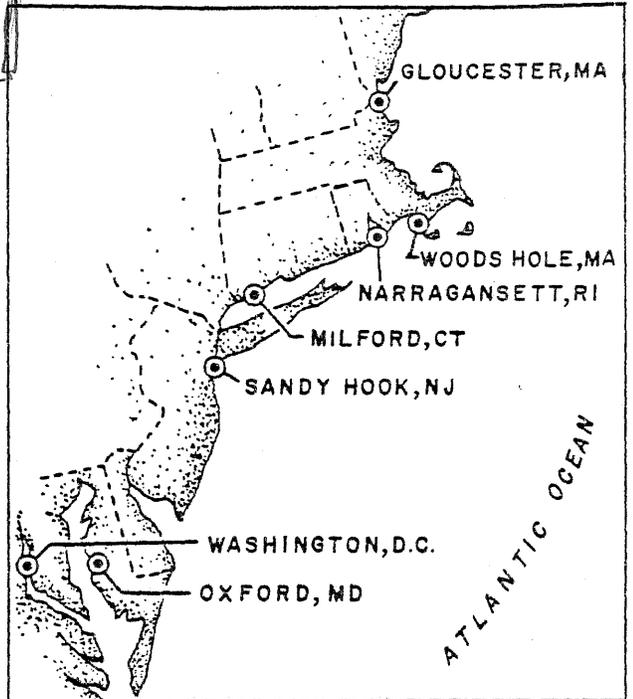


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29 MAY 1978

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FEBRUARY 1978

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Editor, Jon A. Gibson



U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL MARINE FISHERIES SERVICE



RESOURCE ASSESSMENT DIVISION

Resource Surveys Investigation

The four-part surf clam and ocean quahog survey was completed in February aboard the Delaware II. Henry Jensen (Chief Scientist) and Andy Thoms (Watch Chief) participated during the entire cruise. Because of their efforts and the cooperation of the crew of the Delaware II, this cruise was one of the most successful in the recent series. The cruise began on 4 January and ended on 11 February; in all, 351 dredge tows were made.

The first part of the Atlantic mackerel, Atlantic herring, and squids survey on the Soviet R/V Argus (Bill Overholtz, Chief Scientist) was completed on 13 February. The second part of the cruise (John Messersmith, Chief Scientist) began on 14 February and is scheduled to end in early March. Data collection during the first part included sampling of special stations and a 24-hr study of the feeding habits of squids. In addition, 25 trawl stations were sampled as part of the Atlantic mackerel and Atlantic herring survey.

John Nicolas, working with Ollie Brazier of the Woods Hole Oceanographic Institution, completed for the College of the Atlantic a compilation of whale observations made during 1977 bottom trawl survey cruises. Corrections to the final audits on the 1977 fall bottom trawl survey data were made by Linda Despres. Malcolm Silverman and Chuck Byrne completed auditing and correcting historical cruise tapes (primarily inshore cruises) brought to Woods Hole from Sandy Hook. Many of these cruises have been put into tape storage and one, two, and four-card listings are currently being generated.

Age and Growth Investigation

Mr. Joe Hunt from St. Andrews Laboratory in Canada visited the Woods Hole Laboratory to review the aging of Atlantic herring with Louise Dery and Fred Nichy. Canadian and American age samples were examined to substantiate the Canadian aging of older fish, mainly the 1970 year class.

Judy Penttila and Fred Nichy completed reviewing the proposal for a contract to develop programs for an automatic aging system. A delay has occurred in preparing age samples for the proposal because of the loss in delivery of a new type of laminate plastic.

Vi Gifford and Kris Kantola assisted four, 6th-grade students in a special out-of-school program in removing age structures from fish and demonstrated how these structures are aged.

Age samples completed during the month were: (1) redbfish (from Albatross IV Cruise No. 77-07); (2) pollock (from commercial samples from the second, third, and fourth quarters of 1977); (3) red hake (from Albatross IV Cruise No. 71-01); and (4) scallops (from commercial samples of the F/V Kolina, the F/V Sharon, and the F/V Noreen).

Sandy Hook Investigation

Estimates of fecundity were completed for 147 summer flounder, Paralichthys dentatus, previously collected. An ecological study of seasonal changes in the relationships of benthic finfish fauna in Sandy Hook and Raritan Bays was initiated based on analysis of data collected from June 1974 through November 1976.

Length-weight relationships were calculated for the major species of fish observed in the New Jersey party and charter boat fishery. Calculation of the relationships was made necessary as some of the interview data contained a high proportion of weights of gutted fish which caused underestimation of weights for some species. Revision of the computer program to incorporate a gutted-weight-to-whole-weight conversion routine was initiated.

Fishery Analysis Investigation

Ralph Mayo and Bill Callahan spent the entire month gathering and summarizing data for Joe Mueller of the Regional Office. Harold Foster began analyses on the Atlantic cod stocks, relieving Paul Wood of the responsibility for that species. Paul Wood began preparatory work for a FMP on sea scallops; he and Fred Serchuk also attended on 28 February a meeting in Woods Hole on the management plan, with representatives of the New England and Mid-Atlantic Councils present. Fred also continued his work on Atlantic cod and red crabs. Steve Murawski began initial analyses of population indices for surf clams in the Mid-Atlantic from the latest cruise.

Many in the group attended meetings. Fred Serchuk attended the following meetings: NERFMC Groundfish Oversight Committee on 1978 Groundfish Management Plan in conjunction with recreational industry advisors - 3 February, Peabody MA; public hearing on 1978 Groundfish Management Plan - 3 February, Brunswick, ME; Gloucester Fishermen's Association on Groundfish Management Plan - 4 February, Gloucester, MA; NERFMC Groundfish Oversight Committee on 1978 Groundfish Management Plan - 6 February, Peabody, MA; public hearing on 1978 Groundfish Management Plan - 6 February, Gloucester, MA; NERFMC monthly meeting - 14 February, Peabody, MA; and IYABA monthly meeting - 15 February, Sandy Hook, NJ. Judy Brennan gave a seminar to a group of faculty and students of the University of Connecticut at Wolcott, CT, on 21 February. The topics were: the Schaefer model for estimating the MSY for the total biomass; and the uses of linear programming in fisheries work. She also attended negotiations with Cuban delegates concerning increasing the quotas on their by-catch species, 27-28 February, Washington, DC, and completed the update of the Report to Congress on Overfishing since 1972. Steve Murawski presented a paper at the Northeast Fish and Wildlife Conference at White Silver Springs, WVA.

Fishery Assessment Investigation

Steve Clark attended a meeting of the Northern Shrimp Scientific Committee on 21 February in Portsmouth, NH, at which time an assessment was prepared concerning the impact of reopening the shrimp fishery in the Gulf of

Maine. Steve, as Chairman of the Committee, presented the assessment results to the Northern Shrimp Sub-board of the ASMFC on 22 February. Based largely on the advice of the Committee, the Sub-board voted against reopening the fishery in 1978.

On 28 February, Steve presented a paper at the Northeast Fish and Wildlife Conference held in White Sulphur Springs, WVA, entitled: "The Application of Bottom Trawl Survey Data to Fish Stock Assessments."

Emma Henderson has been assembling data for updating red hake and summer flounder assessments and developing some computer programs to aid in prorating sampling data.

Bill Overholtz was aboard the USSR R/V Argus during the first part of the Atlantic mackerel and squid bottom trawl survey from 27 January to 13 February in the Georges Bank area. In addition, he has been calculating numbers-at-age catch data for haddock for use in virtual population analysis, processing commercial weighout reports for ADP, and preparing an Atlantic mackerel report for the USA Research Report to ICNAF.

Brian Hayden completed work on some historical Atlantic mackerel catch data and participated in the second part of the R/V Argus survey from 14 February to 2 March. Brian also received a 700-hr extension on his part-time appointment.

Thurston Burns and Frank Almeida were aboard the FRG R/V Anton Dohrn for the first part of the spring juvenile Atlantic herring survey which began on 28 February. Thurston has also assumed responsibility for processing the commercial weighout reports for ADP.

Frank Almeida completed a report on von Bertalanffy growth equations for the silver hake stocks and has continued to assemble silver hake and red hake data for assessments. Frank has assumed responsibility for processing the New England industrial fishery statistics, has completed the final computer runs for the 1977 data, and has begun work on the 1978 samples. On 22 February, Frank attended a meeting of the New England Fishery Management Council's S&S Committee held in Boston to discuss data needs and progress on the silver hake FMP.

Emory Anderson gave a lecture on assessments on 15 February at the Woods Hole Laboratory to a class in fishery economics from the Massachusetts Maritime Academy. Emory attended the meeting of the ICES Mackerel Working Group held in Charlottenlund, Denmark, during 20-24 February, and then was in Gdynia, Poland, at the Sea Fisheries Institute from 27 February to 6 March working with Andrzej Paciorkowski on a joint Atlantic mackerel paper to be presented at the ICES/FAO/ICNAF Pelagic Fish Stock Symposium to be held in July in Scotland.

Fishery Systems Investigation

Assessment activity continued during February 1978. In addition, Lange attended the 13-18 February ICNAF STACRES meeting held in Havana, Cuba, to discuss management recommendations for the Illex fishery in ICNAF Subareas 3 and 4. Canada requested this meeting to reconsider previous management schemes in light of the greatly exceeded 1977 recommended TAC in this area (25,000 ton recommended TAC vs. 80,000 ton catch). The results of the meeting were to recommend a TAC of 100,000 - 120,000 tons to be divided between

Subareas 3 and 4. This changes the previous viewpoint of managing the entire fishery from Subareas 3 through 5 and Statistical Area 6 as a single stock, setting an overall TAC, and then dividing catches among all four areas. The possibility of managing this species by catch-per-effort restrictions, rather than catch limitations, was also discussed and referred to the April assessment meeting. A recommendation for standardized data collection was also made, including length-frequency sampling by sex and 0.5-cm intervals.

Michael Sissenwine represented the NEFC at a public hearing on the Groundfish Management Plan held in New Bedford on 1 February. He also attended the National Marine Fisheries Service Ecosystem Modeling Workshop in Seattle, WA, during 6-10 February and a meeting of the Steering Committee of the Fisheries and Climatology Workshop on 24 February at the University of Rhode Island. The full workshop will be held 29-31 March in Rhode Island. During 25-28 February in New York City, he participated in a working group preparing further cross-examination for electrical power generating utilities in the Hudson River Adjuditory Hearing Case.

Manuscripts

Anderson, E. D., and F. P. Almeida. 1978. Assessment of the Gulf of Maine silver hake stock. NMFS, NEFC, Woods Hole Lab. Ref. No. 78-10 (mimeo.).

Almeida, F. P. 1978. Determination of the von Bertalanffy growth equation for the southern New England - Middle Atlantic, Georges Bank, and Gulf of Maine stocks of silver hake. NMFS, NEFC, Woods Hole Lab. Ref. No. 78-13 (mimeo.).

Serchuk, F. M., P. W. Wood, and B. E. Brown. 1978. Summary and review of the 1978 assessment and status of the Georges Bank cod stocks. NMFS, NEFC, Woods Hole Lab. Ref. No. 78-11.

MARINE ECOSYSTEMS DIVISION

Ecosystem Dynamics Investigation

Ed Cohen and Marv Grosslein with inputs from Mike Sissenwine and Frank Steimle completed a status report on energy flow studies by the Center (Woods Hole Laboratory Reference No. 78-14). Ed presented the report at the ecosystem modeling workshop in Seattle during 7-9 February. Comparisons of the energy budgets for Georges Bank and the North Sea indicated that Georges Bank was much more productive at all levels of the food web. The production estimates for Georges Bank are preliminary, but the consistently higher values for all levels suggest that the difference is real. Further study is necessary to evaluate the degree of differences between Georges Bank and the North Sea.

Ed Cohen and Marv Grosslein assisted Dr. Vinogradova and other scientists from the USSR R/V Argus in preparing for their cruises. This involved making arrangements with Dr. Guillard's group at WHOI for phytoplankton cultures, obtaining glassware and chemicals for culturing the

phytoplankton at sea, providing plastic bottles for nutrient samples, and preliminary coordination of the productivity studies to be done on Argus in March and April with NMFS and Brookhaven National Laboratory scientists.

Mike Pennington and Marv Grosslein completed a manuscript on accuracy of abundance indices based on stratified-random trawl surveys, and Mike presented the paper at the American Fisheries Society Meeting (Northeast Division) in West Virginia during 26 February - 1 March 1978. Theoretical and empirical analyses suggest that a significant part of the variability associated with survey catch-per-haul abundance indices may simply reflect variability inherent in the distances towed on standard 0.5-hr hauls. Preliminary estimates suggest that if towing speed and distance over the bottom could be held constant on each haul, the gain in precision might be equivalent to doubling the number of hauls. For example, confidence limits around an index from a single survey on Georges Bank might decrease from $\pm 50\%$ to $\pm 30\%$. Smaller improvements in precision may be possible by post-stratification of the survey data according to time of day; more important, anomalies in night/day ratios of catch may prove to be useful in detecting changes in catchability coefficients which can induce bias in indices for any one survey.

Recruitment Processes Group

In the Recruitment Processes Group analysis of the existing larval herring data base continued for an up-to-date assessment of the larval Atlantic herring time series, 1968-77. Fifty-six surveys are included; 10 surveys have been processed for herring larvae since the first of the year by the Woods Hole, Narragansett, and Sandy Hook Laboratories. Our best quantitative estimate of the 1977 larval herring production for the Georges Bank-Nantucket Shoals area is 80.3×10^{11} larvae, which is intermediate in size between the record low of 1976 (1.11×10^{11}) and 1971 (193×10^{11}). Refer to the October monthly NEFC report for a complete listing of the 1971-76 larval herring production estimates.

The February larval herring survey (Albatross IV Cruise No. 78-02) left Woods Hole 14 February with Georges Bolz as Chief Scientist and coop-students Elizabeth Stein, Dana Temple, and Peter Hamer on their first survey. The first leg of the standard survey ended 22 February and then Greg Lough, Cabell Davis, and Hal Merry boarded Albatross IV to conduct special vertical sampling with MOCNESS until 8 March. Observations from the first leg indicated a typical February larval herring distribution with a few larvae per haul on central Georges Bank and Nantucket Shoals.

Benthic Dynamics Investigation

Evaluation and analysis of the quantitative data pertaining to the New England macrobenthic invertebrate fauna were continued; a report on the distribution of nemertines was completed. Progress also was made on updating selected portions of this macrobenthic data set and in assembling data and checking records in relation to the distribution of bivalve mollusks.

Food habits analysis of the 1969-1972 Pleuronectiformes data base is in progress. All the data have now been keypunched and are being audited. The food habits of juvenile haddock, 1956-1976, have been tabulated for each of

five ecological areas. Albatross IV Cruise No. 78-02, a fish food habits and feeding chronology study, was cancelled because of bad weather. The cruise will be rescheduled later in the year.

Fishery Oceanography Investigation

Preparation for and participation in cruises occupied much of February. Ron Kirschner prepared drogues for use on the MOCNESS cruise on Albatross IV and Gil Dering installed the thermosalinograph for the same cruise.

While Albatross IV was in port we tested the new transducer installation for use during the current-meter recovery cruise in March. The STD temperature sensor was also calibrated and the current-meter hardware purchased.

With the beginning of the 1978 series of MARMAP cruises, we supplied Niskin bottles, thermometers, and other equipment to Delaware II. Tim Cain and Ray Cloutier sailed as oceanographers on the first leg of the cruise; Anne Dorkins and Dan Patanjo on the second leg.

Meanwhile, Sam Nickerson has continued plotting XBT data, Steve Ramp has been looking at current-meter data, Anne Dorkins, and Tim Cain have kept reducing the backlog of salinity samples, and Gil Dering has been assembling the current-meter test equipment. Dan Patanjo has been organizing a cruise report data inventory, Ray Cloutier has been plotting horizontal charts of larval herring cruise distributions, and Red Wright, Ron Schlitz, and Steve Ramp have been working on their AGU papers. Bob Pawlowski worked on his manuscripts while not away at NOS training sessions, and Kirschner produced the January SOOP report.

Larval Physiology and Biochemistry Investigation

Studies of the influence of prey densities of 0.01-3.0/ml on growth, survival, and feeding of larval Atlantic cod from hatching to metamorphosis continued into their 5th week of a 2-mo study. Winter flounder eggs and larvae are being analyzed for DNA, RNA, and protein content as part of a cooperative study with EPA on the effects of petroleum hydrocarbons. Studies of the influence of prey densities on larval cod DNA, RNA, and protein content, and measurements of the excretion rates of nitrogen containing compounds were continued.

Adult haddock have been obtained to serve as spawning stock for studies of competition between cod and haddock larvae with regard to feeding and growth experiments with both species held in the same tanks.

Ichthyoplankton Investigation

We have reached the halfway point in our third ichthyoplankton survey of this fiscal year. Weather has been favorable and progress to date is ahead of schedule. Plankton volumes are light in samples taken throughout the Middle Atlantic Bight and southwest Georges Bank. As expected, the sand lance, Ammodytes sp., dominates the ichthyoplankton north of Chesapeake Bay. On the basis of preliminary observations, however, sand lance larvae are not as abundant as last year. Staff biologists were excited over the capture of a

juvenile oarfish, Regalecus sp., off the outer banks of North Carolina. Also known as king of the herring, this rare oceanic species ranges worldwide in the northern hemisphere. It's our first specimen.

Baseline maps have been prepared for the BLM contract and we began plotting distributions of fish eggs and larvae collected on semiannual surveys in the Middle Atlantic Bight. The data will show that spawning activity is more intense during the fall surveys, conducted in October and November, than during spring surveys, which are usually conducted in March. For the next few months we will continue to concentrate on ADP aspects of the historical data base. Myron Silverman is performing quality audits on data entered into the MIS. Pat Rosenberg is transferring historical ichthyoplankton data and ancillary environmental observations to OPSCAN so that the data can be entered into MIS.

Plankton Ecology Investigation

Plankton Sorting Group

Selected stations from Albatross IV Cruise No. 75-12 and Argus Cruise No. 77-01 were sorted for herring larvae and the data summaries sent to Greg Lough. Information on the relative abundance (No./100 m³) of euphausiids on Georges Bank during the spring and fall of 1971-75 was provided for a communication sent to Woods Hole. A high priority goal of the group was accomplished with the completion of samples from Albatross IV Cruise No. 71-01, 6B-3, on Georges Bank. This provides a set of zooplankton data for 1971-1975 for spring and fall for this area. This task was initiated in the fall of 1976 and involves approximately 400 samples. A careful adherence to quality control and sorting protocol was maintained despite changing personnel and other tasks. The 1971-1975 spring-fall bottom trawl survey temperature (XBT) data are being summarized for inclusion in a study of zooplankton distribution based on collections made on these surveys.

Biostatistics Unit

Data processing efforts were divided between the BLM contract data for Sandy Hook and ichthyoplankton data from the Polish Sorting Center. Some progress was made on both fronts despite adverse climatic conditions.

Gene Heyerdahl, Kay Paine, Ed Handy, and Herb Stern met with all of the Narragansett Laboratory investigation chiefs on 2 February to discuss the data processing problems associated with the forthcoming termination of the contract with the University of Rhode Island for the development of the MARMAP Information System (MIS).

Several students have joined the Biostatistics Unit since the first of the year. Linda Cummings (Suffolk University), Eric Stirrup (Roger Williams College), and Gary Johnson (University of Rhode Island) are assisting in data entry, quality control, and data retrieval. Mark Nally (University of Rhode Island), a computer programmer, is studying the programs in the MIS to assist the Biostatistics Unit in the operation of the system.

Kenneth Sherman met with several members of the Biostatistics Unit and the Ichthyoplankton Investigation on 3 February at the Newark airport to

discuss data processing responsibilities within Survey I. It was resolved that Sandy Hook would fulfill all keypunching requirements for Survey I data and that data entry into the MIS will be performed at Narragansett. Quality control will be shared within the division.

Apex Predators Investigation

Tag returns were received from four sharks during February. Two were male blue sharks tagged off Shinnecock and recaptured by Korean longliners in 1976. The first was at liberty 1,386 days and was taken 260 mi ESE of Cape Hatteras. The second was out 809 days and traveled east to within 600 mi of the Azores. A third female blue shark tagged off Montauk, NY, was recaptured 441 days and 116 mi to the southeast. A female nurse shark was "hand caught" by divers after 1,103 days at liberty 10 mi south of the tagging location. This recapture method is discouraged by our program.

The contract for printing the biannual shark tagging newsletter was awarded by the GPO, Boston. Delivery is expected in early March. Preparations were started for a 19-day Wieczno cruise in March to longline for apex predators. John Hoenig completed his term of employment.

Meetings, Talks, Visitors, Publicity

Gene Heyerdahl, Herb Stern, Ed Handy, Merton Ingham, Kay Paine, Robert Marak, Jack Jossi, and Kenneth Sherman met on 2 February at the Narragansett Laboratory to discuss ADP problems.

Kenneth Sherman, Donna Busch, and David Bearnse traveled to Newark on 3 February to develop data processing schedules with the staff of the Sandy Hook Laboratory.

Geoffrey Laurence and Kenneth Sherman went to a NMFS Ecosystem Modeling Workshop at Seattle, WA, during 7-10 February. Geoff delivered a presentation on empirical and stochastic modeling of larval fish survival and Ken described results of our ecosystem studies.

On 15 February an IYABA meeting was held at Sandy Hook, NJ. Kenneth Sherman, Geoffrey Laurence, Donna Busch, Jan O'Reilly, Joel Bodammer, Fred Thurberg, Fred Serchuk, and Judy Krzynowek attended.

On 22 February, Vyacheslav V. Konchin, visiting scientist from the Soviet Union, gave the Narragansett Laboratory staff a slide show of some historical sites in Russia.

Also on 22 February, Redwood Wright, George Kelly, Carolyn Griswold, Kenneth Sherman, Donna Busch, Merton Ingham, Lockwood Chamberlin, Reed Armstrong, Marvin Boussou (RO), and Don Phelps (EPA), met at the Narragansett Laboratory to discuss the approach to a joint NMFS/EPA plan for dealing with assessment studies for spills of oil and other toxic substances.

On 23 February, Kenneth Sherman and Carolyn Griswold attended a meeting at the Regional Office, Gloucester, to discuss the development by ERL of a Regional Response Plan for oil spills.

Dr. Red Wright represented the NEFC at a conference on long-term ecological monitoring at MBL, and attended an NEFC/EPA meeting in Narragansett on oil spill response plans. George Kelly also took part in both meetings.

Dr. Wigley conferred with members of the benthic invertebrate research

group at the Sandy Hook Laboratory. Principal topic of discussion was the quantitative benthic sampling conducted in the Middle Atlantic Bight.

Rich Langton was an invited speaker at the "Cieme Colloque Annuel" at Universite Laval, Quebec. He presented a lecture entitled, "The Argo Merchant Oil Spill," which was one of six talks dealing with man's impact on the environment.

Ed Cohen, Marv Grosslein, Mike Sissenwine, and Frank Steimle completed a status report on energy flow studies by the Center (Woods Hole Lab. Ref. No. 78-14) and Ed presented the report at the ecosystem modeling workshop in Seattle, 7-9 February.

Mike Pennington and Marv Grosslein completed a manuscript on accuracy of abundance indices based on stratified-random trawl surveys, and Mike presented the paper at the American Fisheries Society Meeting (Northeast Division) in West Virginia, 26 February - 1 March 1978.

Adam Benovic, currently visiting a number of US laboratories on a NATO Fellowship from the Marine Biological Institut, Dubrovnik, Yugoslavia, talked with Greg Lough, 14 February, regarding plankton activities at the NEFC.

Marv Grosslein attended the S&S Committee meeting for the New England Council on 22 February. Recommendations for continued herring tagging studies by the Center were discussed among other items.

Publications

Colton, J. B., Jr., W. C. Smith, A. W. Kendall, Jr., P. L. Berrien, and M. P. Fahay. Principal spawning areas and times of marine fishes, Cape Sable to Cape Hatteras. Fish. Bull. (S)

Langton, R., and R. Brodeur. Occurrence of a rare adult mud shrimp, Naushonia crangonoides (Kingsley, 1897) from the Chesapeake Bay Region. Crustaceana (A)

Langton, R. W., J. E. Winter, and O. A. Roels. 1977. The effect of ration size on the growth and growth efficiency of the bivalve mollusk Tapes japonica. Aquaculture 12 (1977):283-292. (P)

Laurence, G. Comparative growth, respiration, and delayed feeding abilities of larval cod and haddock. Mar. Biol. (A)

Reports

Griswold, C., and K. Sherman. 1978. Offshore oil spill ecological damage assessment plan for fisheries.

Sherman, K., D. Bearse, and J. B. Colton, Jr. 1978. Zooplankton biomass 1971-1975 spring and fall: Georges Bank.

Sherman, K. 1978. Summary of the biological sessions of the Argo Merchant symposium.

MANNED UNDERSEA RESEARCH AND TECHNOLOGY PROGRAM

During the period 22-23 February, the NEFC dive team traveled to Rockport, ME to assess the impact of storm surge from the "Blizzard of '78" on subtidal habitats. The inshore ecology and lobster habitat of this area have been observed over a period of years by the dive team and presumably marked change or disruption could be evaluated.

Ten man-dives were logged during four observation and photographic transects. The dives were spaced at 0.25-mi intervals from Bearskin Neck northward where the most extensive shore damage was noted. Each dive began near shore (10-15 ft depth) in bedrock-rock rubble and extended seaward until flat sandy bottom was reached (40-60 ft depth).

The most notable damage observed was breakage at the holdfasts of the large kelps Laminaria and Agarum; overall, an estimated 20% of the kelps were so damaged. The remaining more or less intact individuals had extensively frayed fronds. Occasional heads and stems of the stalked ascidian Boltenia were seen in the aggregations of bottom detritus along with lobster trap remains, coils of pot warp, and scattered lobster and crab legs. No rocks, other than those immediately adjacent to the shoreline were dislodged from the matrix of other rocks and boulders. We conclude that the wave surge effects were not as extensive as anticipated, at least in this particular study area.

Roger Clifford and Clifford Newell received extensive classroom and tank training in the operation and use of the rigid 1-atmosphere dry dive suit "JIM" during an invited, Navy sponsored orientation program in the Washington, DC area. This British-conceived dive suit may be used with self-contained breathing apparatus to depths of 1,000 ft without subjecting the diver to compression and decompression hazards of normal diving (hardhat or SCUBA). With its articulating arms and legs the "JIM" suit is, in effect, a walking mode one-man submersible which should eventually find wide application in deep ocean research diving.

Manuscripts

Uzmann, J. R., R. A. Cooper, R. B. Theroux, and R. L. Wigley.
1977. Synoptic comparison of three sampling techniques for estimating abundance and distribution of selected megafauna: Submersible vs Camera Sled vs Otter Trawl. Mar. Fish. Rev. 39(12):11-19. (P)

Sears, J. R., and R. A. Cooper. 1978. Descriptive ecology of offshore, deep water, benthic algae in the temperate western North Atlantic. Mar. Biol. 44(4):309-314. (P)

DIVISION OF ENVIRONMENTAL ASSESSMENT

Behavior of Marine Fishes and Invertebrates Investigation

Results of our studies on the behavior of the blue crab, Callinectes sapidus, as influenced by petroleum hydrocarbons, have indicated that although the animals can detect low concentrations of naphthalene, they apparently do not possess the capability to avoid such levels. It can be assumed, therefore, that at least at these levels, the animals cannot mitigate the effects of the contaminant by a behavioral act. We are continuing to investigate the responses at higher concentrations and should be able to conclude whether the animal has within its repertoire the capability to avoid this hydrocarbon.

We have been recently notified that this part of our research effort, done in cooperation with Battelle Northwest Laboratories, will continue to be funded by the Energy Research and Development Administration. The studies will also be expanded to include research on the red hake, Urophycis chuss. This work will interface with our efforts currently supported by the Environmental Research Laboratories through Environmental Protection Agency pass-through funding.

Biological Oceanography of Stressed Environments Investigation

In early February the Biological Oceanography Investigation conducted a 1-day cruise on the R/V Kyma to obtain respiration, productivity, and chlorophyll measurements in the New York Bight apex prior to the spring bloom. These measurements will be integrated with previous and future measurements obtained during MESA-SINC cruises; such measurements are important to complete an annual cycle which already includes similar data for March, June, July, September, and November; one of the problems with many data sets on productivity is the lack of frequent or even seasonal data points.

The Phytoplankton Baseline Survey Subtask sampled 60 stations and 411 depths on the first leg of a R/V Delaware II (14-24 February 1978) cruise between North Carolina and New York. Eight hundred twenty-two samples were returned to the laboratory for chlorophyll analyses. Data from the October-November USSR R/V Argus cruise are being graphed. Preliminary results suggest that nanoplankton (less than 20 μm) chlorophyll predominated. Chlorophyll concentrations at stations off New Jersey and over Georges Bank were generally low and vertically homogeneous. Chlorophyll concentrations over the shelf, between Delaware and Virginia and at isolated areas in the Gulf of Maine, appeared to be higher and many stations exhibited a subsurface chlorophyll maximum. Chlorophyll appeared to be low and vertically homogeneous at stations nearest the coast between Cape Hatteras and Sandy Hook. The pattern is spotty and difficult to interpret at present, but should become clarified as additional data from this cruise are graphed. Hopefully some consistency in annual patterns will become apparent after longer periods of monitoring, analysis, and plotting.

The Algal Bioassay Subtask continued its investigations in regard to the effects of temperature on the growth of phytoplankton species which bloom annually in the New York Bight apex. Often these species have resulted in

noxious red tides. Growth rate tests at 18°C were completed and tests of growth at 22°C were begun.

The Ocean Chemistry Subtask completed analyses of nitrate, nitrite, silicate, and phosphate in samples collected over Deepwater Dumpsite 106; the data are presently being calculated. These data will be furnished to the NOS Ocean Dumping Program. Calculations are continuing on analyzed nutrient data from our SS Advance II and FRS Albatross IV cruises in the New York Bight and over Georges Bank. To examine organic and inorganic compartments of nutrients limiting or regulating phytoplankton we are building a UV irradiation system for the oxidation of organic components so that the latter can be analyzed using the autoanalyzer.

Initial calculations using seabed oxygen consumption data collected during the Advance II and Albatross IV cruises (spring and summer 1977) were begun. Calculations are yet to be undertaken in connection with cadmium effects on benthic community metabolism. These data were taken during the FRS Delaware II cruise in conjunction with Dr. F. Thurberg, Milford Laboratory.

Coastal Ecosystems Investigation

We continued work on: (1) an atlas of distributions of the benthic invertebrates of the New York Bight apex; (2) benthic macrofauna data sets resulting from MESA-sponsored cruises made in June 1973, November 1975, and March 1976; (3) processing samples from a benthic census of Block Island Sound and from a study of impacts of and recolonization after the 1976 hypoxia; (4) attempts to obtain reliable population estimates from split benthic samples to shorten processing time for anticipated Ocean Pulse monitoring collections; and (5) coordinating the upcoming (April-May) Ocean Pulse cruise on the Researcher.

We completed the data report section of our pre-oil development benthic study of the Baltimore Canyon Trough (BCT) for the Bureau of Land Management. We began analysis of distributions of sediments, sediment metals, and macrofauna species in the BCT, as well as interrelationships between species, animal sediment relations, and long-term stability of the benthic fauna (the latter based on comparisons with the more recent study conducted by the Virginia Institute of Marine Science).

Coastal Monitoring, Assessment, and Prediction Investigation

A meeting addressing the problems of "Long-term Ecological Measurements" sponsored by the National Science Foundation was held at the Marine Biological Laboratory in Woods Hole during 6-9 February. Redwood Wright and George Kelly attended most of the sessions, although, at the outset, it was made clear that the term "marine" applied principally to the estuarine waters. Most of the participants were involved with programs of terrestrial or freshwater ecology. It appeared that the group recognized the difficulty of the problems they were facing, but had difficulty in finding a common ground for a means of attacking them.

Ken Sherman convened a meeting of NEFC participants at Narragansett on 22 February to plan a joint oil spill contingency plan for the Center and the EPA Narragansett Laboratory to be put into operation when the Center is called

upon for action by the Regional Response Team. Red Wright and George Kelly attended from Woods Hole, and, although no consensus was reached among the participants, sufficient groundwork was laid for development of a suitable research plan for use on future oil spills.

In late February, Jack Holston of the New England Regional Fishery Management Council contacted George Kelly to determine if he would be interested in reviewing the preliminary draft of a management plan for redfish that was prepared by TRIGOM for the Council. Kelly is reviewing the plan.

An interesting series of seminars on "coastal processes" was begun in February at the WHOI Clark Building on alternate Friday mornings from 9 to 11 a.m.. This multidisciplinary review of ongoing studies offers a varied and stimulating perspective of the ecological processes that are important in fisheries studies. Participation by staff members of other NEFC laboratories would be welcome.

Environmental Chemistry Investigation

A great deal of trouble has been encountered with our Anodic Stripping (ASV) analyses for metals in seawater. The electrodes became contaminated somehow and even after thorough cleaning we have not been able to get good consistent results. We will work with the instrument for a while longer, but may have to send it back to the manufacturer for their evaluation.

A new employee entered on duty in February--Patrick Bowe, a 1-yr temporary technician. He enjoys shipboard work and in fact got initiated right away with a cruise on the Kelez, 8-10 February. He is a welcome addition to our staff.

The cruise on the Kelez mentioned above was to collect samples for organic analyses as part of our contract with the MESA New York Bight project.

Samples obtained from the EPA Narragansett Laboratory have been nearly completed for the analyses of several metals. These data should be available soon to send out for comparison tests.

Physiological Effects of Pollutant Stress Investigation

Physioecology

Experiments to determine the effects of metals on bivalve embryos and larvae under various environmental regimes were interrupted due to spawning failures and laboratory closure caused by bad weather. These experiments will resume in March; it is anticipated that the bivalves we are working with, oysters and clams, will be in good spawning condition.

Physiological Effects

Two groups of animals were removed from the chronic-exposure system this month: 80 winter flounder, Pseudopleuronectes americanus, half exposed to 10 ppb cadmium for 60 days and half to 10 ppb cadmium for 60 days with a subsequent recovery period of 15 days in Cd-free water. They were examined for metal-induced changes in gill-tissue oxygen consumption and hematology. Gill tissues were also removed and packaged for later biochemical analysis at

Long Island University in Greenvale, NY. A series of striped bass, Morone saxatilis, exposed to mercury for 60 days, was similarly examined. Additional bass held in Hg-free water will be examined at later intervals to monitor recovery rates.

Work continues on a study of bivalve filtration and feeding rates. Several weeks of baseline data have been collected and analyzed and the first metal, silver, has been introduced into the system.

Biochemical Effects

Two experimental exposures of winter flounder to cadmium (see Physiological Effects) were terminated this month. Gonads, kidney, liver, and heart were taken for biochemical examination. This is the first experiment where the tissue samples will have been held frozen at -80°C , a temperature that should maintain tissues in a better state than heretofore, although they still must undergo the damaging -10° to 0°C range during freezing and thawing. We'll see how the livers hold up.

We are presently working on the gonads, using some new protocols worked out this month. Although there were 22 fish for controls and 22 for experimentals, the sample number for gonads is considerably less, because of differences in sex and degree of maturation.

Anaerobic Bacteriology/Metabolism

Bottom sediments, representing a range of sediment types, from 10 stations of the New York Bight apex region were obtained by the personnel of the Environmental Chemistry Investigation from the recent cruise of the R/V Kelez (6-10 February 1978). The sediments are for the study on procedure evaluation for total anaerobic bacteria and clostridial counts, particularly of the perfringens type, in marine sediments.

The checking of toxicities of the several bacterial isolates obtained from diseased eels was delayed because of unexpected mortalities in recently acquired mouse and goldfish stocks.

Several gram-negative hydrogen sulphide-producing bacteria have been obtained from sediments from the anoxic area off the New Jersey coast, and are being maintained in culture. Reagent and standards ordered for the procedure to test the H_2S -producing ability of these isolates are long overdue.

Meetings, Talks, Visitors, Publicity

Miss Edith Gould and Mr. John MacInnes attended the annual meeting of the American Association for the Advancement of Science in Washington, DC, 13-17 February. Miss Gould presented a paper, "Long-term Response of the Winter Flounder, Pseudopleuronectes americanus, to Sublethal Amounts of Cadmium".

Dr. Frederick Thurberg attended the Center IYABA meeting at the Sandy Hook Laboratory on 15 February. Mr. Jay O'Reilly hosted the group.

On 15 February Dr. John Pearce met with personnel of the College of Marine Sciences, University of Delaware, in order to present a seminar on the overall research program of the NEFC concerned with environmental assessment. As part of the seminar Dr. Pearce reviewed environmental research ongoing in

the New York and Middle Atlantic Bights and ancillary waters such as Long Island Sound, especially as this research relates to the new Ocean Pulse initiative. Dr. Pearce also discussed how the research program at the University of Delaware, especially elements under the direction of Dr. Donald Maurer, could interface with the Ocean Pulse program.

Dr. Frederick Thurberg presented a seminar on sublethal effects of heavy metals in the marine environment, to the Biology Department of Western Connecticut State College in Danbury on 22 February.

Dr. Peter Byrne visited Sandy Hook Laboratory on 22 February. Dr. Byrne is a postdoctoral fellow at the Osborne Marine Laboratories, New York Aquarium. He is interested in diseases of marine organisms, particularly as disease is related to parasitic worms. Dr. Byrne is interested in the Ocean Pulse program and will participate in the upcoming Researcher Ocean Pulse cruise to be held in late April and May.

On 23 February, Dr. Roland Wigley, Woods Hole Laboratory, visited Sandy Hook Laboratory to review ongoing benthic research being conducted by personnel of the Coastal Ecosystems Investigation. Dr. Wigley was briefed by Dr. John Pearce, Bob Reid, and Frank Steimle on the status of sample processing, condition of data sets, and future plans for benthic macrofauna studies within the Coastal Ecosystems Investigation, as well as published papers and reports.

Dr. Pearce participated in the Scientific and Statistics (S&S) Committee meeting of the Mid-Atlantic Fishery Management Council on 24 February. The meeting was held at Arlington, VA, and was largely concerned with a review of the Atlantic mackerel and squid fishery management plans recently developed by the Council staff and NMFS. Also, the nature of the environmental statements of the fishery management plans was thoroughly discussed. Members of the S&S Committee felt that in the future individual environmental statements should be drawn up for each species for which a fishery management plan is developed.

Dick Greig spent a day at the Beaufort (NC) Laboratory discussing a second cooperative study with Dr. Ford Cross and he also talked with several investigators about their current research interests.

Mr. William Phoel gave two talks this month to local groups. The first was presented to the Kiwanis Club, Eatontown, NJ, and was entitled, "Ongoing Biological Oceanography at the Sandy Hook Laboratory." The second talk was presented at the Career Day Program at the Shore Regional High School in West Long Branch and was entitled "Oceanography as an Occupation."

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AQUACULTURE DIVISION

Aquacultural Genetics Investigation

Mass Selection and Related Experiments on the Commercial American Oyster, *Crassostrea virginica*

Foundation stocks from the mass selection experiment are being spawned to produce the first generation of selected oysters. All three of the selected lines, the high-growth line, the low-growth line and the control line, are being propagated simultaneously. One cross from the high-growth line and one cross from the control line have produced viable larvae. The smaller oysters from the low-growth line have not yet been successfully induced to spawn. Perhaps because of their small size these oysters have not yet become sexually mature.

An experiment comparing growth rate of the high-line larvae with that of the control-line larvae has been initiated. Eight replicate cultures from each line are being maintained. At 1-wk of age the larval offspring of the high-line oysters were 10-15 microns larger than the progeny of the control-line oysters. Selection of the parent oysters occurred at 1-yr of age. These results indicate that selection for faster growth in the adult form of the

oyster produces faster growth in adult form of the oyster produces faster growth in the larval stage as well.

Genetic variation in both wet and dry meat weights is being analyzed. Correlation between shell size and meat weight is also being examined.

Hybridization and Inbreeding of the Commercial American Oyster,
Crassostrea virginica

Length data have now been analyzed for oyster larvae from geographic hybrid crosses between commercial Virginia and local New Haven Crassostrea virginica and their contemporary controls. As preliminary results indicated, there was no significant difference between the two groups of larvae in growth at days 2, 7, 14, and 21. Similar results were obtained for hybrid and control larvae grown under high and low temperature stress. More such trials are planned in attempts to assess genetic-environmental interaction of hybrid populations. Additionally, these trials will be tests for heterosis of adaptation to environments differing from the usual ones of the established parental populations.

Three geographic hybrid crosses were made between Maryland and local C. virginica. Two of these crosses were polycrosses in which gametes were pooled after separate spawning by the oysters. The other was a single pair cross. Average percent development to the straight-hinge larval stage was 50% in hybrid cultures, ranging from 25% to 98%, compared to 61.5% in local control cultures, with a range from 44% to 79%. Cytogenetic examination of meiosis and fertilization in these crosses revealed that 60% of the hybrid eggs were cleaving approximately 1 hr after fertilization. This figure was 90% for controls. However, there would appear to be no great barrier to fertilization in these particular hybrid crosses and in the crosses made with Virginia oysters last spring. Besides, crossability, conditioning, and spawning ability are being noted. These laboratory results could give some indication of success of hybridization in transplantations of oysters in the field from these areas. Mass spawning in nature, though, could affect actual hybrid production by allowing preferential within- or between-group fertilization.

Variance measurements are being initiated to compare volume, weight, length, and other characteristics among various oyster populations, including inbreeding lines. In addition, qualitative characters, such as the color of the muscle scar and the color of the mantle fringe, are being observed. Preliminary determinations show that wet meat weight is only about 10% or less of the total weight of an oyster and dry meat weight is only about 20% of the original meat weight. After more measurements are taken, some correlations will be attempted.

Some of the original population of Japanese oysters (C. gigas), obtained for hybridization studies, have survived with a minimum of maintenance in static seawater here at Milford Laboratory for at least 2 yr.

Oysters from six inbreeding lines of the 1976 year class, are being conditioned for spawning in anticipation of obtaining an F₂ generation. Animals from some of these lines with significant numbers will be used in the variance studies to look for differences between full-sib groups and their hybrids.

Aspects of Nutritional Requirements of Mollusks Investigation

Harvests from algal mass cultures yielded 976 liters of larval foods and 1,152 liters of juvenile foods (calculated as packed-cell volumes at 0.0003 ml per 1 ml of culture). Food cultures were distributed to the various investigations as follows: genetics, 520 liters; physioecology, 415 liters; rearing of mollusks, 802 liters; and pathobiology, 32 liters. Tank cultures with mixtures of algal food are being maintained to provide a continuous food supply for animals being fed in the Rearing of Mollusks Investigation.

Strains in the stock culture collection were subcultured on schedule. Several pure cultures were requested by two commercial aquaculture facilities: F.M. Flower and Sons; and Shellfish, Inc. Work is being conducted to purify the remaining four bacterized cultures in the collection. One diatom species, Cyclotella cryptica, has responded to our efforts and is now axenic.

Experimental work is proceeding in several areas. Some earlier studies on cryopreservation of algal strains were repeated to resolve the previously obtained conflicting data. Experiments were also conducted to confirm earlier studies on tolerances to selenium and on observations of some growth stimulation in very dilute concentrations of selenium. Results on inhibition levels of selenium were confirmed, but, unfortunately, the earlier dramatic examples of growth stimulation at low concentrations of selenium were not repeated in the recent experiments. The possible reasons for this discrepancy are being considered.

Additional data on the studies of oyster larvae feeding responses assayed by fluorescence microcopy were obtained. This information was added to the manuscript that is in preparation describing these observations. Additional work was put into the draft manuscript by Babinchak and Ukeles now entitled, "Epifluorescence Microscopy, a Technique for the Study of Feeding in Crassostrea virginica Veliger Larvae."

Spawning and Rearing of Mollusks Investigation

Bay scallops from both the 1976 and 1977 year classes have been acclimated to the elevated temperatures necessary to hasten gametogenesis. No mortality occurred in these populations during acclimation; a stark contrast with our experiences in the past. Part of the success this winter may be due to the major bloom of food organisms, dominated by Skeletonema sp., that occurred during this period. We are measuring length and weight changes and observing gonad development in these scallops at various temperatures and food levels.

A sample of bay scallops reared by our investigation last year has been sent to the Oxford Laboratory for pathological examination prior to shipment of a stock to the Prince Edward Island Department of Fisheries.

Several experiments are being carried out to determine the optimum growth rate of post-set Spisula solidissima. In a multifactorial experiment, groups of 25, 4-mm surf clams were maintained in 1-liter cultures at 17.5°C, 20°C, 25°C, and 28°C, and in algal food levels of 2×10^5 cells/ml, 3.5×10^5 cells/ml, and 5×10^5 cells/ml for each liter of culture. Growth was shown to be dependent on both food level and temperature. Best growth occurred at 25°C and at the highest feeding level. It became evident as the experiment

progressed, however, that animals maintained at 25°C and 28°C showed a marked decline in their growth rate. Correspondingly, the filtration rate was measured to be much lower than it had been initially in these treatments. Protozoan epizootic fouling organisms were more abundant at 25°C and 28°C than at 17.5°C and 20°C. It is believed that at elevated temperatures surf clams are not suited for prolonged static culture.

To further explore growth of post-set surf clams, animals have been raised in flowing systems. Results indicate that good growth can be maintained in 25°C, which was not possible in static culture. Recent experiments using a flowing culture system have attempted to evaluate the amount of algae required for growth. Data indicate that clams held in 1-liter containers with a flow rate of 25 ml/min with a net exchange of 35 l/day, can be reared successfully using the same amount of algae necessary to promote growth in a comparable 1-liter culture. Therefore, the amount of food used in flowing culture does not have to be greatly increased to compensate for algal cells that might pass through the system unused. It appears that if flow and feeding rates are balanced and if the animals are feeding efficiently, little food will be wasted.

Visitors

Biology Class, University of Bridgeport.

PATHOBIOLOGY DIVISION

Comparative Pathobiology Investigation

Almost all activity in the Molluscan Pathology Subtask was related to manuscript preparation and participation in lab-related activities outside the Laboratory. Diagnostic services were provided to the Cotuit Oyster Company of Cotuit, MA.

Photomicrographs are being prepared of tissue sections from normal blue crab tissues. Many photomicrographs are required to supplement the text of the monograph on the normal histology of the blue crab, Callinectes sapidus. Parts of the manuscript are being revised and augmented continually based on recently published papers. Data acquisition continues for the chapter on crustacean diseases that is being prepared for the treatise "Crustacean Biology."

Two apparently new diseases of striped bass, Morone saxatilis, are being investigated. The first disease was brought to our attention by scientists from the Center for Estuarine and Environmental Studies (CEES) at the University of Maryland. Three wild, mature, female striped bass were caught to estimate the maturity of their eggs. When attempts were made to insert a catheter in the gonoduct, it was noted that the catheter could not be inserted. The fish were sacrificed and their ovaries examined. Grossly, the ovaries were fibrous, waxy, and contained adhesions to other visceral organs. Tissues from these fish will be examined microscopically. We are attempting to determine if this condition occurs commonly in large female striped bass and, if so, what causes it.

The second striped bass disease involved a 1 1/2-yr-old fish which had

been held in a laboratory aquarium for several weeks. Grossly, the fish exhibited bilateral eye hemorrhage. At necropsy, the fish had fatty degeneration of the liver and a pancreatic tumor. Microscopic examination of tissue sections revealed pancreatic and fat necrosis.

Arrangements have been made with staff at the Narragansett Laboratory to obtain a series of developing winter flounder, Pseudopleuronectes americanus, larvae. These larvae will provide a reference collection for histologic studies on larval development.

During the month, the histology laboratory sectioned 971 blocks and stained 1,156 slides from a large variety of marine fishes, crustaceans, and mollusks.

Disease and Environmental Stress Investigation

Three cruises were made in the New York Bight to monitor the prevalence of winter flounder with fin rot disease. On 23 and 24 February, 318 winter flounder from Sandy Hook/Raritan Bay were examined for fin rot and epidermal papilloma; 1/318 (0.3%) fish exhibited fin rot and 0/181 young-of-the-year (1977 year class) winter flounder had epidermal papillomas. On 28 February, 344 winter flounder from the sewage sludge area were examined; 8/344 (2.3%) fish had fin rot. None of 225 young-of-the-year fish had epidermal papillomas. Icing prevented any trawling in Great Bay during February.

The examination with electron microscopy of laboratory-induced integumental lesions continues. A number of observations have been made of winter flounder exposed to NaF for 24 hr at 19°C; these are: (1) the tissues often exhibited extensive cellular separation and exaggerated intercellular space sometimes referred to as acantholysis; (2) the stellate condition of the epidermal cells was most noticeable in the basal layer and within mid-regions of the epidermis; (3) readily observed within cells of the intermediate and basal layer were large accumulations of glycogen-like particles, indicating that the NaF had indeed inhibited normal processes relating to glycogen utilization and storage; (4) in some cells the accumulation of glycogen-like particles was so extensive that large aggregates (pools) appeared to be isolated from adjacent organelles; and (5) dividing cells were not observed. These observations mimic to a reasonable extent the cellular changes observed in fin tissues taken from winter flounder captured in the New York Bight and Raritan Bay. In some instances the fins were completely devoid of epidermis (this experiment), indicating that a lesion of great extent could be initiated through the use of these chemicals. The nonproliferative response of the basal cells may bear relevance to the lack of regenerated fin tissues frequently observed in feral fish that have not succumbed to this disease.

Biochemical tests of the organism causing striped bass mortalities in western Long Island Sound indicate that the organism may be identical or closely related to the Pasteurella piscicida bacterium which caused extensive mortalities in white perch and striped bass in Chesapeake Bay in the summer of 1963.

Rock crabs, Cancer irroratus, were collected near Ambrose Light (sewage sludge area) in December in order to study fouled gills just prior to the winter molt cycle of adult males. Microscopic study showed that 24/26 had

debris between the lamellae, 26/26 had fouling bacteria on the gill epicuticle, and 20/26 had diatoms between the gill lamellae. Only one crab had gill copepods. The December collection provided animals representative of the maximum fouling and discoloration sustained by rock crabs in the New York Bight.

Aquaculture: Control of Larval Disease Investigation

Fortuitous purchases and deliveries have updated completion of the Genetics Investigation quarantine system by 3 wk. Each component part of this UV-ozone sterilization system was assembled and tested. Major piping and wiring have been completed, except for the contact tank which will be completed within a week. The system should be operational by mid-March.

Investigators at the Milford Laboratory have been experiencing difficulty in spawning oysters and in getting the resulting embryos to develop. In response to the problem, a bacteriological study was initiated to determine if the problem was bacteriological in nature. Although the study began too late to be conclusive, the presence of the pathogenic red pseudomonad in the seawater of each laboratory tested strongly suggests that it may have been at least partially responsible. This organism is seldom found on routine plating of seawater.

In the continuing UV study, bacteria found after UV treatment are being characterized to ascertain whether the test bacteria are being killed or whether they are mutating from UV irradiation.

In studying the mechanisms of disease resistance in oyster larvae, it was noted that motile cells, capable of attaching to glass slides, are present in the animal from day 6 forward. These early cells are small and essentially structureless under the microscope (both in killed, stained preparations and in living phase contrast preparations). Further, they seem to be incapable of engulfing algal cells in vitro. Between the third and fourth week after fertilization the larvae (now approaching 300 μ in size) contain glass-attaching cells which have a marked, granular appearance, though not as granular as adult hemocytes. These cells are capable of phagocytosing algal cells. Attempts are being made to get the larvae to "set" on rough mylar film so that portions of the same spat can be removed at timed intervals for further observation of cellular maturity. Cell separation techniques to obtain homogeneous populations of the immature cells are being investigated. Extracellular lytic enzymes are being sought as evidence for immune function in these cells.

Meetings, Talks, Visitors, Publicity

On 2 February, Drs. Rosenfield and Murchelano and Mr. O'Connell provided a tour of the facilities and discussed research programs, managerial activities, communications, and other possible problem areas with Mr. G. Taché of the Secretary's Office. Dr. Rosenfield participated in a Maryland Oyster Resource Expansion (MORE) meeting in Annapolis on 15 February. Dr. Rosenfield visited Mr. Ed Tolley, Executive Director, Shellfish Institute of North America (SINA), in Baltimore on 17 February to discuss the programs for the forthcoming SINA/National Shellfish Institute meeting in New Orleans. Drs.

Rosenfield and Murchelano attended a Center budget meeting at the Sandy Hook Laboratory on 21 February.

Dr. Murchelano, together with Mr. Ellison and Ms Confer, discussed BLM/ADP requirements at the Sandy Hook Laboratory with Mr. LeBaron on 16 February.

Dr. Sawyer attended a State-Federal program review as a USDA representative at the University of Maryland Eastern Shore Branch in Princess Anne on 6-7 February.

Dr. Bodammer attended an IYABA meeting in Sandy Hook on 14-15 February.

Mr. Kern conferred with Drs. Blogoslawski and Thurberg on 15-17 February at the Milford Laboratory on ozone depuration of PSP toxins in shellfish.

Mr. Daniel Russo (6-mo nonrenewable appointment) started work for the Division in the Control of Molluscan Disease investigation.

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RESOURCE UTILIZATION DIVISION

Resources Development & Improvement Investigations

Fisheries Engineering

Materials and equipment are being procured to refurbish the NMFS small boat currently at Sandy Hook. Also, an audiovisual presentation system for use by the Gloucester Laboratory staff was assembled.

The testing of the primary sorter has been held up by weather. Existing data are being worked on.

Facilities Engineering

Mike Corbett met with an architect and the Director of the Woods Hole Laboratory to review concept drawings for renovating the "White House" building. There were also several other meetings concerning other construction work in the region.

Weather has delayed work on the second floor addition to the State Fish Pier building. Work quality continues at a high level.

A study has begun to determine possible areas of energy conservation for the Gloucester Laboratory.

Processing Engineering

Schematics have been drawn up for each of the mechanisms which show the most promise for the skinning and eviscerating operations in the squid processing machine.

We are now working on a mock-up of the pneumatically operated tail fin remover, head slicer, and transfer conveyor. We are also debugging the mechanisms that we have already developed in order to get the highest processing efficiency.

Secondary Grader

The prototype has arrived at the Laboratory, and its specifications have been checked out. The variable-speed drive unit is being installed on the machine so that it can be tested.

Storage Study of Mussels

There appears to be definite seasonal variation among mussels in protein content, moisture content, and acceptability during frozen storage. Because protein values for cooked mussels are proportionately lower than protein values for raw mussels and all other parameters measured are not significantly different between raw and cooked, the data pertains to raw mussels but is applicable to cooked as well.

Fresh raw and cooked mussels contain a significantly higher percent protein in the spring months of May and June than the months of July-November. The months of July through December see mussels increasing in moisture content from spring values of 76 percent to about 81 percent. The protein content from July through November is significantly lower than the spring months; however, it does not vary significantly within the former period. The protein content for mussels in December is significantly lower than the previous 7 mo.

The overall taste-test scores have a similar descending pattern with acceptability of the fresh sample going down as the year progresses into fall and winter.

The taste-test flavor scores after storage of the mussels show more seasonal variation in the mussels. Samples stored in June were still being rated fair to very good after 5 mo of storage in 0°C and none were rated significantly different from the fresh control. The 6-mo stored raw sample scored slightly above borderline in flavor and was significantly lower than the fresh control.

The September sample, on the other hand, scored below borderline in flavor acceptability after 2 mo and was significantly lower than the fresh control at 1 mo of frozen storage.

Raw mussels after storage are developing an appearance acceptability problem, a curd forms upon heating. Since it is easier to shuck mussels when cooked, it is probably academic to freeze them raw, and probably should not be

pursued further.

Fat content does not appear to change seasonally, whether raw or cooked, or with storage.

Squid Processing Studies

Work was continued on the removal of skin from squid in the modified rotary fish scaler. The optimal blanch temperatures and times found for frozen and thawed Illex illecebrosus for machine skinning are 170°F for 15 and 30 sec and 150°F for 30 sec. After 30 min of tumbling in the machine, about 99 percent of the skin was removed from the squid. Damage such as holes in the mantle and torn or ragged tails was the least in squid blanched at 150°F for 30 sec.

These results were quite different from those obtained with the Loligo species where almost all the skin was removed after only 5 min of tumbling. However, physical damage was extremely high.

Guaranteed Quality Program

The final report on Phase III of the Guaranteed Quality Program has been completed and distributed in-house for review for final issuance as part of the contract we have with the New England Fisheries Development Program (NEFDP). Although the formal termination with NEFDP is complete, plans for investigation of potential problem areas concerned with the processing and distribution of packaged fresh fish are underway. The first is the reactivation of the odor assessment panel so that subtle changes in stored fresh fish can be accurately determined. The second is the assemblage of equipment to study practical, quick-chilling methods no necessary to the success of the program.

Product Quality, Safety, and Standards Investigations

Product Quality

Blocks of minced silver hake (whiting) containing either 10 or 20% minced quahogs were still considered acceptable in flavor and texture, although borderline, after 74 wk storage at +5°F. The control samples (100% minced whiting) had been declared unacceptable after 25 - 36 wk. The addition of quahogs to the minced whiting has retarded both flavor and texture changes. A parallel study is in progress at -5°F; and after 84 wk, all samples, that is, both controls and whiting-quahog are still at a moderate level of acceptability with no difference due to treatment.

The effect of mincing temperature (warm vs cold) on frozen storage characteristics of minced whiting blocks was assessed after 9 mo at 0°F. No differences were detected by organoleptic methods, and only a slight difference in the degree of protein denaturation was discerned by chemical tests.

Product Safety

Validation of the multidetection method at the 4, 2, and 1-ppb level in smoked salmon is continuing. We are encountering major difficulties in the isolation workup. Each step of the procedure is being checked, and the source of the problem appears to be the liquid- solid chromatography step. A new bottle of highest purity silica gel was just received. It is not what it pretends to be and is causing most of the 14 volatile N-nitrosamines to be lost.

Product Standardization

The following activities were conducted: (1) resolved comments on proposed unified shrimp standard covering all forms except breaded; (2) proposed a revision of four Inspector's Instructions for breaded fish sticks and portions; (3) started a review of the Codex Draft Code of Practice for Battered and/or Breaded Fishery Products in collaboration with interested people in the seafood industry; (4) reviewed and redrafted a proposed final rule making notice for the Federal Register concerning the unified fillet standards for grades; and (5) proposed a revision of the frozen, fried scallop standard to include breaded scallops.

Technical Assistance and Training

Norman Smith and Neal Hallee of the University of Maine Engineering Department demonstrated a device for the extraction of meat from rock crab. The model tested consisted of a plate into which 1/8-inch diameter holes were drilled, a cylinder onto which the plate was mounted, and a plunger which was operated by hydraulic pressure. The pressure from the plunger (2,000 psi) forces the meat out of the shell and through the holes in the plate. We did not determine the yield of meat from this test; however, shell content determinations were made. In two successive tests on meat extracted from the body, the percent shell was 0.43 and 0.64, respectively. Meat extracted from the legs and claw arms contained 0.19 percent shell, and meat from the leg tips contained 0.34 percent shell.

We will be working with the University of Maine and the Stonington Lobster(Maine) Cooperative in establishing a pilot project for the processing of rock crab.

Our Bibun meat and bone separator has now been loaned to a fish processor, and we have been instructing and helping the firm to gear up to prepare enough minced fish to form the basis of a small market survey of a new product. In our limited efforts, we have pinpointed a serious deficiency in the nature of the raw materials being used by the processor. He has asked for recommendations to improve the quality of final product.

Technical assistance activities also included information to fishermen on fishing economics, stern trawling, vessel hydraulics, and clam dredging.

We also furnished information on the following subjects: labeling of pollock as Boston bluefish; characteristics of Greenland turbot fillets; occurrence and life history of limpets; packaging of salt fish; lobster gear;

marketing of gray tilefish; labeling of tongue fish as tongue sole; design of fish pots; life history of starfishes; life cycle of lobster; labeling of imported frozen crab meat; laws governing catching of lobsters; flatfish of the New England coast; quality attributes of pickled herring; safety of eating raw fish; and processing frozen lobsters and codworms.

Visitors

Visitors included: Dr. Robert Slabyj, University of Maine (mussels, squid, and ocean quahog); Dr. Herb Halson, University of Massachusetts (enzymes from fish); Mr. Jack Reardon, Cohasset, MA (lobster processing); Mr. David Rogers, International Seafood Co. (fish processing); and Mr. Tom McPartland, Marketing Services Group, (marketing of underutilized species).

Meetings

Al Blott attended the 4th Annual Atlantic Coast Commercial Fishermen's Trade Exposition in Maryland and took the opportunity, while there, to survey local shellfish harvesting techniques.

Bob Learson met with personnel from Blue Gold Seafoods to discuss their new venture into mussel aquaculture.

Lou Ronsivalli and John Kaylor met with management personnel of DeMoulas Supermarkets to discuss the Quality Fish Program results.

NATIONAL SYSTEMATICS LABORATORY

Pelagic Fishes

A paper was prepared reviewing the Spanish mackerel genus Scomberomorus for presentation at the Gulf States Marine Fishery Commission. Counts and measurements taken from samples of Scomberomorus maculatus from the Gulf of Mexico and the Atlantic were compared; no significant differences were found. Work continued on a review of Indo-West Pacific halfbeaks (Hemiramphidae).

Benthic Fishes

Completed and submitted for publication a paper on variation in and the taxonomy of the fourbeard rockling, a gadid fish from the North Atlantic.

Crustaceans

Preparation continued on a Guide to the Temperature Water Decapod Crustaceans of the U.S. East Coast. A short paper was completed on the taxonomy of a xanthid crab from the southwest Atlantic.

Meetings, Talks, Visitors, Publicity

Sessions of the AAAS meetings in Washington, DC were attended by Cohen and Collette.

Visitors included Dr. D. P. deSylva of the University of Miami and Dr.

Peter Major of the US Coast Guard.

Manuscripts

Cohen, D. M., and J. L. Russo. Variation in the fourbearded rockling (Enchelyopus cimbrius), a North Atlantic gadid fish, with comments on the genera of rocklings. Fish. Bull. (S)

Williams, A. B., and T. W. Duke. Crabs (Arthropoda: Crustacea: Decapoda: Brachyura) in Hart and Fuller, eds., Pollution Ecology of Estuarine Invertebrates. Academic Press. (S)

ATLANTIC ENVIRONMENTAL GROUP

Ocean Monitoring and Climatology Task Group

Data analysis Product No. 8 (Update of Sea Surface Temperature Time Series for Eastern Georges Bank) was sent to Northeast Fisheries Center scientists early in February. The DAP portrays, in 12 monthly maps, trends in sea surface temperature in the four 1° squares around 42°N, 66°W for the 29-yr period of 1948-76. The data from which the portrayals were constructed were provided by the Pacific Environmental Group and have been added to the environmental data base in the MARMAP Information System, where they are available for computer processing and display.

During February the cooperative Ship of Opportunity Program obtained six transects, one in the Gulf of Maine, one across the southern New England shelf, three across the shelf in the New York Bight area, and one in the Cape Hatteras area. The Coast Guard recently has agreed to make on a routine basis XBT observations along the 71°W meridian across the southern New England shelf on cutters in transit to and from fishery patrol. The target frequency of these occupations of this monitoring transect is once per 15-30 days.

On 10 February, Reed Armstrong and Steve Cook of AEG conducted the third in a series of seasonal dye-diffusion experiments off Galveston, TX. They released about 10 gal of a fluorescent dye in an oil field in the Gulf of Mexico and monitored the spread and movement of the dye plume using a shipboard fluorometer and aerial photography. Drifting transponding buoys were deployed in the dye patch and tracked from land for the following 3 days. The study is designed to provide information for predicting the movement and concentration of potential contaminants that may be released into the marine environment from OCS petroleum operations. The project has been carried out in cooperation with the Galveston Laboratory of SEFC, NMFS, and is part of an EPA-sponsored program (Buccaneer Oil Field Studies).

A one-page article updating the location and configuration of Gulf Stream eddies adjacent to the continental shelf in the Middle Atlantic Bight was submitted for publication in the March Atlantic Notice to Fishermen. The article also was released to a mailing list of interested individuals at the same time.

Ocean Dumping Task Group

The month of February was marked by a research cruise to Deepwater Dumpsite 106 aboard the FRS Albatross IV to investigate the physical, chemical, and biological aspects of a waste dump at the site. One million gallons of duPont Edgemore (acid-iron) waste was discharged on 2 February and tracked for 3 days using acoustic gear from Woods Hole Oceanographic Institution and 11 STD/water sampling stations. Data to be examined from this cruise are 72 XBT and sea-surface observations, STD profiles, oxygen data from 106 water samples, surface current drogue data, and detailed analyses of infrared satellite imagery from the operations area provided by NAVOCEANO. Analyses of these data have just begun, along with preparation of a preliminary cruise report.

Planning and construction of equipment for the coming cruise effort to DWD 106 during April 1978 has been initiated.

The physical oceanographic report concerning this past summer's cruise to DWD 106 has been completed as a first draft (FRS Albatross IV Cruise No. 77-05). This report should soon be available in final form.

Meetings, Talks, Visitors, Publicity

On 15 February, Mert Ingham conferred with NMFS personnel at Headquarters in Washington, DC. He also visited the NOAA Ocean Dumping Program Office.

Mert Ingham attended a meeting of the steering committee at the University of Rhode Island on 24 February for the upcoming Fishery Climatology Workshop.

Manuscripts

Cook, S. K. 1978. Expendable bathythermograph observations from the NMFS/MARAD Ship of Opportunity Program for 1975. NOAA Tech. Rep. NMFS SSRF. (A)

Ingham, M.C., S. K. Cook, and K. A. Hausknecht. 1977. Oxycline characteristics and skipjack tuna distribution in the southeastern tropical Atlantic. Fish. Bull. 75(4). (A)