HONOLULU

LA JOLLA

TIBURON

SOUTHWEST FISHERIES CENTER

MONTHLY REPORT—DECEMBER 1974

RESEARCH HIGHLIGHTS

NOAA/NMFS

SOUTHWEST FISHERIES CENTER
La Jolla, California

HONOLULU LABORATORY
LA JOLLA LABORATORY
TIBURON LABORATORY

MONTHLY REPORT—DECEMBER 1974

STATUS OF PUBLICATIONS

Published

Hobson, Edmund S. 1974. Feeding relationships of Teleostean fishes on coral reefs on Kona, Hawaii. NMFS Fish. Bull. 72(4): 915-1031.

Fishes inhabiting coral reefs exhibit an especially diverse array of feeding morphologies and behaviors, and include the majority of highly evolved species in the sea. Feeding relationships of fishes on coral reefs at Kona, Hawaii, are defined in this paper and related to their evolution. The adaptability of their feeding apparatus has given rise to a wide variety of specialized forms, including both carnivores and herbivores, that have diverged from one another mostly on the basis of their differing food habits. These food habits are described and related to their specific behaviors.

Owen, R.W., Jr. 1974. Distribution of primary production, plant pigments, and secchi depth in the California Current region, 1969. Calif. Coop. Oceanic Fish. Invest. Atlas 20: xi-xiv, 20 charts.

Owen, Robert W., Jr. 1974. Optically effective area of particle ensembles in the sea. Limnol. Oceanogr. 19(4): 584-590. Abstract.

The optically effective area (OEA) concentration of particles was computed from measured size distributions and concentrations of particles in the upper 100 m of the Pacific Ocean off Baja California and is shown to correspond closely to direct measurements of the volume coefficient of light scattering at an angle of 20°, shown previously to be proportional to total scattering.

Plots of OEA as a function of particle diameter exhibit a maximum contribution at about 2 μm diameter at offshore stations and at 3.5 μm at nearshore stations. The roll-off at smaller particle diameters is attributed to diminished optical efficiency rather than to decreased concentrations of smaller particles.

Smith, Paul E. 1974. Distribution of zooplankton volumes in the California Current region, 1969. Calif. Coop. Oceanic Fish. Invest. Atlas 20: xv-xvii, 8 charts.

Struhsaker, Paul, and Donald C. Aasted. 1974. Deepwater shrimp trapping in the Hawaiian Islands. U.S. Natl. Mar. Fish. Serv., Mar. Fish. Rev. 36(10): 24-30. (MFR Paper 1095.)

The results of preliminary deepwater shrimp trapping surveys in the Hawaiian Islands consisting of 82 sets involving totals of 306 traps and 3,960 hours of fishing time in the 75- to 450-fathom (135-825 m) depth range are discussed. A variety of traps, bait containers, and baits were tested. Attempts to capture the penaeid shrimp, Penaeus marginatus, in substantial numbers were unsuccessful. More success was experienced in trapping the caridean shrimps Heterocarpus ensifer and H. laevigatus. For these species, traps covered with burlap cloth outfished uncovered traps by factors of 2.5 to 10.

Approved by Center Director

"Effect of diet-contained DDT on survival of progeny of the teleosts Bairdiella icistia and Engraulis mordax" by Charles P. O'Connell. For publication in the Fishery Bulletin, U.S.

"Dwarf hake off the coast of Baja California, Mexico" by Andrew M. Vrooman and Pedro A. Paloma. For publication in the California Cooperative Oceanic Fisheries Investigations Reports.

"Culture and growth of anchvy larvae Engraulis mordax" by John R. Hunter. For publication in the Fishery Bulletin, U.S.

ALBACORE FISHERIES INVESTIGATIONS

Joint Research Aids in Development of New Offshore Fishery for Albacore Tuna

A new offshore fishery for albacore tuna has developed as a result of the joint National Marine Fisheries Service-American Fishermen's Research Foundation albacore studies, according to Dr. Laurs, Leader of the Albacore Fisheries Investigations at the La Jolla Laboratory. Industry sources and an analysis by scientists at the La Jolla Laboratory indicate that the new fishery has great potential. It is conservatively estimated that 1500 tons can be produced from the offshore fishery by existing jig boats capable of fishing in the offshore area and that the potential is greater if bait fishing proves to be successful. About 25 to 30 vessels participated in the offshore fishery in 1973 and more than 50 in 1974.

Dr. Laurs and Mr. R. Lynn, Oceanographer, are preparing a manuscript for publication dealing with the offshore distribution and relative abundance of albacore during early season migration routes followed by albacore into North American waters.

As part of the albacore research studies conducted in the offshore region, data were collected during Jordan Cruise 86 to examine the length-weight relationship of albacore found in offshore waters. R. Dotson, Biological Aid, collected measurements of fork length to the nearest millimeter and of weight to the nearest gram on 477 fish and is presently analyzing this information. A regression curve was fitted to the data and the resultant equation is: $M_f = 4.514 \times 10^{-5} L^{2.8746}$. A statistical comparison of these results with length-weight relationships for fish taken in the nearshore fishery (Clemens, 1961) is underway.

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Dr. N. Clark, Meteorologist at the La Jolla Laboratory, spent part of the month working on a description of the relationships between ocean-atmosphere regimes or periods when yearly variations in the environmental system are relatively small when compared to changes that occur over longer time periods and regimes in the geographical distribution of the North American albacore fishery.

Dr. Clark also worked with Robert Born of the Scripps Institution of Oceanography NORPAX staff in adapting their historical sea surface temperature data over the North Pacific for use in a multiple regression screening program in order to expand the statistical analysis of environmental influences on the geographical distribution of the albacore fishery.

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The La Jolla Laboratory accepted delivery of a new Salinity-Temperature-Depth (Plessey model 9040 STD profiler) to be used aboard the NOAA research vessel, Jordan. This unit also has a dissolved oxygen probe which will provide a continuous trace of oxygen with depth and has a resolution within a few meters. The measurement of the fine scale structure in dissolved oxygen distribution along with that in temperature and salinity should prove very useful in many field studies. Initial reports indicate the STD is functioning well on CalCOFI Cruise 7412, presently in progress.

COASTAL FISH COMMUNITIES INVESTIGATIONS

Quarterly Monitoring of the Lion's Head Kelp Bed Continues to Record Change

This month, Dr. Edmund Hobson, Leader, and Fishery Biologist Tony Chess of the Kelp Bed Recreational Fish Communities Task at the Tiburon Laboratory,

completed their regular quarterly assessment of the biota in the Lion's Head kelp bed. At this station they are monitoring conditions in the bed and adjacent habitats along an 80-m transect line.

From a point of 3 m of water shoreward of the bed, the line runs through the bed to a point in 25 m of water on open and seaward of the bed.

The loss of Macrocystis plants--the giant kelp--at the nearshore edge of the bed, where the water is 3 to 5 m deep, has been reversed, and many young plants now grow in this area. At the same time, the low benthic algae, notably Pterocladia and other reds, that had proliferated in the absence of the light-blocking Macrocystis surface canopy, are now deteriorating under the new canopy. On the other hand, while the Macrocystis has returned to the shallow regions, there has been a marked loss of plants at the center of the bed, where the water is 10 to 15 m deep. As occurred earlier in the shallow water, low benthic algae are now proliferating on the rocks where the overhead Macrocystis canopy is now gone. These are not red algae, as was the case inshore; instead species of low brown algae, notably Dictyopteris and Colpomania, cover the rocks. The impact of those changes in the habitat are being related to the movements in and out of these areas by certain fish species.

COASTAL FISHERIES INVESTIGATIONS

First Pen-Reared Salmon Caught by Bay Fisherman

Biologist Susumu Kato, Investigation Chief, reports the first capture of silver salmon reared at the Tiburon Laboratory was made this month. An angler fishing at the Berkeley Marina in San Francisco Bay on December 23 caught two silver salmon 14-1/2 inches and 16 inches total length while bottom-fishing with grass shrimp. The fish were kept alive in a tank for a while before being released since they were not of legal size. The fisherman observed that the adipose fin was missing on both fish, indicating that the salmon originated from our pens. Both fish were reportedly in perfect condition. The lengths of the captured fish indicate substantial growth since the release date, November 6, when the larger salmon averaged 8.7 inches in length.

Bids were solicited for construction material to build three additional 16 x 22 ft. pens. The California Department of Fish and Game has agreed to supply 40,000 silver salmon juveniles for this year's project, which will again be a cooperative effort of California Department of Fish and Game, University of California Sea Grant, the San Francisco Tyee Club (a sportfishermen's group) and the Tiburon Laboratory.

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Work Continues on Angler's Guide to the United States Pacific Coast

Work continues on the Angler's Guide, being prepared by Jim Squire, Fishery Biologist at the La Jolla Laboratory, and Susan Smith, Publications Specialist at the Tiburon Laboratory.

The Guide gives information on marine game fish, fishing grounds, and angler facilities all along the U.S. West Coast from California to Alaska, and also includes Hawaii and the Trust Territories of American Samoa and Guam.

This month senior author Jim Squire, of the La Jolla Laboratory, finally received the review copy of the Washington section back from Washington Department of Fisheries. This section, an essential part of the publication, has been in the hands of the reviewers for 6 months. Ms. Smith spent most of the month getting the manuscript ready for final typing. Because of the length of the manuscript and the rough shape that some of the sections are still in, it is expected that final editing and typing of the manuscript will take at least another month.

FISH ENVIRONMENT INVESTIGATIONS

Experimental Ecology Group Monitors Activities of Tunas in Salinity Gradients

The long-range goal of the Honolulu Laboratory's Experimental Ecology group is to generate a predictive model of tuna distrubution. Important inputs to the model are the functional relationships between swimming activity of the fish and salinity patterns of the environment. Dr. Andrew E. Dizon, group leader, has initiated a series of experiments to determine such functional relationships. Swimming speed and turning rate are being monitored in the behavioral thermoregulation tank while the sea water is diluted with fresh water so that the salinity falls at about 0.2‰ per minute. These salinity experiments are being conducted while repairs are being made to the system's heat exchanger. At the moment, we have no control over temperature in the tank.

To date, one skipjack tuna, one yellowfin tuna, and three kawakawa have been tested. Basal swimming data are collected for 100 minutes prior to dilution of the tank. Then fresh water is introduced at 6 gallons per minute (gpm) into the intake side of the system's 250 gpm recirculating pump. This insures complete mixing and reduces the possibility of extraneous cues to the fish. Fresh water is allowed to enter the tank until tank salinity has dropped from 34.4‰ to about 25‰ . Salinity, temperature, swimming speed, and turning rate are recorded.

Because of an equipment failure, no data were collected from the one skipjack tested. No responses, either alteration in swimming speed or increase in turning rate, were observed in the yellowfin or the kawakawa. This lack of response is noteworthy when compared with the effects of temperature on turning tendency.

Free-Swimming Kawakawa Tested for Maximum Daily Food Consumption

Ms. Sherry Steffel, under the direction of Drs. John J. Magnuson and Andrew E. Dizon, has commenced work aimed at determining input parameters for the tuna bioenergetics model of Kitchell, Neill and Magnuson. The first study in the project involves determination of maximum daily consumption and diel feeding periodicities.

A kawakawa has been trained to swim through a submerged trough to receive pieces of smelt. The fish is allowed access to the trough at specified times day or night; all passes then receive food reinforcement. The purpose of the experiment is to determine maximum daily consumption, diel feeding periodicities, and caloric compensation. Since the experiment is automated, data collection is greatly facilitated.

The first kawakawa tested consistently consumed 420-450 g wet weight of smelt when allowed 24-hour access to the apparatus. This is approximately 33% of the tuna's body weight. The fish fed all day with no evidence of periodicity but never fed at night although levels of illumination seemed adequate for performance. No compensation was observed after 24-hour fasts. When access to the apparatus was restricted to 1 hour per day, consumption dropped to between 100 and 220 g wet weight. Thus, on a restricted feeding schedule some caloric compensation was observed.

Routine Metabolism of Skipjack Tuna Measured

Productivity of the seas in terms of tuna flesh must depend on whether or not food supplies are adequate to provide the energy required by tunas for activity and growth. Previously completed experiments on routine metabolism of skipjack tuna at a single temperature (24°C) conducted by Fishery Biologist Reginald M. Gooding and experiments on routine metabolism at temperatures throughout the fishes' zone of thermal tolerance by Research Assistants Randolph K.C. Chang and Bernard M. Ito, all of the Honolulu Laboratory, have now been analyzed by stepwise linear regression. The relationships (at 0.05 level of significance) are as follows:

(Gooding's data) $\log r = -1.20116 + 0.19106 \log w + 0.21311 s$
$s = 3.11647 - 0.53155 \log w$

(Chang and Ito's data) $\log r = 0.48940 + 0.21524 s$
$s =$ (weight range not large enough to establish a relationship)

where r is respiration rate in mg $O_2 g^{-1} hr^{-1}$; w is weight in grams; and s is speed in body length per second.

Routine metabolism and swimming speed were determined to be temperature independent. Correspondence between the sets of data is excellent with

respect to slope but somewhat poorer with respect to intercept. If respiration rate and swimming speed are calculated from Gooding's relationships on Chang and Ito's geometric mean fish, the results, $r = 0.508$ and $s = 1.45$ are somewhat lower than the actual geometric mean r and s, 0.706 and 1.57, respectively.

MARINE MAMMAL INVESTIGATIONS

NMFS Large-Volume Purse Seine Net to be Tested During Commercial Fishing Operations

The NMFS large-volume purse seine net, designed by Mr. Richard McNeely and his team of gear experts at the Northwest Fisheries Center in Seattle, Washington, will be lengthened about 100 fathoms in the near future and will then be tested by Caribbean Marine Services vessels during the remainder of the 1975 tuna fishing season on three commercial fishing trips. The vessels will carry NMFS porpoise observers on these trips to obtain information on the performance of the net in expediting release of porpoises caught during fishing operations.

Two San Diego-based fishing vessel captains have volunteered to test the so-called "porpoise apron" during their first fishing trip of the 1975 season. The "porpoise apron" is a modification of the backdown area of the tuna purse seines, also developed by Mr. McNeely and his staff, to create a webbing ramp facilitating release of the porpoise from the net.

Twenty-Two NMFS Porpoise Observers Accompany U.S. Tuna Seiners as Fishing Season Begins

Dr. Eric Barham, Porpoise Program Manager, reports that 22 NMFS porpoise observers have been placed on U.S. tuna purse seine vessels for first trips within the Commission Yellowfin Regulatory Area at the start of the 1975 tuna fishing season. Presently, two boats are on the fishing grounds and two vessels have not yet left port. With one exception, all the vessels carrying NMFS porpoise observers were randomly drawn by lottery. The number of trips required for 1975 was determined by NMFS on the basis of sample sizes needed to provide adequate precision in estimating average porpoise kill rates. All told, 36 observer trips (24 inside and 12 outside the Commission Yellowfin Regulatory Area) are planned. The data gathered by the observers in past years on the porpoise/tuna interaction have provided essential information on porpoise associated with the tuna fishery.

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Drs. William Perrin and Tim Smith and Messrs. Izadore Barrett and Richard McNeely attended the NMFS hearings in Washington, D.C., on proposed changes in porpoise regulations.

PHYSIOLOGY INVESTIGATIONS

Study of Effects on Fish of Low-Level Exposures to Benzene Continue

Investigators at the Tiburon Laboratory continued their study of effects of crude oil components on various life stages of fishes. Dr. Jeannette Struhsaker, Chief, Physiology Investigations, conducted an experiment to test the effect on herring of exposures to low levels of benzene (100 and 850 ppb for 48 hours) just prior to spawning.

Herring were thought to be particularly sensitive to pollutant stress since they are already stressed from not feeding at this stage. Further, eggs in ovaries have high lipid concentrations and fat-soluble benzene should accumulate rapidly, possibly affecting egg development and survival.

Results of the experiment verified this assumption, showing the greatest effect yet observed at low concentrations of benzene. Benzene affected the behavior of the adult herring; inducing spawning prematurely, disrupting schooling, and causing hyperactivity and disequilibrium for the entire 5-day experimental period. After 48 hours, at both concentrations, most ripe ovaries contained dead or dying eggs. Survival at hatching and through yolk-absorption to first-feeding larvae was significantly less than controls (about half) in embryos and larvae from eggs of females spawned after cessation of exposure and most surviving larvae from eggs of exposed females were abnormal.

The maximum accumulation in ripe ovaries after a 48-hour exposure to ^{14}C labelled benzene and metabolites was 1.4 ppm, an accumulation of 14 times that in the water column (100 ppb). Most of the benzene and its metabolites were depurated from ovaries 24 hours after cessation of exposure, but not significantly reducing the survival of eggs and larvae, and affecting adult spawning and schooling behavior.

Fishery Biologist Maxwell B. Eldridge, assisted by Ms. Tina Echeverria, Biological Technician at the Tiburon Laboratory, performed the first of a series of experiments to study the chronic effects of low concentrations of benzene on Pacific herring embryos during the incubation period. Eggs were artifically fertilized onto clear-glass plates and exposed to initial concentrations of 100 ppb and 1 ppm benzene (static system) within 1 hour of fertilization. Throughout the 9-day incubation period, studies were made of embryonic growth and development, heart beat rate, respiration, calorific content, and uptake.

Embryonic development did not vary significantly between treatments although exposed embryos did show slight advancement controls at the 48-hour stage. By 96 hours no detectable differences were apparent. At hatching, however, the standard lengths of the larvae differed inversely to the benzene concentration. The first noticeable regular heart beats occurred at 96 hours and the controls had consistently lower heart beat rates than the exposed embryos through incubation. The 100 ppb treatment illicited the fastest rates during the experiment.

Preliminary measurement of respiration rates using a Gilson differential respirometer showed mixed responses to benzene exposure. Generally, respiration rates of controls and 100 ppb treatment embryos were similar and 1 ppm embryos exhibited higher rates than controls.

Calorific content analyses using a microbomb adiabatic calorimeter were inconclusive. Variation in the calorific content of the eggs between treatments and times during incubation is being analyzed.

Benzene and its metabolites accumulated to a level six times that of both test concentrations within 6 hours after exposure to ^{14}C labelled benzene. Highest concentration levels in the eggs were found at 12 hours. These declined to 3X at 24 hours and finally reached the initial dosage levels of 100 ppb and 1 ppm by 72 hours.

During December, results of an uptake study with benzene and striped bass were analyzed by Sid Korn, Fishery Biologist and Nina Hirsch, Biological Technician at the Tiburon Laboratory. Striped bass exposed to 100 ppb benzene for 48 hours accumulated the greatest amount of this chemical in mesenteric fat and gall bladder followed by the gill, liver, intestine, brain, colon, spleen, heart, stomach and muscle, in that order. Accumulation of 5 ppm occurred in the fat and gall bladder after 24 hours. The next group of tissues (gill, heart) accumulated 100-200 ppb. The lowest accumulations were 100-200 ppb after 24 hours. Residues rapidly dissipate with most tissues losing detectable levels in 4 to 6 days. The liver, fat, and gall bladder had 50 to 100 ppb remaining after 9 days when the study was completed.

This study, and those done previously, indicate that benzene accumulates rapidly in lipid rich tissues and is eliminated within 2 weeks. A major pathway of excretion involves the breakdown of benzene into metabolites in the liver; then storage in the bile of the gall bladder seems evident. The data is being keypunched and will be compared to uptake results with anchovy and herring and at different concentrations of benzene.

Biological Technician Nina D. Hirsch of the Tiburon Laboratory, completed a four-part experiment designed to investigate marinas as a possible source of aromatic hydrocarbon pollution. An outboard motor was run in a sea water test tank using two modes (neutral and simulated trolling) and two different gasolines. Gas chromatograph analysis showed that relatively high concentrations of certain aromatic compounds remained in the test tank sea water up to 7 days after the experimental run. Further processing of the data obtained on concentrations of different aromatics is needed before conclusions and a realistic evaluation can be made. Part of this processing will involve relating the levels of aromatics found in the sea water test tank to bioassays being run concurrently by Research Chemist Pete Benville.

STOCK ASSESSMENT AND FISHERY EVALUATION INVESTIGATIONS

Draft Manuscript Completed on Ex-Vessel Prices for Southern California Commercial Fishery Resources 1941-72

Dr. Gary Stauffer of the La Jolla Laboratory and Mr. Alec MacCall of the California Department of Fish and Game have completed the first draft of their manuscript on ex-vessel prices for Southern California commercial fishery resources for the period 1941 to 1972. The annual average prices were adjusted by wholesale price index to eliminate effects of dollar inflation. Price trends and influential events are discussed briefly.

Ex-vessel prices for wetfish species prior to 1960 were dominated by the scarcity of Pacific sardine and Pacific mackerel. Anchovy prices in the mid-60's declined as the result of the instigation of the reduction fishery. More recently anchovy prices have increased as a result of the collapse of the Peruvian anchovets fishery. Tuna prices surged upward with post-World War II inflation, but domestic prices dropped in the mid-50's due to Japanese imports of frozen and canned tuna.

Prices in the 60's have increased with expansion of the world tuna market. The U.S. bonito production in the mid-50's was taken over by Peruvian imports and domestic ex-vessel prices declined. By the mid-60's Peruvian imports had decreased, bonito prices increased, and the U.S. fishery was rejuvenated. The market fish (larger migratory coastal fishes) are sold fresh and frozen in local retail fish markets. Prices for this group are on the average greater than those for the wetfish groups. Ex-vessel prices for market fish have remained relatively stable. Exceptions are the price increases from post-war inflation and price declines during periods of increased availability as in the warm water years of the late 1950's.

Record Number of Striped Marlin Tagged in Cooperative Program

During the 1975 striped marlin season off Southern California more fish were tagged by sportsmen during the year than during any previous year, according to Mr. James Squire, Fishery Biologist at the La Jolla Laboratory, who compiles tagging results for the cooperative billfish program. The latest count shows 75 striped marlin tagged, over three times the number tagged previously. The total catch of striped marlin off Southern California was about 900 fish. Although this number did not equal the 1,200 caught in 1963, it was a significant improvement over the total catch made during the past few seasons. Using the 900 figure, approximately 8.3% of all fish caught off Southern California during 1975 were tagged and released by sport fishermen.

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Construction of an electronic device, designed and built by Mr. Mark Sweeney, Electronic Technician at the La Jolla Laboratory, was completed this month. This device will allow rapid coding of aerial fish spotter flight logs for effort, by 10 degrees longitude by 10 degrees latitude squares or "block areas." This instrument has a series of relay counters and permits tracing the flight track of the spotter pilot. An electronic pointer energizes the counter for each "block area" in which the aircraft traveled.

STOCK AND RECRUITMENT INVESTIGATIONS

Cooperative Project on Larval Fish Mortality Studies Begun with Brookhaven National Laboratory

Dr. Reuben Lasker, Leader of the Stock and Recruitment Investigations at the La Jolla Laboratory, reports that he has initiated a cooperative project with the Brookhaven National Laboratory on larval fish mortality studies in the New York Bight. Preparations were made this month for Mr. Lloyd Farrar, Marine Operations Supervisor for National Ocean Survey, stationed at the La Jolla Laboratory, to join Brookhaven scientists at Woods Hole for a 1-week cruise in January aboard the research vessel, Knorr. Data to be collected will be chlorophyll profiles at stations off Long Island across the continental shelf, phytoplankton using a plankton pump, and ichthyoplankton samples using opening and closing bongo nets. Similar work has been started off California and Baja California to find and delineate the major feeding areas for first-feeding anchovy larvae. In this regard the CalCOFI cruise on the Jordan this month has collected similar samples (although not with bongo nets).

In the laboratory, cell counts and phytoplankton identification have been made of Los Angeles Bight water samples taken in September and October and these confirm the stability and richness of phytoplankton patches suitable for larval anchovy first feeding in the nearshore zone (within 3 miles of shore).

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Drs. Lasker and P. Smith prepared a paper, "Estimation of the effects of environmental variations on the eggs and larvae of the northern anchovy," for the International Decade of Ocean Exploration scientific workshop on the phenomenon known as El Niño, held in Guayaquil, Ecuador, December 4-12, 1975.

Dr. Smith presented the paper which described sample size needed for monitoring stock size and for determining mortality rates of anchovy larvae. New data was presented on zooplankton cycles, spawning and fat cycles in the northern anchovy as well as larval and adult growth rates as related to the food energy required to sustain anchovy populations off California. Suggestions for future research were also part of this paper.

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Striped bass maturation out of season has been attempted again this winter by Mr. K. Lal of the California Department of Fish and Game. Although three females developed ova 0.75 mm in diameter after 129 days on a photoperiod of 15 hours light and 9 dark, and relatively warm temperature (15°C), no further development has taken place even after 12 days following injections of human chorionic gonadotrophins (HCG). Additional treatment with HCG continues at this writing.

Mr. Lal, Dr. Reuben Lasker and Mr. Kuljis, formerly a biological aid at the La Jolla Laboratory, wrote and completed a manuscript, "Acclimation and rearing of striped bass larvae in sea water," which describes and summarizes their attempts to acclimate striped bass larvae to a salinity of 33.7 ‰. Salinity tolerance data is given as well as a protocol for rapid (30 days) acclimation to full sea water.

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As convenor, Dr. Lasker was occupied in December with the details of an upcoming colloquium (January 20-23, 1975) to be sponsored jointly by the Scripps Institution of Oceanography and the Southwest Fisheries Center on the stock and recruitment relation and larval fish mortality.

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Dr. Geoffrey Moser, Fishery Biologist at the La Jolla Laboratory, reports progress made on the identification guide to the larvae of scorpionfish during the past month. The description of the blackbelly rosefish, Helicolenus dactylopterus, was completed, and work on the commercially important redfishes, Sebastes spp., of the North Atlantic was initiated. Although the several redfish species of the North Atlantic have historically received considerable scientific attention, they were included in this study for comparative purposes and to see whether taxonomic characters used on eastern Pacific species provide solutions to some of the persistent problems associated with redfish larvae. For the first time, morphometric measurements were made on larval series of S. marinus, S. viviparous and the American forms whose taxonomic status is uncertain. Morphometric analysis did not point out any substantial differences between these larval series; however, it did show the close similarity of the Atlantic species and the eastern Pacific species, S. jordani. Analysis of pigmentation produced a character that separates larva of S. marmus from those of the American form and lends weight to the suggestion of some workers that the latter is a distinct species. Additional material is needed to substantiate this finding.

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Fish eggs and larvae have been identified in most of the regular plankton hauls taken on extended cruise of the NOAA research vessel, Jordan, in May 1972. When the tabulation of these is completed, they will be incorporated into the manuscript dealing with the neuston net hauls taken on this cruise, and the manuscript can then be made ready for publication.

This work is being done by Dr. E. Ahlstrom, Senior Scientist, and Ms. Elizabeth Stevens, Biological Technician at the La Jolla Laboratory.

A manuscript dealing with the life history of stromateoid fishes of the eastern Pacific is nearing completion, according to Dr. Ahlstrom, although there are a number of loose ends still to be finished. This manuscript is a joint effort by Dr. Ahlstrom, and John Butler and Barbara Sumida of the Smithsonian Institute, presently working at the La Jolla Laboratory.

Dr. Ahlstrom has been working with the selected bibliography to be included in the FAO Manual dealing with fish egg and larval surveys. This bibliography will include about 1,500 references, which are cross-indexed as to subject matter.

SURVEY SYSTEMS ANALYSIS INVESTIGATIONS

La Jolla Fishery Biologist Attends Guayaquil, Ecuador Symposium on Anchoveta and the El Niño

Dr. Paul Smith, Leader of the Survey Systems Analysis Investigations at the La Jolla Laboratory, attended the El Niño workshop to present a paper by Drs. R. Lasker, Physiologist, and Dr. Smith entitled, "Estimation of the effects of environmental variations on the eggs and larvae of the northern anchovy." This paper reports recent work at SWFC to use existing laboratory data on food requirements and historical data on natural variation to improve field work on the natural mortality of fish larvae in the sea and its causes.

The primary consensus of the workshop was an enthusiastic endorsement of the regional plans to intensify the study of recruitment of the Peruvian anchoveta, and to expand the regional activities in monitoring the currents which influence the fisheries along the coast. One feature of the El Niño was clarified in 1972. The primary productivity of the upwelling region (1 gram of carbon per square m per day) is about an order of magnitude greater than adjacent tropical surface waters (0.1 grams of carbon per square m per day). In the El Niño the productivity fell to 0.3 g C/m^2/day. The workshop recommended a full study on the linkage between this primary production and the productivity of the Peruvian anchoveta.

Draft reports, background papers and recommendations of the meeting may be obtained on request to Dr. Smith.

TUNA ASSESSMENT AND DEVELOPMENT INVESTIGATIONS

Bait Density Experiment Results Available; Bait Transport Economics Revised; Latest Trial Bait Shipment Destroyed by Mechanical Failure

The Honolulu Laboratory is continuing its study of transporting baitfish in a tank trailer aboard a freighter as one solution to the problem of shortages of bait in areas such as Hawaii.

The density studies completed in Long Beach last month yielded enough data to obtain a good fit on a survival model of simulated ocean crossings. The preliminary conclusion is that optimum loading for our bait transport tank is approximately 1,750 pounds. After 4 days in the test tank, this loading yields about 1,100 pounds of live bait, a much greater load than we had expected of the tank earlier in the study.

With this information and better cost figures gained through experience in the last several months, Roger Green, baitfish project leader, and Paul Callaghan, University of Hawaii graduate student, undertook a revision of an economic study that they had completed earlier this year. The revised study indicates that bait can be hauled in this manner at costs of $12 to $19 per 7-pound bucket depending on aging and transit mortalities.

The December trial shipment of 1,600 pounds of anchovies died as a result of a failure in the closed circulation system while the baitfish were in transit between the bait aging station in Long Beach Harbor and the Matson dock at Terminal Island. A bottom straining device slipped off a tank outlet leading to the recirculating pump. Nearly all of the fish were sucked into this line and through the pump. With hindsight, corrective measures are obvious, consisting of larger, heavier, and more positively fastened screens covering the bottom outlets. Such devices have already been installed in the three hatches to protect the fish from the top discharge lines. These effectively solved an earlier problem of fish going out the top overflow discharge.

The Baitfish Committee, an ad hoc committee composed of government, industry, and University representatives, met on December 11 to consider future directions of the bait transport project. It was agreed that the project still has a good chance for success and should be continued for two more trial shipments. The costs of these would be underwritten by industry, Office of Marine Affairs Coordinator (State of Hawaii), and Sea Grant. The Honolulu Laboratory will provide the labor and arrange the shipments, the first of which is expected in February 1975.

Population Dynamics Work on North Pacific Albacore Continues

During December, Dr. Jerry A. Wetherall, Fishery Biologist in the Tuna Assessment and Development Investigations, continued to work on a study of North Pacific albacore population dynamics. Part of the first phase

of the study involves an examination of trends in the catch rates of long-liners in the Japanese fishery. Dr. Wetherall has produced computer plots (with accompanying tables) of trends in standardized catch per 100 hooks and standardized effort for over 300 space-time strata. Some plots give monthly points, while others are based on annual points covering 11 years (1962-72). Concentration coefficients over various space-time groupings were also calculated along with the time series plots. When the concentration coefficients are computed monthly over the entire range of the fishery they show a concentration of the longline fleet on albacore from October through March or April in most years, with peak concentration in February and March. From May through September of all 11 years the fleet was not concentrating on albacore. Computing the coefficients over all months and areas shows a slight concentration on albacore from 1962 through 1969, with a very weak negative correlation between fishing intensity and catch rates in more recent years.

Results are Presented of Exploratory Shrimp Trawling in Hawaiian Islands

Examination has been completed by Fishery Biologist Dr. Paul Struhsaker of the results of exploratory shrimp trawling in the Hawaiian Islands during six cruises of R/V Townsend Cromwell. These results are incorporated in a manuscript presently in preparation. One species of shrimp, Penaeus marginatus, was found in quantities thought sufficient to sustain a small trawl fishery. Average catches in the four most productive areas ranged from 4.7 to 31.0 pounds (2.1 to 14.1 kg) per hour (heads-on weight) with a single 41-foot (12.5 m) shrimp trawl. There is evidence that individual shrimp move offshore into deep water (100 to 125 fathoms--185 to 230 m) during daytime, with most individuals returning to shallower depths (35 to 100 fathoms--65 to 185 m) during night. Optimum trawling speed was between 2.3 and 3.0 knots with best catches being made at 2.5 to 2.8 knots. The size of the shrimp at most stations ranged from 16 to 19 individuals per pound (heads-on). In any given depth range the females tend to be larger than males, while in depths greater than 100 fathoms (185 m) the males are 3 to 4 times more numerous than females. Small amounts of shrimps of the genera Heterocarpus, Aristeus, Pandalus, and Pleisioneka were taken in depths of 150 to 385 fathoms (275 to 705 m), but never in quantities sufficient to justify the sorting effort required.

Tuna Monitoring and Assessment Task Reports for December

The Tuna Monitoring and Assessment Task places major emphasis on those aspects of the SWFC skipjack tuna development plan dealing with fishery analysis. It also monitors the status of exploited stocks of other tuna and tunalike resources of U.S. concern through the systematic collection and analysis of fisheries data. For these purposes, the task is organized into three subtasks: fishery liaison and monitoring, assessment of skipjack tuna resources, and assessment of other tuna and tunalike resources.

Fishery liaison and monitoring. As of December 31, 1974, the estimated cumulative skipjack tuna landings in Hawaii were 3,131 metric tons (MT). This is 1,326 MT below the long-term average (1948-73) for the same period and 1,746 MT below last year's landings. In the history of the fishery, there have been 9 years with landings lower than this year's: 1948, 1952, 1957, 1958, 1960, 1963, 1967, 1969, and 1970.

Landing reports from the South Pacific albacore fishery are now being received from only one of the two canneries. The reason for this has not yet been determined. Since the landing reports are used to check logbook records collected from the fishing vessels, our ability to monitor this fishery has been severely restricted.

Assessment of skipjack tuna resources. Mr. Richard N. Uchida, Fishery Biologist at the Honolulu Laboratory has started to revise his manuscript, "Recent development in fisheries for skipjack tuna, Katsuwonus pelamis, in the central and western Pacific and Indian Oceans," after "outside" review. This manuscript is to be published in an FAO series.

Dr. Robert A. Skillman, Fishery Biologist, and Ms. Marian Y.Y. Yong, Mathematician, are continuing their study of skipjack tuna growth, utilizing tagging information. Preliminary analysis indicates that skipjack tagged in the spring and fall seem to grow at a different rate than those tagged during the summer "season" months.

Assessment of other tuna and tunalike resources. Mr. Uchida, at the request of the Laboratory Director, started preparing a summary of information, published and unpublished, on climatology, oceanography, and experimental fishing surveys conducted in the Line Islands area.

Dr. Skillman finished revision of the manuscript, "Von Bertalanffy growth curves for striped marlin, Tetrapturus audax, and blue marlin, Makaira nigricans, in the central North Pacific Ocean," and has sent it on to the Chief, Technical Services, for editorial review.

Hawaiian Skipjack Tuna Fishery Closes an Inauspicious Year

The December 1974 catch of skipjack tuna in the Hawaiian fishery reached an estimated 109 MT, 59 MT below the catch in December 1973 and 14 MT less than the long-term December average (1948-73).

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According to Research Assistant Ray F. Sumida, Government of American Samoa employee Pulou Niuatoa recorded the lengths of 1,346 albacore from 30 vessels during the period November 23 to December 27. He also collected 45 sets of catch and effort data. An average size of 90.1 cm and an albacore catch per 100 hooks of 2.1 were determined utilizing data from 10 vessels.

SWFC HOSTS MEETINGS OF IWC AND INTERNATIONAL EXPERTS ON MARINE MAMMALS

At the invitation of Dr. Robert White, Administrator of NOAA and U.S. Commissioner on the International Whaling Commission (IWC), a Special Meeting of the Scientific Committee of the IWC was held at the Southwest Fisheries Center in La Jolla, December 3-13. The meeting, convened by Mr. K. Radway Allen, Chief of the Division of Fisheries and Oceanography, CSIRO, Cronulla, Australia, and Chairman of the IWC Scientific Committee, was attended by more than 30 scientists representing nations in the IWC. The Soviet Union and Japan, among the principal whaling nations, were particularly well represented at this meeting.

Among other matters the scientists considered their new responsibilities to provide the IWC with recommendations on the criteria to be used in classifying whale stocks into three categories of: protection stocks, sustained management stocks and initial management stocks, and to make an initial allocation of stocks within these categories. Also a review was undertaken at this meeting of recent developments in knowledge of the biology and status of stocks of sei whales and the development of specific proposals for research projects which might be considered as part of the International Decade of Cetacean Research, and submitted to the United Nations Environmental Programme for support. The Honorable Inge Rindal, Chairman of the International Whaling Commission, stationed in Antwerp, Belgium, attended the Committee meetings during the closing 2 days.

Following immediately on the heels of the IWC Scientific Committee meeting at the Southwest Fisheries Center was the Advisory Committee on Experts on Marine Resources Research (ACMRR) Working Party on Marine Mammals: Ad Hoc Group 2 on Small Cetacea and Sirenea. The session, which met from December 16 to 19 at the Center, under the chairmanship of Dr. E. Mitchell of the Fisheries Research Board of Canada, was convened under the FAO/United Nations Environment Programme. In attendance were experts on marine mammals from Australia, Canada, India, Japan, Netherlands, Norway, USSR, United Kingdom, U.S. and Uruguay. The group considered current problems, ecological interaction and management of smaller cetaceans and sirenians (dugongs, manatees), many of whom are presently endangered species. Dr. William Perrin, Fishery Biologist at the La Jolla Laboratory, was an official delegate to this meeting and presented a paper entitled, "Present catch levels and their impact on populations of spinner, spotted and whitebelly porpoise in the eastern tropical tuna-porpoise fishery, co-authored jointly with Drs. T. Smith and G. Sakagawa, also of the La Jolla Laboratory.

The SWFC provided facilities and supporting services during these international meetings.

TIBURON LABORATORY RECEIVES NPDES PERMIT FROM EPA

Research Chemist Pete Benville has been spending much of his time working out the details of a National Pollutant Discharge Elimination System (NPDES) permit which the Tiburon Laboratory received from EPA for their sewer system. The permit is similar to permits issued by the State to cities for their sewer systems. These problems still remain: 1) how to measure the discharge flow for the plant; 2) whether the laboratory needs to be certified by the State for the analyses we perform; and 3) two plans must be submitted (preliminary engineering report and construction/ specification report). Mr. Benville has been visiting agencies involved with discharge permits to better understand permit procedures. The permit of the Tiburon Laboratory should be effective on January 31, 1975.

SEMINARS

La Jolla Laboratory

December 20 - Professor J.H. Van Bree, University of Amsterdam, presented a lecture on "Speciation in the Cetacea."

MEETINGS AND TRAVEL

December 5 - Norman J. Abramson, Director, Tiburon Laboratory, attended a meeting at La Jolla, CA, to discuss the TDP's and budget revisions.

11 - A meeting of the ad hoc Baitfish Committee at the Honolulu Laboratory was held to discuss problems connected with the latest shipment (December 6) of anchovies from California to Hawaii. The committee agreed that at least two more trial shipments would be needed to establish the feasibility and economic viability of this method.

12 - Fishery Biologist Susumu Kato of the Tiburon Laboratory addressed Ft. Bragg fishermen, belonging to Salmon Trollers Marketing Association, concerning research conducted at the Tiburon Laboratory.

16-19 - Norman J. Abramson, Director, Tiburon Laboratory, and Richard Shomura, Director, Honolulu Laboratory, attended a meeting in La Jolla, CA., to discuss the TDP's and attended a Management by Objectives meeting in Long Beach, CA. Mr. David Macket, Planning Officer, SWFC, also attended the meeting.

December 26 - Dr. Philip Helfrich, new Director of the International Center for Living Aquatic Resources Management (ICLARM), met with Mr. Shomura to discuss South Pacific fisheries programs.

27-30 - Dr. Robert E. Kearney, principal biologist with the Department of Agriculture, Stock and Fisheries in Papua New Guinea, was in Honolulu to consult with Honolulu Laboratory staff scientists. Dr. Kearney met with Messrs. Shomura, Otsu, and Uchida, and Drs. Skillman and Wetherall to discuss the preparation of a detailed tagging proposal for skipjack tuna in the western Pacific Ocean.

VISITORS

Honolulu Laboratory

December 2 - Ens. Christine S. Carty, NOAA Ship Researcher, Port Boulevard, Miami.

4 - Mr. Katsuharu Okuhira, University of Hawaii student from Okinawa.

6 - Mr. Nat M. Andrade, Mid-Pacific Sea Van Waters, Honolulu, Hawaii.

9 - Mr. Walter H. Stolting, Consultant, NMFS, Washington, D.C.

11 - Mr. John B. Loftus, Peace Corps, Phillipine Islands.

La Jolla Laboratory

December 1-16 - Dr. K. Radway Allen, Dept. of Fisheries and Oceanography, CSIRO, Cronulla, Australia.

1-20 - Dr. P.B. Best, Sea Fisheries Branch, Cape Town, South Africa.

- Mr. Rudolph Borodin, VNIRO, Moscow, USSR.

2-4 - Dr. William Aron, NOAA, Washington, D.C.

- Dr. J.L. Bannister, Whale Research Unit, British Museum of Natural History, London, England.

2-14 - Dr. D.G. Chapman, University of Washington, Seattle, Washington

December 2-14 - Dr. I. Christensen, Institute of Marine Research, Nordnes, Norway.

- Dr. Y. Fukuda, Far Seas Fisheries Research Laboratory, Japan.

- Dr. M. Evashin, VNIRO, Moscow.

- Dr. A. Jonsgaard, Statens Institut for Hvalforskning, Oslo, Norway.

- Dr. J. Jonsson, Marine Research Institute, Reykjavik, Iceland.

- Dr. S. Ohsumi, Far Seas Res. Lab., Japan.

- Dr. H. Omura, Whales Research Institute, Tokyo, Japan.

- Mr. Dale Rice, NMFS, Seattle, Washington.

- Dr. Lee Talbot, Council for Environmental Quality, Washington, D.C.

2-16 - Dr. R. Gambell, British Museum of Natural History.

2-19 - Dr. Sydney Holt, FAO, Rome, Italy.

- Dr. Nishiwaki, Ocean Research Institute, Tokyo.

2-20 - Dr. M. Tillman, NWFC, Seattle, Washington.

- Dr. P.J.H. Van Bree, University of Amsterdam, Amsterdam, Netherlands.

- Dr. E.D. Mitchell, Fisheries Research Board of Canada, Montreal.

- Dr. James Mead, Division of Mammals, Smithsonian Institute.

- Dr. V.A. Zemsky, VNIRO, Moscow, USSR.

- Dr. W.H. Dawbin, University of Sydney, Australia.

- Dr. A. Yablokov, Institute of Developmental Biology Moscow, USSR.

5-14 - Dr. T. Nemoto, Ocean Research Institute, Tokyo, Japan.

December 7-20 - Dr. L.K. Boerema, FAO, Rome, Italy.

14-20 - Dr. G.C.L. Bertram, St. John's College, Cambridge, England.

15-17 - Dr. D.L. Alverson, WWFC, Seattle, Washington.

15-19 - Ms. Edith Markoff, University of Miami, Florida.

- Ms. Sandra Husar, University of New Mexico, Albuquerque.

- Blair Irvine, National Fish and Wildlife Laboratory, Gainesville, Florida.

- Mr. Howard W. Campbell, National Fish and Wildlife Laboratory, Gainesville, Florida.

- Daniel K. Odell, University of Miami, Miami, Florida.

- Ms. Diana M. Magor, Instituto Nacional de Pesquisas de Amazonia, Amazonas, Brazil.

- Mr. V. Kozicki, Arctic Biological Station, Quebec, Canada.

- Mr. Daryl P. Domning, Dept. of Paleontology, University of Berkeley, CA.

- Dr. W. Evans, Naval Undersea Center, San Diego, CA.

15-20 - Dr. S. Jones, Kerala, India.

- Dr. R. Praderi, Museo Nacional de Historia Natural, Montevideo, Uruguay.

- Dr. H. Heinsohn, James Cook University, Queensland, Australia.

- Dr. R.L. Brownell, Smithsonian Institute, Washington, D.C.

Tiburon Laboratory

December 6 - J. Liebman, L.S.M.F.T., San Francisco, CA.

19 - James H. Mullick, Coast Guard, Pacific Area.

- James Schmidt, UCSD, SIO, La Jolla, CA.

December 19 - Robert P. Huffer, UCSD, SIO, La Jolla, CA.

- Gary E. Gnauch, ESL, Synnyvale, CA.

- Jo Ann Spaulding, ESL, Sunnyvale, CA.

20 - Richard Shomura, Director, Honolulu Laboratory, Honolulu, Hawaii.

PERSONNEL ACTIONS

Deputy Director Izadore Barrett will be on educational leave at the University of Washington, Seattle, Washington during calendar year 1975. During his absence, Mr. Robert F. Scott, Chief of the Program Planning and Evaluation staff in the Office of Resource Research in Washington, D.C., will serve as Acting Deputy Director of the SWFC.

Mr. Scott will resume his former duties in Washington when Mr. Barrett returns to La Jolla, in December 1975.

			Laboratory
December 2	-	Dale Ueki, Biological Aid, Expiration of Appointment.	La Jolla
8	-	Carol Sanchez, Biological Technician, Promotion.	La Jolla
	-	Tapuni Mulitauaopele, Fishery Biologist, Promotion.	La Jolla
	-	Kathleen Coleman, Clerk Typist, Promotion.	La Jolla
	-	Kenneth Raymond, Scientific Illustrator, Promotion.	La Jolla
	-	Roy Allen, Illustrator Aid, Promotion	La Jolla
	-	Randolph K.C. Chang, Biological Technician, Quality Step Increase.	Honolulu
	-	Hazel S. Nishimura, Librarian, Quality Step Increase.	Honolulu
9	-	Peter B. Adams, Biological Aid (Fisheries) Converstion to 700-hour Appointment.	Tiburon

December 13	-	Kenneth Brennecke, Termination	La Jolla
	-	William H. Neill, Fishery Biologist, Resignation.	Honolulu
16	-	Marjorie K. Massie, Clerk-Typist, Temporary Appointment.	Honolulu
	-	The following Biological Technicians received a temporary appointment	
	-	J. Halas	La Jolla
	-	W. Flerx	La Jolla
	-	T. Duffy	La Jolla
	-	H. Thompson	La Jolla
	-	W. Walker	La Jolla
	-	M. Jacobsen	La Jolla
	-	G. Friedrichsen	La Jolla
	-	L. Wade	La Jolla
	-	R. McClain	La Jolla
	-	R. Charter	La Jolla
	-	R. Fountain	La Jolla
	-	S. Baril	La Jolla
	-	A. Bates	La Jolla
	-	T. Shay	La Jolla
	-	K. Wallace	La Jolla
	-	C. Peters	La Jolla
	-	O. Seth	La Jolla
	-	K. Leveille	La Jolla
	-	F. Ralston	La Jolla
	-	D. Bratten	La Jolla
	-	M. Fitzsimmons	La Jolla
	-	J. Lambert	La Jolla
	-	D. Gruber	La Jolla

December 20	-	J.F.T. Saur, Oceanographer, Discontinued Service Retirement.	La Jolla
22	-	Elaine Sandknop, Biological Technician, Promotion.	La Jolla
	-	Elizabeth Stevens, Biological Technician, Promotion.	La Jolla
30	-	Charles Oliver, Computer Technician, Temporary Appointment.	La Jolla
	-	Robert Butler, Computer Technician, Temporary Appointment.	La Jolla
	-	Eric Wolin, Computer Technician, Temporary Appointment.	Honolulu
31	-	Josefina B. Whitmore, Clerk-Typist, Resignation.	Tiburon

TRAINING

December 9 - Mr. Charles J. Hill, Chief, Support Services, La Jolla Laboratory, attended a Supervision and Group Performance course in Seattle, Washington, sponsored by the Civil Service Commission.

10 - Mr. Frank Colianna attended a Transportation Seminar, sponsored by the General Services Administration in Los Angeles, CA.