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LA JOLLA
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SOUTHWEST FISHERIES CENTER

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NOAA/NMFS

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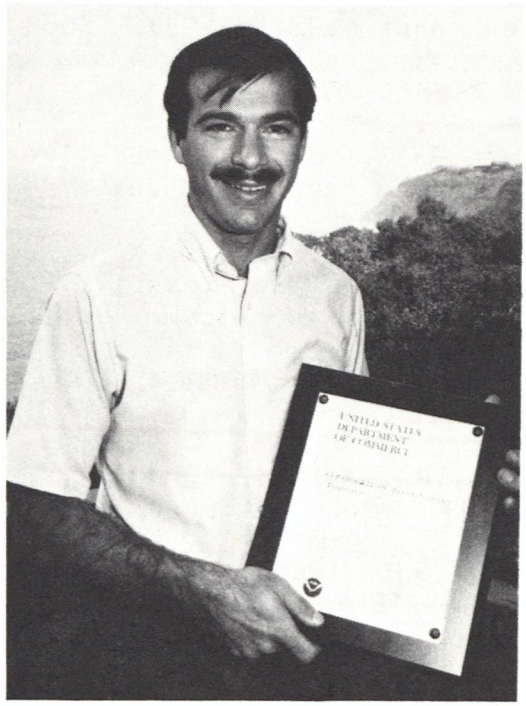
AUTHORS' AWARDS AND PUBLICATIONS, 1985

Dr. Richard Methot of the Southwest Fisheries Center received the NMFS Outstanding Publication Award for the best publication appearing in a 1983 issue of the U.S. Fishery Bulletin. The paper, "Seasonal variation in survival of larval northern anchovy, Engraulis mordax, estimated from the age distribution of juveniles," was cited in a letter from William Gordon, Assistant Administrator for Fisheries, to Methot as a "significant contribution to the understanding and knowledge of NMFS mission-oriented studies."



Dr. Richard Methot honored for best publication in U. S. Fishery Bulletin for 1983.

Two other staff members of the Southwest Fisheries Center were awarded Honorable Mention Recognition by the Outstanding Publications Awards Subcommittee of the Publications Advisory Committee: Dr. Stephen Reilly of the SWFC in La Jolla was recognized for his paper, "Population assessment of the gray whale, Eschrichtius robustus, from California shore censuses, 1967-80," written with Dale Rice and Allen Wolman, and Stephen Ralston was recognized for his paper, "Analyzing the width of daily otolith increments to age the Hawaiian snapper, Pristipomoides filamentosus, co-authored with Garrett Miyamoto.

Center Director Barrett noted that scientists at the Southwest Fisheries Center have received the Outstanding Publication in a Fishery Bulletin award for 6 of the last 7 years.

Barrett has stressed the importance of publications as an essential part of the research done at the SWFC. Through publications, the Center research is disseminated to the scientific community and it becomes available to those interested in fishery research. In addition, the publications are a tangible representation of the research that has gone on at the Southwest Fisheries Center.

THIS REPORT DOES NOT CONSTITUTE PUBLICATION AND IS FOR INFORMATION ONLY.

SWFC Papers Published and in Press in Peer-Reviewed Journals in 1985

During 1985, Center scientists published 53 articles in peer-reviewed journals. Ten Technical Memorandums were produced. Below is a list of the articles and Technical Memorandums published by Center scientists in 1985.

Ankenbrandt, Lisa. 1985. Food habits of bait-caught skipjack tuna, Katsuwonus pelamis, from the southwestern Atlantic Ocean. Fish. Bull., U.S. 83(3):379-393.

Bakun, A. 1985. Comparative studies and the recruitment problem: searching for generalizations. Calif. Coop. Oceanic Fish. Invest. Rep. 26:30-40.

Balazs, G.H. (In press.*) Ontogenetic changes in the plastron pigmentation of hatching Hawaiian green turtles. J. Herpetol.

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Balazs, G.H. 1985. Status and ecology of marine turtles at Johnston Atoll. Atoll Res. Bull. 285:1-46.

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Benville, Pete E., Jr., Jeannette A. Whipple, and Maxwell B. Eldridge. 1985. Acute toxicity of seven alicyclic hexanes to striped bass, Morone saxatilis, and bay shrimp, Carangon franciscorum, in seawater. Calif. Fish and Game 71(3):132-140.

Boehlert, George W. 1985. Using objective criteria and multiple regression models for age determination in fishes. Fish. Bull., U.S. 83(2):103-117.

Boehlert, G. W. and J.B. Morgan. 1985. Turbidity enhances feeding abilities of larval Pacific herring, Clupea harengus pallasi. Hydrobiologia 123:161-170.

Boehlert, G.W. and B.C. Mundy. (In press.*) The role of behavioral and physical factors in fish recruitment to estuarine nursery areas. Trans. Am. Fish. Soc.

Boehlert, G.W. and M.M. Yoklavich. 1985. Larval and juvenile growth of sablefish, Anoplopoma fimbria, as determined from otolith increments. Fish. Bull., U.S. 83:475-481.

*Will have a publication date of 1985.

Boehlert, G.W., D.M. Gadomski, and B.C. Mundy. (In press.*) Vertical distribution of ichthyoplankton off the Oregon coast in spring nd summer months. Fish. Bull., U.S. 83(4).

Fiedler, Paul C., Gary B. Smith, and R. Michael Laurs. 1985. Fisheries applications of satellite data in the eastern North Pacific. Mar. Fish. Rev. 46(3):1-13.

Genin, A. and G.W. Boehlert. (In press.*) Dynamics of temperature and chlorophyll structures above a seamount: An oceanic experiment. J. Mar. Res. 43(4).

Gerrodette, Tim, Daniel Goodman, and Jay Barlow. 1985. Confidence limits for population projections when vital rates vary randomly. Fish. Bull., U.S. 83(3):207-217.

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Govoni, J.J., G.W. Boehlert, and Y. Watanabe. (In press.*) The physiology of digestion in larval fishes. Environ. Biol. Fishes.

Guillemot, Patrick J., Ralph J. Larson, and William H. Lenarz. 1985. Seasonal cycles of fat and gonad volume in five species of northern California rockfish (Scorpaenidae: Sebastes). Fish. Bull., U.S. 83(3):299-311.

Hewitt, Roger P. 1985. Reaction of dolphins to a survey vessel: Effects on census data. Fish. Bull., U.S. 83(2):187-193.

Hewitt, R.P., G.H. Theilacker, and N.C.H. Lo. 1985. Causes of mortality in young jack mackerel. Mar. Ecol. 26(1-2):1-10.

Hightower, J.E. and G.D. Grossman. 1985. Comparison of constant effort harvest policies for fish stocks with variable recruitment. Can. J. Fish. Aquat. Sci. 42:982-988.

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Henderson, J.R. 1985. A review of Hawaiian monk seal entanglements in marine debris. In R.S. Shomura and H.O. Yoshida (eds.), Proceedings of the Workshop on the Fate and Impact of Marine Debris, 26-29 November 1984, Honolulu, Hawaii, p. 326-335. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-54.

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Uchida, R.N. 1985. The types and estimated amounts of fish net deployed in the North Pacific. In: R.S. Shomura and H.O. Yoshida (eds.), Proceedings of the Workshop on the Fate and Impact of Marine Debris, 26-26 November 1984, Honolulu, Hawaii, p. 37-108. U.S. Dep. Commer., NOAA Tech. Memo., NOAA-TM-NMFS-SWFC-54.

HONOLULU LABORATORY
Honolulu, Hawaii

INSULAR RESOURCES INVESTIGATION

Effects of Southeast Hancock Seamount on the Pelagic Ecosystem Studied

Most of the research for the Honolulu Laboratory's Seamount Resources Study Program is conducted at the Hancock Seamounts, which are about 200 nautical miles northwest of Midway in the central Pacific. These are the southernmost seamounts where a significant fishery existed for the pelagic armorhead, Pseudopentaceros wheeleri, and the alfonsin, Beryx splendens, until the Seamounts were recently closed to foreign fishing as a result of declines in the stock. During the first 9 years of the fishery, Japanese and Soviet catch was approximately 1 million tons of armorhead alone. Recruitment failure also may have led to the decline in the stock. The Seamount Resources Study Program is monitoring the stock recovery during the closure.

During cruises TC-84-05 (summer 1984) and TC-85-01 (winter 1985) on the NOAA Ship Townsend Cromwell, the pelagic ecosystem in waters overlying Southeast Hancock was studied; the Southeast Hancock Seamount has a summit depth of 265 m. Dr. George W. Boehlert, Chief, Insular Resources Investigation, research assistant Michael P. Seki, and fishery biologist Bruce C. Mundy have been comparing the upper 200 m over the seamount with control stations that are between 5 and 20 km. They compared the Seamount area and the control stations using midwater trawls, plankton tows, and acoustic transects. Acoustic transects (Figure 1) showed a high nighttime

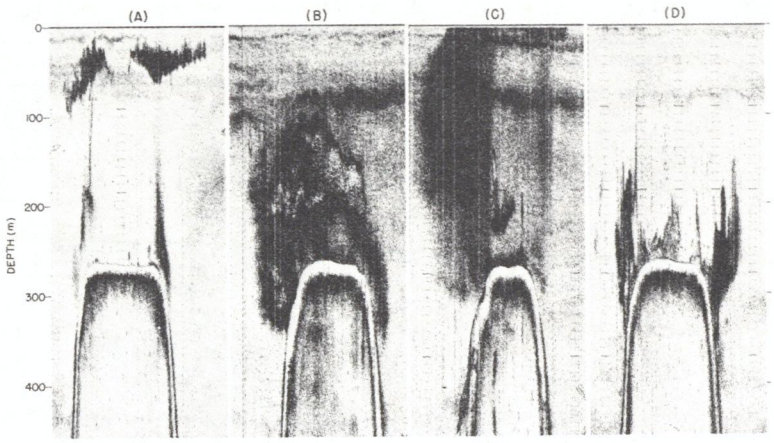


Figure 1. Hydroacoustic transects with a Simrad EQ-38 echosounder over Southeast Hancock Seamount, July 17-18, 1984; each transect is from west (left) to east (right), and the flat portion of the seamount is about 1.8 km across. Times are (A) 1931, as the scatterers rise shortly after sunset; (B) 0330; (C) 0430, with upward motion as light intensity increases; and (D) 0630, over an hour after sunrise.

biomass over the seamount, dominated by the Maurolicus muelleri and the mysid, Gnathophausia longispina. These animals migrate to the flanks of the seamount in the morning and the scatterers that are present (Figure 1D) are apparently larger fishes which are not usually captured in the small midwater trawls. Oceanic micronekton are typically less abundant over the seamount than in the control stations; data for crustacean groups are shown in Figure 2. Most of those taxa with lower abundance over the seamount are important prey sources for armorhead and alfonsin. The differences are not as pronounced in winter months. Results from plankton sampling show that in summer months ichthyoplankton are markedly less abundant over the seamount (Figure 3), but the situation is reversed in winter months (Figure 4).

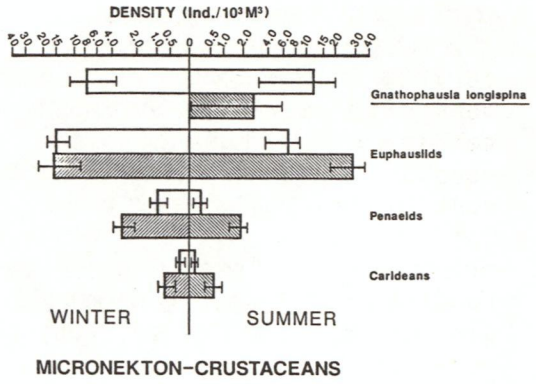
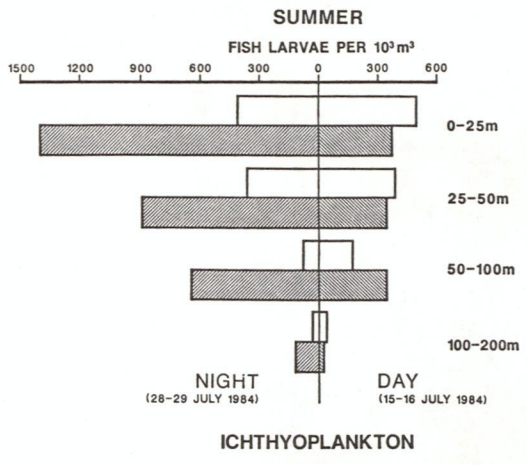


Figure 2. Crustacean micronekton densities from summer and winter cruises determined with a 6-ft IKMT. The upper bar represents the density over the seamount, the lower, stippled bar at the control stations.



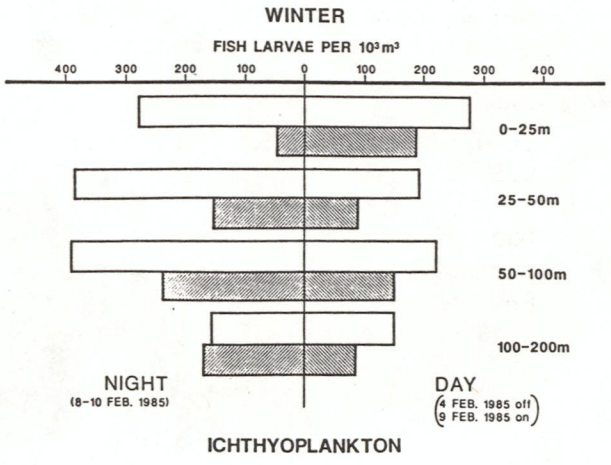


Figure 3 (left). Ichthyoplankton densities taken with a Tucker trawl in summertime. Upper bars represent samples from above the seamount. Figure 4 (right). Ichthyoplankton densities taken with a Tucker trawl in wintertime.

These observations can be explained by three hypotheses: (1) interactions of regional currents with the seamount result in localized upwelling or stationary water columns causing localized convergences and areas of high abundance, (2) predation on oceanic plankton and micronekton by resident fishes, and micronekton reduces densities of oceanic taxa, and (3) vertical migrators coming from waters below summit depth are excluded from the waters above the seamount. The analysis of the distributions will be supplemented by physical oceanographic data taken from the Cromwell, which are being analyzed by Lt. Russell Brainard, NOAA Corps, at the Pacific Fisheries Environmental Group in Monterey, California. It is clear, however, that seamounts can induce significant variability in biological features of overlying waters. (G. Boehlert, FTS (808) 943-1221)

FISHERY MANAGEMENT RESEARCH PROGRAM

Work Done on Lobster Trap Escape Vents

During Leg I of the Townsend Cromwell cruise TC-85-05, cruise members attempted to determine the catch rate of slipper lobster, Scyllarides squammosus, and spiny lobster, Panulirus marginatus, in traps equipped with escape vents located in the upper edge of the side panels of black plastic lobster traps. The traps used were the same as those being used by the industry. Dr. Robert A. Skillman, Leader of the Fishery Management Research Program, was field party chief; he was assisted on the cruise by Gary L. Kamer, Statistician, and Research Assistants Raymond P. Clarke, Alan R. Everson, and Happy A. Williams.

In field trials a year ago, traps with escape vents located in the lower edge of the side panels and traps with no escape vents (the controls) were tried. The traps with escape vents in the lower edge retained as many legal spiny lobster as the control traps, while releasing a substantial portion of the sublegal spiny lobster (and unfortunately most of the slipper lobster as well). Following these field trials, laboratory trials were conducted on traps with escape vents located in the upper edge. These traps retained 60% of the slipper lobster, compared with control traps; traps with vents on the lower edge were not nearly as effective. The work on the recent cruise was done to see if the field trials could produce results similar to those in the laboratory experiments.

Although Maro Reef is the most important fishing ground for spiny and slipper lobsters, most of the trapping was done at Necker Island because of the heavy seas near Maro Reef. Necker Island is, nonetheless, the second most important fishing ground. Although the catch of slipper lobster in the high vented traps was only 33% of the catch in the control traps, the catch of legal spiny lobster was 120% of the catch of the control traps, sublegal was 43%, and the catch of berried spiny lobster was 65%. The catch in the low vented traps was somewhat less than the catch for the high vented traps for both lobster species and all spiny lobster categories. Thus, the high vented trap did not perform as well as expected in retaining slipper lobster, but it performed better than the low vented trap. Both vented traps significantly outfished the standard or control trap in catching legal spiny lobster while releasing large proportions of the

sublegal lobsters. The size distribution of slipper and spiny lobsters retained by the control and vented traps will be examined using estimates of price per weight category to aid in evaluating the effectiveness of the traps.

Although weather conditions caused gear loss and damage and prevented fishing during some days, the catch rates were the highest recorded on Laboratory cruises in many years. The catch rates for legal, sublegal, and berried spiny and slipper lobsters were 2.71, 1.59, 0.13, and 1.16 lobster per trap, respectively, which compares favorably with industry figures for the same period. (R. Skillman, FTS (808) 943-1221)

Work Continues on WPACFIN

David C. Hamm, Computer Systems Analyst, has been working on the design and development of a data management system for the Suisan fish auction, the fish auction for Hilo, Hawaii. Information on the transactions that occur at the auction is important to fishery managers, and an automated system will help improve the accuracy of recording the information. Hamm met with Paul Agamata, Stanley Kohashi, and Chris Gushiken of Suisan Inc. to review the overall system design and demonstrate the data entry modules of the system as initially programmed.

Hamm is also producing a series of reports on fishery statistics from western Pacific islands. For the report, he designed and implemented an automated data editing and updating system for data received from the American Samoa Office of Marine Resources (OMR). Commercial landings data submitted by OMR are frequently missing price per pound information. The new editing system updates individual records that are missing this information by using a three-tiered approach for estimating price. Each record changed in the data base is also flagged as to which of the three methods was used to estimate the value of the catch. This simplifies further analysis and summarization of the data.

Hamm has also worked on producing the first volume of a report series that will summarize fishery statistics for the western Pacific islands participating in the Western Pacific Fishery Information Network (WPACFIN). Hamm met with Kitty Simonds, Executive Director of the Western Pacific Regional Fishery Management Council (Council) to discuss some of the details on format and graphic presentation for the report series. The first volume will contain data for American Samoa (1982-1984), the Commonwealth of the Northern Mariana Islands (1979-1984), and Hawaii (1979-1984); the volume is scheduled for completion by February 1986. The second volume will contain summaries for Guam (1979-1984) and possibly the Republic of Belau (1983-1984), and it will be completed in the summer of 1986. Volume three will contain 1985 data from each of these island groups and is tentatively scheduled for release in September 1986. This series of reports is expected to fulfill the majority of data requests received by all WPACFIN participants. (D. Hamm, FTS (808) 943-1221)

DATA MANAGEMENT AND TECHNICAL SERVICES

Improvements Made in Honolulu Laboratory Computer System

Fletcher V. Riggs, Chief, Data Management and Technical Services, reports that several improvements have been made to the six Honolulu Laboratory IBM PC/AT systems to increase their usefulness. The quantity of random access memory has been expanded to 640K bytes in five of the systems and to 1152K bytes in the sixth system which will allow such programs as the BMD-PC statistical package to be run. Additional serial and parallel I/O ports have been added making a total of two serial and two parallel ports on each system. Communications software for the AT's has been expanded to include CrossTalk, MODEM7, and KERMIT. The latter can emulate the standard Visual 330 terminal used on the Laboratory's Molecular supermicrocomputer system. Each AT is being connected to the Develcon switching system to provide access to the Molecular, to direct lines to the University of Hawaii (UH) Computer Center, and to modems and telephone lines. Graphics output to the enhanced graphics display and the HP 7475A plotter has been successfully tested using Lotus 1-2-3, ChartMaster, and Omniplot. In addition, regular get-togethers of AT users are being organized by David A. Somerton, Fishery Biologist, with the assistance of Janet L. Pappas, Computer Programmer, to provide an opportunity for users to share experiences, problems, solutions and the latest information on IBM PC/AT hardware and software.

All work stations and computer ports within the Honolulu Laboratory are now connected to the Develcon switching system. Work stations include all terminals, all PC/AT's, and one dial-in modem. Computer ports include all Molecular user ports, all CompuPro user ports, three dial-out modems, and six direct lines to the UH Computer Center. This switching system allows more efficient use of all computer related resources by (1) allowing any work station or computer port to attach to any other work station or computer port and (2) allowing the addition of new work stations without increasing the number of available computer ports. (F. Riggs, FTS (808) 943-1221)

COASTAL FISHERIES RESOURCES DIVISION
La Jolla, California

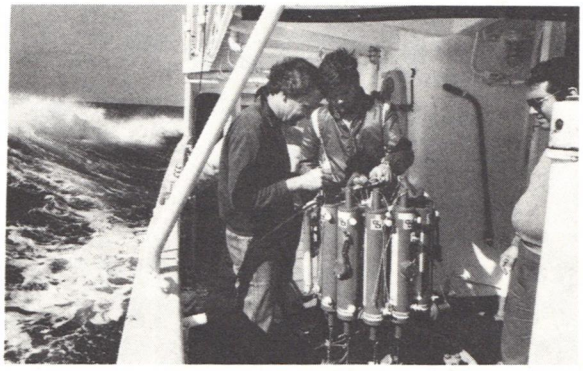
SARP Training Session Held at Southwest Fisheries Center

The NMFS Southwest Fisheries Center (SWFC) at La Jolla, California, has been the institution primarily involved in the genesis and operation of the Sardine/Anchovy Recruitment Project (SARP) conducted under the auspices of the Ocean Sciences in Relation to Living Resources program of the Inter-Governmental Oceanographic Commission (IOC), FAO of the United Nations and NOAA. As a consequence of their work on sardine and anchovy over several decades, SWFC scientists have pioneered in the development of techniques which can be used to study recruitment in pelagic fishes. Among these are the demonstration that daily rings are laid down on the otoliths of sardines and anchovies; that starvation in fish larvae can be demonstrated by histological methods; that modern oceanographic and computer techniques can be applied to recruitment studies; and that successful cruise planning and statistical sampling depend on knowledge of the fish population involved and the spawning habits of the species.

Through a collaboration of the SWFC with the IOC, an **ad hoc** training course was held November 11-22, 1985 for 15 Latin American scientists to learn about these state of the art techniques. Attending the 2-week course were four scientists each from Mexico, Peru, and Chile, and 2 from Ecuador. Each of these countries previously expressed a desire to participate in SARP and took advantage of this opportunity to bring their scientists up to date on the latest in current technology. The Mexican scientists were brought to the United States for this course under a special Congressional appropriation to the SWFC. Visitors from Japan, Argentina, and Morocco also attended lectures and special sessions held in connection with the course work.

The staff of the Coastal Fisheries Resources Division at the Southwest Fisheries Center under the direction of Dr. Reuben Lasker was solely responsible for the training of the scientists. The courses, which emphasized both practical and theoretical aspects, included such subject areas as determination of birthdate distributions through the analysis of otoliths, histological techniques, physical oceanography, and cruise planning. A one-day cruise aboard the NOAA Ship David Starr Jordan during the training period provided an opportunity for the students to practice net sampling and plankton preservation procedures, use of the CTD computer system at sea, and data processing analysis.

Thus trained, the students returned to their respective countries to begin their participation in the year-long SARP program which is designed to provide definitive information on the all-important question of recruitment: how to estimate or assess the number of young fish entering a fishable population each year. (R. Lasker, FTS 893-6212)



At left, oceanographer Ken Bliss demonstrates the pre-launch preparation of the Niskin rosette water sampler to Tomas Fonesca from Chile. Right, fishery biologist Gail Theilacker, Sr. Luis Jaurez of Ensenada, Mexico, and Dr. Yoshiro Watanabe of Japan note the presence of anchovy larvae collected in a net haul during the SARP training cruise.

ECOLOGY AND TAXONOMY OF FISHES, CalCOFI

Dr. Geoffrey Moser Awarded Commerce Silver Medal for Major Literary Contribution

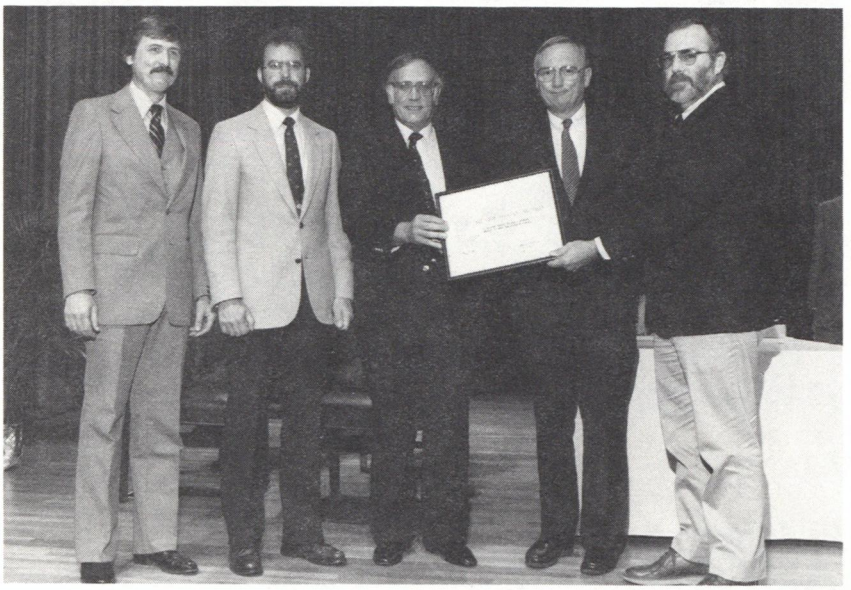
Dr. Geoffrey Moser, Leader of the Ecology and Taxonomy of Fishes, CalCOFI Task, Coastal Fisheries Resources Divison, La Jolla and a fishery biologist for 22 years with the National Marine Fisheries Service, was awarded the Commerce Department's Silver Medal in ceremonies in Washington,D.C., November 13, 1985.

The award was presented for Moser's role in editing and co-authoring a major publication on the early life history of fishes. With his Fisheries Service colleagues, Dr. William Richards of Miami, Florida, Michael Fahay of Locust, New Jersey, and Dr. Art Kendall of Seattle, Washington, Moser was honored for contributions to the book, "Ontogeny and Systematics of Fishes." The book has been widely praised by fisheries scientists in the U.S. and throughout the world as an outstanding contribution to the scientific literature on fish and fisheries.

The Associate Director of the National Museum of Natural History, Smithsonian Institution, Dr. James Tyler, wrote in a review, "It covers the fields of fisheries and ichthyology at one end of the spectrum to developmental and regulatory biology at the other. It can be used in studies of recruitment and stock assessment, as well as more basic investigations into the relationships and classification of fishes."

Moser, a government scientist since his received his doctoral degree

from the University of Southern California in 1963, has authored many papers on the critical early life stages of fishes. He is an expert on larval fish identification, particularly on the families of the abundant rockfishes and lanternfishes. He has frequently served as a consultant to scientists in the U.S. and abroad on the systematics and distributional studies of fishes. With Dr. Elbert H. Ahlstrom, to whom the ontogeny book is dedicated, Moser shared the Wildlife Society's Award in 1970 for the outstanding paper on fish ecology and management for their work on the development of lanternfishes in the California Current.



Shown receiving the Silver Medal Award from Dr. Richard E. Hallgren, Assistant Administrator for Weather Services, at ceremonies in Washington, D.C. are from left: Michael Fahay, Art Kendall, Hallgren, Bill Richards, and Geoff Moser.

COMMERCIAL AND RECREATIONAL FISHERIES RESEARCH FOR MANAGEMENT

Researchers Plan to Coordinate Efforts on Coastwide Assessment of Dover Sole Stock

Dr. Richard Methot, Fishery Biologist, was in Eureka, California, November 13-15 to plan a coastwide assessment of the Dover sole stock in cooperation with researchers from the California Department of Fish and Game (CFG), Oregon Department of Fisheries (ODF), and Oregon State University (OSU). According to Methot, each region of the fishery will be assessed independently, but similar assumptions and techniques will be used for each assessment.

Most of the discussion at this meeting concerned analysis of the historical data collected in northern California. Trawl surveys and tagging studies conducted during 1969-1971 by CFG are suitable for

estimating Dover sole biomass; state biologists will carry out this analysis.

Methot plans to adapt his model of stock synthesis for analysis of the Dover sole fishery data. This model, an adaptation of separable cohort analysis, is well suited for this application because of its ability to incorporate a variety of assumptions regarding errors in age determination.

Participants at this meeting were introduced to the break-and-burn technique for examining Dover sole otoliths (ear bones) for age determination. Previous studies by ODF and OSU researchers indicate that otoliths read by this technique yield more accurate age estimates than the scale-reading technique. The otoliths examined at the meeting had previously been read by examining annuli visible on the surface of the otoliths. The number of annuli visible with the break-and-burn technique was more than 50% greater than the surface readings. Calibration of the large historical data base of surface scale readings needs to be carried out before age-structure models (cohort analysis) can be used to study the population dynamics of Dover sole. (R. Methot, FTS 893-6225)

Feasibility of Groundfish Demand Model Explored

Cynthia Thomson, Industry Economist, is completing her investigation into the feasibility of modelling the demand for Pacific Coast groundfish. After doing some background research on the market for Pacific Coast groundfish and completing a literature search of demand and market models for seafood in general (not just groundfish), she explored several alternative ways of modelling the market. Two general approaches were investigated. The first is an econometric model containing simultaneous supply, demand, and inventory and price adjustment equations. The other approach is to model groundfish in the framework of a system of consumer demand equations.

Thomson identified the variables needed to estimate both types of models. From her research into various NMFS and non-NMFS data sources, she concluded that the econometric model cannot be estimated with available data. The reason for this is that a number of the data series which are critical to this model are either not available or of questionable quality. Thomson is now completing her research into possible sources of data for the demand model. The results of her investigation will be distributed to SWC/SWR economists and other interested parties. (C. Thomson, FTS 893-6209)

Economic Analysis of Optimum Pacific Coast Trawl Fleet Size

Drs. Daniel Huppert and Dale Squires, Industry Economists at La Jolla, have completed a mixed integer programming model of the Pacific coast trawl fleet. Acting as a hypothetical centralized owner/manager of the fishery, the computer model seeks to maximize fleetwide economic profits by choosing the optimum vessel numbers in five vessel size classes and by assigning these vessels to fish the optimum number of weeks in each season, and fishing mode. The result is useful as an economic benchmark

for evaluation of alternative planning and management programs, and it yields an estimate of potential economic surplus available through either centralized management or rational de-centralized management systems.

The Pacific trawl fishery is a multiproduct industry represented in the model with six distinct production processes or fishing modes: (1) mixed species groundfish trawling in the Vancouver-Columbia area, (2) mixed species groundfish trawling in the Eureka area, (3) mixed species groundfish trawling in the Monterey area, (4) single-species pink shrimp trawling, (5) single-species Dungeness crab pot harvesting, and (6), single-species joint venture fishing for Pacific whiting. Eight species categories are caught in the groundfish modes: Dover sole, other flatfish, cod and ling cod, widow rockfish, other rockfish, whiting, sablefish, and miscellaneous. The mixed integer programming model is disaggregated into three geographic areas, four calendar quarters and five vessel size classes.

The model incorporates two sets of decision variables: the number of vessels in each size class, and number of weeks fished. Fishing weeks are broken into areas, seasons, and vessel size classes--resulting in 120 variables. Two types of constraints are imposed: (1) those representing limits of biological productivity for each species group and (2) those representing limits on fishing activity of the trawlers. The biological constraints simply require that total catches across seasons and size classes do not exceed the allowable catches. The allowable catch levels in the program were adopted from the Pacific Fishery Management Council's estimates for 1985. Other constraints limit vessels to the typical numbers of weeks fished by very active trawlers during 1981 and 1982. Additional constraints can be imposed to examine the effect of special restrictions on the fleet.

Multi-species groundfish, shrimp and Dungeness crab catch rates are from the PACFIN research data base maintained at the La Jolla Laboratory. Average weekly catches for 1981-82 are computed for each fishing mode, area, size class and season. Catch rates for Pacific whiting joint venture fishing were based upon information from private companies and financial reports. Costs of building, maintaining, and operating trawl vessels were obtained from financial statements and various secondary information sources. Cost data covering years from 1980 to 1983 were used to estimate average weekly operating costs and annual fixed costs for each length class. Exvessel fish prices were taken from the 1984 PACFIN management data base. All these estimates are combined in the program to compute the fleet's profit (gross exvessel value of harvest minus fleetwide variable and fixed costs) for any combination of weeks fished and number of vessels. To provide a baseline for comparison, the prospective fleet profit was calculated for the 1984 trawl fleet, assuming the pattern of fishing weeks observed for the fleet in 1982.

Table 1 displays a summary of results from the mixed integer program. The best estimate of recent trawl fleet profit (shown in the first column) is $-10.25 million. The economic optimum depends critically upon the extent of the joint venture (JV) whiting fishery. With enough foreign processing capacity to permit harvest of the entire Pacific whiting allowable take, the optimum fleet size is 338 and yields an annual profit of $17.7 million. With no joint venture fishery the optimum fleet

has only 238 vessels and yields only $7.61 million in annual profit. Assuming the JV fishery catches 79 thousand tons (the 1984 level of catch), the optimum fleet would contain 262 vessels and generate almost $12 million in profits.

The size distribution of vessels in the optimum fleet differs markedly from the baseline. Absence of the largest and smallest vessel size classes in the optimum is not unexpected, due to corroboration with informal observations from industry members. The surprising absence of mid-sized, 60-69 foot trawlers in the optimum fleet evidently occurs because the greater harvest rates achieved by these vessels as compared to 50-59 foot vessels do not sufficiently counterbalance the proportionately greater increase in harvesting costs.

The level and distribution of weeks fished by fishing mode and vessel size class (aggregated over seasons) also differ between the baseline and either the with- or without-JV optimum fleets. All of the fishing time in the optimum fleet without JV vessels is concentrated in the second and fourth vessel classes: 71% in Class 2 and 29% in Class 4. Several other significant changes in fishing patterns occur in the optimization: the proportion of weeks assigned to pink shrimp trawling doubles from 22% to 44% of the total; groundfish trawling in the Eureka area declines by almost 65%. When the JV fleet harvests the entire allowable catch of Pacific whiting, the number of weeks assigned to JV fishing jumps to 28% of the total, shrimp harvesting weeks fished becomes 32% of the total, and the number of weeks fished assigned to groundfish drops from 66% of the total in the baseline case to only 36%. Finally, with the JV fleet of 1984, the number of weeks fished assigned to pink shrimp harvesting is 39% of the total, to JV fishing 12%, and to groundfish harvesting 46%.

Sensitivity of the mixed integer programming solution to changes in the underlying technological and economic conditions was assessed by rerunning the program with alternative constraints and parameters. The optimum fleet size and configuration are robust to 10% changes in fixed costs, but are greatly affected by 30% variations. A 30% increase in fixed costs reduces the optimum fleet to 156 vessels, while a 30% decrease results in an optimum fleet of 281 vessels.

As shown in Table 1 the optimum fleet is extremely sensitive to plus or minus 50% variation in the size of the pink shrimp catch. In contrast, the optimum is little affected by equivalent variations in the crab catch. Other sensitivity analyses show that increasing the number of fishing weeks for every vessel by one week per season causes a very slight increase in optimum number of fishing weeks and a $1.4 million increase in profit. A combined increase in catch rates of 50% for widow rockfish and 30% for other rockfish causes only a 3.7% increase in fleet size and a $2.4 million increase in profit.

A SWFC Administrative Report provides extensive details regarding the data and methods used in the study, and a summary of the work is being prepared for the Limited Access Working Group Report on Management Alternatives for Pacific Coast Groundfish.

Table 1. Results of Mixed Integer Programming for the Pacific Trawl Fleet.

		OPTIMUM FLEET, PROFIT AND FISHING WEEKS				
	Baseline fleet in 1984[1]	(1) JV takes whiting MSY[2]	(2) 1984 JV harvest[2]	(3) With no JV[2]	(4) +50% shrimp catch[3]	(5) -50% shrimp catch[3]
Number of vessels						
Class 1	106	0	0	0	0	0
Class 2	118	245	180	180	231	178
Class 3	138	0	0	0	0	0
Class 4	55	93	85	58	93	55
Class 5	12	0	0	0	0	0
Total number	429	338	265	238	324	233
Profit ($million)	-10.25	17.7	11.96	7.61	12.26	11.42
Total weeks	11,763	11,034	9,041	8,054	10,774	7,807
Proportion in:						
Shrimp fishing	.218	.320	.380	.440	.405	.223
Crab fishing	.044	.042	.050	.060	.043	.059
JV fishing	.074	.280	.130	.000	.102	.180
Groundfish	.664	.358	.440	.500	.450	.538

[1]The 1984 Baseline fleet does not represent an optimum distribution of fishing weeks. The number and size distribution of vessels represents the 1984 fleet while the distribution of weeks fished is taken from the 1982 PACFIN research data base. All prices and costs used in calculating profits are in 1984 dollars.

[2]Effect of Joint Venture fishing was computed assuming average level of pink shrimp harvest (17,218 short tons).

[3]Effect of varying total pink shrimp harvest was computed assuming that the JV fishery for whiting remains at 1984 level.

OCEANIC FISHERIES RESOURCES DIVISION
La Jolla, California

MARINE MAMMAL ASSESSMENT

SWFC Plans a Program of Research Vessel Surveys to Monitor Abundance of Porpoise in the ETP

Survey plans for monitoring porpoise stocks (MOPS) in the eastern tropical Pacific Ocean (ETP) are being coordinated by Dr. Wes Parks of the Oceanic Fisheries Resources Division. The plans were first developed in 1984 in response to the amended Marine Mammal Protection Act which calls for surveys to monitor population trends of porpoise associated with the purse seine fishery for tunas in the ETP.

A survey design group composed of Oceanic Division staff members was formed in September 1984. Members compiled information related to dolphin surveys and prepared a draft plan for monitoring the stocks. At the same time a committee of expert scientists was formed to assist the SWFC in reviewing the plan.

The committee met under the chairmanship of Dr. Douglas DeMaster in November 1984 and in February 1985 to review the draft plan and other related documents. The committee members discussed factors which they considered important to the proper design of MOPS. The committee addressed two questions: how many research vessels are required to physically survey the area inhabited by the stocks of dolphins primarily involved with the fishery for tropical tuna in the ETP; and how many vessels and how many years are required to detect trends in abundance of the target stocks, given levels of precision attained in previous surveys.

After considering both the draft plan and other material, the committee made the following recommendations: Number of research vessels: The consensus was that a program of annual surveys using two research vessels would make it possible to detect declining trends in abundance of stocks of ETP dolphins with acceptable precision and coverage. Season: The committee agreed that the period August through December was the best for MOPS. Area: There was no consensus on the area to be surveyed by MOPS. The committee noted that the choice of area was contingent on other factors such as available ship time. Helicopter: The committee noted serious difficulties in gathering estimates of school size, a key element. Bias in estimates appears to change with school size and bias changes from year to year. To account for this bias it is necessary to perform "ground truth" experiments annually. This can be done only by calibrating observer estimates to estimates made from aerial photographs. The committee strongly recommended that a helicopter be used in conjunction with at least one of the survey vessels to take photographs of sighted schools. The helicopter should operate with the survey vessels annually. Consistency: The committee panel emphasized that to be able to compare indices of abundance between years, certain features of the annual surveys (e.g.,

area, platforms, procedures, and observer selection) should remain constant over all years of the program.

To enhance the results of MOPS surveys, the committee also discussed using data gathered by observers aboard tuna vessels as part of the observer programs of the National Marine Fisheries Service and the Inter-American Tropical Tuna Commission. The committee noted that, given the relatively long time (5 years) required to detect trends in abundance using MOPS alone, it is important to explore the use of tuna vessel data to supplement a research vessel monitoring program and thereby increase the precision of the overall survey. Planning for this analysis is underway (see "Workshop Held to Plan Analysis of Tuna Vessel Observer Data" by Steve Reilly).

Following meetings of the committee of independent experts, SWFC staff members reviewed the draft design, committee recommendations and available resources and recommended a program in which 2 research vessels and one helicopter would be used during 6 annual surveys over 5 program years.

The first cruises of the survey using the NOAA ships David Starr Jordan and McArthur are scheduled to depart July 28, 1986. (W. Parks, FTS 893-6208)

Meeting Held to Arrange Helicopter Operations on the David Starr Jordan

An integral part of the surveys of dolphin stocks in the eastern Pacific Ocean will be the use of a helicopter in conjunction with the NOAA Ship David Starr Jordan. In preparation for helicopter operations, a meeting of technical experts from NOAA's Office of Aircraft Operations, Office of Marine Operations and Pacific Marine Center was held on December 5 and 6 to coordinate arrangements. Dr. Wes Parks convened the meeting whose objectives were to gain a common understanding of the steps necessary to procure helicopter facilities on the David Starr Jordan; gain a common understanding of the steps necessary to procure a helicopter; agree on activities required to procure a helicopter and facilities; agree on persons assigned to carry out those activities; agree on a schedule.

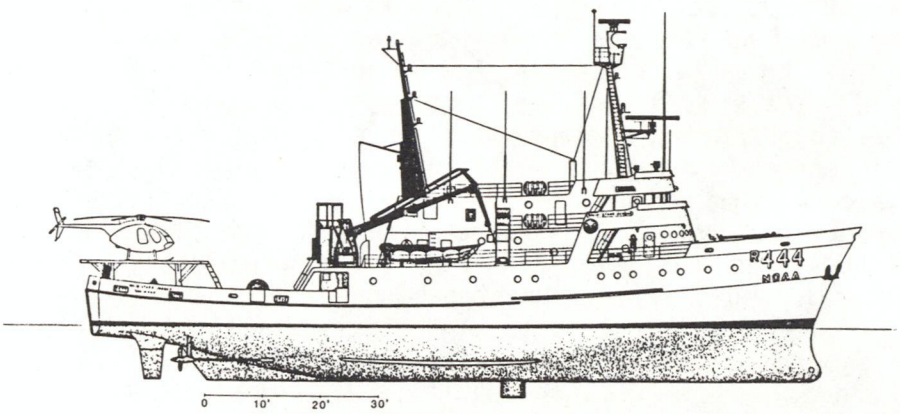


Figure 1. Artist's conception of the David Starr Jordan with helipad and helicopter.

At the meeting Parks and Peter Stangl, NOAA Corps Officer, presented information on the feasibility of operating a helicopter from the Jordan to census porpoise in the ETP. They concluded that it was feasible (see artist's conception, Figure 1).

Bill Gordon, Project Manager of the San Diego branch of M. Rosenblatt and Son, Naval Architects and Marine Engineers (a contractor to NOAA's Office of Marine Operations) checked the Jordan for installing the helipad and support facilities. He presented his findings and the participants at the meeting discussed the requirements for the design of a helipad and associated facilities. The participants then inspected the helipad used on the research vessel Egabrag in San Diego where they were impressed by the simplicity and economy of this design.

Mike Barnhill, liaison officer from NOAA's Office of Aircraft Operations, discussed features that would be desirable in a helicopter for assessing dolphin stocks.

The feasibility of operating a helicopter from the Jordan is based on the use of helicopters on tuna vessels. For that reason, some of the participants went to Gillespie Field in San Diego to talk with representatives of companies that work with tuna vessels and helicopters.

The participants at the meeting also discussed staffing for each of the activities and agreed on a schedule. (W. Parks, FTS 893-6213)

TUNA/BILLFISH INVESTIGATIONS

SWFC Scientists Attend Ninth Regular Meeting of the ICCAT

A delegation headed by Dr. Gary Sakagawa, Leader of the Oceanic Fisheries Resources Division at the Southwest Fisheries Center in La Jolla, attended the Ninth Regular Meeting of the International Commission for the Conservation of Atlantic Tunas (ICCAT), November 13-19, 1985, in Palma de Mallorca, Spain. Sakagawa was accompanied by Drs. David Au and Norm Bartoo.

Carmen J. Blondin, U.S. Commissioner and Chairman of the Commission, opened the conference, which was preceded by a meeting of the Standing Committee on Research and Statistics (SCRS), November 1-12.

The Commission extended through 1986 the management measures currently in effect for bluefin tuna including a quota of 2,660 metric tons (mt6) in the western Atlantic. In light of SCRS findings based largely on results of a meeting of its Bluefin Tuna Working Group in September, the United States proposed extension of the current management measures for a 3- to 5-year period but agreed to the shorter period in order to achieve consensus and prevent a lapse in the ICCAT conservation regime. Working with an improved data base, the SCRS projected a 10 percent increase in stock biomass in the western Atlantic during 1986 if the catch level

remains at 2,660 mt. Surplus production for 1985 and 1986 are projected at 3,850 mt and 4,400 mt, respectively.

While no other management measures concerning other stocks of tuna or tuna-like fish were considered by the Commission, the United States highlighted the SCRS findings on billfish, which have indicated declining trends over a number of years in the blue and white marlin fisheries. In response to repeated statements by the SCRS of the need to monitor these fisheries, the United States proposed that the SCRS develop for presentation in 1986 a billfish assessment program with projected costs.

Carmen Blondin was reelected Chairman of the Commission following a strong show of support for his leadership during 1984 and 1985. (N. Bartoo, FTS 893-6244)

Southern California Sport Fishermen Tag Near Record Number of Striped Marlin for Research

As the year draws to a close, Jim Squire, Fishery Biologist, adds up the number of striped marlin tagged off southern California by sport fishermen. This year, the number of striped marlin tagged to date is 221, only four short of the record number tagged during the warm water El Niño year of 1983, according to Squire who heads the Cooperative Marine Game Fish Tagging Program at the Center.

With the support of the National Coalition for Marine Conservation (Pacific Region), increased emphasis is now being placed on the tagging of striped marlin off southern California.

The 1985 striped marlin fishing season can now be considered to be near an end. The total number of anglers participating in the tagging and releasing of fish is 118, with 88 fish boat captains also cooperating in the tagging program. Tagging leaders are Dave Denholm from Corona Del Mar, California, with 25 fish tagged; Mike Callan of Long Beach, California, 11 fish, Bill Lescher of Seal Beach, California, 10 fish; Robbie Baillor of Huntington Harbor, California, 7 fish; and Mark Wisch of Norwalk, California, and Ken Bottram of San Diego, California, tied at 6 fish each.

The fishing boat captains who tagged and released striped marlin in 1985 were Joe Lopez of Costa Mesa, California, 29 fish; Mike Callan of Long Beach, California, 21 fish; Dick Siemininski, Fullerton, California, 10 fish; Gene Grimes of San Diego, California, 8 fish; and Ron Dixon of South Laguna, Joe Houck of Alta Loma and Ed Cleland of Huntington Beach with 5 each.

A few fish were tagged in late August but tagging increased as the fishing success increased in September and October. The majority of the striped marlin were tagged in the area from Santa Barbara Island north and west to the Santa Barbara Channel Islands. Until the El Niño in 1983, most catches and tagged fish were made off Catalina Island and in the area from Catalina Island to the mainland and south to off San Diego. However, during the warm water years of 1983 and 1984, striped marlin were most abundant in the area south of the Santa Barbara Islands.

In 1984, one of the warmest years on record for southern California waters, striped marlin were tagged and released as far north as off Morro Bay, California. In 1985, even though sea surface temperatures were much cooler, approaching the "normal " or average temperatures for southern California, the best area of catch remained in the northwestern waters of southern California.

The Tagging Program has been conducted since 1963 with the support of the National Marine Fisheries Service in cooperation with the International Game Fish Association. The objective is to enlist the support of recreational fishermen to tag billfish and help fishery scientists determine the migration and distribution of these fishes. Marine game fish anglers have tagged and released billfish in many areas of the Pacific. The NMFS program has been responsible for an extensive tagging effort off Australia to map the migration of black marlin, and for tagging billfish and mako sharks off New Zealand in cooperation with the New Zealand Ministry of Agriculture and Fisheries.

The longest migration recorded thus far was that of a black marlin tagged and released off Cabo San Lucas, Baja California, Mexico in early 1983. This marlin was recovered about 18 months later off Norfolk Island, northwest of New Zealand. This fish traveled a straight line distance of more than 5,700 miles between the points of tagging and recovery and represents a world record for billfish travel between tagging and recovery points. Another noteworthy example is a striped marlin which traveled from Cape San Lucas to an area west of Hawaii in 3 months, a straight line distance of 3,120 nautical miles.

Certain migration patterns, based on results from the tagging program, have become evident. Marlin which are found throughout the year in varying abundance near the entrance to the Gulf of California, migrate southward and westward in the late spring and summer. Some fish round Cape San Lucas and move a short distance northward along the west coast of Baja California. Most fish marked in the fall off southern California show a southward migration toward Cape San Lucas. Some fish, however, have been recaptured near Hawaii. Tagged fish have been recovered more than 4 years after their release.

Fish Mixing Model Aids Interpretation of Tagging Results

Dr. Pierre Kleiber, Fishery Biologist, has constructed a simulation model to help interpret tagging experiments where the tagging effort and fishing effort are concentrated in a small part of the total range of a fish population and where the fish in any small part of the range mix with fish in neighboring parts. This is a common situation with wide-ranging pelagic species, among which are several of the tuna species.

With a tagging experiment, the total number of fish in a population can be estimated using any of a variety of numerical methods. In the situation described above a population estimate can be obtained, but it is unclear what that population estimate means. A mixing rate of zero would be a special case in which it is clear that the population estimate would count only the number of fish in the fishing zone. Another special case

would be a mixing rate high enough that tagged fish are quickly dispersed throughout the total range of the fish. In this case the population estimate clearly would count the number of fish in the whole range. With an intermediate mixing rate, however, the population estimate must correspond to a geographic area somewhere between the fished zone and the total range of the population.

The fish mixing model addresses the last situation and provides a way of estimating the effective area of a tagging experiment. Figure 1 shows a case in point which was built into the model. Tagged fish are released in a fishing zone outlined by the solid line. The resolution is one degree of latitude and longitude. The density of dots in each one degree square indicates the density of tagged fish at large one month after tagging. This is a schematic picture of an actual tagging experiment with skipjack tuna carried out by the South Pacific Commission in the tropical Pacific Ocean. Figures 2 and 3 give the same picture 10 months and 20 months after tagging. The tagged fish disperse with time, and they simultaneously diminish in density due to natural mortality, fishing mortality, and dilution with untagged fish outside the fishing area. This means that the number of tagged fish in the catch diminishes with time in the model, which is also what happened in the tagging experiment.

The dashed line in the figures outlines a second fishing zone where some of the tagged fish released in the first fishing zone were caught. The mixing rate was adjusted in the model until the number of tagged fish caught in the second zone corresponded to the number of such recaptures in the real experiment.

Figure 1
1 month

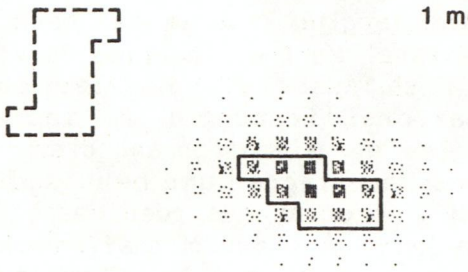


Figure 2
10 months

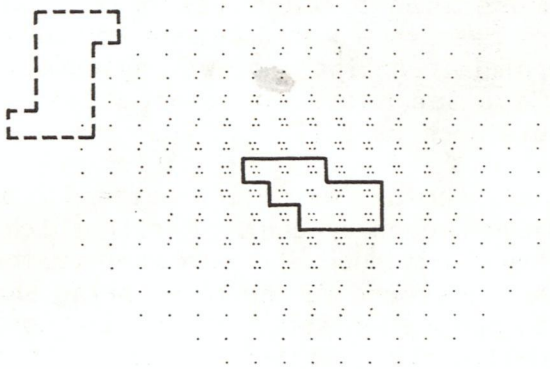
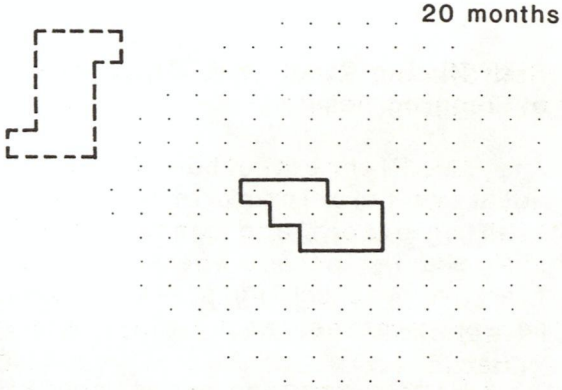


Figure 3
20 months



Figures 1-3. Distribution of tagged fish in one degree squares 1, 10, and 20 months after release. The solid line in each figure outlines the area of the fishery in which the tags were released. The dashed line outlines the area of a second fishery in which some of the tagged fish were caught.

The tag return data generated by the model for the first fishing zone were analyzed just as real tag data would be, and a population estimate was obtained. With the model we have the advantage of knowing the precise number of fish per one degree square because this value is explicitly set in the model. The estimated population from the model tag data turned out to be approximately twice the actual population within the fishing zone (solid line in the figures). Therefore, the effective area of this tagging experiment must have been roughly twice the area of the fishing zone.

This factor of two between the fishing zone and the effective area of the tagging experiment cannot be applied to other tagging experiments because it depends on the mixing behavior of the fish and on the size of the fishing zone (the smaller the zone, the greater the effect). However, this method for estimating the effective area could be generalized. For this particular case the effective area may not be estimated at better than order of magnitude precision, but it is certainly better than only knowing that the effective area is somewhere between the small fishing zone and the whole tropical Pacific Ocean. (P. Kleiber, FTS 894-7305)

BIOLOGICAL INVESTIGATIONS

Use of mtDNA to Discriminate Spinner Porpoise Stocks

Drs. Andrew Dizon and John Graves have been using analysis of mitochondrial DNA (mtDNA) to examine relatedness of populations of spinner dolphins in the eastern tropical Pacific Ocean (ETP). These dolphins are one of the species which are incidentally killed during purse seining for yellowfin tuna. Analysis of mtDNA clones (lineages) among closely related populations allows the tracing of the movements of females. The female's movements can be traced because all the mitochondria comes from the mother; sperm does not transfer any mitochondria to the egg during the fertilization process. For example, if a female from one population stock strays and breeds with a male from a second, the offspring will bear the mtDNA clone-type of the female. Since this mtDNA clone-type is probably neutral (not subject to selection), it will remain in the second population and be passed on to subsequent generations. In contrast, nuclear genes expressing morphological traits are subject to selection and, as in the example, may prevent the morphological characteristics of the female from spreading in the second population.

On examining a pair of population stocks, four "scenarios" are possible: (1) Large mtDNA differentiation and large morphological variation would indicate two discrete stocks with little or no gene flow and little adaptation to local environment. (2) Little mtDNA differentiation and little morphological differentiation would indicate considerable gene flow. (3) Large mtDNA differentiation and little morphological differentiation would indicate two distinct stocks with little or no gene flow and which are subject to very similar environmental selection pressures. (4) Little mtDNA differentiation and large morphological differentiation indicates a situation where gene flow has resulted in the mixing, between stocks, of

opposite mtDNA clone-types, and strong selection pressures have resulted in the elimination or suppression of the opposite morphotypes.

For the ETP spinners, Dizon and Graves are interested in whether scenario 1 or 4 is likely since they know that considerable morphological variation exists between the easterns and the whitebellies. In more detail, they are asking about the nature of the "overlap" of the two populations--is it a common area of two isolated stocks with little or no gene flow between stocks, is it a bi-directional zone of hybridization between the two stocks, or is it uni-directional where genes from one stock are accumulating in the gene pool of the other but not vice versa?

For the ETP spinners, Dizon and Graves have some tentative answers. The molecular phylogeny based on clones of mtDNA (think of it like the inheritance of surnames but passed on by the female rather than the male) is best explained by scenario 4. That is, sufficient interbreeding between the stocks, in the sampled region, has occurred (or is occurring) so that the distribution of the mtDNA clones does not appear to be correlated with morphotype. It is likely that selection has occurred (or is occurring) to maintain morphological discreteness in the presence of gene flow.

These findings have management implications. The distribution of mtDNA clones in the sampled population indicates a fair degree of gene flow and it is undeniable that two morphotypes are being maintained in that sampled population. This implies that these physical traits confer an adaptive or survival benefit to its possessor. It is likely that the morphological traits of the eastern morphotype have survival value in the regions where the eastern stocks are predominantly distributed and vice versa. It might not, therefore, be prudent to manage the spinners in the ETP as one stock and risk the elimination of the more heavily fished eastern morphotype.

Current work is aimed at completing analysis of an additional group of about 70 spinner samples from the ETP and 12 from the Timor Sea just north of Australia. The larger sample size will allow Dizon and Graves to examine the distributions of lineages in animals killed in the same set. Presumably animals from the same set should be much more highly related than those between sets and between sets separated by large distances like the Timor Sea animals. One question that may be answered is whether school groups (presumably, those killed in a set are all from the same schools) are "tribal" and composed of animals showing common maternal ancestory. (A. Dizon, FTS 893-6213)

ECOLOGICAL FISHERIES INVESTIGATION

Workshop Held at Southwest Fisheries Center to Plan Analysis of Tuna Vessel Observer Data for Monitoring Dolphin Populations

Information on dolphins in the eastern tropical Pacific has been collected systematically by scientific observers aboard commercial tuna purse seiners since the early 1970's. These data have been used to monitor

the mortality of dolphins which occurs incidentally in the tuna purse seine fishing operations and to study dolphin life history, stock structure, and movements and distribution. Using a variety of approaches and techniques, scientists at the Center are examining the possibility of monitoring and detecting trends in abundance of these dolphin stocks from these observer data.

Dr Steve Reilly convened a meeting held on November 13 at the Center to determine how and to what extent the tuna vessel observer data can best be used to monitor trends in population abundance and to identify the specific elements of a research plan to accomplish this. Experts on the tuna/dolphin interaction were asked to provide advice and counsel to the NMFS. Taking part in this meeting were technical representatives of the U.S. tuna industry, the U.S. Marine Mammal Commission, Inter-American Tropical Tuna Commission, and members of the OFRD staff. The meeting was facilitated by the Center's Planning Officer Mr. David Mackett.

After reaching agreement on the objectives, members of the Workshop group suggested 42 research or development projects which might be expected to yield the kinds of information required for the abundance study in the following topic areas:

- Stratification and search processes,
- line transect methods,
- school size estimation,
- stock identification,
- method development and comparisons,
- observers' effects on estimates, and
- economics of the fishery.

The participants also ranked these suggestions in order of significance and relevance bearing on the desired objectives.

The staff of the Oceanic Fisheries Resources Division will incorporate the recommendations of the participants at this meeting to develop a research plan which can test and develop the use of the tuna vessel observer data for monitoring purposes. As one result of this meeting close collaboration between researchers at the Southwest Fisheries Center and the IATTC on this problem is anticipated. In addition, the representatives of the Marine Mammal Commission and the tuna industry have committed themselves to continue their involvement in the planning and evaluation process attendant on this program, although specifying that additional research on some of the suggested topics take place before further workshops are held. The attendees strongly agreed that NMFS should give high priority to the development of effective methodologies, using tuna vessel observer data, for monitoring dolphin stocks in the eastern tropical Pacific. (S. Reilly, FTS 893-6385)

PACIFIC FISHERIES ENVIRONMENTAL GROUP
Monterey, California

Recreational Fisheries Data Base under Development

At the Pacific Fisheries Environmental Group laboratory in Monterey, California, fishery biologist Richard Parrish and statistician Donna Mallicoate have started a cooperative project with Dan Gotshall, a marine biologist with the California Department of Fish and Game's (CF&G)Monterey office. The purpose of the joint work is to develop and analyze recreational fisheries survey data taken by the CF&G during 1957-1972.

The area of the recreational fisheries during those years extended from Point Arguello, California to the Oregon border; the fishing methods included partyboat, skiff, skin diving, pier, and shore fishing. The data consists of species composition and length frequencies by month. Because of the sheer volume of data, only information on the Monterey location, two fishing methods (partyboat and skiff), and the length frequencies of 10 to 15 of the most common species will be processed initially. As time and money permit, a data base of survey data from additional locations, fishing methods and species will be developed.

The researchers plan to link the historical data to sportfish data taken during several, more recent survey to establish a 1957-1958 time series. When completed, this data base will be used by researchers at NMFS and CF&G to provide the first site-specific analysis of historical changes in northern California marine sportfisheries.

Preliminary analyses of changes in species composition, size composition and juvenile adult ratios of the dominant sportfish species at Monterey are expected to be completed within a year, according to Mallicoate. (R. Parrish, FTS (408) 646-3311)

TIBURON LABORATORY
Tiburon, California

GROUNDFISH COMMUNITIES INVESTIGATION

Daytime Surface Aggregations of Krill Studied

The neritic euphausiid, Thysanoessa spinifera, an important prey of many coastal fishes, aggregates in conspicuous daytime swarms at the ocean surface during the spring and early summer. This seasonal behavior is unusual because it occurs when most vertically migrating euphausiids aggregate near the bottom or retreat to deeper water. Because these surface swarms are important features in the trophic dynamics of many coastal fisheries, fishery biologist Susan Smith of the Groundfish Communities Investigation at the Tiburon Laboratory has been studying them together with other factors that determine the availability of this important prey for coastal groundfishes.

Little is known about these rust-colored patches of euphausiids at the sea surface or what triggers their formation along the U.S. West Coast. Although a relatively common phenomenon during most years, the swarms have proved difficult to sample because they appear sporadically and unpredictably. Last May, however, during a research cruise aboard the NOAA Ship David Starr Jordan, samples were obtained from nine patches of a surface swarm off San Francisco. The samples were dipnetted from patches ranging in size from 1 m^2 to 5 m^2 and spaced about 137 m apart, covering an area of about 1 km^2. The ship's echosounder indicated that the aggregations extended from the surface down to about 37 m (20 fathoms) in water 71 m (37 fathoms) (Figure 1). The animals apparently left the swarm area by nightfall, judging from their absence in plankton samples and on

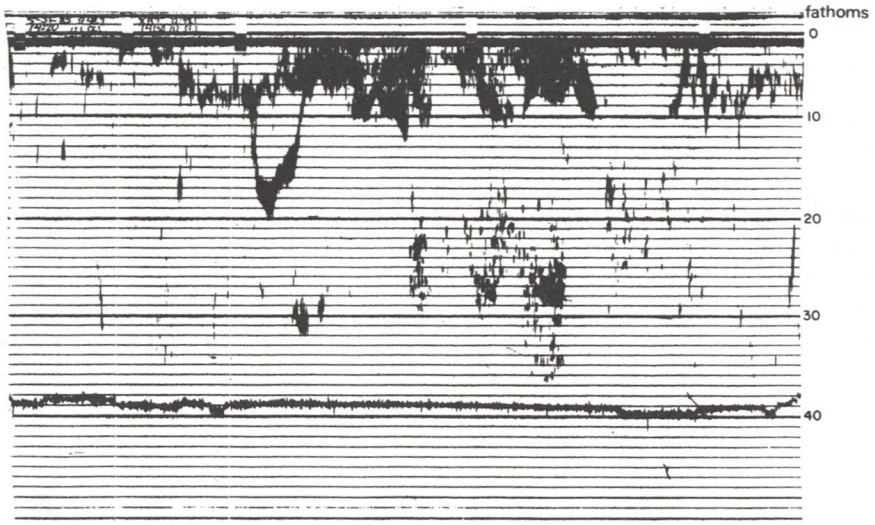


Figure 1. Echosounder recording of a euphausiid surface swarm that occurred off San Francisco, May 31,1985 (observed 1:00 to 3:00 p.m.).

echosounder tracings, but considerable numbers of euphausiid eggs--an estimated 31,600 per 1,000 m^3 of water--were sampled from surface waters in the swarm site that night.

Analyses of length frequency distribution and sex and maturity stage composition showed that approximately 95% of the euphausiids were in a reproductive condition--males with ripe spermatophores and fertilized females with late-stage eggs. There was a surprising difference in sex ratio from patch to patch. Six of the nine patches differed significantly from the expected 50:50 male:female ratio, with males dominating four patches (7:3, 7:3, 9:1, 6:4) and females dominating two (7:3, 6:4). Statistical analyses of length frequencies by maturity stage helped to distinguish three different components of the swarm patches that were sampled (Figure 2). The pre-dominant group was represented by sexually mature males (TL mean 20.7 mm), which were smaller than the second most dominant group of sexually mature fertilized females (TL mean 25.4 mm). Both are presumed to be of the 1983 year class. A third lesser group was composed of small developing females (TL mean 19.9 mm), presumably sexually precocious individuals of the 1984 year class.

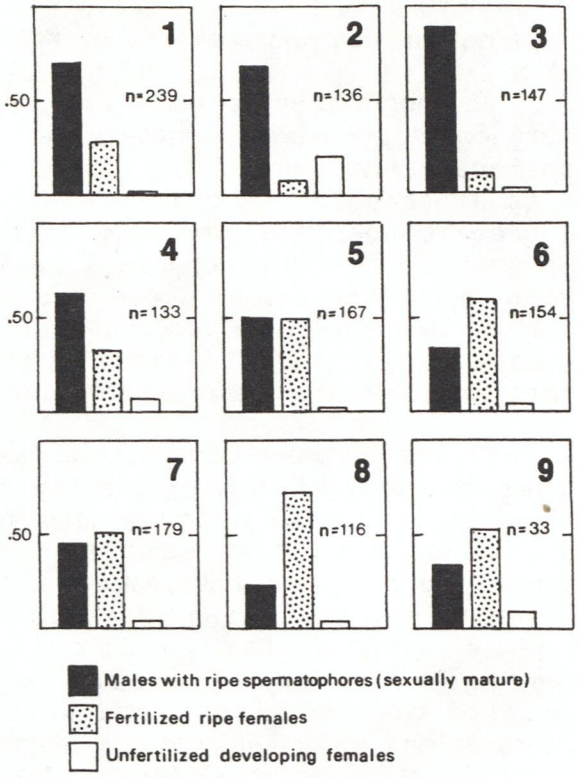


Figure 2. Sex and maturity-stage composition of nine surface swarm-krill patches, sampled 20 miles west of San Francisco on May 31, 1985. All patches were composed of the species Thysanoessa spinifera.

These results indicate that swarming behavior is related to reproductive activity and provides evidence of sexual segregation in the patches. The sexual segregation may be related to differences in swimming efficiency between the smaller adult males and their larger female counterparts. Patches where segregation is less pronounced may represent various stages of convergence in male and female populations, and observers in the field have reported seeing swarm patches merging and separating. The virtual absence of mature but unfertilized females would suggest that males may transfer their spermatophores to females in other areas or at other depths. It is noteworthy that while males have predominated in samples from the patches, mature females have predominated in the stomach contents of chinook salmon, a predator known to feed heavily on T. spinifera during the swarm season. (S. Smith, FTS 556-0565)

Study Shows Few Filefish Integrated into Hawaiian Reef-fish Communities

The filefish Pervagor spilosoma has been unusually abundant in Hawaiian reef habitats during this past year (Figure 3). It was the most numerous species in all reef habitats examined recently by a team of reef specialists from the Groundfish Communities Investigation at the Tiburon Laboratory. The team consisted of Dr. Edmund Hobson, Investigation Leader, fishery biologist Tony Chess, and fishery technician Dan Howard. P. spilosoma represented over 40% of the fishes counted on line transects in habitats where, in more typical times, it would represent less than 1%. Relatively few of these fish are being integrated into the reef community, however. Those P. spilosoma that are part of the reef community normally live closely associated with the reef, where they feed primarily on a wide variety of benthic organisms, including algae, scleractinian corals, bryozoans, mollusks, tunicates, and amphipods. The benthic habits that characterize this species have been documented by Hobson in extensive studies throughout the archipelago; 80% of the sharply increased numbers recently observed in Kona by the Groundfish Communities team were hovering in the water column, high above the reef. (Most of an unusually large number of P. spilosoma noted by Hobson at Lisianski Island and Neva Shoal in 1980 were also in the water column; see Southwest Fisheries Center Monthly Report for October 1980.) Both groups--those near the reef, and those in the water column--were sampled to compare their food habits. All 16 specimens from the reef (55 to 96, $\bar{x}$ = 71.3 mm SL) were virtually full, while the 16 specimens from the water column (69 to 90, $\bar{x}$ = 83.5 mm SL) contained far less food (2 were empty). Their diets also differed: those from the reef had fed primarily on benthic organisms, as identified above, whereas those from the water column had fed primarily on organisms known to be planktonic (e.g., pteropods, veligers, and cyclopoid copepods) or on material presumed to be planktonic (e.g., fish feces, organic aggregates in mucoid matrices, and algal fragments). Another striking difference between the specimens of the two groups was in the condition of their livers: although all those from the reef had large, apparently healthy livers, 14 of the 16 from the water column had atrophied, discolored livers; many also contained cysts. Finally, P. spilosoma observed in the water column often appeared sluggish, and some were even moribund. It appeared to be from

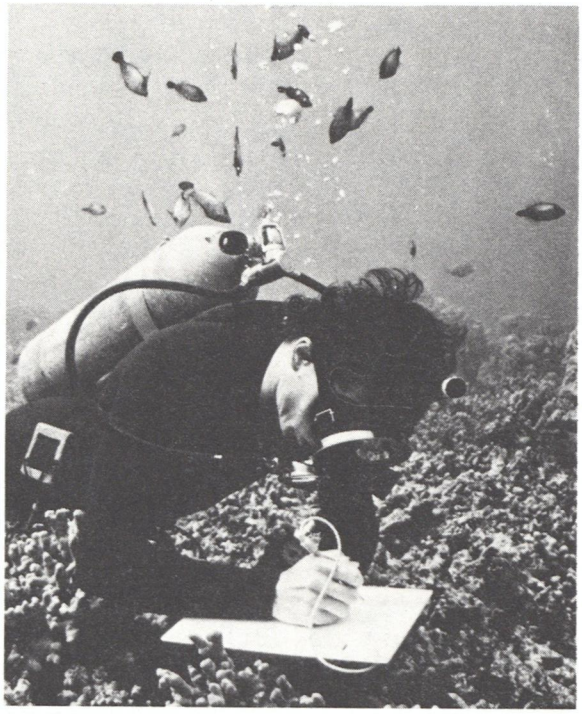


Figure 3. Filefish, Pervagor spilosoma, swarm like flies about a biologist. This species is at present exceptionally numerous in Hawaiian reef habitats.

among these individuals that many drifted ashore to lie dead on the beaches. (E. Hobson, FTS 556-0565)

GROUNDFISH PHYSIOLOGICAL ECOLOGY INVESTIGATION

Cruise for Yellowtail Rockfish Completed

The staff of the Groundfish Physiological Ecology Investigation completed a cruise aboard NOAA Ship David Starr Jordan, which departed from Sausalito, California, on December 13 and returned December 19. Michael Bowers, Fishery Biologist, was cruise leader. Operations were conducted in the vicinity of the Farallon Islands and Cordell Bank. The major objectives were 1) to assess the condition and reproductive state of several species of rockfishes, especially the yellowtail rockfish (Sebastes flavidus): 2) to collect and preserve subsampled tissues for subsequent biochemical and histological analyses; 3) to collect environmental and oceanographic information at the time when the specimens are collected; and 4) to collect and maintain live female yellowtail rockfish to transport to the Bodega Marine Laboratory (BML) for later experimentation.

The main objectives of the cruise were met. Dr. Bruce MacFarlane, Fishery Biologist, took blood samples and Dr. Jeannette Whipple and Maxwell Eldridge, Fishery Biologists, completed autopsies and subsampling on 19 yellowtail rockfish. Autopsies were also completed on specimens of bocaccio (S. paucispinis) and widow rockfish (S. entomelas). Preliminary observations showed that the rockfishes were in good health and had few parasites and no external or internal lesions. No obvious parasites were found in 26% of the yellowtail rockfish; the rest contained some roundworm larvae (Anasakidae). The protozoan Henneguya sebastoda was observed on the hearts of 26% of the yellowtail rockfish. There were no external or internal lesions or abnormalities. Most of the yellowtail adult ovaries were undergoing vitellogenesis, but eggs were still in relatively early maturation stages.

Subsamples were taken for later analyses, including histology of ovaries and eggs, and proximate analyses and calorimetry of liver, gonad, and muscle.

Brian Jarvis, Biological Technician, and other scientists and crew collected 28 adult yellowtail rockfishes by hook-and-line fishing. The air bladders were punctured to remove air, and fish were tagged and placed in the live well (Figures 4 and 5). They were transported within 24 hours to the Bodega Marine Laboratory by Maxwell Eldridge and Research Chemist Pete Benville via the BML vessel Susan K., where the rockfishes were treated with antibiotics and placed in large tanks in the laboratory. All fish have survived (10 days after capture) and are beginning to feed.

Figure 4. Tiburon Laboratory staff fishing for yellowtail rockfish on NOAA Ship David Starr Jordan. Left to right: Susan Smith, Brian Jarvis, and Michael Bowers. Figure 5. Maxwell Eldridge and Bruce MacFarlane of the Groundfish Physiological Ecology Investigation puncturing the air bladder and tagging yellowtail rockfish.

GROUNDFISH ANALYSIS INVESTIGATION

Fish Stomach Contents as Indicators of Rockfish Recruitment

Tina Wyllie Echeverria, Fishery Biologist with the Groundfish Analysis Investigation, has been evaluating the usefulness of sampling stomachs of piscivorous fish to estimate juvenile rockfish abundance. Ten adult Sebastes species, Sebastolobus alascanus, and Ophiodon elongatus were collected from April to September in 1983 and 1984 from sport and commercial landings in central California. Many (60%) of the sampled stomachs were empty or everted due to the expansion of the gas bladder as the fish were brought up from depth.

Even though El Niño conditions prevailed during 1983, but not 1984, fish occurred as a prey item in nearly equal numbers in both years. In both years, 24% of the stomachs contained invertebrates and 16% held fish or fish with invertebrates.

However, frequency of occurrence of juvenile (young-of-the-year) rockfish was considerably lower in 1983 than in 1984. Juvenile rockfish occurred in stomachs of Sebastes pinniger (8%) and Ophiodon elongatus (2%) in 1983. They were found in S. pinniger (40%), S. auriculatus (12%), S. caurinus (4%), S. flavidus (3%), S. goodei (2%), S. melanops (30%), S. paucispinis (1%), and Ophiodon elongatus (5%) in 1984. Echeverria concluded that, with the possible exception of Oncorhynchus tshawytscha, which are being studied by the staff of the Groundfish Communities Investigation, stomach contents of piscivorous fish are not a practical sampling tool for juvenile rockfish because the stomachs of most of the species infrequently contain juvenile rockfish and the contents are so digested the species of juveniles can seldom be identified. (T. Wyllie Echeverria, FTS 556-0565)

FISHERIES INFORMATION SYSTEMS & ADP

Computer System Aboard Jordan Slated for Sea Trials

In mid-November 1985, computer programmer Rob Karstein at the Southwest Fisheries Center in La Jolla was successful in linking the Cipher magnetic tape drive with the shipboard supermicro 15-8. This success was largely due to the reconfiguration of the tape interface board by a representative from QSA, a computer consultant company in San Diego. With the tape interface now functional on the 15-8, Susan Jacobson, Computer Programmer and Karstein proceeded with the interface of the CAMAC to the 15-8. (The CAMAC, which was developed by Mike Webb, Electronic Engineer at NOAA's Pacific Marine Center in Seattle, Washington, is an electronic device which collects signals from the numerous shipboard data collection instruments.) The interface with the supermicro will permit input of signals from the CAMAC for screening, processing, and storing on the 15-8 hard disk for output to the magnetic tape.

Problems were encountered, however, and Webb was asked to come to La Jolla during the weekend of December 6 to help resolve the CAMAC/15-8 interface difficulties. Although Webb's visit was useful, the interface was not fully operational when he returned to Seattle on December 9. During the following 3 weeks, Webb continued to provide Karstein with instructions by phone on test procedures for the systems. With this help, the interface is now functional and the CAMAC, 15-8, and the Cipher tape drive will be installed aboard the Jordan in January 1986 for sea trials. (D. Roll, FTS 893-6250)

SWFC Plans CRAY Supercomputer

In May 1985, the National Science Foundation authorized San Diego as a site for a Supercomputer Center. Within 6 months of this authorization, a 25,000 square foot building for the Center was constructed on the University of California, San Diego campus to house the CRAY X-MP/48, which can perform 840 million calculations a second. Upon delivery of the CRAY in November, GA Technology, who manages the Center, began the installation and testing of the equipment.

The Supercomputer Center is a consortium of 19 universities, clinics, and research institutions. As a consortium member, the Southwest Fisheries Center (SWFC) is granted 200 hours of CRAY time a year on the system. To use this resource effectively, the SWFC established a CRAY technical committee. The members, representing the scientific and computer technical staff at the Center are R. Bistodeau, A. Bindman, R. Charter, A. Coan, L. Eber, H. Kirch, P. Kleiber, A. MacCall, D. Mackett, P. Smith, D. Roll, and E. Vetter. In early December, this committee approved the procedure for the Peer Review process. The procedure, which was developed by Alec MacCall, defines the categories of the proposed projects and sets the ground rules for submitting proposals.

During the December Center Management meeting Director Barrett appointed R. Lasker, G. Sakagawa, and D. Mackett as members of a management committee to implement the Peer Review process and to manage the Supercomputer resources. This committee will enlist members of the staff and other specialists to review the proposals. As chairman of this committee, Reuben Lasker has distributed a memo, in which he urges the staff to submit proposals by January 17, 1986. (D. Roll, FTS 893-6250)

ADMINISTRATIVE ACTIVITIES

ADP Management Review Document Prepared

Ben Remington, Executive Officer at the Southwest Fisheries Center and Leader of the ADP Management Review Study Team, reported that a draft document, "Management review of automated data processing in the southwestern U.S.," was distributed to members of the Southwest Fisheries Center Management Team on November 22. On December 4, the Team members, Atilio Coan of the Oceanic Division, Rich Charter of the Coastal Division, Dorothy Roll, ADP Operations, La Jolla, Fletcher Riggs of the Honolulu Laboratory, Gerald Hornof, Southwest Region Coordinator, and Carolyn Riley-Payne, WASC Personnel, and Remington met to discuss the document in detail with Darrell Tidwell, NMFS Review Coordinator and Dean Brinker of Washington, D.C.

The group reviewed progress, discussed problems encountered, and confirmed the schedule for completion of the Management Review. They concluded that there were no significant problems with the draft and that the Southwest Fisheries Center is on schedule for delivery of the final Review document to NOAA's Deputy Assistant Administrator for Science and Technology on February 15, 1986.

MISCELLANEOUS

PUBLIC AFFAIRS

SWFC Participates in Oceans '85 Conference

Drs. R. Michael Laurs and Paul Fiedler, Oceanographers, represented the Southwest Fisheries Center at the 10th annual meeting of Oceans'85 in San Diego. Oceans '85, held from November 12 to 14, 1985, is the world's leading ocean engineering conference and exposition. In the exposition were 120 displays of ocean technology and services by commercial, military, governmental, scientific, and academic entities. The exhibit manned by Laurs and Fiedler displayed work on fisheries applications of satellites and turtle migration and tracking. Laurs and Fiedler also gave presentations at the conference.

Dr. Michael Laurs (center) discusses fisheries applications of satellites with Oceans '85 participants.

La Jolla Laboratory

Dorothy Roll, Chairperson of the 1985 Combined Federal Campaign at the Southwest Fisheries Center in La Jolla, reported that this year's effort resulted in pledges and contributions of $6,065 by 40 participants. The total dollar amount was down somewhat from 1984 but exceeded the suggested dollar goal of $5,607 for the Center.

Tiburon Laboratory

Employees of the Tiburon Laboratory pledged and contributed $2,714 to the 1985 Combined Federal Campaign, an increase of 23% over last year. Chairman for this year's effort was Dan Howard.

HONORS AND AWARDS

La Jolla Laboratory

Dr. John R. Hunter, Leader of the Population Biology of Fishes of the Coastal Eastern Pacific, Coastal Division, La Jolla, was elected the American Institute of Fishery Research Biologists' (AIFRB) President-Elect. Hunter will assume the helm of AIFRB in September 1986.

SEMINARS

Honolulu Laboratory

November 6 - Dr. Roy Mendelssohn, Pacific Fisheries Environmental Group, SWFC, Monterey, California, spoke on "Environmental influences on small pelagics off the Ivory Coast."

La Jolla Laboratory

November 6 - David Rockland, Sport Fishing Institute, Washington, D.C., spoke on "Artificial reef research and the new economic focus of the sport fishing institute.

7 - Terje Van der Meeren and Hans-Petter Roverud, Austeroll Aquaculture Station, Norway, gave a seminar on "Postmetamorphosis culture and harvesting of cod at the Austeroll Aquaculture Station in western Norway."

26 - Dr. Kunihiko Fukusho, Chief of Breeding Section, National Research Institute of Aquaculture, Nansei-Cho, Japan, spoke on "Mechanization in mass larval rearing of red sea bream, Pagrus major."

December 6 - Dr. Ellen Pikitch, Assistant Professor, Department of Fisheries and Wildlife, Oregon State University, Corvallis, Oregon, presented a seminar "Biological and management concerns regarding Dover sole and other west coast flatfish."

10 - Dr. Erlend Moksness, Flodevigen Biological Station, Arendal, Norway, spoke on "Interaction of herring and capelin larvae in a mesocosm study."

17 - Dr. Stuart L. Pimm, Graduate Program in Ecology, Department of Zoology, University of Tennessee, gave a seminar on "Ecological stability in exploited systems."

19 - Dr. Michael Sinclair, Halifax Fisheries Research Laboratory, Halifax, Nova Scotia, spoke on "Population

regulation in oceans: Pattern, richness, absolute abundance, and temporal variability.

Pacific Fisheries Environmental Group

December 5 - Andy Bakun presented a seminar at Hopkins Marine Station entitled "The larval retention puzzle: Comparative perspectives on the relationship of ocean hydrodynamics to reproductive success of coastal fishes."

Tiburon Laboratory

December 2 - Dr. Chris Kitting, California State University at Hayward, spoke on "Herbivore/plant interactions in a shallow water seagrass meadow."

10 - James E. Bauer and Paul Montagna, University of California Lawrence Livermore Laboratories, spoke on "Microbiology, meiofauna, and Santa Barbara oil seeps." The Tiburon Seminar Series is a cooperative effort of the Paul F. Romberg Tiburon Center for Environmental Studies (San Francisco State University) and the Tiburon Laboratory.

VISITORS

Honolulu Laboratory

November 7 - Dr. Jed Hirota, Department of Oceanography, University of Hawaii visited Dr. Boehlert and B. Mundy to discuss samples from the vertical distribution collections around Oahu.

15 - Robert Gillett, South Pacific Regional Fisheries Development Programme, FAO, visited R. Shomura.

15 - Dena Gadomski, Occidental College, Los Angeles, visited Mundy and Boehlert to examine larval fishes and to discuss Honolulu Laboratory ichthyoplankton research.

18 - R. Shomura and Dr. Boehlert welcomed the National Research Council (NRC) site review team, including Drs. J. Chester McKee, Roland Kinney, and L. Joe Berry, who conducted a site review of the Honolulu Laboratory to assess its suitability as a location for an NRC Postdoctoral Associate. They met with R. Shomura, Dr. Boehlert, William G. Gilmartin, and Dr. Jeffrey J. Polovina in the morning for a briefing on Honolulu Laboratory research and later toured the facilities.

December 6 - Drs. R.E. Young from the University of Hawaii and Roger Seapy from California State University at Fullerton visited Dr. Boehlert to discuss access to the zooplankton from the Fisheries Habitat Research Program's vertical distribution ichthyoplankton study.

11-12 - Dr. Sachiko Tsuji, Ocean Research Institute, Tokyo, visited Dr. Boehlert, Dr. Stephen Ralston, and James H. Uchiyama to discuss otolith and growth research.

La Jolla Laboratory

November 7 - Ken Lilly, Jr., NOAA, National Weather Service, Western Region, Salt Lake City, Utah, visited the Center.

25 - John W. Bellinger, U.S. Army Corps of Engineers and currently working at the Office of Resource Investigations, Washington, D.C., visited the Center.

December 2- 3 - Dr. Al. Pruter, Natural Resources Consultants, Seattle, Washington, visited the Center.

2- 4 - Carolyn Riley-Payne, Area Personnel Officer, Western Administration Services Center, Seattle, Washington, met with staff at the Center.

3- 5 - Fletcher Riggs, Honolulu Laboratory, participated in the ADP review at the Center.

4 - Jerry Hornoff, ADP, stationed at Terminal Island, participated in ADP review at the Center.

5- 6 - Dr. Ellen Pikitch, Oregon State University, met with Coastal Division staff to discuss her research on Dover sole and other groundfish.

11-12 - E. Charles Fullerton, J. Gary Smith, James H. Meehan, Richard S. Shomura, and Richard H. Parrish attended the Albacore Constituents meeting at the Center.

13 - Norman J. Abramson, Andrew Bakun, and Richard S. Shomura attended the Center Management meeting at the Center.

16 - A group of Mexican observers visited the Center.

Pacific Fisheries Environmental Group

November 4- 5 - Jack Jossi, Northeast Fisheries Center, Naragansset, visited Paul Sund to discuss exchange of time series data and analytical methods.

Tiburon Laboratory

November 12 - Carol Brown, Port of San Francisco, met with Sennen Salapare.

26 - Chieu Pham, Vietnamese Fishermen's Association, met with Brian Jarvis.

December 5 - Al Pruter, Natural Resources Consultants, Seattle, met with Bill Lenarz.

20 - Helmut Gieben, West Indies Laboratory, St. Croix, Virgin Islands, visited the Laboratory and met with Norman Abramson.

27 - George Zorzi, Carmichael, California, met with Sus Kato to discuss shark research.

MEETINGS AND TRAVEL

Honolulu Laboratory

November 1 - At the invitation of Dr. Albert Simone, President, University of Hawaii, Laboratory Director Richard S. Shomura, and Dr. Boehlert attended a briefing at Bachman Hall, UH, to honor Dr. Keishi Amano, President, Tokyo University of Fisheries. Shomura gave a presentation at the briefing.

3- 8 - R. Shomura traveled to Panama City, Florida, to participate in a stock identification workshop. He served as moderator of a panel discussion, "Utilization of Stock Identification Techniques."

November 4- 6 - Dr. Skillman represented R. Shomura at the 51st meeting of the Council held in American Samoa. Skillman presented a brief summary of recent Honolulu Laboratory research and the Laboratory's review of Amendment 3 to the Lobster Fishery Management Plan.

11-12 - R. Shomura and Boehlert attended a meeting of the Ciguatera Ad Hoc Committee, Hawaii Department of Health (DOH) at the DOH Library.

20 - Richard Shomura departed Honolulu to (1) attend a South Pacific albacore cooperative research meeting in Auckland, New Zealand (11/22); (2) meet with fishery officials in Bangkok, Thailand (11/25); (3) chair a meeting on the Expert Consultation of Tunas in the Indian Ocean (11/28-12/2); (4) participate in the 8th Session of the Indian Ocean Fishery Commission (12/3-5); and (5) participate in

a meeting of the Ad Hoc Consultation of Tuna Statistics in Colombo, Sri Lanka (12/6-7).

22 - Dr. Boehlert attended a meeting of the UH Sea Grant Advisory Council where he discussed Honolulu Laboratory programs and possible future Laboratory-Sea Grant initiatives.

December 4 - Dr. Boehlert attended a meeting of the UH Coordinating Council for Research on Seafloor Processes to discuss coordination of upcoming Sea Grant proposals.

9 - Richard Shomura participated in the SWFC albacore constituents' meeting (12/11-12) and the Center Management Meeting (12/13) in La Jolla.

11-12 - Reginald M. Gooding attended a meeting of the Federal-State of Hawaii Environmental Impact Statement Task Force on cobalt-rich manganese crust mining within the Exclusive Economic Zone around the Hawaiian Archipelago and Johnston Island. This is the final meeting of the full task force before the scheduled publication of a draft environmental impact statement in March.

La Jolla Laboratory

November 1- 4 - Pierre Kleiber traveled to Palma Mallorca, Spain, to attend a meeting for the Scientic Committee on Research and Statistics.

2-13 - David Au and Norman Bartoo participated in the International Commission for the Conservation of Atlantic Tunas meeting and the Scientific Committee on Research and Statistics meeting in Palma Mallorca, Spain.

2-20 - Gary Sakagawa traveled to Palma Mallorca, Spain, to participate in the meetings of the International Commission for the Conservation of Atlantic Tunas and the Scientific Committee on Research and Statistics.

4- 7 - Andy Dizon traveled to Panama City, Florida, to attend a stock identification meeting sponsored by the Southeast Fisheries Center.

11-13 - Daniel Huppert participated in the Pacific Fishery Management Council's Scientific and Statistical Committee meeting in Renton, Washington.

11-16 - Cynthia Thomson traveled to Washington, D.C., to attend a seminar on management development.

12-16 - Izadore Barrett made a presentation at the Marine Fisheries Advisory Committee meeting in Charleston, South

Carolina, and he attended the Seafood and Health meeting in Seattle, Washington.

12-17 - Geoffrey Moser received a Department of Commerce Silver Medal at awards ceremonies in Washington, D.C.

13-15 - Richard Methot traveled to Eureka, California to work with state agencies on coast-wide assessment of Dover sole.

14-22 - Steve Reilly traveled to Seattle, Washington, to work on gray whale population assessment for the Northwest and Alaska Fisheries Center.

18-19 - Daniel Huppert traveled to Sacramento, California, to attend a meeting on the contract to develop a Chinook salmon biophysical-economic model for the Sacramento River basin.

20-24 - Michael Laurs traveled to Reno, Nevada, to make a presentation at the Western Fishboat Owner's Association Annual meeting.

20-27 - Elizabeth Vetter attended a Pinniped Energetics Symposium and the 6th Biennial Conference on the Biology of Marine Mammals in Vancouver, B.C., Canada.

21-27 - Attending the 6th Biennial Conference on the Biology of Marine Mammals in Vancouver, B.C., Canada, were Jay Barlow, Rennie Holt, Aleta Hohn, Charles Oliver, William Perrin, Steve Reilly, Ken Wallace, Hannah Bernard, and Susan Chivers.

December 2- 3 - Izadore Barrett attended a West Coast Regional and Center Directors' meeting in Seattle, Washington.

2- 5 - Michael Prager visited Norfolk, Virginia, to confer with the oceanography faculty of Old Dominion University, from which he is on leave.

7-10 - Steve Reilly traveled to San Francisco, California, to attend the American Geophysical Union meeting to arrange for ancillary research for monitoring of porpoise stock cruises.

8-12 - Ron Lynn attended an American Geophysical Union meeting in San Francisco, California.

8-21 - Paul Smith traveled to Lima, Peru, to teach a course on Biomass Assessment using the egg production method, and he completed manuscripts in cooperation with Peruvian scientists.

16-19 - Izadore Barrett traveled to Washington, D.C., to attend NMFS Director's meeting.

17-18 - Chuck Oliver traveled to Long Beach, California, to assist the Southwest Region in conducting a monitoring survey of pilot whale distribution around Santa Catalina Island.

26-30 - David Au attended the annual meeting of the Western Society of Naturalists in Monterey, California.

Pacific Fisheries Environmental Group

November 7 - Andy Bakun attended a meeting at Fleet Numerical Oceanographic Center with Paul Wolff, NOAA Assistant Administrator for Ocean Services and Coastal Zone Management, CDR Joe Bush, Chief, Ocean Applications Group, Monterey, Doug McLain, OAG, various other National Ocean Service/OAG personnel and FNOC Department heads. The topic discussed was NOS/FNOC collaboration in Ocean Data Assimilation.

18 - Dick Parrish traveled to La Jolla to participate in the SARP training session and to work on an albacore research paper with SWFC staff.

9-12 - Four members of PFEG traveled to San Francisco for the Fall meeting of the American Geophysical Union: Dave Husby, Jerrold Norton, Rusty Brainard and Tom Pham. Three posters were presented: "Coastal Ocean Monitoring Using Daily Sea Surface Temperatures from Shore Stations" by Jerrold Norton and Doug McLain, "Decadal Shifts in Atmosphere Circulation over North America and Their Relation to Oceanography and Fisheries of the California Current" by Doug McLain and Jerrold Norton, and "The Effects of Sea Surfce Temperature Anomaly in the Temperate Western North Atlantic on the Precipitation over the Northeastern United States" by Tom Pham.

10-12 - Dick Parrish traveled to La Jolla to attend the Albacore Constituents Meeting.

13 - Andy Bakun traveled to La Jolla for the Center Management Meeting.

Tiburon Laboratory

November 14 - Norman Abramson attended a meeting of the NMFS Goundfish Planning Team at the Northwest and Alaska Fisheries Center, Seattle, Washington.

December 13 - Norman Abramson attended a meeting of the Center Management Team in La Jolla.

TRAINING

Tiburon Laboratory

November 6 - Candis Cooperrider, Fishery Biologist - "Technical Writing and Editing Workshop," UC Berkeley Extension.

PERSONNEL ACTIONS

Honolulu Laboratory

November 5 - Rodney T. Watson, Biological Technician (Wildlife) - Termination.

6 - Annette W. Young, Biological Aid - Termination.

19 - Julie J. Eliason, Biological Technician (Wildlife) - Termination.

December 9 - Bernard M. Ito, Physical Science Technician - Disability Retirement.

13 - Matthew T. Wilson, Biological Technician (Fisheries) - Resignation.

14 - Joan P. Thomason, Computer Programmer - Extension of Temporary Appointment.

16 - Brenda L. Becker, Biological Technician (Wildlife) - Termination.

18 - Michelle L. Reddy, Biological Technician (Wildlife) - Termination.

December 21 - Austin K. Whiting, Data Processor - Termination.

22 - David A. Somerton, Fishery Biologist (Research) - Conversion to Temporary Appointment.

26 - Alton W. Chung, Biological Technician (Fisheries) - Resignation.

La Jolla Laboratory

November 12 - Sharon Kramer, Biological Technician - Entererd on Duty.

13 - Lavina Williams, Data Transcriber - Entered on Duty.

December 2 - Burton Baker, Computer Programmer - Entered on Duty.

23 - Anne Mahan, Clerk - Entered on Duty.

28 - Debbie Snow, Computer Clerk - Entered on Duty.

Pacific Fisheries Environmental Group

December 6 - Dr. Doug McLain transferred from PFEG to National Ocean Service, Monterey.

Tiburon Laboratory

December 4 - Elizabeth R.J. McGahan, Biological Aid - Temporary Appointment.

STATUS OF PUBLICATIONS

Published

Balazs, G. H. 1985. Impact of ocean debris on marine turtles: Entanglement and ingestion. In R. S. Shomura and H. O. Yoshida (editors), Proceedings of the Workshop on the Fate and Impact of Marine Debris, 26-29 November 1984, Honolulu, Hawaii, p. 387-429. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-54.

Marine turtles are affected to an unknown but potentially significant degree by entanglement in, and ingestion of, synthetic oceanic debris. Nearly all known records of olive ridley turtle, Lepidochelys olivacea, in the Hawaiian Islands have resulted from entanglement in drifting scraps of fishing gear. In the North Pacific (lat. 35°-45°N), incidents of leatherback turtle, Dermochelys coriacea, fatally entangled in pieces of monofilament mesh have been recorded. However, as with many such cases involving marine turtles, it is unclear if entanglement occurred in discarded fragments or in intact gear being actively fished.

Marine turtles have been found to eat a wide array of synthetic drift items, including plastic bags, styrofoam beads, and monofilament fishing line. Toxic chemicals released by these materials, as well as physical obstruction to the digestive tract, are two possible adverse impacts.

Boehlert, G.W. 1985. Using objective criteria and multiple regression models for age determination in fishes. Fish. Bull., U.S. 83:103-117.

Analysis of the age structure of exploited fish populations is necessary for models upon which management decisions are made, but existing aging methodology for many species is hindered by subjective criteria used in age determination. A new technique is described in which age is estimated using multiple regression models based upon the measurable parameters otolith weight, otolith length, and otolith width in the splitnose rockfish, Sebastes diploproa, and the canary rockfish, S. pinniger. Models were calibrated using ages determined by interpretation of both whole otoliths and otolith sections which differ within these species, particularly at greater lengths. The models typically explained from 70 to 92% of the variability in age depending upon species, sex, and method of age analysis. In another sample used to verify the precision of the models, variability associated with model-estimated ages was generally less than that induced by variability in ages between different agencies. Based upon the pattern of otolith growth in length, width, and weight in these and other species, it is suggested that these methods would be applicable to a wide variety of fishes. Implementation of this type of age determination methodology could result in savings in time and cost for fisheries management agencies while decreasing variability among age estimates between different laboratories.

Boehlert, G. W., and M. M. Yoklavich. 1985. Larval and juvenile growth of sablefish, Anoplopoma fimbria, as determined from otolith increments. Fish. Bull., U.S. 83:475-481.

Gerrodette, T. 1985. Toward a population dynamics of marine debris. In R. S. Shomura and H. O. Yoshida (editors), Proceedings of the Workshop on the Fate and Impact of Marine Debris, 26-29 November 1984, Honolulu, Hawaii, p. 508-518. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-54.

Adopting a population dynamics viewpoint can provide a useful overview of the problem of marine debris. This paper outlines the information needed to establish an understanding of the population dynamics of marine debris, notes existing sources of data which could provide such information, points out potential gaps of information, and suggests experiments or sampling which could help fill those gaps. First, a typology of marine debris is needed; because the kinds of marine debris vary so widely, separate estimates of "birth" and "death" rates will be needed for each "species." Data on birth or generation rates of marine debris must include not only "species" and abundance, but location and seasonality. Mortality or degeneration rates of marine debris can be summarized with a survivorship curve. Although decay of the material is the only true death, for certain applications debris can be considered dead by being cast on a beach or by sinking to the ocean bottom. Fouling organisms may contribute to decreasing buoyancy and hence hasten the sinking of objects such as ropes and trawl netting. An important question is the choice of units to be used in a quantitative description of marine debris. The choice of units will depend on the type of debris, and meaningful units should have the property of independence. The choice of units will also reflect whether the impact of marine debris is being measured on fish stocks, fishing operations themselves, vessel navigation and safety, or marine bird and mammal populations.

Gerrodette, T., D. Goodman, and J. Barlow. 1985. Confidence limits for population projections when vital rates vary randomly. Fish. Bull., U.S. 83:207-217.

Due to unpredictable future environmental changes, population growth is more realistically viewed as a stochastic than a deterministic process. Environmental variability is modeled by allowing the population's survival and fecundity rates to be correlated random variables. The expected future population vector and its variance-covariance matrix are computed. The projected total future population size is approximately log-normally distributed, but confidence limits for future population size can be more accurately computed from the distribution of the realized factor of increase. Numerical examples illustrate how the calculation of confidence limits for future population size and of the probability that the population will increase in size can be applied to the managment of living resources.

Guillemot, Patrick J., Ralph J. Larson, and William H. Lenarz. 1985. Seasonal cycles of fat and gonad volume in five species of northern California rockfish (Scorpaenidae: Sebastes). Fish. Bull., U.S. 83:299-311.

Seasonal changes in visceral fat volume and gonad volume are compared in five species of rockfish from northern and central California: Sebastes entomelas, S. paucispinis, S. goodei, S. pinniger, and S. flavidus. In these species, visceral fat was deposited between spring and fall, at the same time as gametogenesis. Visceral fat declined in volume between fall and spring, coinciding with the decline in volume of testes and preceding the release of embryos in females. We suggest that increased feeding during the summer upwelling season provides the energy for simultaneous fat accumulation, gametogenesia, and perhaps somatic growth. During subsequent seasons of presumed food storage, these rockfishes may utilize visceral fat reserves for maintenance. This pattern of fat deposition and utilization may contribute to the long life and repeated reproduction of rockfishes, at the expense of current fecundity and growth.

Our data also suggest that rockfishes which spawn only once during the reproductive season have fat cycles of greater magnitude than those spawning more than once a year. Of the species that we studied, the apparent single spawners S. entomelas and S. flavidus have more northerly geographic distributions and larger fat cycles than the multiple spawners S. goodei and S. paucispinis. It is possible that the shorter and more pronounced productive season in the north leads to a greater need for fat reserves during winter and makes the wintertime production of additional batches of eggs energetically difficult.

Henderson, J. R. 1985. A review of Hawaiian monk seal entanglements in marine debris. In R. S. Shomura and H. O. Yoshida (editors), Proceedings of the Workshop on the Fate and Impact of Marine Debris, 26-29 November 1984, Honolulu, Hawaii, p. 326-335. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-54.

Hawaiian monk seals may become entangled in net fragments and other flotsam carried by currents from the North Pacific to the Hawaiian Islands. Through 1984, 27 entanglements have been observed, and at least 8 additional seals are scarred from entanglements. One of these entanglements was probably fatal, and six would likely have resulted in the death of the seals had biologists not intervened. Although weaned pups comprise only about 11% of the total population, pups were involved in 41% of the observed incidents. Mechanisms to account for this disparity are proposed. Observed entanglements have declined since initiation of a regular program to gather and burn potentially hazardous debris.

Henderson, J. R., and M. B. Pillos. 1985. Accumulation of net fragments and other marine debris in the Northwestern Hawaiian Islands. [Abstr.] In R. S. Shomura and H. O. Yoshida (editors), Proceedings of the Workshop on the Fate and Impact of Marine Debris, 26-29 November 1984, Honolulu, Hawaii, p. 197. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-54.

Hewitt, R.P., G.H. Theilacker, and N.C.H. Lo. 1985. Causes of mortality in young jack mackerel. Mar. Ecol. 26(1-2):1-10.

Field and laboratory experiments were conducted with the purpose of partitioning jack mackerel Trachurus symmetricus larval mortality into

portions due to starvation and to predation. Field collections were made to determine larval condition, growth, net retention and production; laboratory experiments were conducted to determine growth and body shrinkage due to preservation treatment. Age-specific starvation and total mortality rates were estimated and predation was inferred as the difference between the two. In the offshore oligotrophic part of the spawning habitat, larvae suffered a high rate of mortality which rapidly declined as they developed. Predation was the major source of mortality of yolk-sac larvae. As the yolks were absorbed and the larvae began to feed, starvation became a significant source of mortality. As the larvae further developed, starvation rapidly declined and predation again became the dominant source of mortality, although at a much lower rate.

Hohn, Aleta A., Susan J. Chivers, and Jay Barlow. 1985. Reproductive maturity and seasonality of male spotted dolphins, Stenella attenuata, in the eastern tropical Pacific. Mar. Mammal Sci. 1(4):273-293.

We estimated age at attainment of sexual maturity and examined reproductive seasonality for male spotted dolphins, Stenella attenuata, from the eastern tropical Pacific Ocean. Maturity was determined by histological examination of testes. Average age at sexual maturation was 14.7 years (the mean of two readers' age estimates). Testis and epididymis weight and seminiferous tubule diameters were reliable indicators of maturity, whereas age, length and color phase were less reliable. Seasonality was determined by changes in testis and epididymis weight, relative quantity of spermatids and spermatozoa, and lumen diameter, as well as an index of testis development (weight of the right testis and epididymis divided by length of the right testis). Testis and epididymis weights and index values peaked in July and August, midway between two predicted mating seasons for the northern offshore stock, but spermatozoa levels were elevated during the predicted breeding seasons.

Laurs, R.M., R. Nishimoto, and J.A. Wetherall. 1985. Frequency of increment formation on sagittae of North Pacific albacore (Thunnus alalunga). Can. J. Fish. Aquat. Sci. 42:1552-1555.

An examination of sagittae from 116 albacore (Thunnus alalunga) caught in the North Pacific, injected with tetracycline, tagged, released, and subsequently recaptured in sport and commercial fisheries showed that detectable increments are formed on these otoliths at an average rate of 0.954 per day. We take this as a confirmation of daily increment formation in North Pacific albacore sagittae. The slight departure of observed mean increment counts from the expected rate of one per day may be due to an occasional interruption of otolith growth, or to a systematic bias in detecting daily increments or interpreting otolith microstructure. The estimated rate of detectable increment formation applies explicitly to albacore of fork lengths between about 50 and 100 cm. If the same rate holds for fish smaller than 50 cm, as is likely, most albacore taken in sport or commercial catches can be aged accurately by applying our methods and expanding the increment count by 5%.

Lenarz, W.H. 1985. Theoretical first approximations of densities of discarded webbing in the eastern North Pacific Ocean and Bering Sea. In: Richard S. Shomura and Howard O. Yoshida (eds.), Proceedings of the Workshop on the Fate and Impact of Marine Debris, 27-29 November 1984, Honolulu, Hawaii, p. 213-217. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-54.

First approximations of densities of discarded webbing in the eastern North Pacific Ocean and Bering Sea are developed and discussed. The approximations are based on estimates of northern fur seal mortality rates, assumed distributions of webbing, and assumptions on fur seal behavior. The results are examined with respect to the design of sea surveys to determine the validity of the assumptions and estimate densities of discarding webbing.

Mackett, David J. 1985. Strategic planning for research and management of the albacore tuna fishery. Systems Research 2(3):201-210.

The National Marine Fisheries Service (NMFS) employed the principles of interactive management, supported by consensus building techniques for facilitating meetings, to produce a strategic plan for research on and management of an important fishery. A technically oriented task force aided by a planner was assigned the task of facilitating the production of the plan; an important first step was the production of a probable future scenario of the fishery. Interested citizens, informed by the scenario, were invited to state their goals for the fishery and to list what they considered desirable future trends and events. An options field for the research and management strategy consisting of 17 design categories was produced by the task force and knowledgeable members of NMFS management. The pros and cons for including each option in the NMFS strategy were discussed in a meeting of NMFS Headquarters, Regional and Laboratory management. A set of options was chosen by consensus to represent the NMFS strategic plan for its research and management of the North Pacific albacore fishery.

Morrow, R. J., and E. K. Buelna. 1985. The Hawaiian monk seal and green turtle on Necker Island, 1983. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-55, 11 p.

Polovina, J. J., and M. D. Ow. 1985. An approach to estimating an ecosystem box model. Fish. Bull., U.S. 83:457-460.

Polovina, J. J., and R. S. Shomura. 1985. An experimental design to estimate yield enhancement for bottom fishes resulting from the use of bottom shelters on banks in the Pacific. [Abstr.] Bull. Mar. Sci. 37(1):399-400.

Shomura, R. S., and H. O. Yoshida (editors). 1985. Proceedings of the Workshop on the Fate and Impact of Marine Debris, 26-29 November 1984, Honolulu, Hawaii. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-54, 580 p.

Uchida, R. N. 1985. The types and estimated amounts of fish net deployed in the North Pacific. In R. S. Shomura and H. O. Yoshida (editors), Proceedings of the Workshop on the Fate and Impact of Marine

Debris, 26-29 November 1984, Honolulu, Hawaii, p. 37-108. U.S. Dep. Commer., NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-54.

The report reviews the major net fisheries of the North Pacific and provides crude estimates of the amount of net gear available to the various coastal and high seas fisheries. Specifications of gill nets, purse seines, trawls, set nets, haul seines, and lift nets, when available, are provided, together with the number of units of nets and vessels operating in the fisheries. First-cut estimates indicate that there are about 170,000 km of gill net, 2,000 km of purse seine, 5,500 km of trawl net, and 8,900 km of miscellaneous net gear available to the various North Pacific net fisheries.

Administrative Report

Boehlert, G. W., P. L. Jokiel, and D. J. Mackett. 1985. Issues in fisheries habitat conservation and research for the Hawaiian Archipelago and central Pacific. Results of a Planning Workshop 27-28 June 1985. Southwest Fish. Cent. Admin. Rep. H-85-10, 39 p.

Kam, A. K. H. 1985. Green turtle research on Lisianski Island, 1983. Southwest Fish. Cent. Admin. Rep. H-85-11, 11 p.

Polovina, J. J. 1985. Status of stocks of spiny lobsters at Necker Island and Maro Reef, 1985. Southwest Fish. Cent. Admin. Rep. H-85-12, 11 p.

Translation

Fedosova, R. A., and O. E. Komrakov. 1975. Feeding of Pentaceros richardsoni frys in the Hawaiian region. [In Russ.] Invest. Biol. Fish. Fish. Oceanogr., TINRO, Vladivostok 6:52-55. (Engl. transl. by W. G. Van Campen, 1985, 4 p., Transl. No. 100; available Southwest Fish. Cent. Honolulu Lab., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96812.)

Fedorov, V. V., V. A. Snytko, and V. M. Matyushin. 1975. Morphology and some biological data of scorpionfish, Helicolenus avius Abe and Eschmeyer, 1972 (Pisces, Scorpaenidae) from the region of banks at the south Emperor Seamount chain. [In Russ.] Invest. Biol. Fish. Fish. Oceanogr., TINRO, Vladivostok 6:56-63. (Engl. transl. by W. G. Van Campen, 1985, 4 p., Transl. No. 101; available Southwest Fish. Cent. Honolulu Lab., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96812.)

Approved by Center Director

Boehlert, G. W., M. Kusakari, M. Shimizu, and J. Yamada. Energetics during embryonic development in the kurosoi, Sebastes schlegeli. For consideration for publication in Exp. Mar. Biol. Ecol.

Boehlert, G. W., and B. C. Mundy. Recruitment dynamics of metamorphosing English sole, Parophyrs vetulus, to Yaquina Bay, Oregon. For consideration for publication in Estuarine, Coastal, and Shelf Science.

Echeverria, Tina Wyllie. Maturity and seasonality of reproduction in 34 species of rockfish (Sebastes) from central and northern California. For consideration for publication in Fish. Bull., U.S.

Herrick, Samuel F., Jr. U.S. tuna trade summary 1984. For consideration for publication in Mar. Fish. Rev.

Polovina, J. J., and S. Ralston. An approach to yield assessment for unexploited resources with application to the deep slope fishes of the Marianas. For consideration for publication in Fish. Bull., U.S.

Yoshida, H. O. Marine debris: A growing concern. For consideration for publication in World Record Game Fishes published by the International Game Fish Association.

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