was fed as a feed supplement. No fishy flavor was detected in loins of pigs fed diets containing as much as 0.73 percent fish oil supplied by the menhaden meal.

Vol. 5, No. 4. Uptake of oxygen in refrigerated radiopasteurized fish, by L. J. Ronsivalli and B. L. Tinker. October 1969, pp. 143-149, 4 figs.

ABSTRACT

In cans that contained haddock fillets and that were (1) hermetically sealed at atmospheric pressure, (2) radiopasteurized, and (3) stored at about 0.5° C., the level of oxygen dropped from about 21 percent to about 2 percent within 30 days, at which time the percentage of oxygen was still falling. This decrease in the concentration of oxygen indicates that the atmospheric environment within the cans was conducive to the growth of aerobes, microaerophiles, facultative anaerobes, or anaerobes at various stages of oxygen depletion during the storage.

Vol. 5, No. 4. Test-tank studies of shrimp-pot efficiency, by Doyne W. Kessler. October 1969, pp. 151-160, 6 figs., 2 tables.

ABSTRACT

How spot shrimp and dock shrimp escape from shrimp pots and how they react to each of five designs of shrimp-pot entrances were studied. Observations of pot efficiency—that is, of the number of shrimp entering and escaping each type of pot in a given time—indicate that a long conical tunnel was the most effective of the entrances tested.

Vol. 5, No. 4. Distribution of royal-red shrimp, *Hymenopenaeus robustus*, on three potential commercial grounds off the southeastern United States, by Richard B. Roe. October 1969, pp. 161-174, 8 figs.

ABSTRACT

The royal-red shrimp is an underused species. This paper reports on their distribution on grounds east of St. Augustine, Florida; south-southwest of the Dry Tortugas, Florida; and southeast of the Mississippi River Delta. On these grounds, the shrimp live only on soft bottom types and in water temperatures of 8° to 12° C.; the densities of shrimp also varies seasonally—the shrimp move offshore in summer and inshore in winter.

Vol. 5, No. 4. Effect of varying the extraction procedure on the protein extractability of frozen-stored fish muscle, by Elinor M. Ravesi and Margaret L. Anderson. October 1969, pp. 175-180, 2 tables.

ABSTRACT

The amount of extractable protein in frozen-stored fish muscle is often used as a criterion of its textural quality. An assessment of the texture of fish muscle by an organoleptic test panel, however, often shows poor correlation with the amount of protein that is extracted from the muscle.

Because we hypothesized that the amount of protein that can be extracted from frozen fish muscle depends, in large part, upon the technique of extraction used, we studied the effects of varying the solubility-test procedure, using one lot of frozen-stored cod muscle. Depending on the length of time that the sample was blended and the concentration of the neutral-salt extractant used, the amount of extractable protein varied between (1) values considered to represent minimum extractability in frozen cod muscle that has undergone extensive textural deterioration and (2) values considered to be typical of recently frozen cod.

These contradictory results indicate a need for standardizing the extraction procedure. We believe that such standardization will minimize the lack of correlation now found in the literature between the content of soluble protein and the extent that the texture of frozen fish muscle has deteriorated as evaluated organoleptically.

Vol. 5, No. 5. Alaska pink shrimp, *Pandalus borealis*: effects of heat treatment on color and machine peelability, by Jeff Collins and Carolyn Kelley. December 1969, pp. 181-189, 7 tables.

ABSTRACT

For the improvement of the quality of canned pink shrimp, particularly its color, a process is needed so that fresh shrimp, rather than aged shrimp, can be peeled by machine.

In our work on this problem, the retention of color was improved during peeling if the shrimp were first given a heat pretreatment. During in-plant trials, 60- to 500-pound lots of shrimp were given various one-stage and two-stage heat treatments

The precook method of preparing fresh shrimp for peeling by machine resulted in a canned product that had more color and had better texture and flavor than shrimp prepared for peeling by being held in ice or in refrigerated sea water. In some samples, gelling occurred in the liquor, and some cans had more sulfide blackening than usual.
before they were machine peeled and routinely canned.

Vol. 5, No. 5. Depth-time sequential analyses of the operation of two California tuna purse seines, by Roger E. Green. December 1969, pp. 191-201, 11 figs.

ABSTRACT

Little information is available on the depth of a purse seine at different times during setting, though the timing of setting and pursing is important in the development of successful fishing tactics. The depth-time relation during setting was studied for two tuna purse seines of different size (7 strips deep, 470 fathoms long; 8 strips deep, 520 fathoms long) to which depth-time recorders were attached. From data gathered during 32 sets, composite sequence analyses and underwater net profiles were prepared for four basic stages (halfway through setting, end of setting, start of pursing, and halfway through pursing) of the setting and pursing operations.

Vol. 5, No. 5. Recommendations for improving the quality of vessel-caught groundfish, by J. Perry Lane. December 1969, pp. 203-213, 9 figs.

ABSTRACT

Because fish start to lose their quality as soon as they are taken from the sea and because the basic causes of the loss in quality are not readily observable to the eye, fishermen need guidelines for slowing the rate at which the quality of the fish is lost.

Recommended here are suggestions that will enable fishermen to slow the rate of quality loss. These recommendations provide guidelines that are designed (1) to reduce the initial numbers of bacteria on newly caught fish, (2) to prevent the fish from being crushed and otherwise physically damaged, (3) to protect the fish from being contaminated by bacteria from such sources as pughs, hand contact, and viscera, (4) to retard the activity of bacteria and enzymes by rapid and sustained chilling of the fish, and (5) to protect the fish from contamination from such sources as fuel oil and sour bilges.

Putting these recommendations into use will increase the demand for groundfish, will make groundfishing more profitable, and will help the U.S. groundfishing industry to meet foreign competition.

Vol. 5, No. 5. Author index of publications and addresses — 1967 Bureau of Commercial Fisheries Branch of Technology and Branch of Reports (Seattle), by Helen E. Plastino and Mary S. Fukuyama. December 1969, pp. 215-230.

(No abstract.)

Fishery Leaflet

619. Alaska's fishery resources—The pink salmon. By Jack E. Bailey. March 1969, iv + 8 pp., 5 figs., 2 tables.

ABSTRACT

Pink salmon, *Oncorhynchus gorbuscha*, also called humpback salmon, are the most abundant of the Pacific salmon in Alaska. Alaska production of pink salmon has an average wholesale value of $28 million and constitutes more than half of the total North American catch. Female pink salmon carry about 2,000 eggs each and spawn in late summer or early fall. The resulting fry emerge the following spring and migrate directly to salt water. They spend 1 year at sea and return as 2-year-olds to spawn and die in their native stream. Alaskan pink salmon usually spawn only a short distance from the sea; many even spawn in intertidal streambeds. Fewer than 25 percent of the young survive from the time of spawning until the time of emergence from the gravel. Similar low survival rates prevail during the estuarine and oceanic portions of the life cycle. Pink salmon are just over 1 inch long when they enter the sea, but they grow to an average length of about 20 inches and weigh about 4 pounds as adults. Research biologists of several agencies assist fishery managers by determining the migration paths and the factors that affect abundance of pink salmon.

621. Fishery motion pictures. n. d. 26 pp.

(No abstract.)

622. Separates from the Commercial Fisheries Review. October 1969, 8 pp.

(No abstract.)

623. Recent advances in artificial culture of salmon and steelhead trout of the Columbia River. By Fred Cleaver. March 1969, iii + 5 pp., 4 figs., 1 table.

ABSTRACT

The catch of salmon and steelhead trout from fish reared in Program hatcheries increased rapidly beginning in 1964. By 1967 the benefits from operation of these hatcheries appeared to be well in excess of their costs. The Oregon moist pellet diet was the greatest single factor in providing an economically favorable operation.

Further advances in hatchery efficiency are expected in the next few years. Conservation agencies believe that the catch of hatchery-produced Columbia River fall chinook salmon, coho salmon, and steelhead trout can be increased substantially and that the cost per unit of production can be decreased.

624. List of Special Scientific Reports and Special Scientific Report—Fisheries of the U.S. Fish and Wildlife Service. March 1969, 52 pp.

(No abstract.)

625. United States tariffs on selected items of commercial fishing gear. By Jurate E. Micuta. February 1969, 11 pp., 2 tables.

ABSTRACT

A list of equipment in the order of Tariff Schedule classification numbers and a table of step reduction rates for some items are included.

626. Available leaflets on fisheries. December 1969, 7 pp.

(No abstract.)

Special Scientific Report—Fisheries

577. Relation of scale characteristics to river of origin in four stocks of chinook salmon (*Oncorhynchus tshawytscha*) in Alaska, by Richard G. Rowland. January 1969, iii + 5 pp., 5 figs., 1 table.

ABSTRACT

Differences in numbers of circuli and lengths of radii through the first freshwater annulus were used to test the hypothesis that the river of origin could be determined from these characteristics. Analyses indicated that males and females and different age groups of a brood year could be combined for each river, but that comparisons between rivers should be restricted to common brood years.. Although average counts of circuli and average lengths of radii were different in samples from each river, the variability in these characteristics is great, and neither characteristic is clearly diagnostic for the stock in any of the rivers.

578. Hydrological conditions in Clear Lake, Texas, 1958-66, by Edward J. Pullen. January 1969, iii + 8 pp., 7 figs., 6 tables.

ABSTRACT

Temperature and salinity data were collected in 1958-66, and dissolved oxygen, dissolved organic nitrogen, and total phosphorus analyses were made on samples collected in 1964-66 in Clear Lake, a small estuary that flows into upper Galveston Bay.

Seasonal trends in bottom water temperature

were similar in the different years and were related closely to trends in air temperature. Average water temperatures were lowest (about 13° C.) in January and February and highest (about 31° C.) in July. The rate of warming and cooling was directly related to the magnitude of the annual temperature difference between the warm and cool months.

Salinity ranged from 0.1 to 23.7 p.p.t. (parts per thousand) and was related inversely to stream flow and precipitation. Variations in rainfall resulted in fluctuations in stream flow and these, in turn, were reflected by variations in salinity.

Dissolved organic nitrogen ranged from 23.5 to 171.5 μg. at./1. microgram atoms per liter) and averaged 66.4 μg. at./1. Total phosphorus ranged from 1.7 to 26.3 μg. at./1. and averaged 8.2 μg. at./1. Phosphorus values increased markedly in July 1966. No correlation existed between nitrogen or phosphorus and stream flow or rainfall.

Dissolved oxygen ranged from 3.8 to 19.3 p.p.m. (parts per million).

579. Published in 1968.

580. Maturity and spawning of skipjack tuna (*Katsuwonus pelamis*) in the Atlantic Ocean, with comments on nematode infestation of the ovaries, by David C. Simmons. January 1969, 17 pp., 6 figs., 3 tables.

ABSTRACT

Ovaries were examined from 537 fish collected in the eastern tropical Atlantic, western tropical Atlantic, and off New York. The reported incidence of larval and juvenile *K. pelamis* was also reviewed. The minimum fork length of skipjack tuna at maturity was 435 mm. in the eastern tropical Atlantic, and 410 mm. in the western tropical Atlantic. All ovaries collected off New York were in an early stage of development. The percentage of skipjack tuna near spawning or recently spawned was greater in the western tropical Atlantic than in the eastern tropical Atlantic. Skipjack tuna spawn throughout the year in the areas studied in the tropical Atlantic. The number of eggs per spawning for fish 465 mm. to 809 mm. long was 262,000 to 1,331,000.

Nematodes identified as *Philometra* sp. and Spiruroidea infested the ovaries of about 90 percent of the mature skipjack tuna. Both taxa were found in the ovaries of tuna collected in all three areas.

581. Zooplankton volume off the Pacific coast, 1960, by James R. Thrailkill. March 1969, 50 pp., 13 figs., 5 tables.

ABSTRACT

Basic data on volumes of zooplankton are given, together with data for all plankton hauls taken on survey cruises of the California Cooperative Oceanic Fisheries Investigations. Distribution charts showing relative areal zooplankton abundance by month are included.

582. The Japanese Atlantic longline fishery, 1965, and the status of the yellowfin tuna and albacore stocks, by John P. Wise and William W. Fox, Jr. April 1969, 7 pp., 2 figs., 7 tables.

ABSTRACT

Fishing effort reached nearly 100 million hooks in 1965, a level which is more than the yellowfin tuna stocks can support and remain commercially productive. As catch rates for yellowfin tuna decrease, more and more fishing will be directed toward albacore.

583. Electrical installation for control of the northern squawfish, by Galen H. Maxfield, Gerald E. Monan, and Holbrook L. Garrett. February 1969, iii + 14 pp., 8 figs., 4 tables.

ABSTRACT

Electricity was used experimentally to divert and trap squawfish during their spawning migration in 1958 at Cascade Reservoir, Idaho. Electrical fields, created by sequentially energizing a V-shaped array of vertically suspended round electrodes with square-wave, d.c. pulses, were evaluated as a means of diverting squawfish into traps.

Three test conditions of varied pulse frequency, pulse duration, and voltage were tested. Two sets had a pulse frequency of 10 pulses per second (2 per field per second when five fields were pulsed in sequence), a pulse duration of 50 msec., and voltages of 140 and 180 v.; one set had a pulse frequency of 15 pulses per second (3 per field), a pulse duration of 25 msec., and a voltage of 180 v. One set (pulse frequency, 10 pulses per second; pulse duration, 50 msec.; and voltage, 180 v.) was repeated.

The electrical fields of the electrode array were effective in diverting squawfish into traps. The test condition with pulse frequency of 15 pulses per second, pulse duration of 25 msec., and voltage of 180 v. was less effective than the other test conditions.

584. Fur seal investigations, 1966, by BCF, Marine Mammal Biological Laboratory. June 1969, vii + 123 pp., 33 figs., 6 app. C figs., 52 tables, 27 app. A tables, 15 app. C tables.

ABSTRACT

In 1966, 52,497 male and 391 female fur seals (*Callorhinus ursinus*) were killed on the Pribilof Islands.

Counts of dead fur seals included 27,392 pups, 222 adult males, and 227 adult females.

Malnutrition, hookworm disease, infections, and bite wounds were the major causes of death of 164 pups examined in 1966.

On the Pribilof Islands 9,948 harem and 6,856 idle males were counted in 1966.

Of the 51 4-year-old females examined, one was primiparous and post partum; none of the 65 3-year-old females had been gravid.

Handling apparently causes pups to lose weight or slows their rate of weight gain.

A total of 12,499 pups were tagged and check-marked and 12,077 were marked. Two tags were attached to 2,978 males older than pups on St. Paul Island. Recoveries of seals marked in previous years included 4,418 marked as pups and 159 marked at age 1 or older on the Pribilof Islands, and 30 seals marked as pups on the Soviet Islands.

Pups tagged in late September apparently survive the effects of tagging better than pups tagged in mid-August. On the basis of tag recoveries, the estimated number of pups born decreased steadily from 643,000 in 1960 to 440,000 in 1964. The estimate of pups born in 1966 from marked-to-unmarked ratios was 380,000. Estimates from marked-to-unmarked ratios were similar to total counts of pups on three rookeries.

An estimated 78,000 males from each of two year classes (1961 and 1962) survived to age 1.

The forecasted kill of 3- and 4-year old male seals on St. Paul Island in 1966 was 40,000; the actual kill was 37,669. The forcasted kill of males on the Pribilof Islands in 1967 includes 4,000 of ages 2 and 5, 34,300 of age 3, and 17,900 of age 4.

The 249 adult males killed for study and the 157 adult males found dead had similar age distributions. The annual replacement rate for males age 10 and older is estimated aas 0.38.

Sixty-six genital tracts from adult females were collected from 13 September to 28 November. The first of 17 tracts with implantation chambers was collected 4 November; all 5 tracts taken on 28 November had implantation chambers.

In a test to determine accuracy in assigning the correct ages to fur seals from canine teeth, the lowest errors were 2.5 to 3.9 percent for males in ages 2 to 5 and 3.8 to 21.3 percent for females in ages 3 to 7. Japanese and U.S. readers disagreed on 18.2 percent of males in ages 1 to 4 and 36.5 percent of females in ages 1 to 7 in two other groups of teeth.

Succinylcholine apparently is unsafe for use in immobilizing adult male fur seals.

Seal pups gained more weight when fed calcium caseinate and fish flour than when fed fish flour alone. Colostrum milk obtained immediately post partum has much higher levels of albumin and globulin than does milk of later lactation.

Pelagic research was conducted off central and southern California from 21 January to 25 March 1966. Seal distribution was studied along transects extending 19 to 222 km. offshore between lat. 32° N. and 38° N. at 37-km. intervals. Seals were usually found 37 to 130 km. offshore. The largest concentrations of seals were usually near areas where abrupt changes in depths occur along the Continental Shelf and over seavalleys and seamounts.

Of 2,704 seals sighted, 444 were collected, 78 were wounded and lost, and 67 sank after they were killed. Males formed only a small part of the population. Of 428 females taken, 52 percent were gravid; the youngest gravid female was a primiparous 4-year-old.

A lanternfish (*Myctophum californicnse*), a sciaenid (species unknown), and a squid (*Chiroteuthis veranyi*) were found in fur seal stomachs for the first time. Northern anchovy (*Engraulis mordax*), Pacific saury (*Cololabis saira*), Pacific hake (*Merluccius productus*), and squids were the principal food species of fur seals off California.

585. Length-weight relation and conversion of "whole" and "headless" weights of royal-red shrimp, *Hymenopenaeus robustus* (Smith), by Edward F. Klima. May 1969, iii + 5 pp., 3 tables.

ABSTRACT

Differences in the length-weight regression coefficient (b) between sexes are noted for shrimp in one of three areas, and differences among areas are apparent.

Equations for converting whole weight to headless weight and vice versa are given for three areas. The estimating equations differ between the areas. Estimating equations for each area are adequate for describing the relation between whole and headless weights and headless and whole weights.

586. Published in 1970.

587. Transplanting adult pink salmon to Sashin Creek, Baranof Island, Alaska, and survival of their progeny, by William J. McNeil, Stephen C. Smedley, and Robert J. Ellis. August 1969, iii + 9 pp., 3 figs., 6 tables.

ABSTRACT

The return of adult pink salmon, *Oncorhynchus gorbuscha*, to Sashin Creek was very low in the even years from 1946 to 1962. In 1964 an experiment tested a method of transplanting adults to re-establish the even-year run of pink salmon.

About 2,400 adult pink salmon were captured in a purse seine in Bear Harbor and transported alive in brine tanks on a boat to Sashin Creek, a distance of about 80 km. (50 miles). Most of the fish survived the trip; 727 males and 1,139 females were put into Sashin Creek above a weir. The transplanted fish were augmented by 166 females and 121 males of unknown origin that entered the stream naturally.

The distribution of the spawners in the stream was similar to that of native runs of the same size. Survival of the eggs and progeny from a potential deposition of 2,230,000 eggs was relatively good for Sashin Creek — 55 percent to the end of spawning and 14 percent to fry emergence the next spring. The survival of these fish in the ocean was also relatively good, and about 6,000 adults (2 percent of the fry) returned to spawn in 1966. These fish spawned successfully, and survival of fry in 1967 from the potential egg deposition was 12 percent.

588. Processing of digital data logger STD tapes at the Scripps Institution of Oceanography and the Bureau of Commercial Fisheries, La Jolla, California, by James H. Jones. June 1969, iii + 25 pp., 6 figs., and Apps.

ABSTRACT

The development of continuous sampling STD (salinity-temperature-depth) sensors as a prime data collection tool for oceanographic cruises has necessitated the development of techniques capable of handling the data with modern digital computing equipment. This paper describes one such technique that was developed for processing STD data collected as part of the EASTROPAC Survey Program. The description assumes that the data has been digitized and recorded on IBM compatible tape in the field. The computer programs needed for processing the basic data tapes are described, and a listing of the program with subroutines is given in the Appendix.

589. Return and behavior of adults of the first filial generation of transplanted pink salmon, and survival of their progeny, Sashin Creek, Baranof Island, Alaska, by Robert J. Ellis. October 1969, iii + 13 pp., 5 figs., 10 tables.

ABSTRACT

Escapement of adult pink salmon to Sashin Creek in 1966 was 5,761 fish—mostly progeny of 1,866 adults transplanted to the stream in 1964. The adults entered Sashin Creek relatively early in the season and within a short period of time. Most of them spawned in the same two study sections of Sashin Creek ("Lower" and "Middle") used by their parents and by earlier native runs of similar size. The two sections had nearly equal densities of females (about 0.27 per square meter) and potential egg deposition (about 570 eggs per square meter) but different efficiencies of egg deposition (about 47 percent in the Middle section and 28 percent in the Lower). The low average efficiency for the entire stream (37 percent) was probably due to the high streamflow during the spawning season. The proportion of combined eggs and alevins alive in March was nearly equal in the Middle and Lower sections (63 and 65 percent), but the disappearance from the end of spawning to just before emergence was markedly different—about 80 percent for the Middle section and 47 percent for the Lower. Total survival from potential egg deposition to preemergent fry was 9 percent in the Middle section and 15 percent in the Lower.

Estimated number of pink salmon fry produced in Sashin Creek in the spring of 1967 was 750,000, or 12 percent of the potential egg deposition of 6,255,000. This is the survival predicted from the historical relation of total fresh-water survival to the date half the spawners entered the stream.

Several lines of circumstantial evidence indicate that the adult pink salmon that spawned in Sashin Creek in 1966 were mostly progeny of the fish transplanted to the stream in 1964.

590. Distributions of fishes in fresh water of Katmai National Monument, Alaska, and their zoogeographical implications, by William R. Heard, Richard L. Wallace, and Wilbur L. Hartman. October 1969, iii + 20 pp., 2 figs., 3 tables.

ABSTRACT

Katmai National Monument covers 10,916 km.^{2} on the base of the Alaska Peninsula and is divided by the Aleutian Mountain Range into two principal drainage areas. Streams north of the Aleutian Range flow into Bristol Bay of the Bering Sea, and those south of the mountains flow into Shelikof Strait of the North Pacific Ocean. The large multilake Naknek River system is the dominant drainage area on the Bristol Bay side of the monument, whereas small single lakes and short streams and rivers constitute many separate drainages on the Shelikof Strait side. Twenty-four species of fish occur in the Bristol Bay drainages of the monument, but only eight species were collected in streams and lakes draining into Shelikof Strait. Evidently the Aleutian Range has been a barrier to the southward movement of freshwater fishes in the monument. All eight species in Shelikof Strait drainages are capable of dispersal through salt water, whereas several forms in Bristol Bay drainages require fresh water for dispersal. Variable numbers of species occur in the interconnecting lakes of the Naknek River system. Naknek Lake, the downstream terminus of the lake system, contains 24 known species and each upstream lake contains fewer species than the one into which it drains. The present distribution of fishes in this system is discussed in terms of the sequential timing of species invasion and the postglacial development of barriers.

591-592. Published in 1970.

593. Review of studies of tuna food in the Atlantic Ocean, by Alexander Dragovich. December 1969, iii + 21 pp., 1 apps. table.

ABSTRACT

Published and unpublished reports are reviewed and methods used to evaluate the data are discussed. A description is presented of the food of seven Atlantic tunas of commercial importance. little tuna (*Euthynnus alletteratus*), skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), blackfin tuna (*T. atlanticus*), the bluefin tuna complex (*T. thynnus thynnus* and *T. maccoyii*), bigeye tuna (*T. obesus*), and albacore (*T. alalunga*). Their food consists mainly of pelagic fish (mostly juveniles, some larvae and adults), crustaceans (mostly macrozooplankton), and molusks (chiefly cephalopods). The greatest number of food items

are fish taxa (331), followed by crustaceans (111) and mollusks (74). Prey organisms are listed alphabetically, according to the tuna species. The food consumed by the species of tuna was generally similar. Differences in food between the juvenile and adult bluefin tuna were pronounced; juveniles fed largely on crustaceans whereas adults fed primarily on fishes. Seasonal differences were noted in the composition of the food of skipjack and yellowfin tunas in African waters.

594-597. Published in 1970.

598. Size composition, sex ratio, and size at maturity of offshore northern lobsters, by Bernard E. Skud and Herbert C. Perkins. December 1969, iii + 10 pp., 6 figs., 12 tables.

ABSTRACT

The fishery for northern lobsters, *Homarus americanus*, in the offshore waters of the North Atlantic is developing rapidly and is expected to alter certain lobsters have been taken during research cruises and from commercial catches to document the existing size composition, sex ratio, and size at maturity. These records will provide useful indices of population changes as fishing effort increases.

The data in this report are from five of the major fishing areas—Hudson, Veatch, Oceanographer, Lydonia, and Corsair Canyons. Lobsters from canyons 200 km. from shore were substantially smaller than those from areas farther offshore. The size of lobsters generally increased with depth and the proportion of females generally increased with increasing size. Females dominated the samples and sometimes were 70 percent of the catch. The numbers of egg-bearing females are reported. The smallest female with external eggs was 8.0 cm. in carapace length.

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(see Figure 1)

349. Use of abstracts and summaries as communication devices in technical articles. By F. Bruce Sanford. February 1971, iii + 11 pp., 1 fig.

350. Research in fiscal year 1969 at the Bureau of Commercial Fisheries Biological Laboratory, Beaufort, N.C. By the Laboratory staff. November 1970, ii + 49 pp., 21 figs., 17 tables.

351. Bureau of Commercial Fisheries Exploratory Fishing and Gear Research Base, Pascagoula, Mississippi, July 1, 1967 to June 30, 1969. By Harvey R. Bullis, Jr., and John R. Thompson. November 1970, iv + 29 pp., 29 figs., 1 table.

352. Upstream passage of anadromous fish through navigation locks and use of the stream for spawning and nursery habitat, Cape Fear River, N.C., 1962-66. By Paul R. Nichols and Darrell E. Louder. October 1970, iv + 12 pp., 9 figs., 4 tables.

356. Floating laboratory for study of aquatic organisms and their environment. By George R. Snyder, Theodore H. Blahm, and Robert J. McConnell. May 1971, iii + 16 pp., 11 figs.

361. Regional and other related aspects of shellfish consumption — some preliminary findings from the 1969 Consumer Panel Survey. By Morton M. Miller and Darrel A. Nash. June 1971, iv + 18 pp., 19 figs., 3 tables, 10 apps.

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