Northeast Fisheries Science Center Reference Document 97-07

Compilation of Program Booklets Issued for the Northeast Fisheries Science Center's 1978-96 Intraorganizational Research Meetings

by

Jon A. Gibson

May 1997

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Jon A. Gibson
National Marine Fisheries Serv., Woods Hole, MA 02543-1026

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Region
Northeast Fisheries Science Center
Woods Hole, Massachusetts

May 1997

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This report may be cited as: Gibson, J.A. 1997. Compilation of program booklets issued for the Northeast Fisheries Science Center's 1978-96 intraorganizational research meetings. *Northeast Fish. Sci. Cent. Ref. Doc.* 97-07; 258 p. Available from: National Marine Fisheries Service, 166 Water St., Woods Hole, MA 02543-1026.

INTRODUCTION

This report is a compilation of program booklets associated with the six intracenter research meetings held by the Northeast Fisheries Science Center during 1978-96 (Table 1). For the first two and last three meetings, the program booklets include both an agenda and collected abstracts; for the third meeting, the program booklet includes only an agenda. It is the intent of the Center to issue the program booklets of future intracenter science meetings in this *Northeast Fisheries Science Center Reference Document* series just prior to those meetings.

The earliest record of which I am aware for any intraorganizational research meetings by the Center or its predecessor organizations is Galtsoff's (1962) reference to the "research club" organized by Dr. Francis B. Sumner early in his 1904-10 tenure as Director of the (U.S.) Bureau of Fisheries' Woods Hole Station. The club met weekly during the summer--the season when almost all operations of the station took place in that era. According to Galtsoff, genesis of the club was the need by station scientists "for (the) general discussion of scientific problems of mutual interest."

I could not find out what happened to the Woods Hole Station's research club, and I do not know what may have come and gone in the interim, but I do know that when I arrived in Woods Hole in 1976, there were no formal intraorganizational meetings for the general discussion of scientific problems. The 1978 initiation of the current series of intracenter research meetings stemmed from a discussion by Dr. Robert L. Edwards, Center Director, and Dr. Kenneth Sherman, Laboratory Director of the Center's Narragansett (Rhode Island) Laboratory (Edwards, pers. comm.[a]). Both Edwards and Sherman wanted "to build the Center's young scientists into the (research) team more quickly." The intracenter research meetings were one of the initiatives by Edwards designed to achieve that goal.

From the start, the research meetings have sought to provide young Center scientists with: 1) an exposure to research ideas in other disciplines similar to that which would occur at major scientific meetings (which few young Center scientists can attend); 2) the first opportunity to present research findings in a formally-structured conference setting; 3) experience in fielding questions on research findings--ample time has always been set aside at these meetings for such purposes; and 4) the chance to associate with Center colleagues from other facilities and to place faces with names. These meetings have recently begun to include participation by academic researchers associated with the NOAA Cooperative Marine Education and Research Program (at the University of Massachusetts, University of Rhode Island, and Rutgers University), as well as by Center researchers well established in their discipline, but increasingly limited in their ability to travel to major scientific meetings due to budget constraints.

This compilation provides a series of "snapshots" of the nature of research activities being undertaken throughout the Center over the course of two decades. Its value is primarily historical and personal. A review of the titles and abstracts clearly shows trends in the Center's research program. Some disciplines emerged (e.g., socioeconomics, large marine ecosystems), some submerged (e.g., seafood technology, pathobiology), and one even re-emerged (i.e., aquaculture).

[a]R.L. Edwards, Main Rd., Quisset, MA 02540; March 17, 1997.

One area of research that has always remained active is the effort to improve effectiveness and efficiency of field and laboratory equipment and techniques.

When these research meetings began, they were conceived as annual events. Travel restrictions and budget constraints took their toll immediately. While the first meeting in 1978 was called an annual meeting, the second meeting in 1980 dropped the "annual" reference (Table 1). Nonetheless, the meetings have been well regarded by everyone associated with them. Let us hope they continue.

ACKNOWLEDGMENTS

Robert L. Edwards and Kenneth Sherman created the series of intracenter research meetings. One of their parallel creations was an informal association of young Center scientists, called IYABA (for "independent, young, arrogant, bright, and aggressive"). IYABA members played a major role in organizing and conducting the first two research meetings. There is no list of IYABA members, let alone those who were particularly active in these efforts, but the name of Geoffrey C. Laurence would certainly be on that list.

The third through fifth research meetings occurred when Allen E. Peterson, Jr., was Center Director (a position retitled Regional Science and Research Director during his tenure). Allen established a permanent position titled Special Assistant to the Director (held by Arthur W. Neill), as well as a temporary rotational position of the same title. These special assistants played a major role in organizing and conducting the third through fifth meetings. Rotational assistants who were particularly active in these efforts were Alan J. Blott, Carol P. Fairfield, Ronald Goldberg, David A. Nelson, David J. Radosh, and John J. Ziskowski.

The sixth research meeting occurred when Michael P. Sissenwine was Regional Science and Research Director. Emory D. Anderson, John G. Boreman, and Helen Mustafa played a major role in organizing and conducting the sixth meeting.

I personally appreciate the assistance of Lorraine Santos of the Center's Woods Hole Laboratory who assisted me in cleaning up (for photocopying purposes) the original copies of the program booklets. In a couple of cases, only a single copy had survived the years, and that copy had been extensively marked up with inked handwriting.

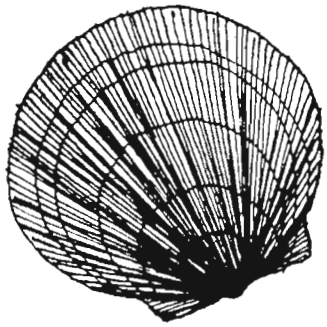
REFERENCES CITED

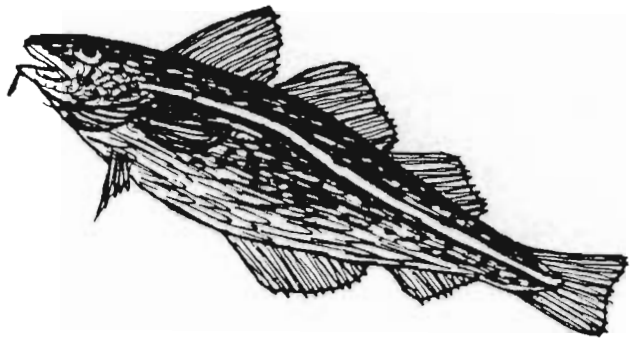
Galtsoff, P.S. 1962. The story of the Bureau of Commercial Fisheries Biological Laboratory Woods Hole. *U.S. Fish Wildl. Serv. Circ.* 145; 121 p.

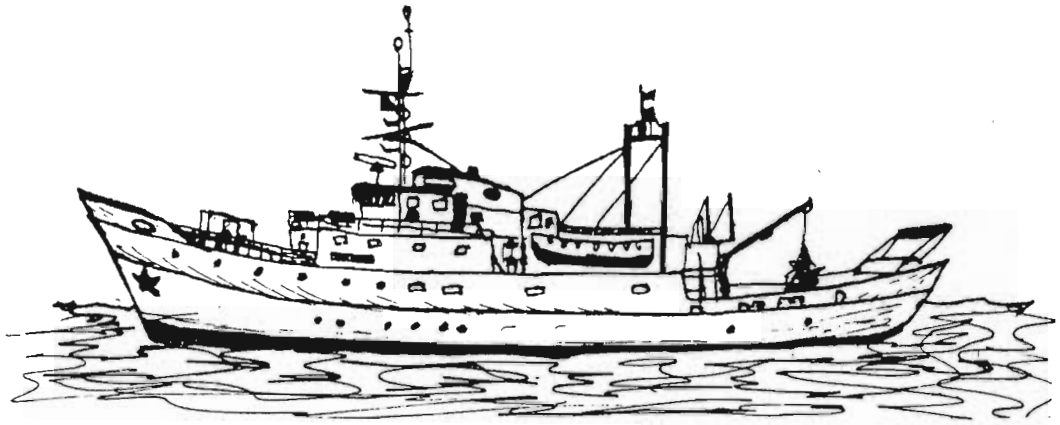
Table 1. Intracenter research meetings of the Northeast Fisheries Science Center held during 1978-96

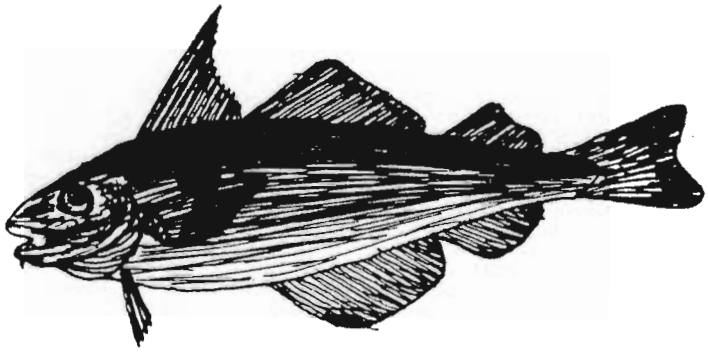
Date	Title	Location
April 24-26, 1978	First Annual Northeast Fisheries Center Research Meeting	Marine Biological Laboratory, Woods Hole, Massachusetts
April 1-3, 1980	Second Northeast Fisheries Center Research Meeting	Marine Biological Laboratory, Woods Hole, Massachusetts
March 12-14, 1985	Third Northeast Fisheries Center Research Meeting	Sea Crest Hotel, North Falmouth, Massachusetts
February 23-25, 1988	Fourth Northeast Fisheries Center Research Meeting	Dutch Inn, Galilee, Rhode Island
April 30 - May 1, 1991	Fifth Northeast Fisheries Center Research Meeting	Woods Hole Oceanographic Institution, Woods Hole, Massachusetts
May 7-9, 1996	Sixth Science Symposium of the Northeast Fisheries Science Center	Quality Inn, Falmouth, Massachusetts

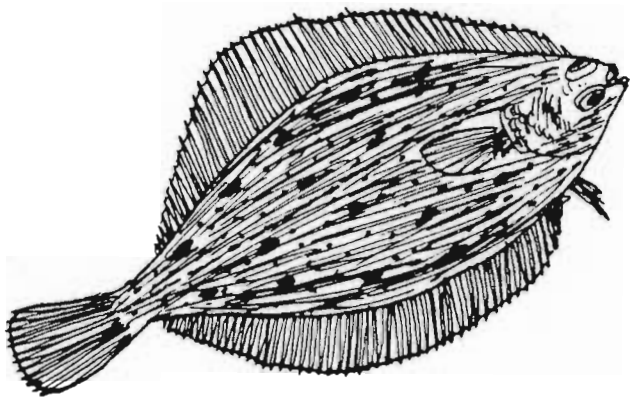
FIRST ANNUAL CENTER RESEARCH MEETING











NORTHEAST FISHERIES CENTER

NMFS NOAA

PROGRAM

FIRST ANNUAL NORTHEAST FISHERIES CENTER RESEARCH MEETING

*** ABSTRACT NUMBERS ARE IN ( ) ***

Monday, April 24

9:00 a.m. Registration - Swope Building (Lobby)

1:00 p.m. Introductory and Welcoming Remarks - Whitman Auditorium

Fred Serchuk, Woods Hole, MA
Robert L. Edwards, Woods Hole, MA

1:30 p.m. Plenary Session - Whitman Auditorium

David H. Wallace, Washington, DC

2:30 p.m. Break -- Adjourn to Sessions A & B - Swope Building

SESSION A - Meigs Room, Swope Building (IYABA Committee Member, Presiding)

2:50 p.m. "Image analysis - A revolutionary tool for plankton research." (55)
Ray Maurer, Jack Green, and Joe Kane, Narragansett, RI

3:10 p.m. "Abundance of larval lobsters in Buzzards Bay, 1976-77." (4)
F. E. Lux, Woods Hole, MA

3:30 p.m. "Ultrastructural studies on bacterial phagocytosis in Pseudopleuronectes americanus: An experimental approach." (17)
Joel E. Bodammer, Oxford, MD, and Richard A. Robohm, Milford, CT

3:50 p.m. "A preliminary energy budget for Georges Bank." (51)
E. Cohen, M. Grosslein, M. Sissenwine, and F. Steimle, Woods Hole, MA

4:10 p.m. "Phytoplankton baseline study from Cape Hatteras to Nova Scotia." (40)
Christine Evans, Sandy Hook, NJ

SESSION B - First Floor Meeting Room, Swope Building (IYABA Committee Member, Presiding.)

2:50 p.m. "Review of the management of the squid (Loligo and Illex) stocks in the Northwest Atlantic." (27)
A.M.T. Lange, Woods Hole, MA

SESSION B - Continued

3:10 p.m. "Conventional and experimental approaches to hybridization and inbreeding research in the oyster." (11)
Sheila Stiles, Milford, CT

3:30 p.m. "Effects of environmental factors on trawl survey operations as evidenced by a Doppler Speed Log." (57)
W. Overholtz, Woods Hole, MA

3:50 p.m. "Fishery development." (47)
J. Perry Lane, Gloucester, MA

4:10 p.m. "Water column respiration in the New York Bight and Georges Bank." (41)
Craig N. Robertson, Sandy Hook, NJ

5:00 p.m. Cocktail Hour - Swope Building

6:00 p.m. Dinner - Swope Building

Tuesday, April 25

7:30 a.m. Breakfast - Swope Building

SESSION A - Meigs Room, Swope Building (IYABA Committee Member, Presiding)

8:40 a.m. "Seasonal variation in the marketing quality of edible mussels." (61)
Judith Krzynowek, Gloucester, MA

9:00 a.m. "Accuracy of abundance indices based on stratified-random trawl surveys." (58) M. R. Pennington, Woods Hole, MA

9:20 a.m. "Protozoa associated with hatchery operations; Free-living and parasitic." (35)
Thomas K. Sawyer, Oxford, MD

9:40 a.m. "Biochemical studies of larval fish development." (24)
Larry Buckley, Narragansett, RI

10:00 a.m. "Selected aspects of party and charter boat fisheries." (42)
Darryl Christensen, Sandy Hook, NJ

10:20 a.m. Break

10:40 a.m. "NMFS marine mammal observation program." (52)
J. R. Nicolas and W. Overholtz, Woods Hole, MA

SESSION A - Continued

11:00 a.m. "Bent fin - a peculiar and undescribed skeletal deformity on Raritan Bay flounder." (48)
John Ziskowski, Sandy Hook, NJ

11:20 a.m. "The international herring tagging program." (32)
G. T. Waring and T. Burns, Woods Hole, MA

11:40 a.m. "What the heck is it? Focal necrosis in Pacific oysters." (10)
Frederick G. Kern, Oxford, MD

SESSION B - First Floor Meeting Room, Swope Building (IYABA Committee Member, Presiding)

8:40 a.m. "A Serchuk sea sampling saga: Cod, scrod, discards, die-hards, and try-hards in the New England groundfish fishery." (43)
F. M. Serchuk, Woods Hole, MA

9:00 a.m. "Evidence of a toxic effect on bivalve embryos by a red pseudomonad." (64)
Carolyn Brown, Milford, CT

9:20 a.m. "Food studies in apex predators." (25)
Chuck Stillwell, Narragansett, RI

9:40 a.m. "Georges Bank haddock - past, present, and future." (16)
S. H. Clark, Woods Hole, MA

10:00 a.m. Break

10:40 a.m. "Processing of Northern crabs." (62)
Kurt A. Wilhelm, Gloucester, MA

11:00 a.m. "A survey of heavy metals in the surf clam, Spisula solidissima, and the ocean quahog, Artica islandica, of the Mid-Atlantic coast of the United States." (1)
Douglas Wenzloff, Milford, CT

11:20 a.m. "Current status of redfish stock in the Gulf of Maine with some observations on growth and distribution." (3)
R. Mayo, Woods Hole, MA

11:40 a.m. "Phytoflagellate blooms in the New York Bight."
John Mahoney, Sandy Hook, NJ

12:00 Lunch - Swope Building

1:30 p.m. POSTER SESSION - Foyer adjacent to Meigs Conference Room, Swope Building

"Preparation of squid."(12)
Mary Ann Perry, Gloucester, MA

"The role of home economists in the NMFS." (59)
Mary Haskins, Gloucester, MA

"Observations of the sea scallop (Placopecten magellanicus), the coelenterate (Cerianthus borealis), and the hagfish (Myxine glutinosa) from the Nekton Gamma during June, 1976." (15)
H. W. Jensen, Woods Hole, MA

"Fiberglass fish models as teaching aids." (56)
D. Flescher, Woods Hole, MA

"Icthyoplankton and zooplankton data processing within the Marine Ecosystems Division." (26)
David Bearse and Tom Plichta, Narragansett, RI

"Fluctuations in the density and distributions of Centropages typicus on Georges Bank." (6)
Ruth Byron and Jacquelyn Frisella, Narragansett, RI

"A technique for measuring zooplankton biomass." (54)
Doris Petrie, Narragansett, RI

"An investigation of predation patterns of chaetognaths from Albatross IV Cruise 74-11." (23)
Jerry Prezioso, Narragansett, RI

"Response of oyster embryos, Crassostrea virginica, to heavy metals in multifactorial studies." (3)
John MacInnes, Milford, CT

"Statistically reliable method of aliquot sampling of benthic invertebrates." (65)
Thomas Wilhelm, Sandy Hook, NJ

"Marine invertebrate virology as a key to the phylogeny of viruses." (18)
C. Austin Farley, Oxford, MD

"A consideration of methods in ultrastructural studies of marine animals." (63)
Jane T. Wade, Oxford, MD

SESSION A - Meigs Room, Swope Building (IYABA Committee Member, Presiding)

2:50 p.m. "Size selection of groundfish by otter trawls." (21)
R. J. Smolawitz, Woods Hole, MA

3:10 p.m. " A study of Hematractidium scombri in the Atlantic mackerel." (8)
Sharon A. MacLean, Oxford, MD

3:30 p.m. "Atlantic mackerel and yellowtail flounder egg production and spawning population estimates for 1977." (38)
Peter Berrien, Sandy Hook, NJ

3:50 p.m. "Culture of unicellular marine algae on paper substrates." (9)
JoEllen Baird, Milford, CT

4:10 p.m. "Advances in fish species identification by electrophoresis." (60)
Ronald C. Lundstrom, Gloucester, MA

SESSION B - First Floor Meeting Room, Swope Building

2:50 p.m. "Spring and fall sea surface temperature and salinity on the Northeastern Continental Shelf: Cape Hatteras to Cape Sable, 1972-1977." (19)
R. J. Pawlowski and W. R. Wright (Charts by S. R. Nickerson, Woods Hole, MA

3:10 p.m. "Sulfide and other chemical observations during the 1976 dysaerobia in the New York Bight." (46)
Andrew Draxler, Sandy Hook, NJ

3:30 p.m. "The status of the three silver hake stocks off the Northeast Coast of the United States." (28)
F. Almeida, Woods Hole, MA

3:50 p.m. "Applications of refrigeration and the freezing and storage of food." (2)
Dan Baker, Gloucester, MA

4:10 p.m. "Distribution and abundance of surf clams and ocean quahogs off the Northeast Coast of the United States."
J. Ropes, Woods Hole, MA

5:00 p.m. Cocktail Hour - Swope Building

6:00 p.m. Dinner - Swope Building

Wednesday, April 26

7:30 a.m. Breakfast - Swope Building

SESSION A - Meigs Room, Swope Building (IYABA Committee Member, Presiding)

8:40 a.m. "Effects of storage time and filtering on nutrient concentrations in frozen samples." (50)
E. Cohen and M. Pennington, Woods Hole, MA

9:00 a.m. "Preliminary estimates of secondary production on Georges Bank." (36)
Jack Green, Narragansett, RI

9:20 a.m. "An assessment of the butterfish, Peprilus triacanthus (Peck), off the Northwestern Atlantic Coast." (34)
S. A. Murawski and G. T. Waring, Woods Hole, MA

9:40 a.m. "Selection for growth in the oyster, Crassostrea virginica." (7)
Ellen Losee, Milford, CT

10:00 a.m. "Phytoplankton populations." (37)
Myra S. Cohn, Sandy Hook, NJ

10:20 a.m. Break

10:40 a.m. "Food habits and food resource partitioning by Northwest Atlantic gadiform fishes." (13)
R. W. Langton and R. E. Bowman, Woods Hole, MA

11:00 a.m. "A mechanical method of removing skin from squid." (20)
Vincent G. Ampola, Gloucester, MA

11:20 a.m. " Fish predation on oil-contaminated prey from the region of the Argo Merchant oil spill." (33)
R. E. Bowman and R. W. Langton, Woods Hole, MA

11:40 a.m. "The food habits of tilefish, Lopholatilus chamaeleonticeps." (49)
Stephen Turner, Sandy Hook, NJ

SESSION B - First Floor Meeting Room Swope Building (IYABA Committee Member, Presiding)

8:40 a.m. "Application of bottom-trawl survey data to fish stock assessments." (31)
S. H. Clark, Woods Hole, MA

9:00 a.m. "Studies on reproduction in sharks." (53)
H. Wes Pratt, Narragansett, RI

SESSION B - Continued

9:20 a.m. "The current status of yellowtail flounder stocks." (22)
M. McBride, Woods Hole, MA

9:40 a.m. "The evaluation of a pumped raceway system for bivalve aquaculture." (30)
Ronald Goldberg and Edwin Rhodes, Milford, CT

10:00 a.m. " A comparison of seabed oxygen consumption between Georges Bank and the New York Bight in summer and winter." (45)
William C. Phoel, Sandy Hook, NJ

10:20 a.m. Break

10:40 a.m. "The 1975 yearclass of haddock: Recrudescence or obsolescence?" (29)
R. Livingstone, Jr., Woods Hole, MA

11:00 a.m. "Degrees of development of larval and adult characters in ophichthid eels." (44)
Michael Fahay, Sandy Hook, NJ

11:20 a.m. "The application of hydroacoustic methods for aquatic biomass measurements." (14)
J. M. Crossen, J. B. Suomala, and W. M. DeRusso, Woods Hole, MA

12:00 Lunch - Swope Building

1:00 p.m. Adjournment

(1) A SURVEY OF HEAVY METALS IN SURF CLAMS (SPISULA SOLIDISSIMA) AND OCEAN QUAHOGS (ARCTICA ISLANDICA) OF THE MID-ATLANTIC COAST OF THE UNITED STATES

Douglas Wenzloff
Milford Laboratory

Surf clams and ocean quahogs have emerged in recent years as important species in the clam industry. In a 1974 resource assessment survey of the United States mid-Atlantic coast by the National Marine Fisheries Service, specimens from 135 stations were analyzed for arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver and zinc. Ocean quahogs generally had higher levels of heavy metals than surf clams. Concentrations of arsenic, silver and zinc in surf clams and arsenic, copper and silver in ocean quahogs varied with latitude, decreasing southward from the New York Bight to Cape Hatteras. Concentrations of mercuey were well under the action limit set by the Food and Drug Administration (FDA) for fishery products marketed in the United States.

(2) APPLICATIONS OF REFRIGERATION AND THE FREEZING AND STORAGE OF FOOD

Daniel W. Baker
Gloucester Laboratory

This paper describes the perishable properties of fish and fishery products, the use of proper refrigeration techniques to retard decomposition of these products, and the effective use of ice in the preservation of foods and an introduction to freezing.

The principles of freezing, related to thermodynamics, heat transfer, and thermal conductivity are discussed to illustrate the charges that occur during the change of state involved in the freezing process. The basic refrigeration machine and refrigeration cycle, developments in compression machines, and the absorption system are explained.

The common types of freezers used in industry today and their uses are explained.

An explanation of various refrigerants, their physical properties, and their application to the food industry are dealt with. The time-temperature tolerance evaluation of the freezing and storage of fishery products is related directly to the application of refrigeration in the extended storage of foods.

(3) CURRENT STATUS OF REDFISH STOCK IN THE GULF OF MAINE

WITH SOME OBSERVATIONS ON GROWTH AND DISTRIBUTION

Ralph Mayo
Woods Hole Laboratory

Current trends in redfish abundance indices based on commercial catch and effort data and bottom trawl surveys are considered. Recent and long-term changes in the Gulf of Maine redfish fishery are analyzed for trends in catch per unit of effort, and an assessment of the current status of the stock is presented.

Recent changes in fishing patterns including seasonality and distribution of fishing effort by vessel size and depth are examined and related to current methods of estimating the commercial catch per unit of effort indices.

Redfish age and growth data from bottom trawl surveys in 1975, 1976, and 1977, are analyzed for the presence of dominant year classes and compared to corresponding length frequency distribution.

The inshore - offshore distribution of Gulf of Maine redfish as determined from USA bottom trawl surveys is examined in terms of size composition and growth rates.

(4) ABUNDANCE OF LARVAL LOBSTERS IN BUZZARDS BAY, 1976-77

Fred E. Lux
Woods Hole Laboratory

Sampling for larval lobsters at selected stations in Buzzards Bay was conducted aboard the PHALAROPE with a neuston net in May to August of 1976 and 1977. All four pelagic stages of larvae were caught in considerable numbers. Catches indicated that hatching began in the last half of May, when the bottom temperature had reached about 12.5°C. In 1976, maximum densities recorded were 93 larvae per $1000m^3$, in 1977, densities as high as 266 larvae per $1000m^3$ were sampled. Hatching was about completed by mid-July in both years. Large numbers of third and fourth stage larvae were recorded, particularly in 1977, suggesting that a relatively large proportion of the larvae survived the pelagic phase. A survey of the literature on lobster larval abundance indicated that Buzzards Bay is one of the most productive areas sampled.

(5) RESPONSE OF THE EMBRYOS OF THE AMERICAN OYSTER, CRASSOSTREA VIRGINICA, TO HEAVY METALS IN MULTIFACTORIAL EXPERIMENTS

John R. MacInnes
Milford Laboratory

The response of embryos of the American oyster, Crassostrea virginica, to copper at various salinity-temperature regimes and also to various combinations of two or three metals (copper, mercury, and zinc as the chlorides) at the optimal temperature and salinity regime was studied in the laboratory using response surface methods and factorial analysis. The experimental design in the first series was a 3 x 3 factorial experiment using temperatures of 20, 25, and 30°C, salinities of 17.5, 22.5, and 27.5 0/00, and it was carried out at copper concentrations of 0, 5, 10, and 20 ppb. Statistical analysis indicated that salinity changes had the greatest effect at 0 and 5 ppb copper concentrations, but temperature changes had as great an effect as those of salinity at 10 and 20 ppb copper concentrations. The toxicity of copper was highest at the lowest salinity and temperature tested and was least toxic at the optimal temperature and salinity (25°C and 27.5 0/00). The experimental design for the metal combination study was a 3 x 3 x 3 factorial experiment using copper concentrations of 0, 8, 16 ppb, zinc concentrations of 0, 100, and 200 ppb, and mercury concentrations of 0, 5, and 10 ppb. Less than additive and simple additive effects were observed with two metals in combination but greater than additive effects were observed with three metals in combinations.

(6) THE DENSITY AND DISTRIBUTION OF CENTROPAGES TYPICUS ON GEORGES BANK, FALL 1971-1975

R. Byron and J. Frisella
Narragansett Laboratory

The most dominant of 136 zooplankton taxa collected on five fall groundfish-plankton surveys on Georges Bank during 1971-1975 was Centropages typicus. Changes in the density and distribution of this copepod species is presented in tabular and graphic form.

(7) SELECTION FOR GROWTH IN THE OYSTER, CRASSOSTREA VIRGINICA

Ellen Losee
Milford Laboratory

A long term, multifaceted selection experiment to obtain increased growth rate in the oyster, Crassostrea virginica, is being conducted at the Milford Laboratory. Studies are being done on the genetic composition of growth rate as well as on anticipated and real response to artificial selection. Heritability estimates have been obtained for larval and spat growth rates. The estimates for larval growth rate ranged from .37 to .57. Heritability estimates for spat growth rate measured six weeks post setting averaged .51. These values indicate that selection for growth rate in such oyster larvae and spat would produce positive results. Relationships between larval and spat growth rates are being analyzed. Studies show that larvae that grow fastest and set earliest continue to grow fastest as spat. Likewise, preliminary experiments show that under assortive mating schemes, faster growing adult oysters produce faster growing larvae. These results will be useful in determining the most efficient method of selection for improved growth rate in the oyster.

(8) A STUDY OF HAEMATRACTIDIUM SCOMBRI IN ATLANTIC MACKEREL, SCOMBER SCOMBRUS

Sharon A. MacLean
Oxford Laboratory

The prevalence of Haematractidium scombri, and intraerythrocytic protozoan, was studied over a three-year period in adult mackerel, Scomber scombrus, from Chincoteague, Virginia. H. scombri was found each year in blood smear preparations of adult mackerel. In 1974, 25%, in 1975, 42%, and in 1976, 45.3% of the fish sampled were infected. Mackerel weighing less than 0.75 lb. were more frequently infected than fish weighing more than 0.75 lb. Parasitemias scored light, moderate, and heavy showed fish weighing less than 0.75 lb. also had the greatest number of heavy infections. H. scombri was not found in blood smears of 14 juvenile mackerel sampled one summer from Montauk, L.I., although another dissimilar organism was observed. H. scombri was found in adult mackerel collected one winter from the Gulf of Maine.

No pathological condition was apparent in infected hosts and with further study this parasite may prove useful in identifying mackerel stocks.

(9) CULTURE OF UNICELLULAR MARINE ALGAE ON PAPER SUBSTRATES

JoEllen Baird
Milford Laboratory

Utilization of paper as a solid substrate for cultivation of axenic strains of marine unicellular algae is being explored in further detail. Twenty-two algal species are routinely subcultured and grown at 20°C on Millipore Filter discs. A regime for growth of organisms at 20°C and subsequent storage at 4°C is being investigated. Fifty-four percent of the algal strains proved viable after eight to nine months in cold storage; one species, after 13 months.

In previous experiments various paper substrates were compared in a test tube strip method. On certain papers, three motile species (Platymonas sp., Tetraselmis maculata, and Dunaliella euchlora) showed a strong positive taxis to the edge of the paper strip near the capped end of the test tube. This phenomenon will be discussed.

Maintenance of pure cultures on paper substrates has several advantages over the traditional culturing methods in broth or on agar media. The technique is simple, inexpensive and favors long-term storage. The method can also be utilized to assay growth-promoting and inhibiting substances.

(10) WHAT THE HECK IS IT? (FOCAL NECROSIS IN THE PACIFIC OYSTER, CRASSOSTREA GIGAS)

Frederick G. Kern
Oxford Laboratory

Fixed paraffin embedded tissues of a Pacific oyster, Crassostrea gigas, were deparaffinized and selected tissues were processed for examination with the electron microscope. The oyster had been diagnosed as having a bacterial disease "focal necrosis." The disease caused by gram positive, acid fast bacteria has never been characterized taxonomically. Ultrastructurally, the procaryotic cells measured .5 by 3 μm, were pleomorphic, had evidence of a crystaloid structure, and an electron dense body was usually present. It is hoped that these ultrastructural characteristics may aid in future attempts to identify this oyster pathogen.

(11) CONVENTIONAL AND EXPERIMENTAL APPROACHES TO HYBRIDIZATION AND INBREEDING RESEARCH IN THE OYSTER

Sheila Stiles
Milford Laboratory

Twelve crosses of foundation stock in the commercial American oyster (Crassostrea virginica) were successfully made to establish traditional full-sib lines for studying inbreeding effects over several generations and ultimately for test-crossing with one another. Experimental manipulation of oyster eggs and cleavages is being used to support such conventional research on inbreeding and hybridization. In an experimental approach to producint inbreds some parthenogenesis was observed in eggs stimulated with spawned oyster sperm that had been X-irradiated at doses ranging from 10,000 to 225,000 R. Geographic and interspecific hybrid crosses with C. virginica have been made. The performance of hybrid larvae stressed with abnormally high and low temperatures was tested. There was better survival and growth of C. virginica geographic hybrids than of interspecific hybrids with C. gigas. Overall, however, there was better survival and growth of local controls in both experimental hybrid crosses and hybrid crosses made specifically for testing the response of larvae to stress. Cytogenetic data suggested rather normal fertilization and meiosis in these hybrid crosses. The feasibility of controlling mass fertilization by temporarily inhibiting fertilization in spawning groups intended for hybridization was investigated using EDTA. The great fecundity and external fertilization of the oyster lend such an invertebrate as this to experimental approaches which can influence the outcome of otherwise difficult-to-achieve crosses.

(12) PREPARATION OF SQUID FOR HOME CONSUMPTION

Mary Ann Perry
Gloucester Laboratory

While squid has enjoyed many years of popularity with Europeans, U. S. consumers are just becoming aware of the value of squid as a food source. It is high in protein and phosphorus and contains traces of iron and calcium. Acceptance of squid would be enhanced if consumers were educated in the cleaning of squid.

(13) FOOD HABITS AND FOOD RESOURCE PARTITIONING

Richard W. Langton and Ray E. Bowman
Woods Hole Laboratory

The food habits of 15 species of gadiform fishes occurring in the Northwest Atlantic, from Cape Hatteras, N. C. to Nova Scotia, have been investigated for the years 1969-1972. The data is presented for each species, as a summary for the entire Northwest Atlantic, and is then divided into five broad ecological areas viz. Middle Atlantic, Southern New England, Georges Bank, Gulf of Maine and Western Nova Scotia. Sexual, seasonal and yearly differences in the food habits for each species of fish are also considered.

The percent similarity between the diets of the 15 species of fish was calculated. It was shown that the Atlantic cod, pollock, silver hake, white hake, offshore hake, and cusk had reasonably similar diets, being primarily piscivorous. The red and spotted hake also had similar diets and were identified as mixed feeders, preying on both fish and invertebrates. The final seven species, haddock, longfin hake, fourbeard rockling, marlin-spike, longnose grenadier, fawn cusk-eel and ocean pout preyed almost exclusively on invertebrates. The major prey of each species was identified and is discussed in relation to resource partitioning between species.

(14) THE APPLICATION OF HYDROACOUSTIC METHODS FOR AQUATIC BIOMASS MEASUREMENTS

J. M. Crossen, J. B. Swomsla and W. M. DeRusso
Woods Hole Laboratory

The objectives and methodology of the NEFC-CSDL cooperative hydroacoustic program are reviewed. The basic program objective is to develop hydroacoustic equipment and techniques enabling the reliable estimation of fish density and numbers for assessment purposes.

The scattering characteristics, or coefficient, of fish is of crucial importance in any application of hydroacoustical methods for aquatic biomass estimations. To date few research activities have directly related the behavioral characteristics of insonified fish in their natural environment to the resulting determination of the scattering coefficient. As a consequence, there is little useful information concerning the validity of the physical scattering models to the true environment.

The results of an experiment designed to obtain hydroacoustical backscattering data from fishes with simultaneous observations via video monitors and diver scientists are discussed.

(15) OBSERVATIONS OF THE SEA SCALLOP (PLACOPECTEN MAGELLANICUS), THE COELENTERATE (CERIANTHUS BOREALIS) AND THE HAGFISH (MYXINE GLUTINOSA) FROM THE NEKTON GAMMA DURING JUNE 1976

Henry W. Jensen
Woods Hole Laboratory

This 10-minute video-tape with narration was taken by myself in the western Gulf of Maine area, while a participant in the June 1976 Atlantic Twin-Nekton Gamma Cruise, NOAA Interagency Submersible Program of the MUST Office. The feeding related activity of the sea scallop, cerianthus and the hagfish was documented. The behavior of a few transient animals can also be observed. The use of current and substrate for the orientation of each animal is evident. The sea scallop is sitting in a depression and is siphoning with its intake end pointed into the current. The ingestion of plankton can be seen. The cerianthus within its tube (both without apparent structural strength when retrieved by a dredge or trawl) is rigidly upright with its tentacles protruding and focused like a radio antenna toward the current, perhaps tuned by a sense we are not aware of. It is well anchored as proven by the submarine being only pulled closer as its mechanical arm attempts to dislodge it. The cerianthus is smashed in the process; bringing in the next subject. The hagfish evidently tasted the smashed cerianthus and has chosen an underground route for the meal which when considered is the only safe place for a small eyeless predator when the taste of food is in the water.

(16) GEORGES BANK HADDOCK - PAST, PRESENT, AND FUTURE

Stephen H. Clark
Woods Hole Laboratory

A history of the fishery, and historical trends in stock abundance, are reviewed. A current assessment of the stock is given and the capacity of the stock to rebuild is considered in light of what we know relative to stock recruitment relationships and environmental factors affecting yearclass size. Past and current management objectives and strategies are considered and new ones presented which could contribute to stock rebuilding.

(17) ULTRASTRUCTURAL STUDIES ON BACTERIAL PHAGOCYTOSIS IN PSEUDOPLEURONECTES AMERICANUS: AN EXPERIMENTAL APPROACH

Joel E. Bodammer and Richard A. Robohm
Oxford and Milford Laboratories

As students interested in piscine hematology are well aware, there is presently little known of the functions of leukocytes in most fish species. In an attempt to assess the phagocytic capability of leukocytes of winter flounder (Pseudopleuronectes americanus), we introduced Bacillus cereus, suspended in sterile saline or tissue culture medium, into the peritoneum of experimental animals and recovered their blood cells by peritoneal lavage after varying time periods (i.e. 30-180 minutes). Fine structural observations on the leukocytes found in the peritoneal fluid indicate that granulocytes were very proficient in their uptake and destruction of bacteria. Details regarding the time-dependent sequence of events in the phagocytic process will be presented.

(18) MARINE INVERTEBRATE VIROLOGY AS A KEY TO THE PHYLOGENY OF THE VIRUSES

C. Austin Farley
Oxford Laboratory

Virus diseases have only been known to occur in marine invertebrates since 1971. Since then, viruses representing at least fourteen families have been described from protists, platyhelminths, mollusks, annelids, and crustaceans. In addition to these new marine hosts, bacterial viruses are known from at least three major groups of marine prokaryotes. All but one of the groups from marine organisms can be placed (on the basis of development and morphology) into well-defined families previously thought to be of vertebrate origin; the one exception is an exclusive arthropod family.

This information forms the basis for the theory that viruses originated in the marine prokaryotes and diversified into the modern families during the period when evolution of the invertebrate phyla was occurring in the sea. These families have shown remarkable stability since that time with few exclusively vertebrate groups in existence.

Information concerning biochemistry, development, morphology and host has been assembled for all of the described groups of viruses found in prokaryotes, plants, marine invertebrates, insects, and vertebrates. Using the accepted evolutionary scheme for living organisms a tentative phylogeny of the viruses has been developed which attempts to correlate sequential development of primitive characteristics with the evolution of hosts.

(19) SPRING AND FALL SEA SURFACE TEMPERATURE AND SALINITY ON THE NORTHEASTERN CONTINENTAL SHELF: CAPE HATTERAS TO CAPE SABLE, 1972-1977

R. J. Pawlowski, W. R. Wright and S. R. Nickerson
Woods Hole Laboratory

Twenty-four charts drawn from the National Marine Fisheries Service (NMFS) groundfish survey data depict spring and fall sea surface temperature and salinity conditions on the northeastern United States continental shelf, Cape Hatteras to Cape Sable, for the years 1972 through 1977. The general temperature and salinity distribution are described, including regions of maxima, minima and sharp gradients. Areas of river runoff, Scotian Shelf inflow and Slope Water intrusions are noted, along with localized effects from such events. Spring flow from the Scotian Shelf into the Gulf of Maine and southwesterly across the Northeast Channel to the Northeast Peak and into the Shelf-Slope Front appeared common characteristics. Shelf-edge and Slope Water intrusions occurred in both the Middle Atlantic Bight and Gulf of Maine during the study period. Other than these patterns, the distribution and range of both temperature and salinity appear similar to the original findings when the area was first intensively studied a half century earlier.

(20) A MECHANICAL METHOD OF REMOVING SKIN FROM SQUID

Vincent G. Ampola
Gloucester Laboratory

The objective of this work was to devise a method of skinning squid in the round. Optimal hot water dip temperature and time required to loosen the skin was determined using a prototype washing machine with its internal vanes and periphery lined with rough metal mesh. The amount of skin removed by abrasion within 15 minutes of agitation was determined. Using the same blanch time and temperature, skin was removed using a modified rotary fish scaler lined with the same metal. Percentage skin removal for thawed Illex illecebrosus heated to 150°- 170°F for 15-30 seconds and tumbled for 30 minutes was about 95-99 percent. Unblanched Loligo pealei tumbled for 10 minutes attained 99 percent skin removal, but there was considerable fin damage.

(21) SIZE SELECTION OF GROUNDFISH BY OTTER TRAWL

R. J. Smolowitz
Woods Hole Laboratory

The first of four mesh selectivity experiments to assess the effect of an increase in cod end mesh size in the New England groundfish fishery on present and future catches was conducted in December 1977 using the commercial fishing vessels, Frances Elizabeth and Christopher Andrew in inshore water off Scituate, Massachusetts. Three four-tow series using 106 mm and 139 mm cod ends (covered and uncovered) were accomplished by both vessels towing in the same area simultaneously during daylight hours.

Data on catch composition of the two cod ends with respect to yellowtail flounder and cod are presented, as well as selection curves for both species. These results are related to past ICNAF and ICES selectivity experiments with these groundfish species.

Mesh regulation management measures are currently in effect for cod, haddock, and yellowtail flounder. The results of this first mesh selectivity experiment imply that several unresolved management issues relative to mesh selection currently exist. These issues are enumerated and discussed.

(22) THE CURRENT STATUS OF YELLOWTAIL FLOUNDER STOCKS

M. McBride
Woods Hole Laboratory

The most recent available commercial catch and effort data for Southern New England, Georges Bank, and Cape Cod fishing grounds, and autumn bottom trawl survey data for Southern New England, Georges Bank, and Mid Atlantic areas both indicate a level of relative abundance of all age yellowtail that is the lowest observed since the 1950's. The total allowable catch for grounds E of 69° (Georges Bank) and W of 69° (Southern New England and Cape Cod) have been reduced by the New England Regional Fishery Management Council from 10,000 to 4,400 tons and from 4,000 to 3,700 tons respectively. These regulations essentially reduce the yellowtail fishery to the level of by-catch only. The allowable catch east of 69° is expected to generate a fishing mortality appropriate to maximize yield per recruit (Fmax). For the area west of 69°, the allowable catch corresponds to a fishing mortality of Fmax on the Southern New England ground and a catch approximately equal to the maximum sustainable yield for the Cape Cod ground.

I will discuss the most recent updates of time series data and how they were considered in determining the catch quotas of yellowtail flounder along the Northeast coast of the U.S.

(23) AN INVESTIGATION OF PREDATION PATTERNS OF CHAETOGNATHS FROM ALBATROSS IV Cruise No. 74-11

Jerome Prezioso
Narragansett Laboratory

The position of chaetognaths on the third trophic level places them as predators of larval fish, and more importantly, as competitors with larval fish for food. The fact that chaetognaths can, at certain times of the year, bloom until they dominate the plankton, points out that they exert a tremendous influence by virtue of their sheer numbers.

Two areas of predation are examined in this study:

1. Prey selection is investigated by comparing chaetognath gut contents with available prey.

2. Incidence of feeding is examined by comparing ratio of empty guts to food-containing guts.

(24) BIOCHEMICAL STUDIES OF LARVAL FISH DEVELOPMENT

L. Buckley
Narragansett Laboratory

Eggs and larvae of winter flounder (Pseudopleuronectes americanus) and cod (Gadus morhua) were analyzed for RNA, DNA and protein content from spawning through metamorphosis. Changes in the concentration of these biomolecules were related to age, stage of development, condition, ration level and growth rate. The larger cod eggs had a higher nucleic acid and protein content than the smaller winter flounder eggs. The percent increase in DNA content from fertilization to hatching was higher in winter flounder than cod, while the percent increase in RNA content was higher in cod. The protein content of both species showed little change prior to hatching. In both cod and winter flounder larvae the pattern of RNA accumulation or loss was very similar to that of protein. The RNA/DNA ratios of larval winter flounder and cod were very sensitive to changes in ration level and may be useful for diagnosis of the starving condition and prediction of larval growth and survival.

A study of the DNA, RNA and protein content of eggs and larvae from adult winter flounder exposed to two concentrations of petroleum hydrocarbons will also be described.

(25) FOOD STUDIES IN APEX PREDATORS

Chuck Stillwell
Narragansett Laboratory

An understanding of the trophodynamics of apex predators has been slow in coming, primarily because of the difficulty of obtaining large specimens for examination. Food studies of large sharks, swordfish, and other apex predators at the Narragansett Laboratory are directed to examining stomachs from samples obtained during longline research cruises and at tournaments along the northeast coast. Results of these studies are discussed for the several species of apex predators.

(26) ICHTHYOPLANKTON AND ZOOPLANKTON DATA PROCESSING WITHIN THE MARINE ECOSYSTEMS DIVISION

David T. Bearse and Thomas J. Plichta
Narragansett Laboratory

Flow diagrams will depict the following:

1. Sample and data flow within the NEFC
2. Data Processing System--data entry, quality control, storage and retrieval

Standardized computer outputs will be provided for demonstration of system capabilities including:

1. Station Activity Summary
2. Net Tow Data
3. Station Position Plot
4. Cruise Track
5. Larval Fish/Zooplankton Density Table
6. Larval Fish/Zooplankton Density Plots

(27) REVIEW OF MANAGEMENT OF THE SQUID (LOLIGO AND ILLEX) STOCKS IN THE NORTHWEST ATLANTIC

Anne M. T. Lange
Woods Hole Laboratory

The two species of squid, found in commercial quantities in the Northwest Atlantic, Loligo pealei and Illex illecebrosus, range generally from Cape Hatteras to the Gulf of Maine and to Newfoundland, respectively. They are shortlived species (averaging 1 to 2 years) probably suffering high post spawning mortality after significant spring inshore (Loligo) and full offshore (Illex) spawning migrations. Squid are important both as predators and as prey of the Northwest Atlantic continental shelf ecosystem.

The squid fishery has become of increasing importance in recent years and as a result, population studies are underway. These studies include analysis of: squid catches in research surveys; catch and effort data from directed squid fisheries; catches of squid from other directed fisheries; collection of biological data such as length-frequencies (commercial and research), length-weight data, sex and maturity information and data on feeding interactions.

To date regulation of the fishery on these stocks has been by the catch limitation method. Where the data base has been inadequate to develop a rigorous scientific justification for catch limits, precautionary regulations have been established to protect the stocks from overfishing while allowing gradual development of the fishery. Improvement of understanding of these stocks and of the fishery will perhaps indicate the need of alternative methods of stock management. Several alternative approaches in management were discussed at the 1978 Special ICNAF STACRES Meeting on Illex in Subarea 3 and 4. The results of this meeting are reviewed in this paper.

(28) THE STATUS OF THE THREE SILVER HAKE STOCKS OFF THE NORTHEAST COAST OF THE US

Frank Almeida
Woods Hole Laboratory

A general description of the biology of Silver Hake including stock identity, early life history, and age and growth is presented. Assessments of the stocks populating the Southern New England- Middle Atlantic, Georges Bank, and Gulf of Maine regions are presented and reviewed. The data base for these stocks includes commercial catch statistics, both USA and foreign, estimated USA recreational catch statistics, and USA spring and autumn bottom trawl survey data from 1963-1977. Estimates of stock size, fishing mortality and recruitment, with projections for catch options in 1978 and the resulting stock sizes in 1979 are also given.

(29) THE 1975 YEARCLASS OF HADDOCK: RECRUDESENCE OR OBSOLESCENCE

R. Livingstone, Jr.
Woods Hole Laboratory

The author presents data on the reproductive condition of the year classes that produced the 1975 yearclass. He then traces the development of the 1975 yearclass and its entry into the commercial fishery and into the spawning population. Finally he questions current management practices which allow unrestricted fishing on the sexually immature components of the stock.

(30) EVALUATION OF A PUMPED RACEWAY SYSTEM FOR BIVALVE AQUACULTURE

Ronald Goldberg and Edwin Rhodes
Milford Laboratory

A land-based pumped raceway system has been in operation for two growing seasons. Seawater is pumped at 50-60ℓ/min. to 10m x 1.3m x 1.0m fiberglass tanks. In vivo fluorescence of seawater has been measured on a daily basis and the yearly profile has revealed distinct seasonal trends. There is a linear relationship between in vivo fluorescence and chlorophyll-a content of seawater measured by the standard spectrophotometric method. Fluorometry has proven to be an excellent indicator of ambient phytoplankton levels, the main source of nutrition to bivalves.

Spisula solidissima have been raised in the system to a potentially marketable size of 55mm in one growing season. Growth of surf clams larger than 20mm is greatly enhanced by rearing them in a sand substrate. The growth rates of 4 size classes of surf clams have been found to be highly correlated with ambient levels of fluorescence.

The raceway system is an efficient method for growing laboratory reared Argopecten irradians juveniles to planting size. Scallop growth in the system is correlated with chlorophyll-a levels, flow rate, stocking density and total stocking biomass. Available food, as measured by chlorophyll-a is the single most important factor influencing scallop growth.

Preliminary economic analysis of the system indicates that operating costs would not be prohibitive in producing seed sized bay scallops or cherrystone sized surf clams.

(31) APPLICATION OF BOTTOM-TRAWL SURVEY DATA TO FISH STOCK ASSESSMENTS

Stephen H. Clark
Woods Hole Laboratory

Applications of bottom-trawl survey data to fish stock assessment work are reviewed. Techniques developed at NEFC to estimate recruitment, total biomass, fishing mortality, and other parameters based on bottom trawl survey data are presented and evaluated using examples from past and current assessments. The potential application of these techniques to other stocks is also considered.

(32) THE INTERNATIONAL HERRING TAGGING PROGRAM

Gordon T. Waring and Thurston Burns
Woods Hole Laboratory

Historically NW Atlantic Herring Stocks in (ICNAF Subarea 4 and 5), have been managed as separate fisheries in Chedabucto Bay, [Division 4w(a)], off Nova Scotia [Division 4xw (b)], in the Gulf of Maine (Division 5y), and Georges Bank south to Cape Hatteras (Division 5z and Statistical Area 6), although stock boundaries have never been well defined. The Division 5y and Division 4xb juvenile fisheries were not under regulation via ICNAF.

Canadian tagging studies in 1974-75 have shown a relationship between herring exploited in Division 4w(a) during winter and in the Division 4wx during summer. Therefore fisheries in these areas are now managed as a single stock.

A joint international herring tagging program, was set up under the auspices of ICNAF in 1976. The objectives were to determine the inter-relationships between spawning, feeding, and overwintering stocks in Sub-area 4 and 5.

Tagging operations were carried out using the procedures developed in Canada as previously reported to ICNAF. In the offshore areas, herring for tagging were collected by purse seines. In the inshore areas, herring for tagging were obtained from purse seines, block seines, or weirs.

Preliminary results indicate intermixing between overwintering fish in Division 5y and 5z, and herring populations exploited during summer in Division 4x.

(33) FISH PREDATION ON OIL-CONTAMINATED PREY FROM THE REGION OF THE ARGO MERCHANT OIL SPILL

Ray E. Bowman and Richard W. Langton
Woods Hole Laboratory

The stomach contents of 21 species of fish and squid were analyzed to determine the potential impact of ARGO MERCHANT oil on the fish stocks in the Northwest Atlantic. Important prey groups found in the stomachs of predators sampled in the region of the oil spill included amphipods, polychaete worms, rock crabs, and American sand lance. The quantities and types of foods eaten by each predator were similar to data previously collected. Amphipods covered with oil were found in the stomachs of Atlantic cod and little skate. Although no oil was found in their stomachs, American sand lance were found to feed on the same genera of copepods previously noted to be contaminated with ARGO MERCHANT oil. Predator-prey relationships showed that 81 percent of the predators that were represented ate amphipods and 43 percent ate American sand lance, thus establishing two potential pathways for the oil to have been passed on to the higher trophic levels.

(34) AN ASSESSMENT OF THE BUTTERFISH, PEPRILUS TRIANCANTHUS (PECK), OFF THE NORTHWEST ATLANTIC COAST

Steven A. Murawski and Gordon T. Waring
Woods Hole Laboratory

Reported landings of butterfish, Peprilus triacanthus (Peck), off the Northwest Atlantic coast increased from 3,209 MT in 1964 to a peak of 19,454 MT in 1973. Most of the catch during this period was taken by Japan, USSR, Poland, and the USA. Unreported butterfish by-catch in the Loligo fisheries of several foreign nations, particularly Spain and Italy, were probably significant additional sources of mortality. Available scientific evidence indicates that during the period 1968-1976, fishing mortality rates increased with the landings, while mean weight of individuals in the exploitable population and average age at capture decreased. Exploitation rates (E) during 1972-1975 ranged from 0.35-0.42. Yield per recruit studies (M=0.8) suggest that E_{max} and $E_{0.1}$ values are 0.37 and 0.27 for a 30 mm mesh net, and 0.55 and 0.36 for a 60 mm one. Mean weights of fish in the catch, at $E_{0.1}$, would be 66.42% greater for the larger net (92.23 g), than for the smaller mesh (55.42 g). Catches resulting from the average annual recruitment of 1138.5×10^6 fish are 14,540 MT (30 mm mesh) and 18,945 MT (60 mm mesh), assuming $E_{0.1}$.

(35) PROTOZOA ASSOCIATED WITH HATCHERY OPERATIONS; FREE-LIVING AND PARASITIC

Thomas K. Sawyer
Oxford Laboratory

Protozoa have been suspected, and sometimes positively identified, as having a major role in disease or stress in animals that are maintained or reared in hatchery operations. Stalked or sessile ciliates usually are not recogized as primary causes of morbidity or mortality, but their presence in large numbers of affected hosts serves as an indication that bacterial food organisms may be present in undesirably large numbers. Recent studies at the University of Delaware have provided new data which suggest that high ciliate populations may be used as indicators of approaching high bacterial loads in tanks and holding trays. Other studies have shown that bactivorous amoebae examined in drops of medium from algal cultures may indicate a potential "crash" of stock cultures. Tissue-eating (histophagous) ciliates were recognized several decades ago as having a major role as indicators of mortality in cultures of larval mollusks. Recent studies have shown that free-living amoebae may feed upon bacteria associated with excessive mucous secretion by gills of stressed fish. A new study is now in progress to identify amoebae associated with whitish cysts on livers and spleens of hatchery-reared trout. A summary of the present status of protozoa as indicators of the condition of aquaculture systems, and as disease entities in laboratory-reared animals will be discussed and illustrated.

(36) PRELIMINARY ESTIMATES OF SECONDARY PRODUCTION ON GEORGES BANK

John R. Green
Narragansett Laboratory

An estimate of the productivity of Calanus finmarchicus on Georges Bank was made on plankton data collected in the spring of 1940. This data although not ideally suited to this type of analysis did provide a preliminary estimate of the productivity of a major component of the zooplankton community. C. finmarchicus and Pseudocalanus minutus were the dominant species on all cruises. C. finmarchicus was most numerous around the periphery of the Bank while P. minutus was most abundant over the central portion. Plots of the distributions of both species indicate that neither population was encompassed completely by the sampling grid. Productivity was measured by a method similar to that described by Winberg et al. (1971) for populations in continuous reproduction. The total production of C. finmarchicus for the approximately 100 day period in spring was 79.46 mg C/m^2 per day. Due to the extrusion of smaller stages through the meshes of the sampling gear used, this estimate does not include naupliar stages and probably does not fully represent the contribution of the smallest copepodite stages.

(37) PHYTOPLANKTON POPULATIONS

Myra S. Cohn
Sandy Hook Laboratory

A taxonomic study of phytoplankton in Lower New York Bay and adjacent New Jersey estuarine and coastal areas was conducted over a two year period. Although phytoplankton populations can be estimated by techniques based on such common properties as carbon or chlorophyll content, painstaking taxonomic evaluation is essential to an understanding of species composition, community dynamics, natural behavior and environmental quality. Intensive sampling was a feature of the study; it was performed at least weekly during the warmer months and biweekly in winter. 334 species were identified in the area. Diatoms, many small, comprise slightly over half (54%) of the number of species and 15.7% of total cell numbers. Microflagellates, covering seven separate classes, compose 44% of total species and about 33% of cell numbers. Small, non-motile chlorophytes make up only 3% of species, but are the most numerous organisms in the survey area.

These findings represent a data base against which man's impact upon his environment may be determined. The development of microflagellates and small diatoms in relation to pollution is discussed, as is the effect of changes in phytoplankton populations on the food chain and possible reduction in fish harvest available for human consumption.

(38) ATLANTIC MACKEREL AND YELLOWTAIL FLOUNDER EGG PRODUCTION

SPAWNING POPULATION ESTIMATES FOR 1977

Peter Berrien
Sandy Hook Laboratory

A series of six plankton surveys, conducted from March to June 1977 between the Gulf of Maine and Cape Hatteras, provides the samples used in making estimates of egg and spawning populations for Atlantic mackerel and yellowtail flounder. Results of these surveys will be presented at a later date, for the sorting, identifying and staging of eggs is still going on. Basic concepts, procedures and sources of error in such estimates are discussed.

(39) PHYTOFLAGELLATE BLOOMS IN THE NEW YORK BIGHT

John B. Mahoney
Sandy Hook Laboratory

A phytoplankton bloom results from an interaction of factors including presence of a seed population, adequate nutrient supply, and favorable light and temperature regimes. After a bloom has begun, hydrological and meteorological conditions strongly influence its fate. A minority of the occurrences are toxic. Both toxic and non-toxic varieties can cause detrimental effects such as mortalities of marine life, harm to public health and economic loss to fishing, tourist, and recreational industries. Most of the phytoplankton blooms in the New York Bight were apparently harmless but some had adverse effects on biological and recreational resources. In the Bight apex, annual episodes in Lower New York Bay and New Jersey northern coastal waters have caused fish kills and have diminished the recreational value of these waters. A massive kill of marine animals in a large area of the Bight in 1976, associated with a bloom, was the largest such event documented in the region. Smaller episodes were also observed in recent years. Evidence from various studies suggests that dinoflagellate blooms in coastal waters are associated with the introduction of organic compounds from the land. Large quantities of organic material, in treated and untreated wastes, are discharged into the New York estuary. At the Sandy Hook Laboratory, tests were made of the ability of three phytoplankters dominant in local blooms to grow with organic carbon, nitrogen and phosphorus compounds. To enhance environmental relevance, these tests incorporated "natural" nutrient levels. The wide use by the three phytoplankters of the organic nutrients supports an association between their blooms and the hypertrophication of local waters.

(40) PHYTOPLANKTON BASELINE STUDY FROM CAPE HATTERAS TO NOVA SCOTIA

Christine Evans
Sandy Hook Laboratory

The Phytoplankton Baseline Study (PBS) is a new study covering an area from Cape Hatteras to Nova Scotia. This study is designed to investigate the distribution of phytoplankton biomass, size composition (net and nannoplankton) and their physiological health.

Contour maps will be presented showing surface distributions of total chlorophyll _a_ and total phaeophytin over this range. Vertical plots of chlorophyll _a_ will also be presented.

Time periods included three cruises which were done in conjunction with the MARMAP Program. They are October to November 1977. November to December 1977, and February to March 1978.

Preliminary results will be presented.

(41) WATER COLUMN RESPIRATION IN THE NEW YORK BIGHT AND GEORGES BANK

Craig N. Robertson
Sandy Hook Laboratory

Water column respiration was measured during the periods of 16 March to 1 April, 1977 and 22 June to 13 July, 1977 for both the New York Bight and Georges Bank. Whole water unconcentrated samples were collected in 300 ml BOD bottles from 5 to 9 depths at each station using Niskin bottles. These were then incubated for 12 to 48 hours at $\pm$ 1°C of in situ temperature and respiration rates were calculated based on measurement of a change in oxygen concentration during incubation using the modified Winkler technique. The range of oxygen consumption rates for the New York Bight and Georges Bank respectively were 0.08 to 34.16 ml $O_2m^{-3}h^{-1}$(0.04 to 18.31mg $Cm^{-3}h^{-4}$) and 0.13 to 35.52ml $O_2m^{-3}h^{-1}$ (0.07 to 19.04 mg $Cm^{-3}h^{-1}$) for March-April, 1977 and 0.08 to 69.52 ml $O_2m^{-3}h^{-1}$(0.04 to 37.26mg $Cm^{-3}h^{-1}$) and 0.04 to 14.66ml $O_2m^{-3}h^{-1}$ (0.02 to 7.86mg $Cm^{-3}h^{-1}$) for June-July, 1977. Maximum values of carbon respired in the New York Bight and Georges Bank respectively were 6.62g $Cm^{-2}d^{-1}$ and 12.61g $Cm^{-2}d^{-1}$ for March-April and 6.44g$Cm^{-2}d^{-1}$ and 5.97g$Cm^{-2}d^{-1}$ for June-July. Respiration in the New York Bight appears to be influenced by the Hudson-Raritan estuary with respiration rates tending to be higher in the Apex and along the New Jersey shore while decreasing seaward and southward. Georges Bank exhibited more homogeneity with highest rates tending to be over the central and southeastern portions during March-April and being largely confined to the central areas during June-July. In general, respiration rates for the near shore and central New York Bight and for Georges Bank are very similar during the early spring while during the early summer, rates measured in the New York Bight Apex and central areas were significantly higher than those found over the central regions of Georges Bank.

(42) SELECTED ASPECTS OF PARTY AND CHARTER BOAT FISHERIES

Darryl J. Christensen
Sandy Hook Laboratory

Between July 1975 and June 1977 over 22,000 fishermen participating on 3,300 charter or party boat trips were interviewed in the field along the coast of New Jersey. Data collected included fishing location, fishing method, trip length, and numbers, lengths and weights of fish caught. The significance of party and charter boat fisheries and preliminary results of the data are discussed.

(43) A SERCHUK SEA SAMPLING SAGA: COD, SCROD, DISCARDS, DIE-HARDS, AND TRY-HARDS IN THE NEW ENGLAND GROUNDFISH FISHERY

F. M. Serchuk
Woods Hole Laboratory

Sea sampling aboard the commercial groundfish fishing vessel M/V Tremont was accomplished during a fishing trip on Georges Bank, 16-19 December. Scientific participation was facilitated through an invitation made by Thomas A. Norris, Vice-Chairman of the New England Regional Fishery Management Council at a special council meeting arranged by Congressman Michael Harrington with Dr. Richard Frank and Robert Schoning, held 21 November 1977. The intent of the sea sampling initiative was to obtain biological data on cod and haddock, directly at sea, from the groundfish fleet itself.

The M/V Tremont sea sampling activities included length-frequency analysis of the catch, and maturity observations on scrod-cod and scrod-haddock. Additional data was obtained on catch/effort, fishing patterns, and log book reporting accuracy. The impact of management regulations on fishing practices for cod and haddock was also assessed.

Biological data on size composition and maturity of cod and haddock compared well with similar data derived from the autumn 1977 NEFC research bottom trawl survey on Georges Bank.

An appraisal of groundfish fishing patterns indicated that some management procedures were either ineffective due to non-compliance, or inappropriate due to the nature of fishing operations.

(44) DEGREES OF DEVELOPMENT OF LARVAL AND ADULT CHARACTERS IN OPHICHTHID EELS

Michael Fahey
Sandy Hook Laboratory

Certain characters in larval ophichthid eels are developed to varying degrees in representatives of seven genera. Further, these characters are progressively more or less developed as one examines these genera. The progression of these larval characters is in synchrony with a progression of a different set of characters in adults of the same genera. Thus, it should be possible to predict the appearance of undescribed leptocephali based on character in the adults.

(45) A COMPARISON OF SEABED OXYGEN CONSUMPTION BETWEEN GEORGES BANK AND THE NEW YORK BIGHT IN SUMMER AND WINTER

William C. Phoel
Sandy Hook Laboratory

Seabed oxygen consumption values in ml $O_2/m^2/hr$ were obtained from the New York Bight and Georges Bank in March and July, 1977 utilizing the Pamatmat multiple cover technique. Preliminary analyses of these data indicate Georges Bank to be basically homogeneous with regard to seabed metabolism. Only two stations on Georges Bank maintained oxygen consumption rates above 10 $ml/m^2/hr$ within the ambient temperature range of 5.0° to 13.0°C. The New York Bight was vastly more heterogeneous, with oxygen consumption rates varying from 88.42 to 4.5, 41.98 to 7.0 and 43.5 to 4.0$ml/m^2/hr$ at 2.5°C, 9.0°C and 13.5°C respecively. The marked heterogeneity of the New York Bight Apex is a clear indication of man's impact on this ecosystem. The data are less heterogeneous in the offshore, less affected areas of the Bight. These offshore data, are for the most part, similar in value to those obtained from Georges Bank. By utilizing cores devoid of macrobenthos, work is continuing toward estimating the combined meiobenthic and microbenthic metabolism in these areas.

(46) SULFIDE AND OTHER CHEMICAL OBSERVATIONS DURING THE 1976 DYSAEROBIA IN THE NEW YORK BIGHT

A. F. Draxler
Sandy Hook Laboratory

Analyses of chemical data from the New York Bight during a summer when dissolved oxygen concentrations below the thermocline were greatly reduced show that approximately four times more nutrient material was mineralized than there was dissolved oxygen available to accomplish this. A possible explanation is discussed.

(47) FISHERY DEVELOPMENT

J. P. Lane
Gloucester Laboratory

One of the adversities of the management of marine species to insure their future availability to man is the necessity to restrict the harvesting of any species when it becomes evident that there is a danger of depleting it. Such a restriction creates unemployment problems as well as a shortage of seafoods at the marketplace. The ability to divert harvesting effort to an underutilized species solves the problems created by necessary restrictions required for effective management of the resource. However, successful fishery development requires the integrated effort of a number of important elements, and a recent study that was successful except for its fishery development aspect supports this thesis.

(48) A BENT FIN RAY CONDITION OF WINTER FLOUNDER FROM THE INNER NEW YORK BIGHT

John J. Ziskowski
Sandy Hook Laboratory

Data are presented on a previously undescribed pathological condition discovered on winter flounder. This skeletal anomaly appears primarily on winter flounder in the Raritan Bay vicinity and has been observed in this area since 1972. Prevalence data collected in 1976 on approximately 3000 fish are presented along with fin rot data from fish captured in the same trawl hauls.

Aside from the obvious external fin distortions, the flounder with bent fin ray condition exhibit various concommitant abberations of the axial skeleton as compared to a control sample of normal-appearing fish.

Speculations are given of the etiology and the significance of the condition to winter flounder populations.

(49) THE FOOD OF TILEFISH, LOPHOLATILUS CHAMAELEONTICEPS BETWEEN CAPE HATTERAS AND CAPE COD

Stephen C. Turner
Sandy Hook Laboratory

The food found within the entire digestive tracts of 98 tilefish ranging in size from 16 to 103 cm, was examined from collections made between Norfolk and Atlantis Canyons from February 1974 to December 1976. Crustaceans were the most frequently occurring food category and were estimated to be the most important caloric source for all sizes of fish.

Small tilefish, 16-49 cm, consumed primarily benthic invertebrates. Medium and large fish, 50-79 cm and 80-103 cm, respectively, while showing increased consumption of crustaceans, were found to shift their secondary diet from echinoderms, bivalves, and polychaetes to fish and cephalopods. Seasonal analysis indicated cephalopods were eaten far more frequently in the winter than in summer by all sizes.

(50) EFFECTS OF STORAGE TIME AND FILTERING ON NUTRIENT CONCENTRATIONS IN FROZEN SAMPLES

E. Cohen and M. Pennington
Woods Hole Laboratory

Two experiments to study the effects of storage time on frozen nutrient samples from Georges Bank were carried out. The results indicate that the nutrient concentrations vary as a function of storage time. Filtering does not appear to have any effect on arresting these fluctuations.

(51) A PRELIMINARY ENERGY BUDGET FOR GEORGES BANK

E. Cohen, M. Grosslein, M. Sissenwine, F. Steimle
Woods Hole Laboratory

Production studies carried out by the NEFC as well as data in the literature we combined to construct an energy budget for Georges Bank. The productivity of the Georges Bank system is compared to that of the North Sea. Georges Bank appears to be more productive at all steps in the food chain.

(52) NMFS MARINE MAMMAL OBSERVATION PROGRAM (MMOP)

John R. Nicolas and William J. Overholtz
Woods Hole Laboratory

Records of marine mammal observations were recorded routinely on Albatross IV survey cruises since 1975. Recently observations were made on the RV Delaware II, U.S. Coast Guard vessels, cooperative foreign research cruises, and by NMFS observers on foreign fishing trawlers in the U.S. zone. The data suggests some interesting thoughts about mammals in the region.

Fin and Humpback whales are thought to feed on American Sand launce. Pilot whales are usually observed near shore and stranded on beaches. Our observations however, suggest that most of their time is spent in offshore or deeper waters. Population parameters on various marine mammal species have been estimated from the surveys by areal expansion.

(53) STUDIES IN SHARK REPRODUCTION

Harold Wes Pratt
Narragansett Laboratory

Ongoing research on Oceanic Gamefish at the Narragansett Laboratory includes work on the reproduction of sharks. Data has been collected both systematically and opportunistically on different species of large Atlantic sharks with special emphasis on the blud shark Prionace glauca. Many elements of the reproductive biology of sharks are imperfectly known. Samples of different species have been examined to discern; mode of reproduction (whether ovipavous, placental, or aplacental) and details of the sexual cycle such as; size at birth and at maturity, intered mating behavior, method of sperm storage, fecundity, seasonality, and anatomical details.

(54) A TECHNIQUE FOR MEASURING ZOOPLANKTON BIOMASS

Doris Petrie
Narragansett Laboratory

A technique for measuring the dry weight of formalin-preserved zooplankton samples is described. Examples of data from various cruises on Georges Bank are given.

(55) IMAGE ANALYSIS: A REVOLUTIONARY TOOL FOR PLANKTON RESEARCH

R. Maurer, J. Kane
Narragansett Laboratory

One of the major difficulties in current plankton studies is the sorting of plankton types from samples since this usually involves painstaking manual counts and often requires highly trained personnel. The present level of MARMAP activity (within NEFC) generates approximately 6,000 plankton samples per year. Information extraction, species composition and enumeration, presently requires 6-8 months with lag times of up to 10 years not uncommon. The results of initial feasibility testing indicates that Image Analysis and more sophisticated pattern recognition systems could rapidly process 8,000-10,000 samples per year. As a tool for more in-depth research this technology will enhance ongoing projects in primary and secondary productivity, feeding and survival of larval fish, effects of oil pollution and genetics studies. A brief glimpse into the future foretells of fully automated sorting systems, in situ shipboard devices and monitoring buoys. Thus bringing plankton research into the "real-time" world.

(56) FIBERGLASS FISH MODELS AS TEACHING AIDS

Don Flescher
Woods Hole Laboratory

Life-size reproductions of marine fishes are made that are suitable for teaching fish identification and biology. Half-models made of fiberglass-reinforced plastic, firmly bonded to a backboard, make portable, light-weight, ready-to-display teaching devices. Multiple reproductions can be produced from each one-piece latex mold. Therefore body parts such as fins and teeth aren't removed and reattached as they would be using standard taxidermy techniques. This may allow models to be used for other purposes (e.g., morphometrics) where faithful reproduction is required.

(57) EFFECTS OF ENVIRONMENTAL FACTORS ON TRAWL SURVEY OPERATIONS AS EVIDENCED BY A DOPPLER SPEED LOG

William Overholtz
Woods Hole Laboratory

This paper investigates the effects of environmental factors (wind and tidal currents) on the distance that the Albatross IV travels during a 30 minute research tow. Tidal current is the most important factor, with wind-driven current having little or no affect on the vessel. A case is made for piloting future survey vessels with the Doppler speed log.

(58) ACCURACY OF ABUNDANCE INDICES BASED ON STRATIFIED-RANDOM TRAWL SURVEYS

M. R. Pennington
Woods Hole Laboratory

The design of the bottom trawl survey program at Woods Hole is reviewed with emphasis on its statistical properties. Both the level of accuracy and possible sources of bias of abundance indices derived from the survey are examined. Possible techniques for increasing the precision of the survey and minimizing the bias are discussed.

(59) THE ROLE OF THE HOME ECONOMIST IN SEAFOOD DEVELOPMENT

Mary Haskins
Gloucester Laboratory

Technology does not stop at machinery. The end product must have consumer acceptance. It is at this point that the services of a home economist are needed. The home economist must tempt consumers to under-utilized species with delectable recipes, organoleptically test stored products for storage stability, and generally contribute to the education of a basically meat-consuming public as to the benefits and enjoyment of eating seafood. Behind every great seafood is a great recipe.

(60) ADVANCES IN FISH SPECIES IDENTIFICATION BY ELECTROPHORESIS

Ronald C. Lundstrom
Gloucester Laboratory

Conventional electrophoretic methods for the identification of fish species have contributed much towards eliminating problems of species substitution. These methods are, however, subject to one or more limitations that lessen their effectiveness as routine species identification tests. Numerous attempts have been made to improve the speed, resolution, and reproducibility of these electrophoretic methods, mostly by the use of different stabilizing media. This paper describes two relatively new protein separation techniques, Isoelectric Focusing (IEF) and Isotachophoresis (ITP). Sarcoplasmic protein patterns are shown for several fish species comparing some of the more important conventional electrophoretic methods with IEF and ITP. The use of IEF, in particular, eliminates many of the problems associated with conventional electrophoretic methods resulting in increased speed, resolution, and reproducibility.

(61) SEASONAL VARIATION IN MARKETING QUALITY OF EDIBLE MUSSELS

Judith Krzynowek
Gloucester Laboratory

The common edible mussel, Mytilus edulis, is a very cheap and nutritious shellfish. Its value has not been appreciated in the United States. The reluctance to cultivate and harvest mussels is based, in part, to the belief that mussels cannot be consumed, stored, or harvested at certain times of the year. Answers to questions such as when, why not, or who says are vague. Storage studies in progess indicate definite seasonal variation in organoleptic acceptance, composition, and storage life.

(62) TECHNOLOGY OF CRABMEAT PRODUCTION IN THE NORTHERN CRAB INDUSTRY

Kurt A. Wilhelm
Gloucester Laboratory

The New England crab industry, directed towards the northern crabs Cancer irroratus and C. borealis, is currently a cottage-type industry. One of the reasons for this is that crabmeat extraction is labor intensive, and the products are normally high price-low volume. One of the effects is that the crab fishermen receive a low price for their catch, and the crabmeat produced is of variable quality. Crab research at the Gloucester Lab is concerned with improving product quality and processing procedures. Specific projects include quantifying acceptable levels of shell in crabmeat, improving methodology for preparing whole cooked crab, and developing butchering and crabmeat extraction techniques. A pilot processing project at Stonington, Maine, is also described.

(63) A CONSIDERATION OF METHODS IN ULTRASTRUCTURAL STUDIES OF MARINE ANIMALS

Jane T. Wade
Oxford Laboratory

Owing to the diversity in cellular and cytopathological studies taking place at our laboratory, we have found it necessary to modify previously established methods in order to meet the varying needs of our staff. The material to be presented at this conference will include photographic illustrations of the larger equipment needed to conduct this research as well as a demonstration of the more delicate instruments needed to manipulate the thin sectioned materials. The fixation and embedding methods we have found to be useful for fish, crustacean, and molluscan tissues will be discussed and copies of these procedures will be provided.

(64) EVIDENCE OF A TOXIC EFFECT ON BIVALVE EMBRYOS BY A RED PSEUDOMONAD

Carolyn Brown
Milford Laboratory

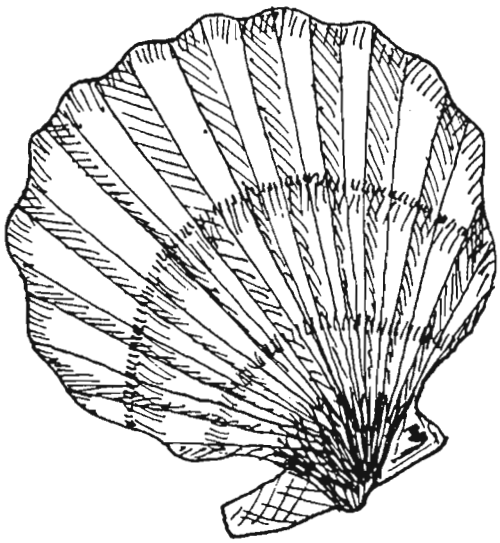
Effective and practical preventive measures against a microbial disease are more likely to be found when there is some understanding of the pathogenesis involved than when these events are ignored. With this in mind, and investigation into the possible role of pigment in mass mortality of embryonic cultures of the oyster Crassostrea virginica is currently underway. The pigment under investigation is produced by a pathogenic red pseudomonad which periodically infects laboratory-reared bivalve embryos. Experiments using 3 types of pigment mutants of the red parental strain provide evidence that the alteration of pigment affects the virulence of the pseudomonad. Further evidence supporting pigment role in the pathology of this bacterium is obtained from experiments using extracted pigments of the red pseudomonad and its yellow and white mutants.

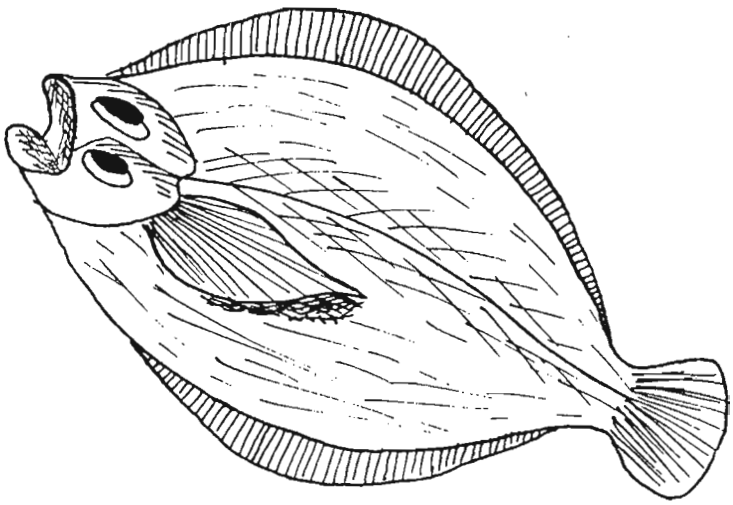
(65) EFFECTIVENESS OF THREE ALIQUOT SAMPLERS IN SPLITTING BENTHIC MACROFAUNA

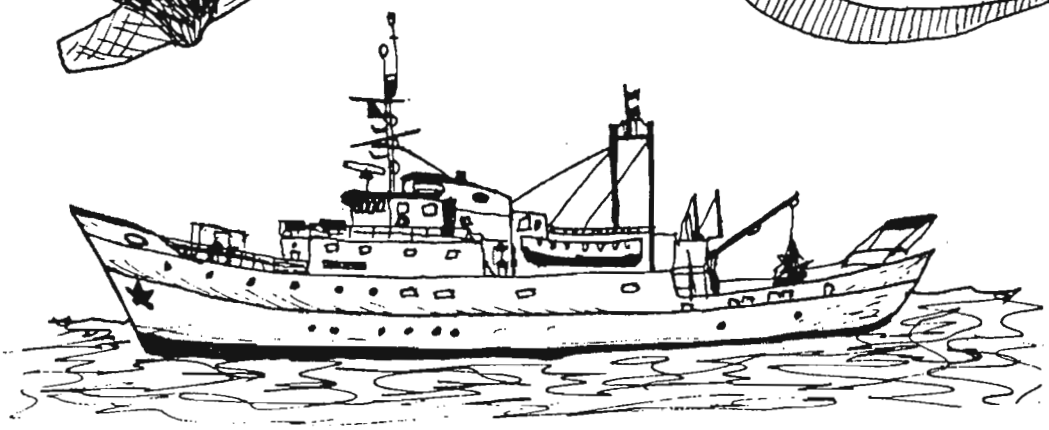
Thomas E. Wilhelm and Frank Steimle, Jr.
Sandy Hook Laboratory

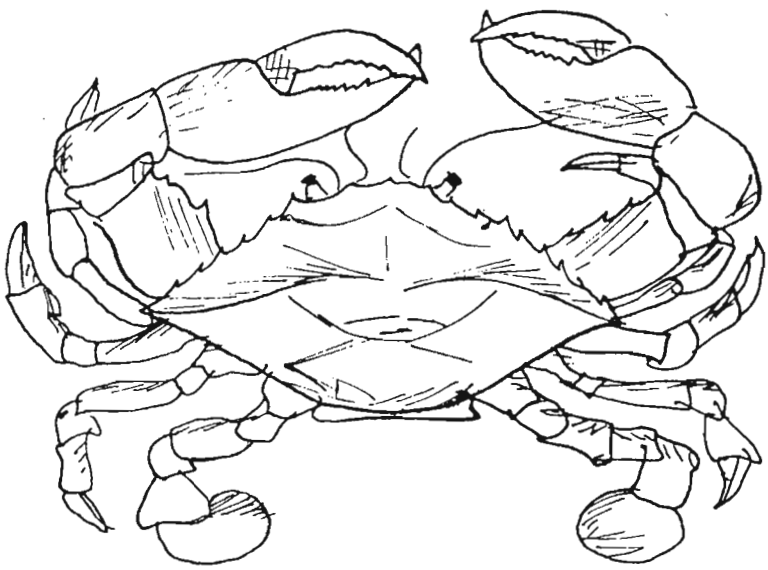
The sorting and identification of numerous benthic invertebrate samples has always been a laborious and time-consuming task. Thus a reliable technique for taking aliquot samples was needed to maintain the macrofaunal integrity of the benthic community. Two manually operated splitting devices designated Benthic Splitter I and Benthic Splitter II were developed and compared to a modified Folsom Plankton Splitter for effectiveness in splitting benthic invertebrate samples. Results indicate that a homogeneous sample in terms of size and density of the organism can be split into statistically similar aliquots. Large invertebrates with relatively small numbers of individuals per sample should be omitted from the splitting procedure to be later counted with the remaining split sample. Analysis of aliquoted subsamples indicates that although approximately 25% of all species present in the original sample were lost after the first splitting, these species were generally composed of one and two total individuals per sample. The relative diversity of each aliquoted sample was very similar to the relative diversity of the entire original sample. These splitting techniques are thus more promising for studying populations of dominate benthic species than for overall community analysis.

SECOND CENTER RESEARCH MEETING









NORTHEAST FISHERIES CENTER

NMFS · NOAA

INTRODUCTION

The Second Northeast Fisheries Center Research Meeting is being held this year in Woods Hole, Massachusetts. The purpose of this meeting, as was that of the first meeting held in April of 1978, is to provide a forum for the exchange of ideas and research progress among those staff members at levels up to and including GS-11. For many people in this grade range, this meeting provides a first opportunity to present research findings to an audience in a formally-structured conference situation. Although paper and poster presentations are solicited from and restricted to that group, all members of the Northeast Fisheries Center are invited to attend and participate in the discussions and social activities.

PROGRAM

SECOND NORTHEAST FISHERIES CENTER RESEARCH MEETING

*** ABSTRACT NUMBERS ARE IN ( ) ***

Tuesday, April 1, 1980

9:00 to 1:00 — Registration - Swope Building (Lobby)

1:30 — Introductory and Welcoming Remarks - Whitman Auditorium
FRED THURBERG, Milford, CT
ROBERT L. EDWARDS, Woods Hole, MA

2:00 — Plenary Session - Whitman Auditorium
TERRY LEITZELL, Washington, DC

2:45 — Break - Adjourn to Sessions A and B - Swope Building
Session A - First Floor Meeting Room
Session B - Meigs Room

	SESSION A	SESSION B
3:00	Review and assessment of the USA offshore lobster fishery. (7) THURSTON BURNS, STEPHEN H. CLARK, VAUGHN C. ANTHONY, and RONALD J. ESSIG, Woods Hole, MA	Vertical distribution of fish larvae in the New York Bight from a 2-year survey, July 1974 through June 1976. (39) CINDY OBENCHAIN-FAHAY, Sandy Hook, NJ
3:20	Implications of age and depth distributions on planktonic fish eggs. (37) ANNE NAPLIN, Sandy Hook, NJ	Food habits of the blue shark, (Prionace glauca) in the Northwest Atlantic. (64) NANCY KOHLER, Narragansett, RI
3:40	Effects of sublethal cadmium and silver concentrations on selected enzymes in the sea scallop, Placopecten magellanicus. (50) ROBERT STAMM, Milford, CT	Some parasites and pathology of planktonic crustaceans. (33) SHARON A. MacLEAN, Oxford, MD
4:00	Current status of the Undulating Oceanographic Recorder. (61) GRAYSON B. WOOD, Atlantic Environmental Group, Narragansett, RI	Current status of New England yellowtail flounder stocks. (36) MARGARET McBRIDE, Woods Hole, MA
4:20	Early life history of the Woods Hole Laboratory. (19) BRENDA FIGUERIDO, Woods Hole, MA	Early phagocyte activation in a larval mollusk exposed to pathogenic Vibrio sp. (47) WILLIAM ROSE, Milford, CT

5:30 — Cocktail Hour - Swope Building

6:30 — Dinner - Swope Building

Wednesday, April 2, 1980

7:45	Breakfast - Swope Building	
	SESSION A	SESSION B
8:40	The status of the Northwest Atlantic sea scallop resource and fishery. (62) PAUL WOOD, Woods Hole, MA	Age and growth of tilefish, Lopholatilus chamaeleonticeps, in the Middle Atlantic Bight and southern New England waters. (54) STEVE C. TURNER, CHURCHILL B. GRIMES, and KENNETH W. ABLE, Sandy Hook, NJ
9:00	Impacts to the benthic macrofauna and recolonization following the 1976 anoxia. (45) DAVE RADOSH and BOB REID, Sandy Hook, NJ	Microalgae cultured in high heavy metal concentrations as food for larvae of the American oyster, Crassostrea virginica. (59) GARY H. WIKFORS, Milford, CT
9:20	Continuous Plankton Records: temperature-copepod relationships in the New York Bight, 1974-1980. (48) DANIEL E. SMITH, Atlantic Environmental Group, Narragansett, RI	Some effects of temperature and feeding on larval growth of Crassostrea virginica. (51) WENDY STEPHENSON, Milford, CT
9:40	Grow-out strategies for the bay scallop, Argopecten irradians. (57) JAMES WIDMAN, Milford, CT	PCB contamination in marine organisms. (34) RICHARD MANEY, Gloucester, MA
10:00	Break	Break
10:20	Histological demonstration of shark spermatozoa. (31) ALAN LINTALA, Narragansett, RI	Fluoremetric analysis of seawater in the study of bivalve nutrition. (20) RONALD GOLDBERG, Milford, CT
10:40	A deepwater scallop bed in western Gulf of Maine. (26) HENRY JENSEN and EVA MONTIERO, Woods Hole, MA	Background and present status of fishery negotiations in the USA-Canadian East Coast Boundary Dispute. (30) ANNE LANGE, Woods Hole, MA
11:00	Diurnal variation in the feeding intensity and catchability of silver hake (Merluccius bilinearis). (5) RAY E. BOWMAN, Woods Hole, MA	Chlorophyll distribution on the shelf between Cape Hatteras and Nova Scotia. (18) C. EVANS and J.E. O'REILLY, Sandy Hook, NJ
11:20	----------	Fourth Polish krill expedition aboard R/V Prof. Siedlecki in Antarctica. (1) MIKE ALLSUP, Gloucester, MA
12:00	Lunch - Swope Building	
1:30	POSTER SESSION - Foyer adjacent to Meigs Conference Room, Swope Building	

1:30 POSTER SESSION - Foyer adjacent to Meigs Conference Room - Swope Building

Menhaden fishing in Gloucester. (3) AL BLOTT and LT. (JG) JACK T. MOAKLEY, Gloucester, MA

Recent US-USSR cooperative research at NEFC. (8) DONNA BUSCH and JACK GREEN, Narragansett, RI

Photographic field guide. (15) LINDA DESPRES and DON FLESCHER, Woods Hole, MA

Comparative study on phytoplankton density, diversity, and species composition in samples collected 1 meter and 3-4 meters off the seabed along the New Jersey coast in October 1979. (17) JAMES DUGGAN, Sandy Hook, NJ

New computer programs available: map plots, histograms, centerwide software-locator system. (25) OTIS JACKSON and BARBARA NORTH, Woods Hole, MA

Gas I: first cooperative survey of hydrocarbon in fish, NEFC-SEFC. (27) JOE KANE and JERRY PREZIOSO, Narragansett, RI

Isaac Kidd midwater trawl hydrodynamic and mechanical study. (28) JOHN KENNEY, Gloucester, MA

Response of embryos of the American oyster, Crassostrea virginica, to heavy-metal mixtures. (32) JOHN R. MacINNES, Milford, CT

Beautiful blue eyes. (38) VERN NULK, Gloucester, MA

When the slick hit the sand. (43) WILLIAM C. PHOEL and LISA A. WIRTH, Sandy Hook, NJ

The early development and distribution of the mooneye cusk-eel, Ophidion selenops Robins and Böhlke. (44) J. CHRISTOPHER POWELL, Narragansett, RI

Large area marine productivity/pollution experiments (LAMPEX); a northeast fisheries remote sensing program. (46) CRAIG N. ROBERTSON and JAMES P. THOMAS, Sandy Hook, NJ

Distribution, abundance, and mortality estimates of larval butterfish (Peprilus triacanthus), 1977-1978. (53) LORRIE SULLIVAN, Narragansett, RI

Seasonal migration of herring tagged in the Gulf of Maine and adjacent waters. (56) GORDON WARING, Woods Hole, MA

Forensic pHocusing. (58) KATE WIGGIN, Gloucester, MA

SESSION A - First Floor Meeting Room - Swope Building
SESSION B - Meigs Room - Swope Building

	SESSION A	SESSION B
3:00	The use of recirculating seawater system for the grow-out of non-indigenous oyster species. (9) JOSEPH CHOROMANSKI, Milford, CT	Phytoplankton "hot spots." (10) MYRA S. COHN, Sandy Hook, NJ
3:20	Marine fish diseases--a microscopic view. (14) LINDA DESPRES, Woods Hole, MA	A fish disease survey of the Raritan Bay and New York Bight apex area, 1973-1980. (63) JOHN ZISKOWSKI, Sandy Hook, NJ
3:40	The NMFS Foreign Fishery Observer Program: a review. (35) RALPH MAYO, Woods Hole, MA	A new parasite from the smooth skate (Raja senta). (22) BRIAN P. HAYDEN Woods Hole, MA
4:00	Nitrogen excretion and oxygen consumption as in situ measures of stress in Asterias vulgaris and Porania insignus. (16) A.F.J. DRAXLER and W.C. PHOEL, Sandy Hook, NJ	Biochemical monitoring techniques: modification of an assay for octopine dehydrogenase in sea scallop adductor muscle. (21) MARY T. GROJEAN, Milford, CT
4:20	A unique method of ageing surf clams. (40) LORETTA O'BRIEN and JOHN W. ROPES	Scallop Gear Trials - 1979. (49) RONALD J. SMOLOWITZ and PATRIC TWOHIG, Woods Hole, MA
5:30	Cocktail Hour - Swope Building	
6:30	Dinner - Swope Building	

Thursday, April 3, 1980

7:45	Breakfast - Swope Building	
	SESSION A	SESSION B
8:50	Oyster mortalities in Todos os Santos Bay, Salvador, Bahia, Brazil. (29) FRED KERN, Oxford, MD	Cytologic, cytogenetic, and embryolog state of Atlantic mackerel eggs from surface waters of the New York Bight in relation to pollution. (24) JAMES HUGHES, Milford, CT
9:10	Ammonium nutrient distribution on the shelf between Cape Hatteras and Nova Scotia. (55) RUTH WALDHAUER, Sandy Hook, NJ	Bottom temperatures from the southern New England continental shelf along 71°00'W, 1974-1978. (12) R. WYLIE CRIST, Atlantic Environmental Group, Narragansett, RI

	SESSION A	SESSION B
9:30	Hematology of windowpane flounder from three stations in Long Island Sound. (13) MARGARET A. DAWSON, Milford, CT	TMAO-ase: purifying a perplexing protein. (11) FRED CORREIA, Gloucester, MA
9:50	Description of recruitment in 18 selected fish stocks. (41) JOAN E. PALMER, R.C. HENNEMUTH, and B.E. BROWN, Woods Hole, MA	Post-fertilization changes in the chorion of winter flounder, Pseudopleuronectes americanus, eggs as observed with scanning electron microscopy. (42) DEAN PERRY, Milford, CT
10:10	Break	Break
10:30	From rigor to rubber. (60) KURT WILHELM, Gloucester, MA	Experimental hybridization of the commercial American oyster, Crassostrea virginica. (52) SHEILA STILES, Milford, CT
10:50	Variability of the shelf/slope front between Cape Hatteras and Cape Cod. (23) JEFFREY E. HILLAND, Atlantic Environmental Group, Narragansett, RI	Silver hake: on the question of stock identification. (2) FRANK ALMEIDA, Woods Hole, MA
11:10	Autumn and winter abundance and distribution of ichthyoplankton on Georges Bank and Nantucket Shoals from 1971-1976 with an emphasis on dominant species. (4) GEORGE BOLZ, Woods Hole, MA	Silver hake (Merluccius bilinearis) regulatory influence on the fishes of the Northwest Atlantic. (6) RAY E. BOWMAN, Woods Hole, MA
12:00	Lunch - Swope Building	
1:00	Adjournment	

(1) N.M.F.S. PARTICIPATION IN THE FOURTH POLISH KRILL EXPEDITION IN THE ANTARCTIC

Michael G. Allsup
Gloucester Laboratory

In January of 1979 the N.M.F.S. was represented aboard the Polish ship R/V Professor Siedlecki. Travels through Argentina and life aboard the ship are explained and augmented with slides. Goals of the entire expedition were to search out new fishing grounds for Antarctic species of fish and Krill (Euphausia superba). Technological problems of harvesting, processing at sea, and coping with the harsh environment are also addressed.

(2) SILVER HAKE: ON THE QUESTION OF STOCK IDENTIFICATION

Frank P. Almeida
Woods Hole Laboratory

The widely distributed silver hake, with a range extending from the Newfoundland Banks to South Carolina, have been managed in USA waters as three stocks: ICNAF Div. 5Y (gulf of Maine), Subdiv. 5Ze (georges Bank), and Subdiv.5Zw and SA 6 (Southern New England-Middle Atlantic).

The choice of these delineations reflected to some extent, the general feeling among scientists participating in ICNAF that these areas did, in fact, somewhat define the stock boundaries, but was essentially a result of the lack of a finer breakdown in the catch statistics reported to ICNAF and the necessity to assess and manage the fishery using the reported catches.

For several years it has been recognized that these stock delineations required either validation or redefinition, and the present study, in concert with previous investigations including morphometric, tagging and serological studies, and otolith zonal formation analysis, is an attempt to clarify the boundaries.

An examination of the silver hake population using a discriminant analysis of morphometric characters from samples collected during the fall 1978 and spring 1979 US Bottom Trawl Surveys is presented in this paper. preliminary results from this study, and a biochemical analysis of tissue samples using electrophoretic techniques indicate that there are possibly two genetically distinct stocks occupying the waters in the study area (Cape Hatteras-Nova Scotia), but with significant amounts of intermixture.

(3) MENHADEN FISH FROM GLOUCESTER

Alan J. Blott and Lt. J.G. Jack T. Moakley
Gloucester Laboratory

A review of the purse seine fishery for menhaden out of Gloucester, Massachusetts. Included are pictures illustrating the purse seining technique and a tabulation of landings in recent years.

(4) AUTUMN AND WINTER ABUNDANCE AND DISTRIBUTION OF ICHTHYOPLANKTON ON GEORGES BANK AND NANTUCKET SHOALS, 1971-1976, WITH SPECIAL EMPHASIS ON DOMINANT SPECIES

G.R. Bolz and R.G. Lough
Woods Hole Laboratory

Total ichthyoplankton was identified and enumerated for the Georges Bank and Nantucket Shoals areas (within the 100-m depth contour) for six periods: September - December 1971 and 1972, September 1973 - February 1974, September 1974 - February 1975, October 1975 - April 1976, and October 1976 - February 1977. A total of 1450 samples (61-cm bongo, 0.333-mm mesh net) have been analyzed to date for this report, collected from 31 of the 56 ICNAF larval herring surveys conducted between 1971 and 1979. The surveys were conducted at 3-4 week intervals during the autumn and bimonthly through the winter-spring on a standard grid of sampling stations 15-20 miles apart.

A total of 157 taxa was identified for the combined areas of which 104 species occurred on Georges Bank and 125 species on Nantucket Shoals. Seventy-two species were common to both Georges Bank and Nantucket Shoals. Despite the high diversity of species for the entire period, greater than 80% of the total abundance of larvae on each survey was composed of only 3-4 dominant species. The seasonal occurrence and geographic distribution, as well as length frequencies, of the dominant taxa (BI>1) were compared and contrasted in relation to variations in environmental conditions during the 6 years. The succession of the dominant species through the autumn and winter remained the same all 6 years despite their fluctuations in abundance. The Nantucket Shoals estimated seasonal ichthyoplankton abundance (September - December) fluctuated from a low of 5031.175 (No. Larvae x 10^9) in 1972 to a high of 30742.241 in 1973. Ichthyoplankton abundance on Georges Bank declined dramatically from a high of 35520.418 in 1974 to a low of 896.887 in 1976. The reduction in abundance in 1976 occurred for all species, with Ammodytes spp. (sand lance) and Clupea harengus (sea herring) showing the greatest decrease. Due to strong winds during the 1976 season, transport of larvae off the banks may have been responsible in part for the low numbers of larvae observed on Georges Bank. Those larvae spawned on Nantucket Shoals would tend to be retained in the nearshore area.

(5) DIURNAL VARIATION IN THE FEEDING INTENSITY AND CATCHABILITY OF SILVER HAKE (MERLUCCIUS BILINEARIS)

Ray E. Bowman and Edgar W. Bowman
Woods Hole Laboratory

Silver hake (Merluccius bilinearis) feeding intensity and catchability during periods of daylight and darkness has been examined. Feeding data were gathered during a feeding chronology study jointly conducted by American and Russian scientists aboard the Russian research vessel BELOGORSK in September of 1978. The ship fished the Russian Hake 815 bottom trawl for 30 minutes, once every three hours, over a 48-hour period on the southern part of Georges Bank. The digestive tracts of 498 silver hake were removed from fish ranging in length from 21 to 40 cm, inclusive. A variety of free swimming crustaceans (i.e., Crangon septemspinosa, Dichelopandalus leptocerus, and Monoculodes intermedius) made up the largest part of the silver hake diet. Examination of stomach fullness, intestinal fullness, the number of empty stomachs, state of digestion of prey, and the ratio of the stomach contents weight to the intestinal contents weight during different time periods shows that silver hake feed at night. Their feeding period begins just after dusk and continues until pre-dawn, with the majority of their prey being taken between dusk and midnight. Prey are broken down in the stomach and passed into the intestine after a period of approximately 15 hours. The intestine is emptied after a further 9 hours has elapsed, which results in a total disgestive tract evacuation time of about 24 hours. The ability of several types and sizes of trawls to catch silver hake has been evaluated. Catch data from various studies, most of which were rigidly controlled trawl comparison experiments conducted from September 1971 through July 1977, show that pelagic trawls, off bottom trawls, and bottom trawls with roller gear tend to pass over silver hake during the day, while bottom trawls with chain-disc sweeps and cable sweeps catch large quantities of silver hake during daylight hours. These data establish that silver hake are located on or immediately above the bottom during the day and that they are off bottom at night. It is suggested that a high opening trawl to catch silver hake at night, combined with a chain-disc sweep to increase the day catch, would substantially increase the overall silver hake catches by a vessel operating on a 24-hour per day basis.

(6) SILVER HAKE'S (MERLUCCIUS BILINEARIS) REGULATORY INFLUENCE ON THE FISHES OF THE NORTHWEST ATLANTIC

Ray E. Bowman
Woods Hole Laboratory

Silver hake feeding data collected during various research vessel cruises conducted by or in conjunction with the Northeast Fisheries Center in Woods Hole, Massachusetts from 1963 through 1977 is presented. Yearly stock assessment and dietary information on Georges Bank silver hake are used to determine what effect silver hake predation may have on other fish populations. Two species of fish in particular, namely haddock and American sand lance, serve as examples to show how silver hake take advantage of increases in fish stocks; thereby tending to maintain stability by ensuring that no one species dominates the ecosystem. The biology of silver hake indicates they are perfectly adapted for this predatory role. They have little dietary preference for any particular fish species and prey mainly on smaller sized fish (mostly juveniles). They also have a wide geographic range and maintain a large population size, which makes silver hake alone stand out as the most influential natural regulatory mechanism on fishes in the northwest Atlantic.

(7) REVIEW AND ASSESSMENT OF THE USA OFFSHORE LOBSTER FISHERY

Thurston S. Burns, Stephen H. Clark,
Vaughn C. Anthony, and Ronald J. Essig
Woods Hole Laboratory

The biology of the American lobster (Homarus americanus) in offshore areas (>19 km from the coast) is reviewed, and the commercial fishery is described and assessed. Current evidence suggests some intermingling between offshore and inshore populations during spring and summer; however, interrelationships have not been clearly defined, offshore lobsters are herein considered as a unit for assessment purposes. The fishery has been conducted by pot and trawl gear from Georges Bank to Virginia (in ICNAF SA 5 and 6); landings rose gradually from 1930 to 1960 and then increased substantially, peaking at 3,982 tons in 1972 before declining to 2,704 tons in 1978. Commercial and research vessel survey abundance indices have generally declined in recent years; the decrease has been most pronounced for the southern New England area and has been least pronounced for Georges Bank. Estimates indicate that current levels of mortality are too high and age at entry too low to maximize yield per recruit.

(8) RECENT U. S. - U.S.S.R. COOPERATIVE RESEARCH AT NEFC

Donna Busch
Jack Green
Narragansett Laboratory

Marine Ecosystems Division and Environmental Chemistry Investigation personnel participated in several joint U. S.-U.S.S.R. studies aboard R/V Belogorsk during 1979. Areas of study included phytoplankton composition, distribution and variability, individual species production, ^{14}C primary productivity, chlorophyll a and nutrient distribution, micro- and macrozooplankton abundance and distribution, zooplankton grazing, water column temperature and salinity structure. Trawl surveys aboard Belogorsk and pelagic fish surveys aboard other Soviet vessels during 1979 are not considered in this presentation.

(9) THE USE OF RECIRCULATING WATER SYSTEM FOR THE THE GROW-OUT OF NON-INDIGENOUS OYSTER SPECIES

Joseph Choromanski
Milford Laboratory

To explore its potential as a unit for maintaining non-indigenous species of oysters for hybridization studies with controlled release of effluent, a recirculating seawater system of basic design was constructed and operated experimentally, with some degree of success, for grow-out of two commercial oyster species. Juveniles of the American oyster, Crassostrea virginica and the Japanese oyster, C. gigas, survived in the recirculating system at a rate comparable with that of a control group of C. virginica juveniles maintained in an outdoor raceway system. However, the growth rate of the oysters in the recirculating system was somewhat less than that for the controls after several months. Of the two groups held in the recirculating unit, the C. gigas juveniles grew faster than C. virginica.

Some problems with the system which will be investigated further include the buildup of metabolic by-products and fluctuations in food density. The desirability of such a system, however, is warranted in the advance of aquacultural studies involving survival, growth, maintenance, and containment of non-indigenous species and their hybrids. Refinements and modifications for improving the recirculating system are planned, which hopefully will provide a more suitable system for pre-spawn conditioning and later grow-out of stocks, particularly of difficult-to-obtain species.

(10) PHYTOPLANKTON "HOT SPOTS"

Myra Cohn
Sandy Hook Laboratory

Qualitative estimates of phytoplankton composition at stations selected from Ocean Pulse and MARMAP cruises covering the period of September 18 through December 20, 1979 were made by Harold G. Marshall and Myra S. Cohn in the course of an ongoing study of phytoplankton communities from Cape Hatteras to Canada. Samples examined were from stations showing highest chlorophyll concentrations determined by J. O'Reilly and C. Evans.

In September, elevated numbers of Coscinodiscus wailesii were found off Narragansett Bay and elevated counts of Ceratium spp. and Prorocentrum micans were recorded at surface stations in the New York Bight; surface stations at the eastern end of Georges Bank toward the end of September showed normal flora for that time of year, i.e. Rhizosolenia and Guinardia spp.

In November, counts revealed slightly elevated levels of Coscinodiscus wailesii, and of three Ceratium species, C. lineatum, C. massiliense, and C. tripos, at surface stations off Montauk, and elevated counts of P. micans and Ceratium spp. at the surface off Cape Cod. Sparse phytoplankton were noted at depths of 8 m.

A December surface sample off northern Cape Cod showed significantly elevated numbers ("bloom" concentrations) of Ceratium spp. and large numbers of Dinophycis spp. and P. micans. At 10 m depth, a station off Cape Hatteras had significantly elevated numbers of Gonyaulax diacantha in mid-December.

These phytoplankton "hot spots" bear further watching. In view of the relatively mild winter we have had, this is especially important in the Middle Atlantic Bight where early stratification and a C. tripos phytoplankton bloom contributed to an anoxia episode and catastrophic shellfish kill in 1976.

(11) TMO-ase: PURIFYING A PERPLEXING PROTEIN

Fred Correia
Gloucester Laboratory

In the early 1960's formaldehyde (FA) was found to be a natural constituent of gadoid fish. It was further observed that FA concentrations increased during frozen storage, and that increasing FA was closely related to toughening of texture and a loss of water-holding capacity. Evidence for an enzymatic mechanism has been gathered, although the enzyme(s) have eluded isolation.

We at the Gloucester Laboratory have been trying to elucidate this enzyme system (TMO-ase) as one part of an on-going red hake project. This study has importance not only in terms of understanding a catabolic fish pathway, but also in enabling the fishing industry to better utilize a number of fish species.

(12) BOTTOM TEMPERATURES FROM THE SOUTHERN NEW ENGLAND CONTINENTAL SHELF ALONG 71°00'W, 1974-1978

R. Wylie Crist
Atlantic Environmental Group

Five years (1974-1978) of expendable bathythermograph data have been collected from south of New England along a transect on or near 71°00'W longitude. Annual analyses of bottom temperature have been conducted by plotting bottom temperature through depth and time. From these data a five year average bottom temperature diagram has been derived. Future bottom temperature analyses will be compared to the average diagram in order to identify the occurrence of unusual temperature conditions.

The seasonal cycle of shelf water bottom temperatures will be discussed. Monthly bottom temperature anomalies will be compared to weather and tide station records.

(13) SEASONAL VARIATIONS IN THE HEMATOLOGY OF WINDOWPANE FLOUNDER FROM THREE STATIONS IN LONG ISLAND SOUND

Margaret Dawson
Milford Laboratory

Seasonal variations in hematology have been documented in certain species of teleosts but in general have received little attention. This places a serious limitation on the interpretation of field samples where a particular species may be collected at a station only once or twice a year. We have attempted to remedy the situation in relation to one species by providing a systematic monthly study of windowpane flounder hematology at a relatively clean station in Long Island Sound and comparing the results to those obtained in two other Long Island Sound stations, one intermediate and the other very contaminated as measured by metal analyses of the sediments. Data from the early portion of the project make it appear that the differences in hematocrit and hemoglobin between stations and those between seasons are not pronounced. Frozen plasma samples are now being analyzed for sodium, potassium, calcium, and osmolality; the initial data suggest that the differences between stations in these parameters may be greater than those in the red cell component of the blood.

(14) MARINE FISH DISEASES - A MICROSCOPIC VIEW

Linda Despres
Woods Hole Laboratory

With the increasing need to acquire base line data on the health of marine fishes, specimen samples have been collected from seasonal bottom trawl surveys. Selected samples were histologically processed and stained. A microscopic view of various skin lesions (ulcer, tumor, lymphocystis and fin rot) will be reviewed.

(15) PHOTOGRAPHIC FIELD GUIDE

Linda DesPres and Don Flescher
Woods Hole Laboratory

Since bottom trawl surveys have been expanded to include the area from Cape Hatteras, NC, to Cape Fear, NC, Don and I decided to compile a photographic field guide to help identify the most commonly trawled species which personnel at the NEFC were not familiar with. We hope this will help the novice and refresh the memory of the more experienced. The book is also developing into a field key with notes on distinguishing features to separate similar appearing species as well as to document the accepted common and scientific names which often vary depending upon which reference book is used and its age.

(16) NITROGEN EXCRETION AND OXYGEN CONSUMPTION AS *IN SITU* MEASURES OF STRESS IN *ASTERIAS VULGARIS* AND *PORANA INSIGNUS*

A. F. J. Draxler and W. C. Phoel
Sandy Hook Laboratory

Monitoring of oxygen consumption and excreted metabolic products has been used *in situ* to determine the state of stress in *Asterias vulgaris* and *Porana insignus*. Animals were subjected to low dissolved oxygen concentrations in closed chambers at the Ocean Pulse station on Jeffries Ledge in the Gulf of Maine (42°46.5'N, 70°14.5'W) in water approximately 36 m deep. The atomic ratio of oxygen consumed to nitrogen excreted was found to decrease by an order of magnitude when dissolved oxygen concentrations decreased to 0.15 ml/l as compared with runs in which the concentration was maintained above 0.5 ml/l.

(18) CHLOROPHYLL DISTRIBUTION ON THE SHELF BETWEEN CAPE HATTERAS AND NOVA SCOTIA

Christine Evans and Jay O'Reilly
Sandy Hook Laboratory

The shelf and coastal water between Cape Hatteras and Nova Scotia has been sampled to determine chlorophyll a concentrations (phytoplankton biomass) during MARMAP and Ocean Pulse surveys between October 1977 and present.

Generally, we have observed a 4-5 fold decrease in phytoplankton concentrations/m^3 proceeding from the coast to the shelf break between Cape Hatteras and Long Island. Distributional patterns of phytoplankton abundance between Long Island and Georges Bank are relatively more variable. On Georges Bank, the highest concentrations of phytoplankton biomass are usually found at the center of the Bank. Chlorophyll a concentrations/m^3 usually decrease progressively from the center to the perimeter of Georges Bank. Generally, phytoplankton biomass in the Gulf of Maine is least abundant (<0.5 mg Chl a/m^3) when compared with other large areas of the shelf sampled.

In addition to intra-annual/seasonal observations of chlorophyll maximum and minima, we have observed some particularly interesting inter-annual differences in phytoplankton abundance over large areas of the shelf. For instance, chlorophyll concentrations on Georges Bank in August 1979 (0.5 mg/m^3) were 1/10th the concentrations observed on Georges Bank in August 1978.

(19) EARLY HISTORY OF THE WOODS HOLE LABORATORY

Brenda Figuerido
Woods Hole Laboratory

The Woods Hole Laboratory is the oldest marine research station in the United States. A brief history of its founding and early work is presented. Notable personnel, vessels, and activities are described. The data base for this information is the laboratory Archives, and the recruitment and preservation of historical materials are reviewed.

(20) FLUOROMETRIC ANALYSIS OF SEAWATER IN THE STUDY OF BIVALVE NUTRITION

Ronald Goldberg
Milford Laboratory

As a potential method for assessing bivalve nutrition, in-vivo fluorometric analysis of seawater has been evaluated as an indicator of the chlorophyll-α content of seawater. The in-vivo fluorometric analytic method has been compared to the widely accepted extractive spectrophotometric technique for both cultured algal suspensions and ambient seawater. Linear relationships have been recognized for in-vivo fluorescence, cell count, and spectrophotometrically determined chlorophyll-α values for dilutions of cultured algae. In-vivo fluorescence of ambient seawater was found to correlate with spectrophotometric values, although a greater degree of variability was encountered than with dilutions of cultured algae. A theoretical approach to reducing variability, by treating in-vivo samples with a herbicide, DCMU 3-(3, 4 dichloropheny 1)-1, 1-dimethyl urea was unsuccessful. The in-vivo fluorescence of seawater samples taken daily over a two year period, reveals distinct seasonal trends. Several experiments are described which illustrate the value of frequent or continuous in-vivo sampling to monitor the amount of algal food, available to or consumed by bivalves. In-vivo fluorescence data correlates well with feeding activity and growth in filter feeding bivalves.

(21) BIOCHEMICAL MONITORING TECHNIQUES: MODIFICATION OF AN ASSAY FOR OCTOPINE DEHYDROGENASE IN SEA SCALLOP ADDUCTOR MUSCLE

Mary T. Grojean
Milford Laboratory

Octopine dehydrogenase is being evaluated for use with other energy-related enzymes in NEFC monitoring work with the sea scallop. Studies were performed to determine the optimum protocol and limiting nature of such variables as pH and substrate concentrations in sea scallop adductor muscle. Column chromatography was employed to distinguish octopine dehydrogenase activity from lactic dehydrogenase activity. The possible role of octopine dehydrogenase in sea scallop is discussed.

(22) A NEW PARASITE FROM THE SMOOTH SKATE (RAJA SENTA)

Brian P. Hayden

Woods Hole Laboratory

During the USA autumn (1977-1978) and spring (1978) bottom trawl surveys 35 smooth skates were examined from catches in the Gulf of Maine, Georges Bank, and Scotian Shelf areas of the western North Atlantic. Twenty-four of these skates were infected with a phyllobothriid, cestode resembling members of the subfamilies Rhinebothriinae and Echeneibothriinae. The combined characteristics of this species are unique from all known genera. Because of these differences the genus Zyxibothrium was created to accomodate the species. The characteristics of the other members of these groups will be discussed.

(23) VARIABILITY OF THE SHELF/SLOPE FRONT BETWEEN CAPE HATTERAS AND CAPE COD

By

Jeffrey E. Hilland
Atlantic Environmental Group

The Shelf/Slope Front along eastern North America separates the cool, less saline shelf water from the warm, more saline slope waters that lie offshore. The Front is delineated by a region of sharp thermal contrast and since June 1973 the sea-surface temperature expression of the Front has been remotely monitored by the NOAA satellite series. Charts produced on a weekly basis, from a composite of daily thermal infrared imagery, have been analyzed to create a 5.5 year time series of the areal extent of Shelf Water, Slope Water and warm-core eddies in the Mid-Atlantic Bight. In addition, movements of the Shelf/Slope Front and Gulf Stream along a transect (oriented 130°T) extending from Sandy Hook, NJ to the north wall of the Gulf Stream have been determined. These quasi-synoptic measurements have shown seasonal fluctuations of the various water masses between June 1973 and December 1978. However, the eddy activity record indicates that the presence of warm-core eddies in the Slope Water was non-seasonal. Time-series data depicting the locations (relative to the 200 m isobath) of the Shelf/Slope Front and Gulf Stream north wall show, with few exceptions, similar geographic trends.

(24) CYTOLOGIC, CYTOGENETIC, AND EMBRYOLOGIC STATE OF ATLANTIC MACKEREL EGGS FROM SURFACE WATERS OF THE NEW YORK BIGHT IN RELATION TO POLLUTION

James B. Hughes
Milford Laboratory

Among chemicals contaminating ocean waters are cytotoxins, mutagens, and teratogens with the likelihood under some conditions of affecting development of pelagic fish eggs. This is in addition to any body or gonad burden of such contaminants in parent fish.

Cytologic, cytogenetic, and embryologic measures made on about 10,000 early-stage Atlantic mackerel eggs from a total of about 80 sites in the pollution-stressed New York Bight provide some evidence for associations between toxic hydrocarbon and heavy metal pollution and such measures of egg health (May '77 cruise). Parameters studied include: 1) general cell and nuclear state; 2) mitotic index; 3) abnormal mitoses and irregular distribution of chromosomes (estimates from mitotic meta- and telophase indicators); 4) cell differentiation difficulties; and 5) gross embryo malformation. Temperature and salinity variables also associated to a certain degree with some of the egg variables though not necessarily in the direction expected.

Estimates of egg moribundity based on cell state, mitotic irregularities and division arrest at gastrulation and the stage immediately following further show statistically significant decreases in egg viability in presumed more impacted Bight areas relative to less impacted areas (May '74 cruise). Generally, there were strong, significant correlations between measures on chronologically related development stages, and in '74 between all stages, excluding cleavage.

Regarded most important is the demonstration of the feasibility of measuring a technically sublethal effect of pollution directly on a fishery resource species.

(25) NEW COMPUTER PROGRAMS AVAILABLE: MAP PLOTS, HISTOGRAMS, CENTER-WIDE SOFTWARE-LOCATOR SYSTEM

Otis Jackson, Barbara North
Woods Hole Laboratory

Some major computer programs have been developed in Woods Hole for center-wide use. This poster session will display a variety of outputs from these new programs (1979).

FISHMAP makes geographic plots with any of a variety of map projections. The user can rotate the plot, annotate directly from the data, view through a "window", provide titles, specify sizes, do only one or several plots in one run, do it on line or in batch, describe the input data as is to FISHMAP, add a coastline with good detail, or statistical areas, or the 100-meter depth contour. The resulting plot(s) can be displayed on a Tektronix terminal, a Versatic plotter, or a Calcomp plotter. Similar flexibility is built into GRAPH, which draws histograms or curves.

The sharing of computer programs over all the laboratories has a high priority in the Northeast Fisheries Information System (NERFIS). An on-line catalog system has been implemented on ADP Network. Programs have been described and classified according to some key concepts: data base, type of analysis, source language, location, etc. Some easy-to-use routines are available to access this new data base.

(26) A DEEPWATER SCALLOP BED IN WESTERN GULF OF MAINE

Henry W. Jensen and Eva S. Montiero
Woods Hole Laboratory

Sea scallops, Placopecten magellanicus, have been caught from 100 to 200 meters in the western Gulf of Maine since the fall of 1976, during the seasonal bottom trawl survey cruises. By combining these data, the extent of a bed is revealed along with an appreciation of some of the area's scallop biology. Past history of scallops in this area; and the size and growth rate of the present scallops are discussed. Also, the feasibility of a commercial fishery is considered, dealing with the limiting aspect of small scallops and deepwater.

(27) GAS I: FIRST COOPERATIVE SURVEY FOR HYDROCARBONS IN FISH NEFC-SEFC

Joseph Kane
Jerry Prezioso
Narragansett Laboratory

During Albatross IV Cruise No. 80-01 the Northeast and Southeast Fisheries Centers undertook the first segment of a survey to determine the presence or absence of petrogenic hydrocarbons in fish flesh. The survey area extended from Cape Hatteras south around the tip of Florida to Pascagoula, Miss. Contamination free samples were collected at a series of stations along the continental shelf from trawls and bottom grabs for later analysis ashore. In addition, radiometric observations were made daily to compare with remote sensing overflights. The Gulf of Mexico to the west of Mississippi will be sampled by the Oregon II of the SEFC, and to the north from Cape Hatteras to Maine by Albatross IV in a subsequent cruise. The results from this initial cruise will be under close scrutiny and will serve to evaluate and modify, if necessary, the procedures to be used for future hydrocarbon monitoring in fish.

(28) A HYDRODYNAMIC AND MECHANICAL STUDY OF THE ISAACS-KIDD MIDWATER TRAWL

John F. Kenney
Gloucester Laboratory

The Isaacs-Kidd midwater trawl developed at Scripps Institution of Oceanography in the early 50's was designed to sample specimens larger than those normally collected in standard plankton nets. To determine the trawl's performance, an engineering study was conducted and data was obtained for the following variables simultaneously: trawl velocity, trawl depth, warp length, warp tension, warp angle at the vessel, warp angle at the trawl, bridle angles, and flow rates at various locations in the mouth of the trawl. In addition to these measurements, an underwater video system was used to observe and record the instrumentation's performance. The poster presentation shows the methods used to measure these variables and the preliminary results obtained from them.

(29) OYSTER MORTALITIES IN TODOS OS SANTOS BAY, SALVADOR, BAHIA, BRAZL

Frederick G. Kern
Oxford Laboratory

Oysters, Crassostrea rhizophrae, from Todos os Santos Bay, Brazil, were examined for parasites and pathology associated with a mass mortality that resulted in a loss of 80 to 100% of the oysters. Tissues were examined from oysters collected prior to and during the mortality. No pathogenic or infectious agents were detected in sufficient numbers or intensity to be considered the causative agent(s) of the mortalities. Other organisms were reported to have died in the area, including barnacles, other mollusks, and fish. The pathology observed in the oyster is consistent with a stress induced morbidity and was probably the result of an environmental factor(s).

(30) BACKGROUND AND PRESENT STATUS OF THE FISHERY NEGOTIATIONS IN THE USA - CANADIAN EAST COAST BOUNDARY DISPUTE

Anne M.T. Lange
Woods Hole Laboratory

The United States enacted the Fishery Conservation and Managment Act of 1976 (FCMA), extending its exclusive fisheries jurisdiction to 200 miles, on March 1, 1977. Canada enacted similar legislation which became effective on January 1, 1977. These two claims of jurisdiction overlap in the productive fishing area of Northeast Georges Bank and as a result negotiations have been in progress between the two countries, since 1976, to determine the management of the disputed resources. Arbitration of the boundary line will be determined by the International Court, after agreements on management of and entitlements to the fishery resources have been reached. Until such agreements are reached, and a treaty signed, each country is responsible for regulation of its vessels fishing in the disputed zone, and management of the resources is on a national basis.

The proposed treaty, now before the legislative bodies of each country, establishes management jurisdiction on a stock by stock basis, with either one country, the other, or both as the party of major concern. This proposed treaty also establishes percent entitlements to each country for every stock under consideration, and provides a mechanism for dispute settlement between the USA and Canada. The intention of the proposed treaty is that once agreed upon, these entitlements will continue, irrespective of the outcome of the determination of the boundary line, although a mechanism for adjustments will be included.

(31) HISTOLOGICAL DEMONSTRATION OF SHARK SPERMATOZOA

Alan Lintala
Narragansett Laboratory

Histological staining techniques can be utilized to demonstrate the presence of spermatozoa in the reproductive tracts of both male and female sharks. Serial sectioning of gonads require a different set of techniques to demonstrate spermatozoa en masse than do smear techniques which allow for a greater understanding of the structure of single spermatozoa. Classic and modified blood techniques to be discussed include MTS, Berg, Diff Quick, Giemsa, and others. The majority of the tissues examined are from the blue shark, Prionace glauca, and other species of the Family Carcharhinidae.

(32) RESPONSE OF EMBRYOS OF THE AMERICAN OYSTER, CRASSOSTREA VIRGINICA, TO HEAVY-METAL MIXTURES

John R. MacInnes
Milford Laboratory

The response of embryos of the American oyster, Crassostrea virginica, to various combinations of two or three metals (copper, mercury, and zinc as the nitrates and chlorides) was studied in the laboratory at optimal temperature and salinity regime for their development. The experimental design was a 3x3x3 factorial experiment using copper concentrations of 0, 8, and 16 ppb; zinc concentrations of 0, 100, and 200 ppb; and mercury concentrations of 0, 6, and 10 ppb. Highly significant toxic synergism was observed in the copper-zinc mixtures and three-metal mixtures of both salts, particularly at high concentrations. Although the chloride salt appeared to be slightly more toxic than the nitrate salt, the overall difference was not significant.

(33)SOME PARASITES AND PATHOLOGY OF PLANKTONIC CRUSTACEANS

Sharon A. MacLean
Oxford Laboratory

Gross and histological examinations were made of several species of euphausiids, isopods (Idotea metallica), amphipods (Parathemisto gaudichaudii), the neustonic shrimp Latreutes fucorum, and a variety of copepods collected on Deepwater dumpsite cruises. Parasites found include ellobiopsids, larval acanthocephalans, isopods, and bacterial and possibly fungal infections. Pathologic conditions were represented by focal gill melanization and muscle necrosis in euphausiids, and complete disintegration and destruction of isopod tissues. On the basis of these field studies there is no direct correlation of disease with ocean dumping. However, the presence of disease entities and prevalence of diseased organisms should be noted and recalled for future reference as possible cues to changes in the ecosystem.

(34) POLYCHLORINATED BIPHENYLS(PCB's) IN MARINE ORGANISMS

Richard S. Maney
Gloucester Laboratory

Recently PCB's have generated considerable public interest. The reasons for this interest are well founded. PCB's are very stable compounds and can take decades to break down. Because of this stability and their carcinogenic properties, they present a very serious health hazard.

In this paper a brief history of PCB's will be given. This will include the purpose of manufacture, the means of disposal, and also the introduction of PCB's into our food chain.

Also to be discussed is the PCB project recently undertaken by this laboratory. This project consists of the seasonal collection of several species of fish from various locations on the Atlantic, Pacific, and Gulf coasts. These fish are then analyzed for PCB content, and the data examined for changes due to the seasons, species, or location.

(35) THE NMFS FOREIGN FISHERY OBSERVER PROGRAM: A REVIEW

Ralph K. Mayo
Woods Hole Laboratory

The National Marine Fisheries Service Foreign Fishery Observer Program has been functioning in the Northwest Atlantic for almost three years. Since the implementation of the Fisheries Conservation and Management Act in March 1977, observers have spent between 1,000 and 2,000 total days at sea annually, aboard foreign commercial fishing vessels, collecting biological data for assessment studies.

The countries participating in the various fisheries, the nature of the fisheries, and the times and locations of the sampling activities are discussed.

In addition to the standardized collection of commercial fishery statistics and the associated biological data, observers have participated in other projects coordinated by NEFC investigators. The relationship of observer sampling activities to current NEFC research is discussed.

(36) CURRENT STATUS OF NEW ENGLAND YELLOWTAIL FLOUNDER STOCKS

Margaret McBride
Woods Hole Laboratory

A review of historical trends and an analysis of recent conditions in the yellowtail flounder populations of Georges Bank, Southern New England plus Cape Cod, and the Middle Atlantic fishing areas is presented. NEFC bottom trawl survey data, commercial fishery data as well as special yellowtail survey data from the State of Rhode Island area are examined in order to make an assessment of the populations' relative abundance, potential for recruitment, and age structure of the present fishery. Questions concerning the recent increased catches of yellowtail in New England are discussed.

(37) IMPLICATIONS OF AGE AND DEPTH DISTRIBUTIONS OF PLANKTONIC FISH EGGS

Anne Naplin
Sandy Hook Laboratory

Fish eggs were collected in a series of discrete depth plankton tows made every 3 h over a 72 h period off Ocean City, Maryland in July 1974. Staging eggs of three species - Merluccius bilinearis, Pisodonophis cruentifer, and Citharichthys arctifrons - provided information about embryonic development, diel spawning and hatching times, and spawning depth. Applications of this type of sampling are discussed.

(38) BEAUTIFUL BLUE EYES

Vernon E. Nulk
Gloucester Laboratory

A design is presented for a scallop harvesting system that represents a radical departure from the conventional. Existing dredge designs are not sufficiently size selective to prevent scallops younger than five years (106 mm) from being caught; yet, recent literature indicates that substantial yearly increases in meat weight occur in scallops until the age of five, making it desirable to limit first age of capture to scallops five years or older. Additionally, past studies indicate that commercial scallop dredges are only 10-20 percent efficient and gear related mortality may reach 20 percent. This means existing dredge designs may be killing a pound for every pound harvested. The new design is the result of an effort to coordinate the performance of the dredge on the bottom and the behavior patterns of the animal it's designed to catch.

The performance of an 8 ft. commercial dredge is analyzed and problem areas defined with the aid of underwater photographs. Behavorial reactions of the scallop to an approaching dredge and methods to make use of them are described. Expected improvements in the harvesting system are discussed and include not only increased selectivity and reduced mortality but easier and safer handling and less susceptibility to fouling in rough bottom.

(39) VERTICAL DISTRIBUTION OF FISH LARVAE IN THE NEW YORK BIGHT FROM A TWO-YEAR SURVEY, JULY 1974 THRU JUNE 1976

Cindy Obenchain Fahay
Sandy Hook Laboratory

An ichthyoplankton-zooplankton and oceanographic survey was conducted in the New York Bight from July 1974 thru June 1976 to investigate biological and physical processes in coastal waters to gather background information for locating proposed offshore nuclear power plants. In addition to a grid sampling scheme, the larval fish results of which were reported at the Early Life History Symposium at Woods Hole, Massachusetts, April 1979, there also was included in the survey a transect consisting of 4 to 8 stations off Shinnecock, Long Island where intensive diel vertical distribution sampling was conducted during nearly every month of the two-year survey.

The predominant species varied seasonally as was similarly found in the grid sampling. Urophycis spp. and Tautogolabrus adspersus were predominant during both summers, Urophycis spp. and either Scophthalmus aquosus or Etropus microstomus were predominant in the fall, Ammodytes spp. predominated the winter species, and Limanda ferruginea and Scomber scombrus predominated the spring. Surface and within thermocline depths showed the greatest abundance during the summers with 1974 being more diverse than 1975. Scophthalmus aquosus represented the majority of the fall 1974 surface catch while the total catch in 1975 was more diverse at the various depths. Ammodytes spp. were significantly more abundant in March and at the surface levels. Limanda ferruginea were abundant in May 1975 with a nocturnal preference for surface layers; their presence was not noteworthy during May or June of 1976. Scomber scombrus were far more abundant during the spring of 1975 than 1976 with an extreme nocturnal preference for surface layers. ANOVA results of distribution and abundance of specific fish larvae show that distance offshore, temperature, depth, and salinity respectively have an affect on certain populations.

Comparison of results of the grid sampling to the vertical distribution sampling show patchiness in larval distribution with some division of species throughout the upper layers of the water column.

(40) A UNIQUE METHOD OF AGEING SURF CLAMS

Loretta O'Brien and John W. Ropes
Woods Hole Laboratory

An ageing technique has been developed for age and growth studies of the surf clam, Spisula solidissima (Dillwyn), which is found in commercial quantities on the Mid-Atlantic continental shelf. The process requires thin sectioning of an excised chondrophore that can then be used directly as a photographic negative. The methodology and consequences of this technique will be presented.

(41) DESCRIPTION OF RECRUITMENT IN 18 SELECTED FISH STOCKS

J.E. Palmer, R.C. Hennemuth, and B.E. Brown
Woods Hole Laboratory

For both predicting and understanding purposes, one is concerned with identifying suitable models and methods that are descriptive of the empirical and theoretical relationships that may exist between fish stock environment, and recruitment. In this paper, we review recruitment in 18 stocks around the world by examining them empirically as to frequency distribution which subsume the total effect of all factors. The actual frequency distribution of individual fish stocks were plotted and each set of recruitment data was tested for goodness of fit to the normal and log normal distributions. Conclusions from the test were that most of the data sets could be described by a log normal distribution function.

Plots of the recruitment data and accompanying catch over time (years) indicated that catch is primarily dependent on the strength of the existing year-classes of recruitment. Serial correlations run on the recruitment data indicate that in most cases recruitment in one year is correlated with the previous year.

(42) POST-FERTILIZATION CHANGES IN THE CHORION OF WINTER FLOUNDER, PSEUDOPLEURONECTES AMERICANUS, EGGS AS OBSERVED WITH SCANNING ELECTRON MICROSCOPY

Dean M. Perry
Milford Laboratory

Little has been reported previously on the fine structure of the outer membrane of fish eggs during and after fertilization. When observed in the S. E. M., the unfertilized egg of the winter flounder, Pseudopleuronectes americanus, is characterized by a crisscross pattern of depressions. These depressions radiate in all directions across the membrane surface creating a wrinkled appearance. After fertilization, the surface of the chorion becomes regular with a much smoother appearance. The pores of the unfertilized egg are flush with the chorion surface, but become thickened and elevated after fertilization. The unfertilized chorion is also smooth and uniformly textured. The fertilized chorion, however, appears extremely granular by first cleavage of the blastodisc. Although no apparent change occurs in the distance between pores after fertilization, statistically significant decreases in pore diameter occur 5 minutes after fertilization. These results are compared to those on egg membranes of other species of fish and invertebrates.

(43) WHEN THE SLICK HIT THE SAND

William C. Phoel and Lisa A. Wirth
Sandy Hook Laboratory

An exploratory oil well blew out in the Gulf of Mexico off Campechi, Mexico on the third of June 1979. Estimates placed the size of the spill as covering one-tenth of the entire Gulf, three million barrels of which were estimated to have impacted the Texas coast primarily along Padre Island. Booms, either complete or staggered were placed across the inlets to prevent oil from entering the environmentally sensitive estuaries including the Laguna Madre. The Laguna Madre is an important nesting area for birds and nursery area for fish. There was concern, however, that subsurface oil of substantial quantities was entering the estuaries under the booms. Diving investigations to observe and quantify the amount of subsurface oil in the inlets showed that between zero and 100 kg of oil particles per day were entering the Laguna Madre.

(44) THE EARLY DEVELOPMENT AND DISTRIBUTION OF THE MOONEYE CUSK-EEL *OPHIDION SELENOPS* ROBINS AND BÖHLKE

J. Christopher Powell
Narragansett Laboratory

Descriptions on the early development of species in the family Ophidiidae from the western North Atlatntic are practically non-existent. Only the striped cusk-eel *Ophidion* (*Rissola*) *marginata* has any published description of its larval development.

Ophidion selenops described by Robins and Böhlke (1959) is a tropical and subtropical species of the continental shelf. Larvae were taken from May to January with peak abundance in August and September. The size and abundance of individuals during these months indicates spawning in late summer.

The incidental occurrence of *O. selenops* larvae on the Georges Bank and Nova Scotian Bank areas are reported. An explanation of these occurrences is given.

Characters and meristics that distinguish this species from other Ophidiids are given.

(45) IMPACTS TO THE BENTHIC MACROFAUNA AND RECOLONIZATION FOLLOWING THE 1976 HYPOXIA

David J. Radosh and Robert N. Reid
Sandy Hook Laboratory

During the summer of 1976, bottom waters over a large portion of the inner continental shelf off New Jersey became hypoxic (less than 2 ml/l dissolved oxygen). Actual anoxic conditions developed and the presence of hydrogen sulfide was noted in an area off the state's central coastline. Initial impacts to the benthic macrofauna, which have been documented elsewhere, included severe reductions in numbers of individuals and species within the anoxic zone. Our studies over the past four years have focused on this particular area and the recovery process has followed three generalized trends: 1) immediate and dense recolonization by several opportunistic and/or tolerant species beginning as early as November 1976 and in some cases lasting through the summer of 1978, 2) strong area-wide recruitment by the summer of 1977 of previously existing dominants with pelagic larval development, and 3) slow to barely detectable recruitment in the central anoxic zone of direct-development species (brooders) through the fall of 1979.

(47) EARLY PHAGOCYTE ACTIVATION IN A LARVAL MOLLUSK EXPOSED TO PATHOGENIC *VIBRIO* SP.

William E. Rose
Milford Laboratory

Currently no information exists on immune defenses in larval mollusks. Changes in relative percentages of morphological cell types were examined in larval oysters (*Crassostrea virginica*) with and without pre-exposure to two pathogenic vibrios. Examination was limited to those cells attaching to plastic cell culture plates after disruption of larvae in a loose-fitting glass mortar with teflon pestle. Some of these cells were capable of ingesting bacteria. Three cell types in 2-day-old larve and five cell types in 6- to 10-day-old larvae were identified by phase contrast microscopy. Exposure to vibrios caused a shift in relative percentages of the cell types in both groups of larvae and a marked increase in total attaching cells in the 6- to 10-day-old animals. Thus, pathogenic bacteria appear to induce phagocytic cell activation in larval oysters as early as 2 days after egg fertilization.

(48) CONTINUOUS PLANKTON RECORDS: PHYTOPLANKTON, ZOOPLANKTON, AND ENVIRONMENTAL FEATURES IN THE MID-ATLANTIC BIGHT. 1974-1979

By

Daniel E. Smith
Atlantic Environmental Group

Plankton samples were collected monthly along two standard routes by Hardy Continuous Plankton Recorders towed at a 10 m depth. The first route extended from Ambrose Light to 30 nm beyond the 106 mile Dumpsite and the second from the Chesapeake Bay mouth eastward into Slope and/or Gulf Stream water. Species composition, seasonal abundance, and timing of blooms are presented as well as effects of temperature and warm-core Gulf Stream eddies on the plankton.

(49) SCALLOP GEAR TRIALS - 1979

(30 Minute Video Tape)

Ronald Joel Smolowitz
Patric Twohig
Woods Hole Laboratory

This tape features both surface and underwater footage taken in June 1979 during a scallop gear trial cruise aboard the R/V RORQUAL. The gear tested included an eight foot wide commercial drag and the eight foot wide survey drag. Scenes included setting and hauling operations, divers riding and filming the gear in action, and footage taken from a warp-mounted camera trolley. Observations include the behavior of various species to the gear as well as the gear's effect on the bottom.

(50) EFFECTS OF SUBLETHAL CADMIUM AND SILVER CONCENTRATIONS ON CERTAIN ENERGY METABOLISM ENZYMES IN THE SEA SCALLOP, PLACOPECTEN MAGELLANICUS

Robert J. Stamm
Milford Laboratory

Live adult sea scallops (P. magellanicus) collected by the National Marine Fisheries Service in 1979 were subjected to 30 or 60 day chronic sublethal silver or cadmium exposure ($AgNO_3$ and $CdCl_2$, respectively). Adductor muscle glycolytic enzyme activities compared.

Possible biochemical mechanisms of toxicity discussed but poorly understood.

(51) SOME EFFECTS OF TEMPERATURE AND FEEDING ON LARVAL GROWTH OF *CRASSOSTREA VIRGINICA*

Wendy Stephenson
Milford Laboratory

In the fall of 1979 at the National Marine Fisheries Service Laboratory in Milford, Connecticut, experiments were conducted examining the effects of temperature and feeding levels on the growth rate of *Crassostrea virginica* larvae. Cultures of oyster larvae were maintained at two different temperatures, 25°C and 30°C, and were fed two different concentrations of algae. One culture at each temperature was given algae at levels typical of what would be given during routine oyster research. The other culture was fed twice this amount. The larvae were measured at two day intervals for six to 17 days. At each of the three temperatures the cultures that were fed twice the usual quantity showed greater growth. Additional study is suggested because of lack of sample size and inadequate number of replicates.

(52) EXPERIMENTAL HYBRIDIZATION OF THE COMMERCIAL AMERICAN OYSTER, *CRASSOSTREA VIRGINICA*

Sheila Stiles
Milford Laboratory

Crosses were made between a population of the commercial oysters, *Crassostrea virginica*, from Long Island Sound and three populations from other geographical areas to evaluate hybrids for crossability and any expression of heterosis. Similarly, interspecies crosses of *Crassostrea* were made utilizing *C. virginica* indigenous to Long Island Sound as one parent. Geographic hybrid larvae usually survived and grew as well as or were intermediate to parental populations. Interspecies hybrid larvae, with one possible exception thus far, generally did not survive and grow as well as parental species or geographic hybrids, at least in conditions under which *C. virginica* is normally reared in Long Island Sound hatcheries. When experimentally stressed with high and low temperatures, or bacteria, non-hybrid larvae in some instances showed better survival and growth than did hybrid larvae; and at other times, the reverse was true. No obvious external differences in morphology were evident between species or in hybrids as larvae. Cytological examination of early embryos points to differences in gametic compatibility and fertilization rates in some of these hybrid crosses. Other experimental approaches to further differentiate and characterize populations and species of oysters are being investigated. Further systematic evaluation of oyster hybrids is planned.

(53) DISTRBUTION, ABUNDANCE AND MORTALITY ESTIMATES OF LARVAL BUTTERFISH, PEPRILUS TRIACANTHUS, FROM MARMAP SURVEYS, 1977 AND 1978

Loretta F. Sullivan
Narragansett Laboratory

The butterfish, Peprilus triacanthus, occurs on the Atlantic coast from South Carolina to Nova Scotia and Cape Breton. They spawn once a year, beginning in late May in Chesapeake Bay, continuing through June and July. Spawning begins in June further north on Georges Bank and the Gulf of Maine, peaks in July and ends in August. Bimonthly Marine Resources Monitoring, Assessment and Prediction (MARMAP) surveys cover the area from Nova Scotia to Cape Hatteras.

Distribution and abundance of butterfish larvae were examined for the 1977 and 1978 surveys, with the focus on the two summer season cruises each year. Larvae were mainly found in the Middle Atlantic and Southern New England areas. Only one occurence of butterfish larvae was found in the Gulf of Maine (August 1978) and only a few larvae were found on Georges Bank (August 1977). The largest concentration was found east of Long Island in late June, 1977 ($1140/10m^2$). Generally, distribution and abundance followed the expected trend of first occurrence in the Middle Atlantic region off Cape Hatteras, moving northward as the summer and spawning season progressed. Mortality estimates were calculated using length frequency distributions for both years.

(54) AGE AND GROWTH OF TILEFISH, LOPHOLATILUS CHAMAELEONTICEPS, IN THE MIDDLE ATLANTIC BIGHT AND SOUTHERN NEW ENGLAND WATERS

Stephen C. Turner[1], Churchill B. Grimes[2], and Kenneth W. Able[2]

[1]Sandy Hook Laboratory

[2]Rutgers University

A commercial fishery for tilefish, Lopholatilus chamaeleonticeps, has become increasingly important since 1972 along the outer continental shelf off southern New England and the Middle Atlantic states. A small recreational fishery for this demersal species has been active since the late 1960's. Observations on the age and growth of tilefish were made on more than 100 specimens using thin cross sections (0.15 to 0.35 mm thick) taken from the center of sagittal otoliths. The maximum age observed to date was 16 years for a 78 cm female.

Back-calculation of length at age was made by measuring the greatest distance to each annulus from the center of the otolith. Otolith size (OS, ocular micrometer units) showed high correlation ($r = .86$) with fork length (FL, cm), and the regression of these dimensions yielded the equation $\ln FL = 0.097 + 0.982 \ln OS$. Growth of approximately 10 cm per year was observed for the first four years, after which growth slowed. The average female matured at 6 years (55-60 cm) and thereafter, grew more slowly than males. By 7 to 8 years (65-70 cm) fifty per cent of the males had matured. Von Bertalanffy growth formula computed from these data were $L_t = 81\ (1-e^{-0.21(t-0.20)})$, for females and $L_t = 111(1-e^{-0.13(t-0.17)})$ for males.

(55) AMMONIUM NUTRIENT DISTRIBUTIONS ON THE SHELF BETWEEN CAPE HATTERAS AND NOVA SCOTIA

Ruth Waldhauer
Sandy Hook Laboratory

To support the PULSE and MARMAP programs, the Environmental Chemistry group has been sampling coastal and shelf waters for nutrients to establish a baseline against which future measurements may be compared, to determine the geographic range of effects of estuarine inputs, and to assess nutrient regulation of phytoplankton growth by sampling when productivity measurements are made.

Preliminary results will be discussed. Cross shelf contour maps and vertical profiles will be presented showing distribution of ammonium over this study area.

(56) SEASONAL MIGRATION OF HERRING TAGGED IN THE GULF OF MAINE AND ADJACENT WATERS

Gordon T. Waring
Woods Hole Laboratory

Since September 1976 the international herring tagging effort sponsored by NEFC, Woods Hole, has tagged about 85,000 adult herring. Tagging was conducted on spawning fish during the autumn and over-wintering and migrating fish during spring. The purpose of the program was to help delineate the intermixture between the herring stocks from southwest Nova Scotia to Cape Hatteras, North Carolina.

The autumn tagging was conducted during September 1976 on Cultivator Shoals (29,500), October 1976 on Jeffreys Ledge (11,000), September 1977 off Chatham (900) and November 1978 on Jeffreys Ledge (10,000). Spring tagging was conducted on Jeffreys Ledge 1977 (11,000) and in the Great South Channell May 1977 (23,000).

Excepting the autumn 1978 Jeffreys Ledge tagging, returns from spawning fish were negligible. These fish moved south and westward during the winter-spring period and returned to the tagging site the following autumn. Fish tagged in the spring generally moved north and eastward along the coast of Maine and southwest Nova Scotia during the summer-autumn period. During the winter-spring seasons these fish moved into the western Gulf of Maine and Block Island Sound.

(57) GROW-OUT STRATEGIES FOR THE BAY SCALLOP, ARGOPECTEN IRRADIANS

James C. Widman
Milford Laboratory

During the summer of 1979, three prospective grow-out methods for the bay scallop, Argopecten irradians were compared. To explore the possibility of maintaining an unrestrained population of scallops in the natural environment, two groups of 1300 tagged scallops (27 mm) were released in a shallow estuary. After 4 weeks both groups had nearly total mortality, probably due to predation. As an alternative approach to free planting, the growth of bay scallops were evaluated in net and cage enclosures. Growth was inversely related to stocking density in both cages and lantern nets. Volumetric biomass was proportional to stocking density for bay scallops at the end of the experiment. No significant difference was found in the growth of scallops maintained at different depths within the 2 m height of the lantern net. The rapid growth of the confined scallops illustrates a promising potential for net and cage enclosures in bay scallop culture.

(58) FORENSIC pHOCUSING

Kate Wiggin
Gloucester Laboratory

Thin layer isoelectric focusing is a means of "fingerprinting" a product by its proteins. This poster shows the "library" of fingerprints taken on various products that have come to the Laboratory for verification of species. Crab species identification is important to insure the correct labeling of imported canned crabmeat. The identification of sea turtle species is necessary to determine the extent of prosecution under the law for molesters of this endangered species. As a quality control method, several species have been identified from consumers' "doggie bags."

(59) MICROALGAE CULTURED IN HIGH HEAVY METAL CONCENTRATIONS AS FOOD FOR LARVAE OF THE AMERICAN OYSTER CRASSOSTREA VIRGINICA

Gary H. Wikfors
Milford Laboratory

The role of algal food organisms in concentrating metals in grazing larvae was investigated under laboratory conditions. Strains of the Chrysophyte Isochrysis galbana were adapted to grow in media containing high concentrations of copper and cadmium by periodic subculture into media containing progressively higher metal concentrations. Veligers of the American oyster, Crassostrea virginica were fed metal-adapted algae daily for eight days starting 48 hours after fertilization of eggs. Algal cells were washed and resuspended in sterile seawater before feeding. I. galbana cultured in 10 mg% $CuCl_2$ used as a food source resulted in an average larval size of only 104.5 µm and mortality of 61.3% as compared with an average size of 160.0 µm and mortality of 14.4% for larvae fed unadapted algae. I. galbana cultured in 2.5 mg% $CdCl_2$ used as a larval food resulted in less inhibition of growth (to 153.0 µm) and mortality of 30.6%. Solutions of metal salts at concentrations approximating those contained within algal cells were added to larval suspensions and did not result in growth decreases or mortalities appreciably higher than those of veligers fed only unadapted I. galbana. Thus, the adaptation of marine unicellular algae to metal concentrations that are growth-inhibiting upon initial exposure was demonstrated. In addition, the bioaccumulation of metal ions within the primary producer was shown to exert a detrimental effect upon a higher trophic level. The importance of these phenomena to natural ecosystems and to commercial aquaculture is discussed.

(60) FROM RIGOR TO RUBBER:

TEXTURAL CHANGES IN FROZEN HAKE

K.A. Wilhelm
Gloucester Laboratory

Toughening of fish flesh during frozen storage is particularly noticeable in the hakes. Textural studies at the Gloucester Laboratory were conducted on minced whiting (Merluccius bilinearis) and red hake (Urophycis chuss) fillets along three concurrent approaches: sensory evaluation, physical testing and chemical assay. Sensory texture and flavor evaluations were performed with a 12 member panel using a 9-point hedonic scale. Compression-shear force measurements were performed with the Kramer Shear Press testing cell. Chemical assays included trimethylamine oxide (TMAO), trimethylamine (TMA), dimethylamine (DMA), formaldehyde, extractable protein (EP), pH, moisture content and moisture loss from cooking.

The information derived from these tests indicate the factors influencing toughening, the chemical mechanisms and posssible procedures which can reduce the physical deterioration of the fish flesh.

(61) CURRENT STATUS OF THE UNDULATING OCEANOGRAPHIC RECORDER

by Grayson Wood
Atlantic Environmental Group

Continued collaboration on the Undulating Oceanographic Recorder (UOR) Project between the Atlantic Environmental Group and Britain's Institute for Marine Environmental Research has produced a ship-of-opportunity version of the vehicle. Smaller, lighter and more hydrodynamically stable than the original Plessey Mark 1, this unit carries not only the Hardy Continuous Plankton Recorder mechanism and sensors for temperature, pressure and conductivity but a new fluorometer for in situ chlorophyll measurement and an improved harmonic drive undulation servo.

Vehicle performance and data capture capabilities are illustrated by way of selected results from recent tows (May 1979) through Gulf Stream/Slope Water fronts, east and northeast of Cape Hatteras. The versatility and future applications of the fluorometer are discussed. Finally, a plan is presented for the use of AEG's own production model which will be delivered in the summer of 1980.

(62) THE STATUS OF THE SEA SCALLOP (PLACOPECTEN MAGELLANICUS) POPULATIONS OFF THE NORTHEAST COAST OF THE UNITED STATES

Paul W. Wood, Jr.
Woods Hole Laboratory

A general description of the distribution of commercially exploited populations in the Gulf of Maine, on Georges Bank, and in the Mid-Atlantic is reviewed. Recent trends in abundance are related to the historically cyclic nature of sea scallop populations by means of USA and Canadian research survey results and commercial landing statistics. The present levels of exploitation are illustrated and projections of future availability presented. Present management practices are described.

(63) A FISH DISEASE SURVEY OF THE RARITAN BAY AND NEW YORK BIGHT APEX AREA, 1973-1980

John Ziskowski
Sandy Hook Laboratory

The analysis of the results of a six year study of fin rot disease in the inner New York Bight has yielded new insights: Diseased winter flounder are not randomly distributed with the New York Bight apex and within Raritan Bay, but are concentrated in certain highly polluted portions of these areas. In similar manner, another environmental disease, the bent fin ray condition of fish such as the winter flounder, is also shown to be concentrated in certain polluted portions of Raritan Bay. An ulcerative disease of red hake captured in the vicinity of sludge dumps in the New York Bight apex has been documented during the last two years and appears to affect red hake captured only in the inner New York Bight.

(64) FOOD HABITS OF THE BLUE SHARK, (PRIONACE GLAUCA) IN THE NORTHWEST ATLANTIC

Nancy Kohler
Narragansett Laboratory

The blue shark, Prionace glauca, is said to be the most numerous of large oceanic sharks in the Atlantic. Cosmopolitan in distribution, it is represented widely in the tropical, subtropical and warm temperate belts of all oceans including the Mediterranean. Food habits studies to date report blues feeding on small fishes and cephalopods. This presentation presents data from examination of 523 blue shark stomachs of which 322 or 62% contain natural food. The 192 females and 331 males range in size from 53-241 cm FL and 68-346 cm FL respectively. These samples were collected at shark fishing tournaments on Long Island, NY and from longline operations aboard commercial and research vessels in the offshore waters between Cape Hatteras and the Grand Banks.

The effect of area and sex on the species composition of the diet is examined. Pisces, with 38% and cephalopods, with 28% by frequency of occurrence are the major food groups eaten by the blue shark. When relative importance values are used, bluefish and gadids represent the major fish groups consumed especially in inshore depths of <50 fathoms. Offshore (>50 fathoms) squid and other teleosts are more important. No significant difference in diet is found between males and females. Mean food volume is 373.3 cc per stomach for inshore sharks and 137.8 cc per stomach for offshore sharks. The maximum amount of food found in a blue shark stomach is 8.8% of its body weight and comprises 35% of its total stomach volume when water volume is used to estimate maximum stomach capacity. Future analyses will include examination of the data for seasonal and size differences.

PROGRAM

THIRD NORTHEAST FISHERIES CENTER RESEARCH MEETING

Tuesday, March 12, 1985

Sea Crest Hotel, North Falmouth, Massachusetts

10:00-1:00	Registration	
1:00	Introductory and Welcoming Remarks	
1:15	Break - Adjourn to Sessions A and B	
	Session A	Session B
1:20	Playing detective: age determiniation and validation for the black sea bass and other species. Louise Dery, Woods Hole, MA	Trends in seabed oxygen consumption rates at the New York Bight sewage sludge dumpsite. 1974-1983. James W. Duggan, Sandy Hook, NJ
1:40	Otolith pattern recognition of larval and young-of-the year winter flounder. Brenda Fields, Woods Hole, MA	Vertical distribution of metals in sediment from the New York Bight sewage sludge disposal site and adjacent areas. Vincent Zdanowicz, Sandy Hook, NJ
2:00	Methodic approaches to ageing large sharks. Gregory Skomal, Narragansett, RI	The pertinence of pollution monitoring in the marine environments. Alan W. Humason, Gloucester, MA
2:20	Age structure and growth of a surf clam population on Georges Bank. Gary Sheperd, Woods Hole, MA	GC/MS: A complete qualitative and quantitative analysis. Cynthia Auld, Gloucester, MA
2:40	Break	Break
3:00	Taxonomy of northwest Atlantic sand lance Ammodytes. Betsy B. Washington, Washington, DC	Chemical processes near the seabed that influence the abundance of benthic organisms. A.F.J. Draxler, Sandy Hook, NJ
3:20	Marine fish species identification--its progress and prospects. Heather MacFarlane, Gloucester, MA	The abundance and distribution of indicator taxa in the New York Bight apex. Steven A. Fromm, Sandy Hook, NJ

3:40	Annotated bibliography on the ocean quahog, Arctica islandica. Judith Brownlow (speaker), and J. Ropes, Woods Hole, MA	Monitoring winter flounder at selected NEMP stations in the northwestern Atlantic: kidney G6PDH activity. Donna Luedke, Milford, CT
4:00	Surimi. Kurt A. Wilhelm Gloucester, MA	
7:30	Happy Hour	

Wednesday 3/13/85

9:00	Prevalence of larval oyster pathogens on adult oyster shell from two sites in Long Island Sound. Lisa Petti Tettelback Milford, CT	A description of temperature conditions and Gulf Loop Current variability for the years 1979-1983 utilizing ship of opportunity data. Stephen P. Matteson, Woods Hole, MA
9:20	Some diseases and other conditions in gills of marine fishes. Earl J. Lewis, Jr., Oxford, MD	Physical oceanography and Marine Resources Monitoring, Assessment and Prediction Program. Daniel Patanjo, Woods Hole, MA
9:40	Histolgic procedures for fish molluscs, and crustaceans. Christina N. Roney, Oxford, MD	Nutrient dynamics along a New York Bight transect and their relation to hypoxia. R. Waldhauer, A.F.J. Draxler, A. Matte, and D. McMillan, Sandy Hook, NJ
10:00	Effects of sublethal copper and cadmium exposure on the reproductive effort and general health of the sea scallop, Placopecten magellanicus. Diane R. Oakes. Milford, CT	Chlorophyll distribution over Georges Bank. Christine Evans-Zetlin, Sandy Hook, NJ
10:20	Break	Break
10:40	NMFS enforcement operations in the Northeast Region. James A. Medeiros, New Bedford, MA	Comparison of two methods for determining variations in shelf waterfront position from satellite infrared data. Kenneth W. Barton, Narragansett, RI

11:00	Grants-in-Aid for commercial fisheries research and development in the Northeast Region--a state/federal perspective. Harold C. Mears, Gloucester, MA	Description and research applications of infrared satellite data. Carol A. Price, Narragansett, RI
11:20	They that go down to the sea in bulldozers and barges. Tracey McKenzie, and Sue Mello Roe, Gloucester, MA	Net phytoplankton in the New York Bight shelfwater, 1976 to 1983: long term mean seasonal cycles and abundance anomolies. Daniel E. Smith, Narragansett, RI
11:40	Fisheries management plan road race. Kathi Rodrigues, Gloucester, MA	Comparison of sea surface temperatures with air temperatures and bottom temperatures for the southern New England continental shelf, 1974-1983. Grayson B. Wood, Narragansett, RI
12:00	Lunch and keynote addresses by: Allen E. Peterson, Jr., NEFC Center Director William G. Gordon, Assistant Administrator for Fisheries, NOAA	
2:00	Poster Session	
3:20	Break	
3:40	Underwater view of otter trawl gear. Vernon E. Nulk, and John F. Kenney, Narragansett, RI	A miniature test system for tracing pathogens in a shellfish hatchery. William E. Rose, Milford, CT
4:00	A distributed delay model of lobster growth. Joseph S. Idoine, Woods Hole, MA	Growth of the surf clam, Spisula solidissima in an experimental upflow nursery system. Kathy Chiba, Milford, CT
4:20	Preliminary identification of species groups in the demersal fish fauna of the New York Bight based on recurrent group analysis. Antonia C. Morris, Sandy Hook, NJ	Density and handling strategies for bay scallops, Argopecten irradiens, grown in lantern nets. James C. Widman, Milford, CT
4:40	Clamming 1984. Malcolm J. Silverman, Woods Hole, MA	A reliable method for culturing a marine algal collection. Gail Ferris, Milford, CT

Thursday 3/14/85

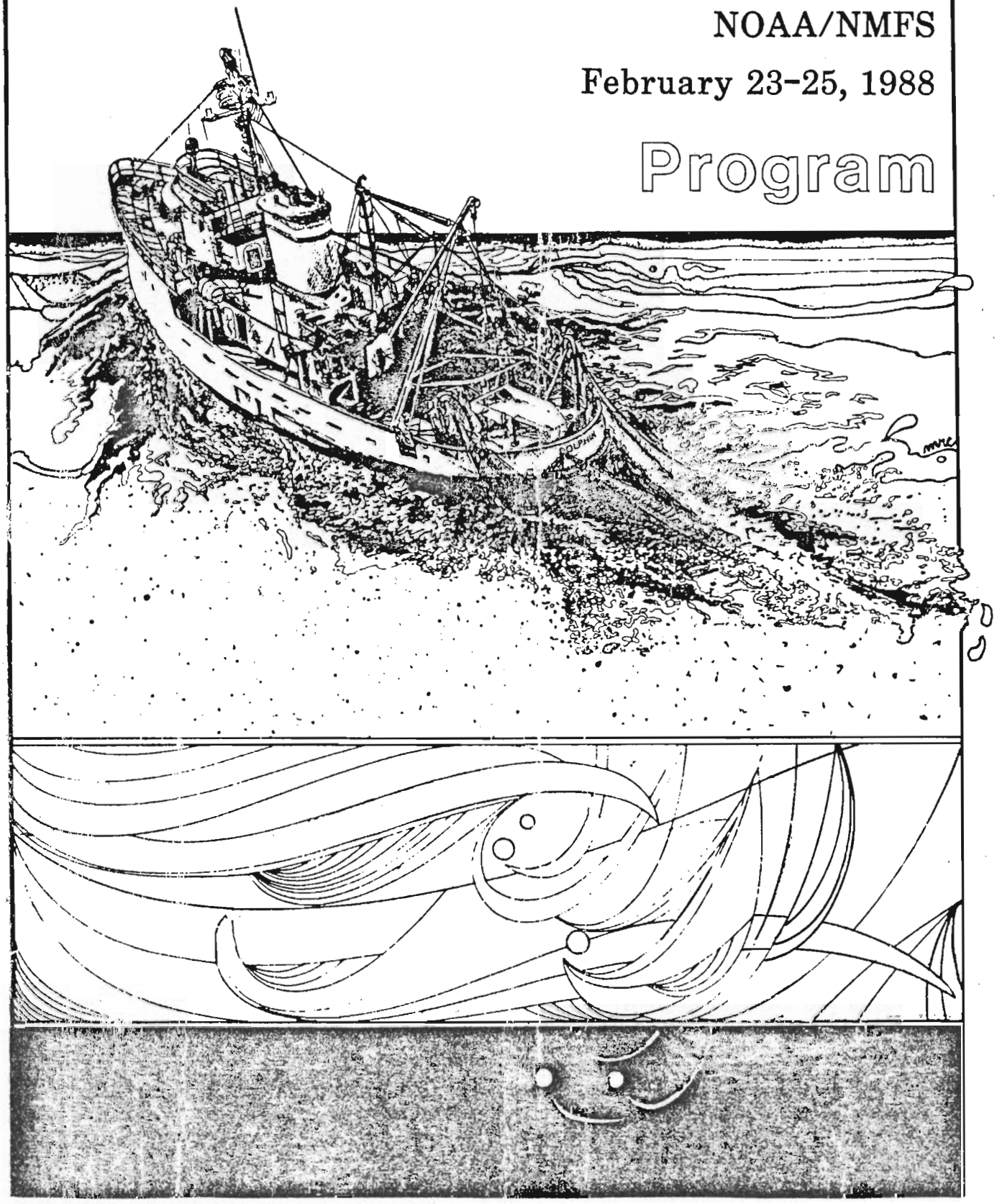
9:20	Food of weakfish and bluefish in waters off the eastern United States. William L. Michaels, Woods Hole, MA	Recent trends in the Georges Bank flounder fishery. Karen Foster, Woods Hole, MA
9:40	Food habits of juvenile bluefish, Pomatomus saltatrix (Pisces: Pomatimidae), during estuarine residency. Kevin D. Friedland, Sandy Hook, NJ	Current abundance and recruitment patterns of sea scallop resources in USA and Canadian portions of Georges Bank. Susan E. Wigley, Woods Hole, MA
10:00	Hematopoiesis and germ-line primordia in embryonic and larval fish. Dean M. Perry, Milford, CT	The distribution and abundance of yellowtail flounder, Limanda ferruginea, larvae in shelf waters off northeastern United States, 1977-1984. Myron T. Silverman, Sandy Hook, NJ
10:20	Break	Break
10:40	Growth selection response in the American oyster. Shearon Dudley, Milford, CT	The commercial fisheries of New York. Emerson C. Hasbrouck, Jr., Greenport, NY
11:00	An evaluation of digital analysis techniques in assessing fecundity. Jay Burnett (speaker), Woods Hole, MA; P. Kostecki, and D. Oliver, Amherst, MA; and S. Clark, Woods Hole, MA	The responsibilities and duties of a Fisheries Reporting Specialist. Susan Koch, Gloucester, MA; Richard Denzler, Hampton, VA; Peter Marckoon, Rockland, ME
11:20	A comparison between conventional and image analysis techniques for measuring krill. Jerome Prezioso, Narragansett, RI	History of fisheries on Georges Bank. Susan Rockwell, Woods Hole, MA

4th NORTHEAST FISHERIES CENTER
Research Meeting

NOAA/NMFS

February 23-25, 1988

Program



ITINERARY

TUESDAY	9:50 - 10	WELCOME/OPENING REMARKS - PETERSON
	10 - 12	6 PRESENTATIONS
	12 - 1	LUNCH
	1 - 3	6 PRESENTATIONS
	3 - 3:20	BREAK
	3:20 - 5:40	7 PRESENTATIONS
	6:30 - 8	DINNER/KEYNOTE ADDRESS - ROE
	8 - 10	POSTER SESSION/HAPPY HOUR
WEDNESDAY	7 - 8	BREAKFAST
	8:20 - 10	6 PRESENTATIONS
	10 - 10:20	BREAK
	10:20 - 12	5 PRESENTATIONS
	12 - 1	LUNCH
	1 - 3	6 PRESENTATIONS
	3 - 3:20	BREAK
	3:20 - 6	8 PRESENTATIONS/CLOSING REMARKS
	6:30 - 7:30	DINNER
	8 - 10	POSTER SESSION/HAPPY HOUR
THURSDAY	7 - 8	BREAKFAST
	9 - 10	ENGR. DEPT. - TOW TANK DEMO.
	10 - 12	URI GSO FACILITY TOUR

POSTER SESSION

UTILIZING MULTIVARIATE ANALYSIS TO REVEAL PATTERNS IN MARMAP SURVEY DATA

Joseph Kane and Jerome Prezioso

MODELLING TECHNIQUES AND TOW TANK DEMONSTRATION

Vernon E. Nulk, Alan J. Blott and John F. Kenney

GEOGRAPHIC INFORMATION SYSTEMS: AN EXAMPLE - VIDEO PRESENTATION -

to be announced

A STUDY OF WINTER FLOUNDER MOVEMENTS IN THE NEW YORK BIGHT

Beth Valdes

THE AMERICAN FISHERIES SOCIETY FISH PHOTO COLLECTION

Don Flescher

ON BOARD COMPUTER DATA ENTRY AT SEA

Joseph B. O'Gorman

ANALYSIS OF HYDROGRAPHIC CONDITIONS IN THE MIDDLE ATLANTIC BIGHT: 1977-1987

James Manning

THE ABATEMENT OF SEWAGE SLUDGE DUMPING AT THE 12-MILE DUMP SITE: SUMMARY OF FINFISH AND MEGA-INVERTEBRATE CATCHES, JULY 1986 - JANUARY 1988

Donald G. McMillan

CENTER RESEARCH MEETING AGENDA

TUESDAY MORNING: 10 - NOON

MISTAKING SUBSAMPLING FOR REPLICATION: IMPLICATIONS FOR THE 12-MILE DUMP SITE SURVEY

Robert Pikanowski

A REVIEW OF THE OYSTER DISEASE MSX (HAPLOSPORIDIUM NELSONI) AND ITS CURRENT STATUS

E. J. Lewis

FECUNDITY OF THE ATLANTIC MACKEREL (SCOMBER SCOMBRUS) OF THE NORTHEAST COAST OF THE UNITED STATES AND CANADA IN 1987

Carolyn A. Griswold and Myron J. Silverman

RED TIDES, POISONOUS FISH AND MARINE RESOURCES

Christopher Martin

A DECADE-LONG WINDFIELD ANOMALY IN THE NORTHWESTERN ATLANTIC

Grayson B. Wood

ECOLOGICAL DISTRIBUTION, DEMOGRAPHY AND BEHAVIORAL OBSERVATIONS ON PERICLIMENES ANTHOPHILUS AN ATYPICAL SYMBIOTIC "CLEANER" SHRIMP

Martha S. Nizinski

TUESDAY AFTERNOON: 1 - 3 PM

FISH MATURITY ANALYSES: COAXING MEANINGFUL RESULTS FROM MESSY DATA

Jay Burnett

ADVANCES IN THE SEMICONTINUOUS MICROALGAL MASS CULTURE SYSTEM SUPPORTING SHELLFISH STUDIES

Barry C. Smith

PRELIMINARY ANALYSIS OF FEEDING HETEROGENEITIES RELATED TO THE LENGTHS OF THREE PISCIVOROUS FISH

Karen L. Foster

A COMPARISON OF HEALTH PARAMETERS OF BLUE CRABS (CALLINECTES SAPIDUS) HELD IN TWO TYPES OF SHEDDING SYSTEMS

Gretchen Roe

DIFFERENCES IN SEA SURFACE TEMPERATURE FOR THE NEW YORK BIGHT

Glenn Strout

A LABORATORY EXPERIMENT ON VERTEBRAL GROWTH IN THE LITTLE SKATE (RAJA ERINACEA)

Lisa Natanson

TUESDAY AFTERNOON: 3:20 - 5:40 PM

SOURCES OF VARIATION IN CATCH PER UNIT EFFORT OF YELLOWTAIL FLOUNDER (LIMANDA FERRUGINIA) HARVESTED OFF THE COAST OF NEW ENGLAND

Loretta O'Brien and Ralph K. Mayo

WATER COLUMN THERMAL STRUCTURE ACROSS THE NEW YORK BIGHT IN 1987

Robert L. Benway

EVALUATING REPRODUCTIVE SUCCESS OF HARD CLAMS (MERCENARIA MERCENARIA) FROM LONG ISLAND SOUND USING LARVAL VIABILITY AS A CRITERION

Joseph Choromanski

THE EFFECTS OF SELECTED ENVIRONMENTAL PERTURBATIONS ON WINTER FLOUNDER (PSUEDOPLUERONECTES AMERICANUS)

Allen Bejda and Beth Valdes

ULTRASTRUCTURAL STUDIES OF PARAMOEBA PERNICIOSA IN THE BLUE CRAB (CALLINECTES SAPIDUS)

Debra Spitzer

PREDATOR-PREY DYNAMICS AND DAILY RATION ESTIMATES FOR THE SANDBAR SHARK (CARCHARHINUS PLUMBEUS) OFF THE U.S. NORTHEAST COAST

C. E. Stillwell and N. E. Kohler

SCALE MODEL TRAWL DOOR COMPARISONS

Vernon E. Nulk

WEDNESDAY MORNING: 8:20 - 10 AM

SHELL DISEASE INCIDENCE AMONG THE NEW YORK BIGHT AMERICAN LOBSTER POPULATION AS AN INDEX OF ORGANIC POLLUTION: AN INTERIM REPORT

Judith Rugg

A SOFTWARE SYSTEM FOR THE TIME-SPACE PORTRAYAL AND ANALYSIS OF PHYSICAL AND BIOLOGICAL OCEANOGRAPHIC DATA

Jack W. Jossi and Daniel E. Smith

CORRELATION OF SATELLITE MONITORED PILOT WHALE MOVEMENTS WITH ENVIRONMENTAL FEATURES

Carol Price Fairfield

AGE, GROWTH AND SEASONAL REPRODUCTION OF TAUTOG (TAUTOGA ONITIS) IN VIRGINIA

Thomas A. Munroe and E. B. Hostetter

BOTTOM TRAWL SURVEY: A VIDEO PRESENTATION

Malcolm J. Silverman

THE DEVELOPMENT OF LARVAE AND JUVENILES OF ATLANTIC COD (GADUS MORHUA) AND HADDOCK (MELANOGRAMMUS AEGLEFINUS) WITH COMMENTS ON BEHAVIOR AND VERTICAL MIGRATION

Peter J. Auditore

WEDNESDAY MORNING: 10:20 - NOON

THE EFFECTS OF DENSITY ON THE GROWTH OF HARD CLAMS HELD IN SUBTIDAL CAGES AT THREE SITES IN LONG ISLAND SOUND

James C. Widman

TECHNIQUES FOR DEVELOPMENT AND PROPAGATION OF HYBRIDOMAS WHICH SECRETE MONOCLONAL ANTIBODIES

Debra J. Rhoades

THE ENZYME-LINKED IMMUNOSORBENT ASSAY AS AN ANTIBODY DETECTION METHOD FOR APPLICATIONS IN FISHERY BIOLOGY

Debra A. Adam

DETERMINATION OF AGE SAMPLING LEVELS FROM THE ESTIMATION OF CATCH AT AGE AND ITS VARIANCE FOR GROUNDFISH STOCKS OFF THE NORTHEASTERN UNITED STATES COAST

Scott E. Moseley and Judy Penttila

THE FEEDING ECOLOGY OF JUVENILE LONG-FINNED SQUID (LOLIGO PEALEI) OFF THE NORTHEAST COAST OF THE UNITED STATES

Jacquelyn Anderson and Carolyn A. Griswold

WEDNESDAY AFTERNOON: 1 - 3 PM

THE EDIBLE SKATE

Barbara L. Jobe and Kurt A. Wilhelm

CHARACTERIZATION OF TOTAL PLANKTONIC AND SEABED OXYGEN CONSUMPTION RATES AT THE SEDIMENT-WATER INTERFACE AT THE 12-MILE SEWAGE SLUDGE DUMP SITE IN THE NEW YORK BIGHT

Charles N. Farris

SCALLOP GEAR SELECTIVITY STUDIES: PANEL COMPARISON IN A RIGID DRAG (PROGRESS REPORT 1987)

John F. Kenney, Vernon E. Nulk and Alan J. Blott

SPATIAL AND TEMPORAL DISTRIBUTION PATTERNS OF USA SCROD COD LANDINGS

Susan E. Wigley

UNDIRECTED UNDERWATER OBSERVATIONS DOCUMENTED BY UNDERWATER PHOTOGRAPHY DURING NOAA PROFICIENCY DIVES

Jerome Prezioso and Harold L. Pratt, Jr.

PURIFICATION OF OMEGA-3 FATTY ACIDS FROM FISH OIL USING HPLC

Daniel S. Uljua

WEDNESDAY AFTERNOON: 3:20 - 6 PM

EFFECTS OF ELEVATED SULFIDE IN SEDIMENTS ON SETTLEMENT OF BENTHIC INVERTEBRATES

Linda L. Stehlik

SIMULATION OF RECOVERY RATES OF FISH STOCKS IN THE SOUTH GEORGIA ISLANDS AREA

R. C. Hennemuth and K. D. Bisack

GROSS MORPHOLOGY AND MORTALITY OF WINTER FLOUNDER EMBRYOS AS INDICATORS OF REPRODUCTIVE SUCCESS IN LONG ISLAND SOUND: 1987

Andrew T. Hebert

ZOOPLANKTON ABUNDANCE DATA FROM GEORGE'S BANK AND THE GULF OF MAINE: A STATISTICAL MODEL

Carol Moise-Munns and Jack Green

DIFFERENCES IN MATURATION BETWEEN TWO SPAWNING GROUPS OF SUMMER FLOUNDER (PARALICHTHYS DENTATUS, L.) IN THE MIDDLE ATLANTIC BIGHT

Richard C. Greenfield

TRACE METALS CONCENTRATION IN WINTER FLOUNDER LIVERS FROM ESTUARIES IN THE NORTHEAST UNITED STATES

Joseph J. Vitaliano

USES OF SATELLITE DERIVED SEA SURFACE TEMPERATURE CHARTS FOR THE SHELF WATER OFF THE NORTHEAST U.S.

Margaret H. Sano

FEEDING ECOLOGY OF THE BLUE SHARK (PRIONACE GLAUCA) IN THE WESTERN NORTH ATLANTIC

N. E. Kohler and C. E. Stillwell

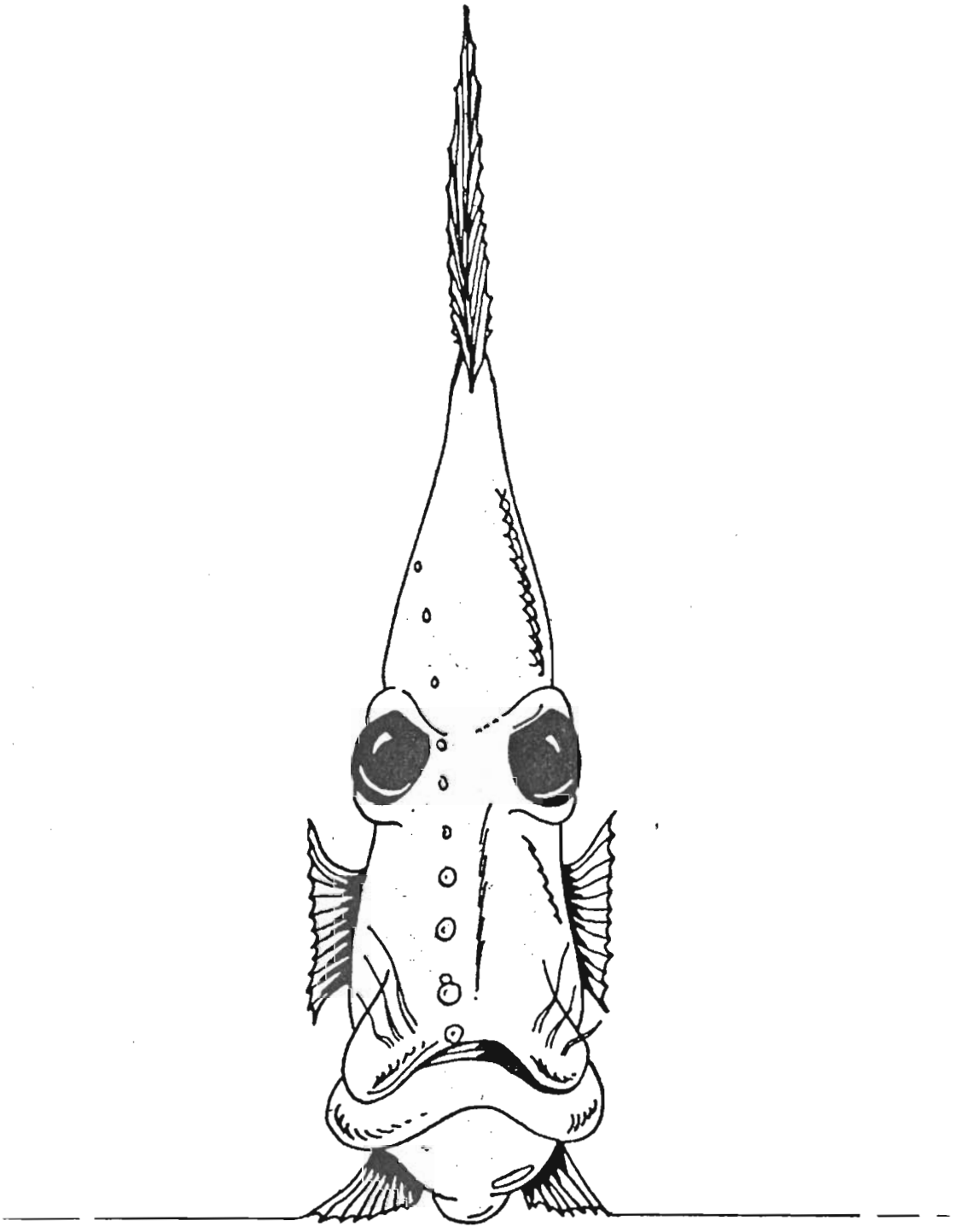
THURSDAY MORNING: 9 - 10 AM

MODELLING TECHNIQUES AND TOW TANK DEMONSTRATION

Vernon E. Nulk, Alan J. Blott and John F. Kenney

THURSDAY MORNING: 10 - NOON

URI/GSO FACILITY TOUR



ABSTRACTS

MISTAKING SUBSAMPLING FOR REPLICATION: IMPLICATIONS FOR THE 12-MILE DUMP SITE SURVEY

Robert Pikanowski
Sandy Hook Laboratory

In field studies of contaminant effects, repeated sampling is often mistaken for replication when in fact it is actually subsampling. When this occurs, erroneous inferences about the effects of contaminants may be made. This talk will explain the difference between replication and subsampling and how a technique, "pseudo-replication", can be used to make the desired inferences. The use of this technique in the design of the 12-MDS survey will be discussed.

A REVIEW OF THE OYSTER DISEASE MSX (HAPLOSPORIDIUM NELSONI) AND ITS CURRENT STATUS

E. J. Lewis
National Marine Fisheries Service
Northeast Fisheries Center
Oxford, Maryland 21654

MSX (Haplosporidium nelsoni), first described from Delaware Bay in 1957, spread to the southern regions of Chesapeake Bay by 1959. During the following decade, MSX devastated the oyster industry in Delaware Bay and the Virginia portion of the Chesapeake Bay. These two bays represented the major source of oyster production in the United States. In the wake of catastrophic losses caused by MSX, management efforts concentrated on growing oysters in lower salinity waters which would not support the parasite. Significant mortalities caused by MSX are limited to areas where salinity ranges from 15-30 ppt. Drought conditions have been experienced in the mid-Atlantic region since 1985, thereby raising salinities and bringing about a resurgence of MSX. MSX is currently exerting pressure on oyster industries along the entire east coast of the United States. For the past two years H. nelsoni has been largely responsible for virtually eliminating the oyster industry in Delaware Bay and greatly reducing harvests in Maryland and Virginia.

FECUNDITY OF THE ATLANTIC MACKEREL (SCOMBER SCOMBRUS) OF THE NORTHEAST COAST OF THE UNITED STATES AND CANADA IN 1987

Carolyn A. Griswold
Narragansett Laboratory

and

Myron J. Silverman
Sandy Hook Laboratory

ABSTRACT

Fecundity estimates of Atlantic mackerel Scomber scombrus were derived from samples collected near known spawning areas in the western North Atlantic as part of BIOMAC, a project to estimate adult spawning biomass of mackerel from a series of egg surveys during the 1987 spawning season. Fecundity - length estimates for fish caught in U. S. waters ranged from 276,000 to 1,457,000 for fish between 310 and 450mm fork length. For canadian fish fecundity estimates ranged from 312,000 to 1,205,000 for fish between 310 and 450mm fork length. Preliminary results indicate fecundity estimates are comparable to earlier published works.

RED TIDES, POISONOUS FISH AND MARINE RESOURCES

Christopher Martin
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Emerson Avenue
Gloucester, Massachusetts 01930

While seafoods as a whole make for tasty and nutritious eating, the existence of poisonous compounds in some marine fish and shellfish constitutes a significant hazard to their full enjoyment. The danger of eating certain species of marine animals has been known since antiquity. Elements of this knowledge became a part of cultural patterns of peoples in many parts of the world and are reflected in food taboos practiced to this day. In spite of the long-standing and widespread recognition that some seafoods were unhealthy, contemporary medical records reveal a significant number of illnesses from foodborne toxins of marine origin. In order to reduce the incidence of disease resulting from consumption of seafood and thereby protect public health while promoting utilization of seafood products, current research seeks to identify the biological sources of these poisons, to characterize their chemistry and to understand the diverse pharmacological properties associated with them.

A DECADE-LONG WINDFIELD ANOMALY IN THE NORTHWESTERN ATLANTIC

Grayson Wood
Narragansett Laboratory

Analyses of wind pattern time series for the North Atlantic have prompted several authors to describe the early onset of April conditions in the marine climate (sea surface warming) during the years 1970 - 1979. The effect on fish stocks of such a pattern change will be widely varied and will depend on a large number of other factors. A discussion is presented which outlines a current effort to examine a time series for haddock year class with respect to the anomalous wind patterns of the 1970's, in the waters around Nantucket Island.

ECOLOGICAL DISTRIBUTION, DEMOGRAPHY, AND BEHAVIORAL OBSERVATIONS ON PERICLIMENES ANTHOPHILUS, AN ATYPICAL SYMBIOTIC "CLEANER" SHRIMP

Martha S. Nizinski
National Marine Fisheries Service
Systematic Laboratory
National Museum of Natural History
Washington, D. C. 20560

Ecology and social behavior of *P. anthophilus* were investigated on a near-shore reef habitat in Bermuda. Distributions and abundances of shrimps and the single species of host anemone (*Condylactis gigantea*) were determined by transect analysis. The shrimp population is not space limited since not all anemones were colonized. Analysis of field data confirmed that the shrimp population is randomly distributed with respect to available host habitat. Shrimps were aggregated (1-9 individuals), however, group size was not correlated with surface area of the host anemone. Although previously described as a cleaner, in 40 hrs of observation using SCUBA, no cleaning behavior was observed. Laboratory experiments indicate that *P. anthophilus* does not exhibit a strong social structure. No evidence of a dominance hierarchy, territoriality, or individual recognition was observed. Since shrimp recruit randomly to host anemones and social interactions are rare, population size seems to be limited largely by stochastic events (recruitment success and predation levels) and not regulated by intrinsic factors (social hierarchies or territoriality) as is commonly found in other anemone shrimp species.

PRELIMINARY ANALYSIS OF FEEDING HETEROGENEITIES RELATED TO THE LENGTHS OF THREE PISCIVOROUS FISH

Karen L. Foster
Woods Hole Laboratory

Food habits data for three piscivorous fish, cod (Gadus morhua), silver hake (Merluccius bilinearis) and spiny dogfish (Squalus acanthias), collected during 1973 to 1980 were examined. Data from these predator's stomachs were utilized in this analysis only if they contained fish prey. A computer program that performed an iterative chi-square test (Tyler, 1969) was used to determine heterogeneity of critical fish prey by predator length. A chi-square statistic was calculated and tested at the 1% and 5% levels of significance.

Chi-square test results indicated that critical fish prey began to emerge in the diet of 24-34 cm. silver hake, 55-70 cm. cod, and 70-82 cm. spiny dogfish. The most common critical preys were sand lance (Ammodytes americanus), silver hake, mackerel (Scomber scombrus) and Clupeidae (unidentified). Results also indicated that a critical prey could be present in the diet of all the predators but emerge at different lengths of each. Presence and absence of mackerel and herring in the predator diets during the 1973-1976 and 1977-1980 data sets may be related to prey species abundance during those time periods. These results will eventually be used in the development of a multispecies VPA-like model for the Northwest Atlantic.

A COMPARISON OF HEALTH PARAMETERS OF BLUE CRABS, CALLINECTES SAPIDUS, HELD IN TWO TYPES OF SHEDDING SYSTEMS

Getchen Roe
National Marine Fisheries Service
Northeast Fisheries Center
Oxford, Maryland 21654

In the Chesapeake Bay region the blue crab industry utilizes shedding systems to produce soft-shell crabs. Two systems in common use are recirculating and flow-through shedding tanks. A literature search did not reveal comparative data between these two type systems in regard to crab mortalities and bacterial or viral infections. Three replicate experiments were performed during the summer of 1986 comparing these two systems for survival and crab health. Each set of crabs was held for three weeks in each system, with dead crabs and those appearing moribund removed daily. Selected tissues from the moribund crabs and from those crabs surviving after three weeks were removed and examined histologically.

Examinations indicated there was no significant difference in either mortalities, bacterial or viral infections, between the recirculating or flow-through systems. There is an indication that earlier deaths can be attributed to bacterial infections; after about a week viruses, in addition to bacteria, can cause crabs to become moribund and eventually die.

SOURCES OF VARIATION IN CATCH PER UNIT EFFORT OF YELLOWTAIL FLOUNDER, LIMANDA FERRUGINIA (STORER) HARVESTED OFF THE COAST OF NEW ENGLAND

by

Loretta O'Brien and Ralph K. Mayo

National Marine Fisheries Service
Northeast Fisheries Center
Woods Hole Laboratory
Woods Hole, Massachusetts 02543 USA

Factors affecting variability in commercial catch per unit effort (CPUE) of yellowtail flounder were examined in order to establish a basis for standardizing fishing effort. Analysis of variance (ANOVA) procedures were employed to test for differences in CPUE among vessel tonnage class, fishing area, and depth zone and the interactions between tonnage class and area, and tonnage class and depth. A series of annual fishing power coefficients was computed for each tonnage class relative to a standard for each stock based on parameter estimates obtained by fitting the CPUE observations to a linear model with tonnage class as the independent variable. Yearly coefficients were computed over the entire 1964-1983 period by incorporating both tonnage class, annual and seasonal effects as independent variables in a three-way linear model. The revised procedures insure adequate representation of all vessel classes engaged in the yellowtail fishery in the CPUE calculations.

WATER COLUMN THERMAL STRUCTURE ACROSS THE NEW YORK BIGHT IN 1987

Robert L. Benway
Narragansett Laboratory

Monitoring of shelf and upper slope water events in the New York Bight continued in 1987 for the twelfth year as part of the NEFC Ships of Opportunity Program (SOOP). Temperature-depth profiles were constructed from 17 expendable bathythermograph (XBT) transects extending from the entrance of New York Harbor through the 106-Mile Dump Site. From the XBT profiles, depictions of the water column temperature structure and of bottom temperatures through the year have been derived. The annual cycle of the water temperatures in 1987 will be described and compared to conditions in previous years.

ULTRASTRUCTURAL STUDIES OF PARAMOEBA PERNICIOSA IN THE BLUE CRAB, CALLINECTES SAPIDUS

Debra Spitzer
National Marine Fisheries Service
Northeast Fisheries Center
Oxford, Maryland 21654

Paramoeba perniciosa, the causative agent of the "gray crab disease," was originally found in blue crabs (Callinectes sapidus) during a crab mortality in the summer of 1965 (Sprague, Beckett and Sawyer, 1969). The amoeba was so named because of its anemic effect on the host. Two brief ultrastructural descriptions of the amoeba have been made. Griffin and Sawyer (1970) studied P. perniciosa's fine structure for taxonomic purposes, while Perkins and Castagna (1970) provided an ultrastructural description of the secondary nucleus, the Nebenkorper. In a histopathological study, Johnson (1976) observed lysis of certain tissues and hemocytes by the amoeba as well as phagocytized, encapsulated, and destroyed amoeba by hemocytes. In this study, P. perniciosa's cytology and organelles were studied ultrastructurally. The fine-structural cytology, which will be discussed, is similar to that of other amoeba. Among the more interesting observations was finding glycogen-filled food vacuoles, lysis of hemocyte cell membranes by the parasite, and the defense response of host blood cells in the antennal gland.

PREDATOR-PREY DYNAMICS AND DAILY RATION ESTIMATES FOR THE SANDBAR SHARK (CARCHARHINUS PLUMBEUS) OFF THE U.S. NORTHEAST COAST

C. E. Stillwell and N. E. Kohler
National Marine Fisheries Service
Narragansett, Rhode Island 02882

Food habits data from 415 sandbar sharks (pups, juveniles, and adults) collected in the area between Cape Hatteras and the New York Bight are examined. Average fork length and body weight (BW) is 166.0 cm and 52.3 kg for adults, 123.0 cm and 23.0 kg for juveniles, and 55.0 cm and 1.72 kg for pups. Forty-nine percent of the stomachs contained food except for the pups of which 80% held food remains. Prey consisted primarily of fish (teleosts and skates) with the pups feeding almost exclusively on soft blue crabs. The average food volume to BW ratio was 0.33, 0.55 and 1.2% for adults, juveniles, and pups. The respective daily ration estimates are 0.19, 0.33, and 1.15% of average BW. Annual food consumption is estimated to be less than one (0.7) times the average BW for adults, 1.2 times for juveniles, and 4.2 times for pups.

A SOFTWARE SYSTEM FOR THE TIME-SPACE PORTRAYAL AND ANALYSIS OF PHYSICAL AND BIOLOGICAL OCEANOGRAPHIC DATA

Jack W. Jossi and Daniel E. Smith
Narragansett Laboratory

The portrayal and analysis of oceanographic data in time and space are often done separately with a combination of the results following at a later stage. This method requires one to make assumptions about the variability of the data before knowing the time-space relationship of such variation. Dissatisfaction with this requirement resulted in the development of a software system which permits the simultaneous time-space analysis, comparison, and portrayal of various scaler oceanographic data. Irregularly spaced scaler values, such as zooplankton abundance, are gridded to produce a uniform time-space matrix of values, usually one year per file. Such files are compared with multi-year files of long-term conditions to determine variability and anomalous features in the time-space array. Different data types, such as temperature and zooplankton can be compared on a cell or lumped cell basis using map stacking techniques. Numerous options for scaling, lagging, and interpolating are available during the analysis and the results can be produced in tabular, or in contoured or 3-D graphical form. The system runs on an IBM-PCXT (with 640K memory and DOS 2.0) or better, and has thus far been used on the physical and biological data from the Ship of Opportunity (SOOP) Program.

CORRELATION OF SATELLITE MONITORED PILOT WHALE MOVEMENTS WITH ENVIRONMENTAL FEATURES

Carol Price Fairfield, NMFS/NEFC, Narragansett Lab

Three pilot whales, which were involved in a mass stranding off Cape Cod in December 1986 and rehabilitated at the New England Aquarium for 6 months, were released on Georges Bank on 29 June 1987. A satellite-monitored tag attached to the largest whale by Oregon State University researchers provided information on the whale's movements for 95 days. The daily positions of the whale from 30 June-1 October plotted over satellite derived sea surface temperature and bathymetric data, illustrate that immediately after it's release, this whale travelled south and remained in the vicinity of a warm-core Gulf Stream ring for several days. The whale then moved northward, and was located along the northern bathymetric and thermal edge of Georges Bank during late July-early August. During mid-August, this pilot whale moved westward and was generally located along the 200m isobath encompassing Wilkinson Basin. In late August, this whale moved eastward along the northern edge of Georges Bank, and by early September, had moved back to the Wilkinson Basin, where it remained until the satellite transmitter failed in early October. The correlation of these movements with bathymetric and/or thermal features is discussed.

DEVELOPMENT OF LARVAE AND JUVENILES OF ATLANTIC COD (GADUS MORHUA) AND HADDOCK (MELANOGRAMMUS AEGLEFINUS), WITH COMMENTS ON BEHAVIOR AND VERTICAL MIGRATION

Peter J. Auditore
Woods Hole Laboratory

A developmental series of larvae and juveniles (3.5 - 50.0mm, standard length) of Atlantic cod (Gadus morhua) and haddock (Melanogrammus aeglefinus), from Georges Bank recruitment surveys (1981 - 1987) is described and illustrated. Cod and haddock like most species of the subfamily gadinae undergo a similar sequence of developmental events. However, a careful examination of Georges Bank specimens has revealed differential development schedules for these two closely related gadids. From the time of hatching to approximately 7.0 - 8.0mm there appears to be little if any variation in morphological development. At 8.0 - 9.0mm postlarval haddock develop a larger pectoral fin and have advanced pelvic fin formation. In addition to earlier completion of notochord flexion haddock maintain a superior number of caudal, anal, dorsal and pectoral fin rays. Perhaps the combination of advanced paired fin development and superior numbers of fin rays allows haddock to be a more efficient swimmer than cod. This may explain the behavioral differences in vertical migration that have been observed during the recruitment surveys.

THE EFFECTS OF DENSITY ON THE GROWTH OF HARD CLAMS HELD IN SUBTIDAL CAGES AT THREE SITES IN LONG ISLAND SOUND

James C. Widman
National Marine Fisheries Service
Milford, Connecticut

Hatchery-reared clams, Mercenaria mercenaria, were held in partially buried, 0.6 x 0.6 x 0.25 m vinyl-coated wire-mesh cages at 3 sites in Long Island Sound. These were grown at densities of 500, 1000 and 3000/m^2 in triplicate at a depth of 5 m mean low water. Clams grew from an initial mean shell height of 12.6 mm in April 1987 to a range of 17.4 - 24.1 mm by November 1987. At one site, cages were deployed with the clams at 5 additional densities ranging from 100-5000/m^2. Density was not a significant factor affecting growth. Location was a significant factor. Clams grown in Greenwich were larger than those grown in Milford or Stonington. Survival was not affected by density although the cages did not completely exclude predators. These results are part of a study examining the factors possibly influencing hard clam recruitment in Long Island Sound.

DETERMINATION OF AGE SAMPLING LEVELS FROM THE ESTIMATION OF CATCH AT AGE AND ITS VARIANCE FOR GROUNDFISH STOCKS OFF THE NORTHEASTERN UNITED STATES COAST

Scott E. Moseley and Judy Penttila
Woods Hole Laboratory

The assessment of the status of a fish stock requires information regarding the age composition of the commercial catch and the variance of the catch at age. The variance of the catch at age can be partitioned into components from the age sample, the length frequency sample, and their interaction. The minimum number of fish to sample for ageing purposes can be determined from the coefficients of variation of the catch at age of prior years. Coefficients of variation were calculated for cod, haddock, pollock, summer flounder, winter flounder, and yellowtail flounder for the years 1981-1985 by stock area and quarter. Coefficients were estimated using actual sampling levels (100%) and age sample sizes equivalent to 50%, 75%, and 200% of the actual levels. Given the levels of precision desired for the catch at age, decisions regarding minimum age sampling levels can then be inferred.

THE FEEDING ECOLOGY OF JUVENILE LONG-FINNED SQUID, LOLIGO PEALEI, OFF THE NORTHEAST COAST OF THE UNITED STATES

Jacquelyn Anderson and Carolyn A. Griswold
National Marine Fisheries Service
Narragansett, Rhode Island 02882

Juvenile long-finned squid, *Loligo pealei*, were collected for a feeding ecology study by trawl from nearshore and offshore stations in the Mid Atlantic Bight, the Gulf of Maine and on Georges Bank during the spring and fall of 1984 and the summer of 1985. A total of 1,892 stomachs from squid having a mantle length (ML) of ≤12.0 cm were examined; of these 62% were feeding. Incidence of feeding was slightly higher in the smaller individuals. Results of prey selection were grouped by 2.0 cm ML increments with copepods being the dominant prey item for squid ≤6.0 cm ML. Juvenile squid became cannabalistic between 2.1 and 4.0 cm ML and were first found to prey on juvenile fish between 4.1 and 6.0 cm ML. Larger crustaceans including amphipods and decapods also became more important once the squid reached 4.1 to 6.0 cm ML. By 12.0 cm ML approximately equal quantities of fish, squid, and crustaceans were being consumed. Seasonal and distributional differences in feeding patterns also are discussed.

CHARACTERIZATION OF TOTAL PLANKTONIC AND SEABED OXYGEN CONSUMPTION RATES AT THE SEDIMENT-WATER INTERFACE AT THE 12-MILE SEWAGE SLUDGE DUMPSITE IN THE NEW YORK BIGHT

Charles N. Farris

Coastal Dynamics Investigation
NOAA/NMFS Sandy Hook Laboratory
Highlands, NJ 07732

Monthly measurements of the seabed oxygen consumption rates and the planktonic respiration rates 0.5m above the seabed have been measured regularly since June of 1985. Additionally, planktonic respiration rates have been measured at 0.1m above the seabed since November 1986. These measurements were taken at six stations which form a transect which passes through the 12-mile sewage sludge dumpsite.

Comparisons indicate an increase in oxygen consumption rates from 0.5m above to the seabed at all six stations. There are also markedly higher oxygen consumption rates at the transect station that receives the highest input from the 12-mile dumpsite and lower rates at the two offshore stations. Seasonal peaks in rates are associated with peaks in bottom water temperature and minimal dissolved oxygen values.

These oxygen consumption rates are an important part of our Investigations' efforts to characterize the metabolic processes at the seabed-water interface and discern the long-term effects of sewage sludge dumping on the ocean floor of the New York Bight. This will give us the ability to monitor changes in the metabolic processes on the seabed as the 12-mile dumpsite area undergoes gradual recovery.

UNDIRECTED UNDERWATER OBSERVATIONS DOCUMENTED BY UNDERWATER PHOTOGRAPHY DURING NOAA PROFICIENCY DIVES

Jerome Prezioso and Harold L. Pratt, Jr.
National Marine Fisheries Service
Northeast Fisheries Center
Narragansett, R.I. 02882

NOAA divers are required to maintain their proficiency by going on two dives per month even when there is no immediate mission to be performed. Proficiency dives offer an excellent opportunity for undirected underwater observation. These observations can, over time, reveal glimpses of behavior patterns of many different marine organisms. Underwater photographs, together with appropriate documentation, can be stored over a number of years to build up a library of information to be drawn upon for illustrating or corroborating ongoing research. Some observations may be valuable enough in themselves to warrant further research or publication. The photographs are also a useful source of material for displays and exhibits. Observations over twenty years of government diving include the incursion of the Asian tunicate, Styela clava, and the alga, Codium fragile into New England waters, the disappearance of the soft coral, Alcyonium digitatum from southern New England, and predation of the sand lance, Ammodytes, by the long-finned squid, Loligo pealei.

PURIFICATION OF OMEGA-3 FATTY ACIDS FROM FISH OIL USING HPLC

Daniel S. Uljua
Gloucester Laboratory

The National Marine Fisheries Service has undertaken the task of supplying fish oil biomedical test materials to researchers for the investigation of the therapeutic value of seafood in the human diet. This report is on a method for the production of purified fractions of selected fatty acids from fish oil concentrate. Eicosapentaenoic and docosahexaenoic acids can be fractionated from fish oil concentrates using the method of reverse phase high performance liquid chromatography. This can be accomplished using milligram or gram quantities of feedstock, and purities up to 99.9% can be obtained in selected eluted fractions. Several column considerations, two mobile phases, and three levels of production are discussed. HPLC is a viable tool for the production of purified fractions of omega-3 fatty acids.

GROSS MORPHOLOGY AND MORTALITY OF WINTER FLOUNDER EMBRYOS AS INDICATORS OF REPRODUCTIVE SUCCESS IN LONG ISLAND SOUND: 1987

ANDREW T. HEBERT

NATIONAL MARINE FISHERIES SERVICE
MILFORD, CONNECTICUT

Gross morphological abnormalities of embryos and overall egg mortality were observed at different development stages in winter flounder (Psuedopleuronectes americanus) as one aspect of a multi-disciplinary study designed to examine their reproductive success in Long Island Sound and Boston Harbor. Adult winter flounder were collected at Norwalk, Milford, New Haven, Madison, CT.; at Hempstead and Shoreham, N.Y.; and at Deer Island and Long Island in Boston Harbor, MA. Data on the age distribution of the adult fish in the study revealed that the Boston Harbor fish were older than Long Island Sound fish. Eggs from 120 females were fertilized with sperm from 360 males. These eggs were then cultured in 250 micron mesh nylon bags in running, ambient sea water. Samples were taken at 16-cell, blastula, gastrula, early embryo, tail-bud and pre-hatch stages. Mean numbers of abnormalities and mean total mortality were highly variable for all stages. Significantly more abnormalities occurred in the tail-bud stage embryos from fish collected at New Haven and Hempstead Harbors. Embryos of fish from New Haven Harbor generally had elevated levels of both abnormal embryos and embryo mortality at all stages.

ZOOPLANKTON ABUNDANCE DATA FROM GEORGE'S BANK AND GULF OF MAINE, A STATISTICAL MODEL

Carol Meise-Munns and Jack Green
National Marine Fisheries Service
Narragansett, Rhode Island 02882

A statistical model was constructed to describe the observed seasonality in abundance of dominant copepod species on George's Bank and Gulf of Maine for the years 1977-1981. In order to determine whether the overall abundance of dominant species had decreased in 1982 and 1983 these data were withheld from the model building exercise. Seasonal models were developed for *Calanus finmarchicus*, *Centropages typicus*, and total copepods. A Chi-square goodness of fit test shows there are significant departures from the observed seasonal cycle for total copepods on George's Bank in 1982 and 1983 ($\alpha = 0.10$) and for *Calanus* on Gulf of Maine in 1982 and 1983 ($\alpha = 0.5$).

USES OF SATELLITE DERIVED SEA SURFACE TEMPERATURE CHARTS FOR THE SHELF WATER OFF NORTHEAST U.S.

Margaret H. Sano, NMFS/NEFC, Narragansett Lab

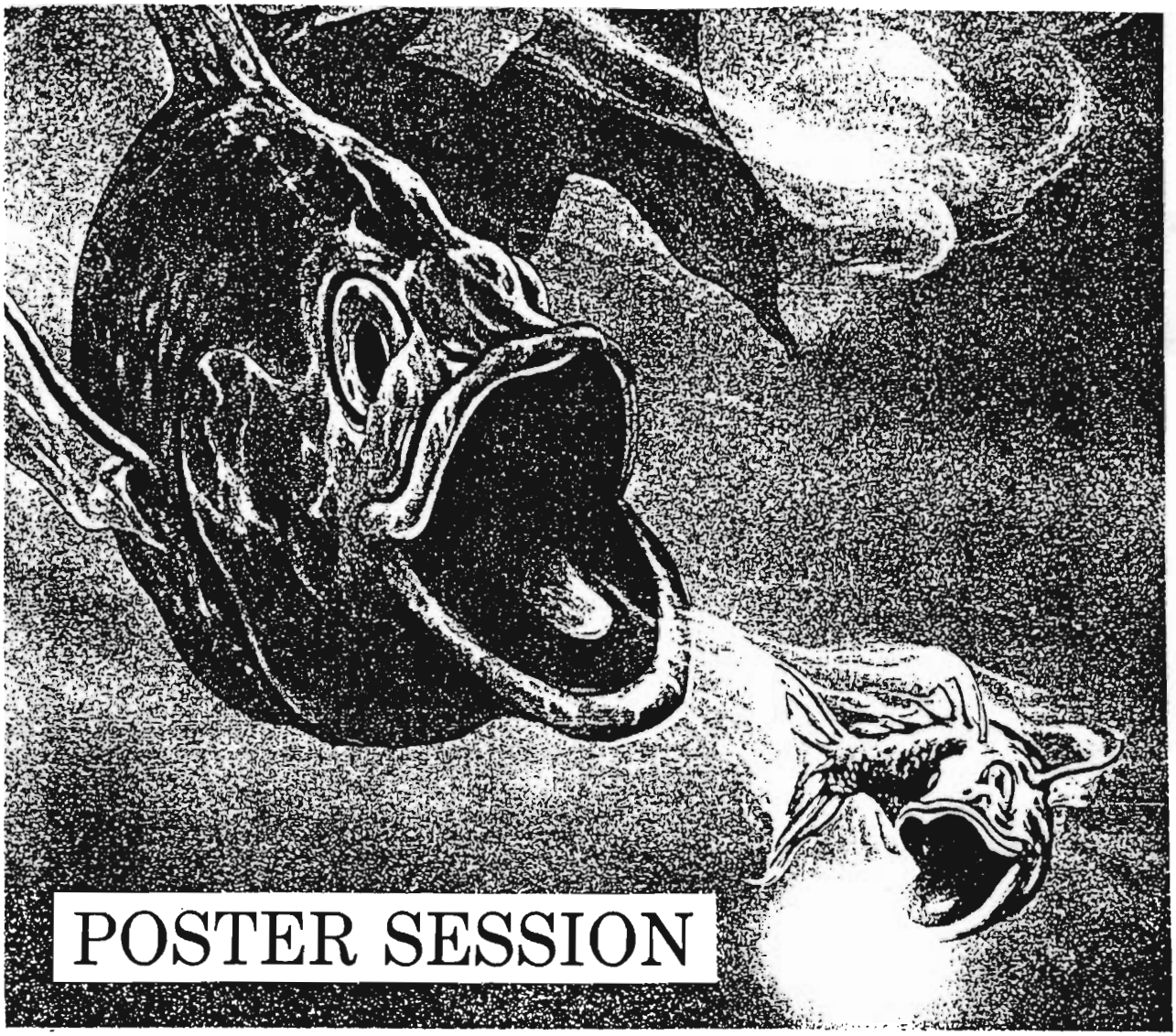
The Marine Climatology Investigation published weekly sea surface temperature charts for the Northeast U.S. on a near real time basis for the period of April - October 1987. The charts were distributed by mail and telecopier to over 200 recipients including scientists at NEFC. Feedback on the charts has been favorable, therefore we will produce the charts again during the 1988 season for distribution within NOAA.

The charts are useful for studying sea surface temperature as an environmental feature which affects fish abundance, distribution and movements. Fishermen use the data to track possible "hot spots" for particular species of fish. The charts provide a record of temperature trends in an area for a given time period. Another type of chart which illustrates temperature differences between time periods is being developed to distinguish temperature patterns more clearly. NEFC scientists are encouraged to use these charts for their research.

FEEDING ECOLOGY OF THE BLUE SHARK (PRIONACE GLAUCA) IN THE WESTERN NORTH ATLANTIC

N. E. Kohler and C. E. Stillwell
National Marine Fisheries Service
Narragansett, Rhode Island 02882

A total of 1,199 blue sharks ranging in size from 53-285 cm fork length were examined for stomach contents. Overall, food was present in 52.4% of the stomach samples which contained a mean volume of 172.2 ml (0.39% body weight). Cephalopods represented the primary food group consumed by the blue shark with a variety of teleost prey of secondary importance. Estimates of the gastric evacuation rate and daily ration were also determined. These results were compared to data from other apex predators in the Western North Atlantic.



POSTER SESSION

GEOGRAPHIC INFORMATION SYSTEMS: AN EXAMPLE - VIDEO PRESENTATION -

Data Management Support

Much attention is being generated in today's computer based work environment concerning the concept and potential analytical use for Geographic Information Systems. The ability to store, retrieve, overlay and then further process large amounts of combined data in a relational way, with rapid response times, affords the researcher an opportunity to interactively consider data inter-relationships. The video presentation is offered as a generic representation of just one of several "GIS" systems, available in today's commercial market. No specific product indorsement is intended. Rather, the video is offered to peak the viewer's imagination as to how this technology might be used to consider the research problems currently being investigated, or contemplated, in support of the NMFS mission.

UTILIZING MULTIVARIATE ANALYSIS TO REVEAL PATTERNS IN MARMAP SURVEY DATA

Joseph Kane and Jerome Prezioso
National Marine Fisheries Service
Northeast Fisheries Center
Narragansett, R.I. 02882

The MARMAP Program of the National Marine Fisheries Service is an ongoing project which monitors seasonal and annual fluctuations in biological and oceanographic components in northwestern Atlantic continental shelf waters through bi-monthly surveys occupying stations spaced 25-35 kms apart between Cape Hatteras, N.C. and Cape Sable, N.S. The analysis of survey data has traditionally focused on the variability of one parameter in a specific geographic area. In this study ten parameters including both biological and physical components from a 1980 survey were selected and analyzed using both cluster and principal component analysis techniques to group stations according to similarities and dissimilarities among them. A discriminant analysis technique was also used on the data to compare station groupings from the multivariate techniques with traditional sub-area designations.

THE ABATEMENT OF SEWAGE SLUDGE DUMPING AT THE 12-MILE DUMP SITE: SUMMARY OF FINFISH AND MEGAINVERTEBRATE CATCHES, JULY 1986 - JANUARY 1988

Donald G. McMillan
Sandy Hook Laboratory

From July 1986 through January 1988, 12 replicate and 9 broad scale trawl surveys were successfully completed in an area associated with the 12-Mile Sewage Sludge Dump Site. 467 trawl stations were sampled with a total of 76 species of finfish and megainvertebrates captured. Since there were seasonal patterns common to both replicate and broad scale surveys, data from the replicate series will be described in a tabular-graphic format. In addition, catch composition and overall rank dominance for both finfish and megainvertebrates will also be presented.

A STUDY OF WINTER FLOUNDER MOVEMENTS IN THE NEW YORK BIGHT

Beth Valdes
Sandy Hook Laboratory

As part of the Environmental Processes Division's 12-Mile Dumpsite Recovery Study, tagging of winter flounder (Pseudopleuronectes americanus) was initiated in July, 1986, to determine the magnitude and extent of movements between the dumpsite area and the surrounding inshore areas. Through December 1987, 3,129 flounder (≥ 17 cm) were tagged at 22 offshore stations associated with the sewage sludge dumpsite and 14 inshore stations in the Sandy Hook-Raritan Bay area. To date, 48 tags have been recovered, primarily by recreational fishermen (72.9 %) with a total return rate of 1.5%. Although the number of returns are low, several trends are suggested. (1) Flounder within the study area exhibit generally accepted seasonal patterns of migration. (2) The greatest number of recaptures occurs when the fish are spawning and are concentrated in inshore waters. (3) There is an interchange between New Jersey and New York waters indicating that populations may not be as discrete as previously believed.

THE AMERICAN FISHERIES SOCIETY FISH PHOTO COLLECTION

Donald D. Flescher
Woods Hole Laboratory

Good fish photographs can aid species identification. Proper identification is a very important part of resource surveys, enforcement, observer and other programs. The American Fisheries Society now has a collection of fish slides that includes many of the species caught during NEFC bottom trawl surveys. As chairman of the AFS Fish Photo Committee, I oversee the project and will be showing some of the 453 slides presently in the collection. Slide catalogs will be available to those who are interested.

ON BOARD COMPUTER DATA ENTRY AT SEA

Joseph B. O'Gorman
Woods Hole Laboratory

Both the turn around time in making survey data available to investigators after a cruise and the accuracy of the data may be increased through on board computer data entry. The configuration and development of a prototype microcomputer based data base management - data entry system will be described. Applications to Scallop Surveys and future usage in Clam and/or Bottom Trawl Surveys will be discussed.

ANALYSIS OF HYDROGRAPHIC CONDITIONS IN THE MID-ATLANTIC BIGHT (1977 - 1987)

James Manning
Woods Hole Laboratory

For the past decade, four to six times per year, observations of temperature and salinity were made throughout the water column at 98 standard stations on the continental shelf of the MAB. The analysis of that data, including TS-volumetrics, seasonal mean distributions, and wind-induced anomalous events, is underway and preliminary results will be presented.

MODELLING TECHNIQUES AND TOW TANK DEMONSTRATION

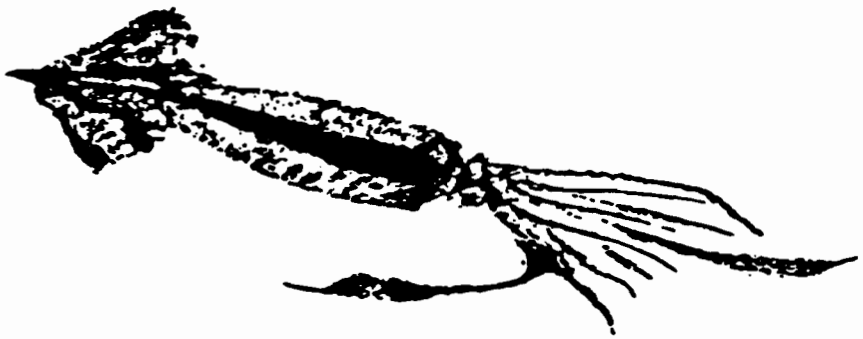
Vernon E. Nulk
Alan J. Blott
John F. Kenney

Narragansett Laboratory

Methods have been developed to test 1/10 scale model trawl nets and doors in the tow tank facility at the University of Rhode Island. Scaling and construction techniques, widely accepted in the research field were used to design a model of the NEFC No. 36 Standard Trawl net, Norwegian BMV oval trawl doors, and the Portuguese polyvalent doors. Laws of modelling, construction techniques, and instrumentation are discussed, and procedures for towing model net and doors in the tow tank are demonstrated.

Fifth Annual
Northeast Fisheries Center

Research Meeting



April 30- May 1, 1991

Carriage House

Quissett Campus
Woods Hole, MA

AGENDA

FIFTH ANNUAL NORTHEAST FISHERIES CENTER RESEARCH MEETING

April 30-May 3, 1991
Carriage House, Quissett Campus, WHOI
Woods Hole, MA

Tuesday, April 30, 1991

7:00-9:00 **Registration and reception**
Shoreway Acres Inn, Falmouth

Wednesday, May 1, 1991

8:00-8:30 **Welcome and opening remarks**
John B. Pearce
NEFC Deputy Center Director
Woods Hole, MA

Michael F. Tillman
NOAA Deputy Assistant Administrator for Fisheries
Washington, D.C.

Session I
Chair: Dave Nelson
NEFC, Milford

8:30-10:00 **Hydrographic variability on Georges Bank during the larval herring season (November-February), 1963-1990**
Tamara J. Holzwarth
NEFC, Woods Hole

Test and evaluation of a temperature-conductivity recorder for moored applications
Maureen H. Taylor
NEFC, Woods Hole

Applications of satellite remote sensing at the Narragansett Laboratory
Cynthia M. Ruhsan
NOAA Corps, Narragansett

Continuous plankton records: Massachusetts to Cape Sable, Nova Scotia and New York to the Gulf Stream, 1989
J. W. Jossi and D. E. Smith
NEFC, Narragansett

10:00-10:30 **Break**

10:30-12:30 **Presentations**

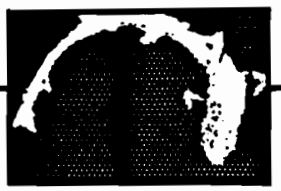
Potential contribution of phytoplankton to the "health" of bottom communities and habitat in relation to the depth of light penetration at the 12-Mile Dumpsite and nearby areas
Christine Zetlin
NEFC, Sandy Hook

Net extrusion of larval fishes: Correction factors for 0.333 mm vs 0.505 mm mesh bongo nets
Donna L. Johnson and Wallace W. Morse
NEFC, Sandy Hook

Semicontinuous algal culture in open tanks
Barry C. Smith
NEFC, Milford

Using absorption spectra of extracted photosynthetic pigments to evaluate the taxonomic placement of strains in the Milford Microalgal Culture Collection
Gail E. Ferris
NEFC, Milford

12:30-1:30 **Lunch**



Session II

Chair: Stu Wilk
NEFC, Sandy Hook

1:30-3:00 **Presentations**

Changes in the blood chemistry of the American lobster, *Homarus americanus*, over the molt cycle
Renee Mercaldo-Allen
NEFC, Milford

A review of principal diseases of the blue crab, *Callinectes sapidus*
Gretchen A. Messick
NEFC, Oxford

An infection study of the American oyster, *Crassostrea virginica*, by *Haplosporidium nelsoni* (MSX)
E. J. Lewis
NEFC, Oxford

Transmission studies of sarcoma disease in the softshell clam, *Mya arenaria*
Shawn McLaughlin
NEFC, Oxford

3:00-3:30 **Poster Session**

3:30-5:30 **Presentations**

Bioeconomic analysis of New England's otter trawl fishery
Steven F. Edwards
NEFC, Woods Hole

The importance of age validation in age and growth studies, with special reference to two NEFC age validation studies in progress
Richard C. Greenfield
NEFC, Woods Hole

Aspects of automated data acquisition from a trawl mensuration system
Joseph B. O'Gorman
NEFC, Woods Hole

Fecundity of the Atlantic herring, *Clupea harengus harengus* L., from the Southwestern Gulf of Maine and Georges Bank in 1989
Myron J. Silverman and Donna L. Johnson
NEFC, Sandy Hook

Thursday, May 2, 1991

Session III
Chair: Judy Krzynowek
NEFC, Gloucester

8:00-10:00 **Presentations**

Diets of Atlantic rock, jonah, and lady crabs in the New York Bight apex
Linda Stehlik
NEFC, Sandy Hook

Three new species of symphurine tonguefishes from tropical waters of the Eastern Pacific (Symphuris: Cynoglossidae, Pleuronectiformes)
Martha S. Nizinski and Thomas A. Munroe
NEFC, National Systematics Lab
Washington, D.C.

Current fisheries research in Portugal with emphasis on projects in Lisbon
Joana Carneiro Da Silva
Visiting scientist from Portugal
Milford

Application of distributed delays to modeling growth in the American lobster
J. S. Idoine
NEFC, Woods Hole

Temporal variability in the benthos at the 12-Mile Dumpsite
Joseph J. Vitaliano amd Steven A. Fromm
NEFC, Sandy Hook

10:00-10:30 **Poster Session**

10:30-Noon **Presentations**

An autometer flow injection system for analysis of nucleic acid levels in fish
E. M. Calderone and L. J. Buckley
NEFC, Narragansett

Generation of monoclonal antibodies for species identification of cooked seafood products: Salmon and trout
Donna A. Luedke, Ronald C. Lundstrom, and Margaret M. Russell
NEFC, Gloucester

Monoclonal antibodies: Application to problems in fishery biology and technology
Stephen M. Mayfield, Ronald C. Lundstrom, Margaret M. Russell, Donna A. Luedke, and Daniel L. Entremont
NEFC, Gloucester

Growth and survival of juvenile *Argopecten irradians* reared on diets of copper-adapted *Isochrysis galbana*: A preliminary study of tolerance range
Diane Rusanowsky
NERO, Milford

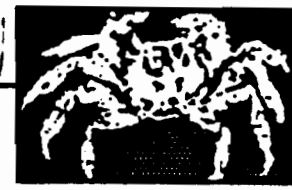
Noon-1:30 **Lunch**

Session IV
Chair: Frank Almeida
NEFC, Woods Hole

1:30-3:00 **Presentations**

Foreign fishing in the Exclusive Economic Zone
Dennis C. Hansford
NEFC, Woods Hole

Scalloping aboard the *Albatross IV*
Malcolm J. Silverman
NEFC, Woods Hole



Distribution of O-group cod and haddock in relation to macro-zooplankton on Georges Bank
Elisabeth Broughton
NEFC, Woods Hole

Compensatory response of the Gulf of Maine population of witch flounder to increased exploitation, 1977-1990
Jay Burnett
NEFC, Woods Hole

3:00-3:30 **Break/Poster Session**

3:30-5:00 **Presentations**

Antibody levels against bacterial pathogens in the sera of winter flounder from Long Island Sound
Diane Kapareiko
NEFC, Milford

Prevalence and intensity of shell disease in lobsters from eight offshore canyons: A progress report
Regina L. Spallone
NEFC, Milford

Effect of cadmium exposure on serum vitellogenin levels and heptasomatic and gonadosomatic indices of winter flounder
J. J. Pereira, R. Mercaldo-Allen, C. Kuropat, D. Luedke, and G. Sennefelder
NEFC, Milford

Winter flounder: Living in a hypoxic world
John J. Ziskowski, Jose Pereira
NEFC, Milford
Don C. Miller, John Sewell
USEPA, Narragansett

Friday May 3, 1991

Session V
Chair: Robert Reid
Sandy Hook

8:00-10:00 **Presentations**

Cytogenetic and cytologic state of embryos of winter flounder, *Pseudopleuronectes americanus*, from Long Island Sound
Dean M. Perry, James B. Hughes, and Andrew T. Hebert
NEFC, Milford

An alternative to producing hazardous wastes when analyzing for contaminants in fish: Supercritical fluid extraction
Thomas W. Finneran and Ashok Deshpande
NEFC, Sandy Hook

Paralytic toxins in Atlantic mackerel
Christopher Martin
NEFC, Gloucester

Fish and ports: Are they compatible? A case history of interagency cooperation in the Delaware River basin to resolve conflicts and minimize adverse effects
Stan Gorski,
NERO, Sandy Hook

10:00-10:30 **Break**

10:30-Noon **Presentations**

Marine mammals in Massachusetts and the Gulf of Maine
Douglas W. Beach
NERO, Gloucester

Sea turtles in the Northwest Atlantic
Colleen C. Coogan
NERO, Gloucester

Scientific information use in the bureaucratic morass
Robert J. Pawlowski
NOAA Corps, NERO, Gloucester

Noon-1:30 Awards Buffet Luncheon

Poster Presentation Titles

Historical trends of the Atlantic coast fisheries: A computer video presentation

Eileen MacHaffie and Donald McMillan
NEFC, Sandy Hook

Cell hybridization techniques and use of hybridomas in seafood technology

Margaret Russell
NEFC, Gloucester

Rearing methods for cross-reaction testing of monoclonal antibodies

Stephen M. Mayfield, Ronald C. Lundstrom, and Margaret M. Russell
NEFC, Gloucester

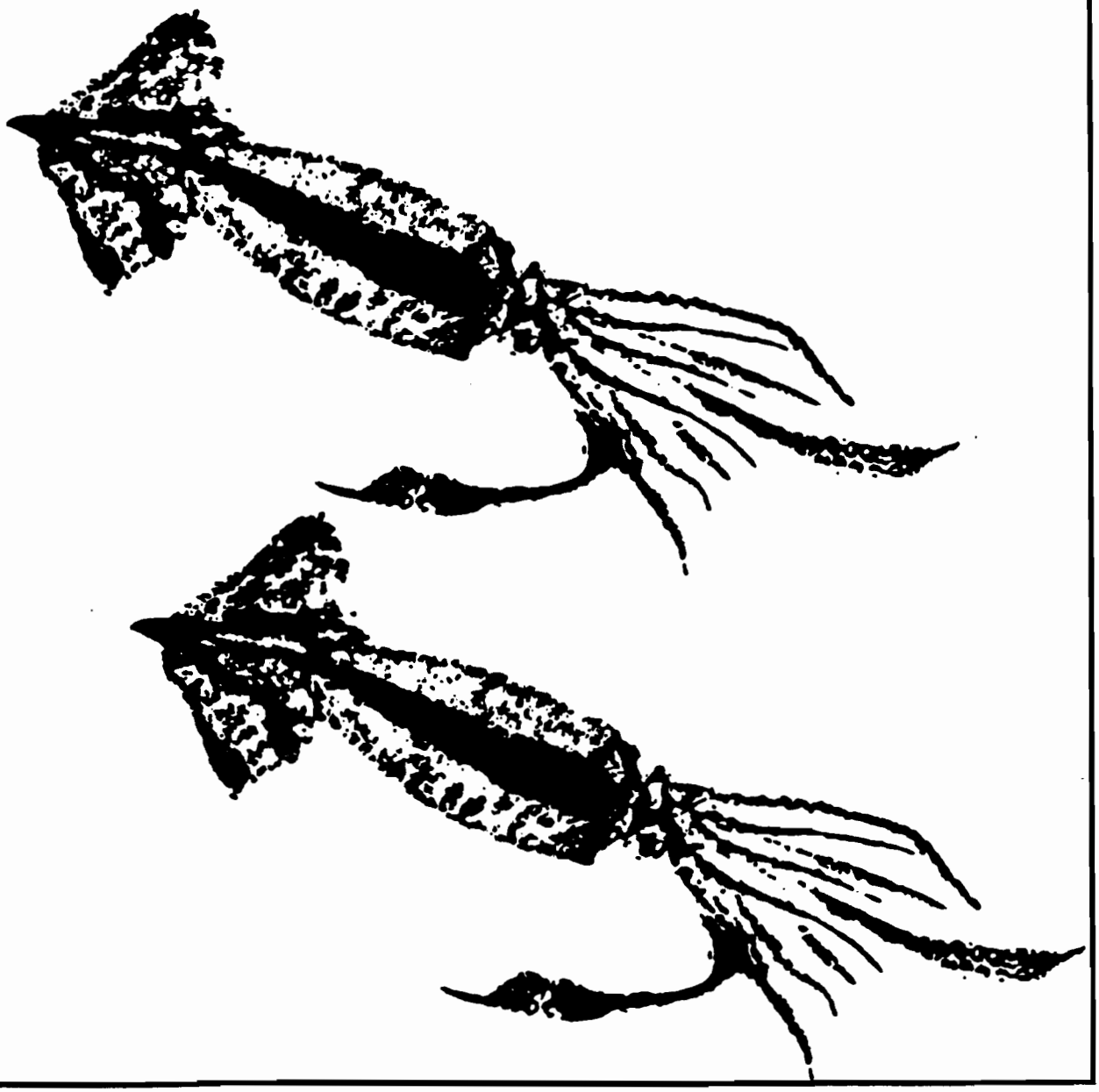
Growth and and settlement of the hard clam, *Mercenaria mercenaria*, in Long Island Sound

Ronald Goldberg and James C. Widman
NEFC, Milford

Some advances in the axenic mass culture of microalgae using a semicontinuous carboy apparatus

Barry Smith
NEFC, Milford

ABSTRACTS



Hydrographic Variability on Georges Bank During the Larval Herring Season (November-February), 1963-1990

by

Tamara J. Holzwarth
NEFC, Woods Hole Laboratory

Atlantic herring were a commercially valuable species in the 1960s that disappeared from Georges Bank in the early 70s. A series of larval herring studies were conducted during the years 1971-1978. A new series was initiated in 1988 and continues to monitor the recent resurgence of herring on Georges Bank as well as collect temperature and salinity data.

Temperature data (and salinity when available) from various cruises during the larval herring season (November - February) are summarized for the period 1963 - 1990. Horizontal contours of surface and bottom data values are presented as well as tables and graphs depicting the annual mean values of the Georges Bank area. The interannual variability and long term trends are described, especially as they may coincide with the rise and fall of the Atlantic herring stocks.

Test and Evaluation of a Temperature-Conductivity Recorder for Moored Applications

by

Maureen H. Taylor
NEFC, Woods Hole Laboratory

Two Seabird conductivity-temperature recorders were evaluated for use in future offshore moored applications. The instruments were mounted together and deployed locally for two days, recording side by side and at the same sampling rate. The data were compared to identify any discrepancies between the two records. A second, longer deployment was made in which the instruments were hung at different depths. The purpose was to obtain a hydrographic data set similar to what would be collected during moored operations to measure stratification. A final side by side deployment was made in order to note any change in the operation of the two instruments after prolonged use. Numerous reference water samples were taken during each deployment for salinity quality control. Instrument set up and design as well as software needs are discussed.

Applications of Satellite Remote Sensing at the Narragansett Laboratory

by

Cynthia M. Ruhsan, LTJG
NOAA Corps, Narragansett Laboratory

Satellite Remote Sensing is used for several applications at the Narragansett Lab. A prime example is the annual 106-Mile Dumpsite Report. Imagery depicting sea surface temperature is used to determine the water mass present at the dump site on each day. Discussion will also include other uses of sea surface temperature imagery, chlorophyll imagery, and the development of Coastwatch.

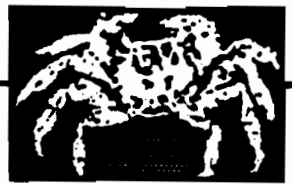
Continuous Plankton Records: Massachusetts to Cape Sable, Nova Scotia and New York to the Gulf Stream, 1989

by

J. W. Jossi and D. E. Smith
NEFC, Narragansett Laboratory

In the Gulf of Maine during 1989 phytoplankton abundance showed major departures from average, mostly due to shifts in timing of up to one month from normal. For the Gulf, and 1989 as a whole, these departures nearly balanced out. Abundance of total Copepoda was above average along the transect for most of the year. One sample in Massachusetts Bay in October contained nearly 300,000 copepods/ 100 m^3 of water strained.

In the nearshore waters of the New York Bight during 1989, phytoplankton were above average during their late summer seasonal peak. Abundances dropped off sharply at the end of October, nearly two months ahead of average. Abundance of total copepoda over the inner 400 km of the transect was above average from March through December of 1989. Values reached 550,000/100 m^3 of water strained at the apex of the Bight in July. One area of below average abundance occurred offshore in March and April and coincided with the presence of warm core ring 88K.



Potential Contribution of Phytoplankton to the "Health" of Bottom Communities and Habitat in Relation to the Depth of Light Penetration at the 12-Mile Dumpsite and Nearby Areas

by

Christine Zetlin
NEFC, Sandy Hook Laboratory

Light penetration data collected in and around the 12-Mile Dumpsite were examined to determine the effect of the cessation of dumping on light levels within the water column. The results are discussed in the context of the role light plays in the function of phytoplankton within near-bottom communities and habitat.

Net Extrusion of Larval Fishes: Correction Factors for 0.333 mm VERSUS 0.505 mm Mesh Bongo Nets

by

Donna L. Johnson and Wallace W. Morse
NEFC, Sandy Hook Laboratory

Collections from a Bongo net frame fitted with 0.333 mm and 0.505 mm nets were analyzed to detect the effects of extrusion on the catches of larval fishes. Sampling extended from Cape Hatteras, North Carolina to Cape Sable, Nova Scotia during eight MARMAP surveys in 1984 and 1985. Total larval catches and 24 individual taxa were analyzed by comparing the mean catch per tow between the two plankton nets.

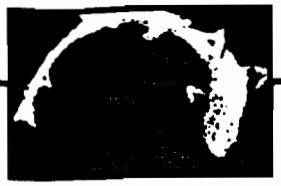
The mean catch per 10 m^2 for all combined was 54 percent higher in the 0.333 mm net. The difference in catches between the nets occurred primarily in the 2 to 5 mm larval lengths, indicating that the smaller larvae were extruded through the 0.505 mm. The detailed analysis of individual taxa revealed significant differences in the catch ratios by length interval, depending upon the species and its morphology. Correction factors were calculated to convert the observed catch in one net mesh to the expected catch in the other net.

Semicontinuous Algal Culture in Open Tanks

by

Barry C. Smith
Milford Laboratory

Microalgae are routinely grown in large volume unialgal cultures throughout much of the aquaculture and marine research industries. These cultures are usually managed as "batches"; a tank of growth medium is inoculated with algae, illuminated and aerated for a number of days, and then the entire contents are harvested for use before microbial contaminants, mainly bacteria, protozoans, and fungi, ruin the culture. We have, for several years, operated tank cultures semicontinuously for long periods, up to a year at a time, replacing harvested volumes with new growth medium. Using a species that is well-suited to this management strategy, yields can exceed 0.03 ml packed cells per 10 ml of culture and each of four 500 l. tanks can produce over 250 l. of dense cell suspension per week. In addition, two 96 l. cylindrical, clear Fiberglas tubes can be operated semicontinuously, yielding more than 80 l. each per week. A reconstituted sea salt medium is used with nitrate, phosphate, vitamin, and trace metal enrichments. Monitoring and adjusting pH to control bacteria and fungi, and high salinity shock to inhibit ciliates, are strategies used to control microbial contaminants, permitting long algal culture life.



Using Absorption Spectra of Extracted Photosynthetic Pigments to Evaluate the Taxonomic Placement of Strains in the Milford Microalgal Culture Collection

by

Gail E. Ferris
NEFC, Milford Laboratory

Ultraplanktonic algae (<5%m) are often visually indistinguishable when viewed through a light microscope. These algae generally have similar nutrient and light requirements in culture; therefore other means of determining algal identity, such as electron microscopy and biochemical composition, are used when there is question as to how to classify a small alga. In the case of a recently-isolated strain, previously identified as the Chlorophyte, *Chlorella minutissima* UTEX 2341, collaborative studies of sterol composition yielded results inconsistent with many other *Chlorella* species previously analyzed. Subsequent analysis of extracted chlorophyll pigments revealed that "*Chlorella minutissima*" is actually a member of the Division Eustigmatophyta, not the Chlorophyta. Further studies have indicated a number of other clearly misidentified strains in our and other algal culture collections. Chlorophyll pigment analysis is a useful and simple procedure for differentiating some algal taxonomic groups that can be performed in the field as well as in the laboratory.

Changes in the Blood Chemistry of the American Lobster, *Homarus americanus*, over the Molt Cycle

by

Renee Mercaldo-Allen
NEFC, Milford Laboratory

The blood chemistry of the American lobster, *Homarus americanus* Milne Edwards, was followed over the individual stages of the molt cycle. Physiological change accompanying the molt caused a significant increase in most blood constituents over the course of premolt, a significant decline during postmolt, and a gradual return to intermolt levels. The premolt concentrations of calcium, chloride, inorganic phosphorus, magnesium, potassium, sodium, total protein, as well as osmolality, were significantly higher than in postmolt lobsters. Variations in glucose could not be correlated with ecdysis. These findings, added to the existing literature on lobster blood chemistry, document hemolymph constituent levels throughout the molt cycle of the American lobster. Such groundwork enables better understanding of disease and pollutant impact on this species.

A Review of Principal Diseases of the Blue Crab, *Callinectes sapidus*

by

Gretchen A. Messick
NEFC, Oxford Cooperative Laboratory

Because of the economic importance of blue crabs, *Callinectes sapidus*, a number of pathologic agents that infect these decapods have been studied. Some of the most harmful pathogens of wild populations and shedding operations will be described. These include microsporidans, an amoeba, a dinoflagellate, a rhizocephalan barnacle and, putatively, a ciliate which infect wild populations. Crabs held in captivity are subject to systemic bacterial, viral, and rickettsial infections. Some pathogens including fungi, nemerteans, and parasitic barnacles decrease fecundity. Still other diseases can reduce marketability of crabs, including shell disease and trematode metacercariae hyperparasitized by a haplosporidan that infects muscle tissue.

An Infection Study of the American Oyster, *Crassostrea virginica*, by *Haplosporidium nelsoni* (MSX)

by

E. J. Lewis
NEFC, Oxford Cooperative Laboratory

Haplosporidium nelsoni (MSX) was first recognized as a disease agent causing oyster mortalities in Delaware Bay in 1957. Salinity has long been considered one limiting factor in the distribution of the disease. The parasite is considered to be only slightly virulent in the salinity range of 10 to 15 ppt and has been shown to be eradicated when salinity falls below 10 ppt.

In 1987, following the first documentation of *H. nelsoni* from the Tred Avon River, Maryland, a study was initiated to follow the infection time frame and disease progress of *H. nelsoni* in susceptible and local oysters. Salinities of 11 to 16 ppt in the Tred Avon River during the study were considered marginal to fully support the disease process by traditional standards. Results showed susceptible oysters to be infected 7 weeks following exposure, with a peak prevalence of 37 percent occurring in 12 weeks. Minimal mortality was observed.

Contrary to previously accepted beliefs, significant mortalities in local oysters were shown to occur while salinities averaged less than 15 ppt.

Transmission Studies of Sarcoma Disease in the Softshell Clam, *Mya Arenaria*

by

Shawn McLaughlin
NEFC, Oxford Cooperative Laboratory

Epizootic sarcomas reported in Chesapeake Bay softshell clams may adversely affect the commercially valuable fishery. Softshell clam sarcomas are transmissable, progressive, and lead to mortalities; however, the etiology of the disease remains uncertain. A viral etiology was investigated in softshell clam sarcoma transmission experiments.

Nondiseased clams were injected with either whole neoplastic hemolymph or a cell-free ultrafiltrate prepared from neoplastic hemolymph. Injected clams were held in separate flow-through aquaria and examined for sarcomas by histocytology and histology.

Data at 17 weeks showed a 41 percent prevalence of sarcoma disease in clams injected with neoplastic hemolymph. No sarcomas were observed in clams injected with the ultrafiltrate or in the controls. The lack of sarcomas in clams injected with the ultrafiltrate supports a nonviral etiology of disease transmission. In a second study, healthy clams were injected with neoplastic hemolymph and held in 12° and 18°C aquaria. After three weeks, 58 percent of the 18°C clams developed sarcomas, compared with 24 percent of the 12°C clams. The results suggest that temperature may affect development of sarcoma disease in softshell clams.

Bioeconomic Analysis of New England's Otter Trawl Fishery

by

Steven F. Edwards
Woods Hole Laboratory

Mathematical models of groundfish stock production, fishing technology, and exvessel demand were combined in a bioeconomic analysis of New England's otter trawl fishery for Atlantic cod, haddock, and flounders. The potential increase in the net economic value of the currently depleted groundfish resources was estimated to be at least $120 million a year, or $4 billion in net present value. In order to achieve this benefit, though, the size of the harvestable stock should be four times larger than it currently is, and fishing effort should be reduced by more than 50 percent (up to 80 percent for haddock). Harvest would then increase by roughly 50 percent, or at least 2 lb of fresh fish per capita in New England.

The Importance of Age Validation in Age and Growth Studies, with Special Reference to Two NEFC Age Validation Studies in Progress

by

Richard C. Greenfield
NEFC, Woods Hole Laboratory

Reliable age determinations for marine finfish and shellfish require that marks identified as annuli in age structures be properly validated as such for all age groups in the population. Examples of various age validation techniques are given, including length frequency modal analysis, marginal increment analysis, back-calculation, cohort analysis, mark and recapture studies, and multiple age structure comparisons. A simulation for a hypothetical marine bivalve is conducted to illustrate the magnitude of error possible in growth and mortality calculations when unvalidated ages are employed.

Two NEFC age validation studies being conducted by the Fishery Biology Investigation are discussed. The first involves rearing captive black sea bass injected with tetracycline in conditions simulating their natural environment over a two-year period. The second employs analysis of oxygen isotope levels present in shell valves to validate the timing and periodicity of annulus formation for sea scallops.

Aspects of Automated Data Acquisition from a Trawl Mensuration System

by

Joseph B. O'Gorman
NEFC, Woods Hole Laboratory

A trawl mensuration system may be a useful tool for examining the way in which the flexible shape of a trawl changes during a tow. A microcomputer based data acquisition system has been developed to automatically sample the acoustic signal from trawl mensuration equipment. Examples of wing spread, head rope height, depth, and temperature data from groundfish and shrimp surveys are presented. Applications to the standardization of trawl performance and the determination of trawl geometry during a tow may be possible with improvements in gear technology and computer software development.

Fecundity of the Atlantic Herring, *Clupea harengus harengus* L., from the Southwestern Gulf of Maine and Georges Bank in 1989

by

Myron J. Silverman and Donna L. Johnson
NEFC, Sandy Hook Laboratory

As part of a study to measure the changing status of Atlantic herring off southern New England, fecundity estimates were derived from mature females collected during summer and early autumn of 1989. Estimates for Georges Bank females 245 to 337 mm TL ranged from 31,000 to 118,000 eggs, while those for southwestern Gulf of Maine females 261 to 355 mm TL ranged from 43,000 to 219,000. Fecundity estimates were higher for both southwestern Gulf of Maine and Georges Bank in 1989 than published results from the 1960s.

Diets of Atlantic Rock, Jonah, and Lady Crabs in the New York Bight Apex

by

Linda Stehlik
NEFC, Sandy Hook Laboratory

The diets of Atlantic rock crabs, *Cancer irroratus*; Jonah crabs, *Cancer borealis*; and lady crabs, *Ovalipes ocellatus* collected from the New York Bight Apex were investigated. The most important prey category for all three species, by frequency of occurrence and volume, was polychaetes, especially *Pherusa affinia*. Mollusks, amphipods, crabs, squid, and fish were also important in the diet of rock crabs. Jonah crabs consumed the above taxa, but significantly more mollusks and more taxa per gut than rock crabs. Lady crabs, caught at the shallower stations, preyed upon significantly more mollusks and crustaceans than rock crabs from the same stations. All three crab species consumed many of the dominant macrobenthic taxa of the study area; thus they can be said to be opportunistic feeders.

Three New Species of Symphurine Tonguefishes from Tropical Waters of the Eastern Pacific (Symphuris: Cynoglossidae, Pleuronectiformes)

by

Martha S. Nizinski and Thomas A. Munroe
NEFC, National Systematics Laboratory

Three new species of *Symphurus* are described based on specimens collected in continental shelf waters from the Gulf of California southward to central Peru. Two species are readily distinguished from other eastern Pacific congeners by their unusual caudal fin ray count of 11 fin rays. These two species can be distinguished from each other by meristic characters (numbers of dorsal and anal fin rays and vertebrae) and pigmentation differences. One has higher counts than the other and lacks the black isthmus and light speckling of the inner lining of the blind-side operculum characteristic of that species. The third species has the more common caudal fin ray count (12 fin rays) and is more easily confused with the other eastern Pacific congeners. This species can be identified, however, by the distinctive combination of relatively high meristics, a pupillary operculum, a more anteriorly located dorsal fin, and long tubular nostril on the blind-side. Comments on bathymetric distribution, size at sexual maturity, and sympatric occurrence with other species of *Symphurus* are provided.

Current Fisheries Research in Portugal, with Emphasis on Projects in Lisbon

by

Joana Carneiro Da Silva
Visiting Scientist
NEFC, Milford Laboratory

Fisheries research in Portugal is mainly conducted at either universities (Universidade dos Açores, Universidade do Algarve, Universidade de Aveiro, Universidade de Coimbra, Universidade de Lisboa, Universidade Nova de Lisboa e Universidade do Porto) or at the Instituto Nacional de InvestigaçMo das Pescas - INIP (Portuguese Fisheries Research Institute). Most of the university projects concern estuaries and coastal waters. These range from biology, ecology and production to aquaculture and pollution monitoring of finfish and shellfish. In addition to projects in some of these same fields, INIP also has projects on new stocks and resource assessment, new fishery products and fishing technology. Limited financial support, lack of much coordination among research teams, scarcity of experienced technicians (and even senior researchers, in some fields), and dependency on foreign technologies are major limitations to fisheries research in Portugal.

Application of Distributed Delays to Modeling Growth in the American Lobster

by

J. S. Idoine
NEFC, Woods Hole Laboratory

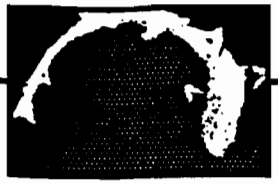
The complexity of American lobster (*Homarus americanus*) growth, due to its discontinuous and variable nature, has created the need for nonconventional methods of modeling that process. Traditional approaches (*e.g.* von Bertalanffy) cannot take into account either the discontinuity nor the wide scale temporal, spatial, and individual variabilities exhibited by these animals. The use of most dynamic pool models of yield per recruit analyses (*e.g.* Beverton-Holt) generally depend on such traditional growth models. Distributed delay models have been used successfully to describe growth of insects and American lobsters by incorporating the individual variability, as expressed by a mean and variance of time spent in multiple growth stages of the animals. These models are based on a mean process time (*i.e.*, growth rate of a size class) with its associated variance. Seasonal growth (based on environmental factors) can be incorporated by overlaying "growing seasons" on the calendar year. Since the model uses a daily time steps it is possible to examine time-varying parameters (*e.g.* seasonal fishing mortalities) and the effects on a cohort's growth and yield per recruit.

Temporal Variability in the Benthos at the 12-Mile Dumpsite

by

Joseph J. Vitaliano and Steven A. Fromm
NEFC, Sandy Hook Laboratory

The 12 Mile Dumpsite Recovery Study has given us a rare opportunity to look at month to month variability in the benthos in the New York Bight Apex. Knowledge of natural variability is important to assess effects of pollutants on the benthic ecosystem. The feeding habits and production of important demersal resource species also may be affected by changes in the numbers and biomass of benthic forage species. Monthly replicate Smith-McIntyre grab samples were taken at three stations (NY6, R2, NY11) in the New York Bight Apex from July 1986 to September 1989. Samples for physical and chemical variables were taken first and the remaining sediment was processed to determine numbers and biomass of the benthic macrofauna. Factors such as water temperature, dissolved oxygen, physical disturbance (wind events), predation, influx of organic matter (natural and anthropogenic), and species natural history cycles may affect benthic community structure and production. Variability in the 12 Mile Dumpsite benthic community will be discussed and the possible influence of these factors on that variability proposed.



An Autometer Flow Injection System for Analysis of Nucleic Acid Levels in Fish

by

E. M. Calderone and L. J. Buckley
NEFC, Narragansett Laboratory

We developed an automated, fluorometric flow injection system (FIS) for analysis of nucleic acid levels in individual larval fish. The method uses the fluorochrome dyes ethidium bromide and bismenzimidazole (Hoechst 33258). DNA concentration was determined from fluorescence of the sample in Hoechst 33258 compared with a calf thymus DNA standard. RNA was estimated from fluorescence in ethidium bromide after subtraction of the fluorescence due to DNA. A calf liver RNA standard was used. Nucleic acids were extracted from individual fish larvae using tris-EDTA buffered 1 percent N-lauroylsarcosine (an anionic detergent). No homogenization was required for most species up to metamorphosis, facilitating recovery of otoliths. The procedure was optimized for dye concentration and extraction efficiency and was sensitive to 0.01 ug of DNA and 0.1 ug of RNA. With automated injection, the RNA and DNA content of larvae as small as 15 mg dry weight can be determined. The amount of tissue required can be decreased several fold by hand injection. The precision was 3.3 percent for DNA and 7.4 percent for RNA. The method estimated RNA and DNA concentrations comparable to those obtained using the Schmidt-Thannhauser UV method.

Generation of Monoclonal Antibodies for Species Identification of Cooked Seafood Products: Salmon and Trout

by

Donna A. Luedke, Ronald C. Lundstrom, and Margaret M. Russell
NEFC, Gloucester Laboratory

Monoclonal antibodies specific for salmon and trout species are being produced. This is part of an ongoing research project using monoclonal antibodies for species identification of cooked seafood products. Mice are immunized with extracts from the various salmon and trout species. B - lymphocytes from the spleen of an immunized mouse are then fused with murine myeloma cells using polyethylene glycol to produce hybridoma cell lines. These hybridomas are maintained under tissue culture conditions where they secrete monoclonal antibodies which recognize specific epitopes. An enzyme-linked immunosorbant assay (ELISA) is used to screen the monoclonal antibodies against a panel of extracts from different seafood species. The screening results of monoclonal antibodies produced from a recent fusion will be presented.

Monoclonal Antibodies: Application to Problems in Fishery Biology and Technology

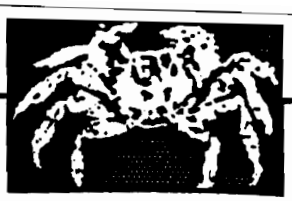
by

Stephen M. Mayfield, Ronald C. Lundstrom, Margaret M. Russell, Donna A. Luedke and Daniel L. D'Entremont
NEFC, Gloucester Laboratory

Monoclonal antibodies are specific biological reagents which are used in a variety of research applications. Species identification of cooked seafood is a growing concern in the face of evidence for wide spread economic fraud. Production of monoclonal antibodies for species identification of cooked seafood products is an ongoing project.

The U.S. Food and Drug Administration now allows the food industry to utilize surimi as an additive in processed meats in concentrations of up to 15 percent. Anti-finfish monoclonal antibodies are being utilized in the development of a technique for quantifying percentage fish in processed meats. Similarly, anti-finfish and anti-crustacean monoclonal antibodies are being utilized in the development of a technique to quantify the percentages of fish and crab meat in seafood analogs.

Mass mortalities of *Mya arenaria* from neoplastic cell disease is a serious problem. Monoclonal antibodies for diagnosis and research of this condition have been developed. Marine biotoxins pose a serious health threat to the seafood consumer. Monoclonal antibodies to Maitotoxin, one of the toxins involved in ciguatera fish poisoning, are being developed. Other potential uses for monoclonal antibodies will be discussed.



Growth and Survival of Juvenile *Argopecten irradians* Reared on Diets of Copper-Adapted *Isochrysis galbana*: A Preliminary Study of Tolerance Range

by

Diane Rusanowsky
Northeast Regional Office, Milford

Static aerated cultures of juvenile bay scallops were established and maintained at constant temperature in natural seawater. Daily rations of the microalga *Isochrysis galbana*, cultured in growth medium containing copper either in trace concentrations or 47.3 ppm, were calculated to supply nutrition ample to promote growth. Precautionary measures were taken to minimize the problems associated with holding organisms for extended time periods in a static environment.

The study featured two controls fed algae containing only trace levels of copper and four experimental groups fed algal diets incorporating 0.81, 0.30, 0.19, or 0.08 μg Cu per scallop daily ration. Growth was significantly impaired at all copper exposure levels as compared with controls. Survival was inversely proportional to dietary copper concentration, with significant mortality in cultures receiving daily copper doses of 0.81, 0.30 or 0.19 μg as compared with those receiving only 0.08 μg or trace concentrations.

Foreign Fishing in the Exclusive Economic Zone

by

Dennis C. Hansford
NEFC, Woods Hole Laboratory

Since passage of the amendment to the Magnuson Act in 1985, the National Marine fisheries Service has been mandated to provide 100 percent observer coverage of all foreign vessels fishing in the United States Exclusive Economic Zone (EEZ). Foreign fisheries compliance inspectors have met that mandate by boarding and monitoring foreign vessels permitted to operate in the EEZ. The foreign fisheries compliance inspector's responsibilities are varied and complex. They serve as compliance enforcers, data collectors, and communications liaisons. The obligations each foreign country and their captains must agree to in order to operate in the various fisheries in the EEZ are just as varied as complex, such as obtaining a Governing International Fishing Agreement (GIFA), submitting an application, submitting an effort plan, and payment of fees.

Scalloping Aboard the *Albatross IV*

by

Malcolm J. Silverman
NEFC, Woods Hole Laboratory

The sea scallop, *Placopecten magellanicus,* is an important commercial species in the Northwest Atlantic; U.S. landings in 1989 totalled more than 33.8 million lb with a value of $132.6 million. The Northeast Fisheries Center has been conducting scallop resource assessment surveys since 1956. The current series using an 8 ft dredge began in 1979. This video presentation provides background history on the fisheries and biological information for the scallop and coverage of the last scallop survey aboard the R/V *Albatross IV*.

Distribution of O-group Cod and Haddock in Relation to Macrozooplankton on Georges Bank

by

Elisabeth Broughton
NEFC, Woods Hole Laboratory

In 1987 a juvenile fish survey covering Georges Bank was conducted during the Spring gelatinous zooplankton bloom. Ninety-five samples were obtained from double-oblique tows using a 10 m MOCNESS net. Initial results from taxonomic and numerical analysis of the samples show large scale patchiness in the macrozooplankton of Georges Bank. Large aggregations of *Cyanea capillata, Meganyctophanes norvegica, Themisto compressa, Pleurobrachia pileus, and Salpa fusiformes* were present. O-group cod and haddock have traditionally been communally associated with scyphomedusae. This study suggests interspecific interactions with other macrozooplankton groups can also influence larval gadid abundance and distribution.

Compensatory Response of the Gulf of Maine Population of Witch Flounder to Increased Exploitation, 1977-1990

by

Jay Burnett
NEFC, Woods Hole Laboratory

Since 1977, the fishery for witch flounder, a slow-growing, late-maturing, deep-water flatfish of the Gulf of Maine region, has evolved from a bycatch fishery into one in which witch flounder have become fully exploited. Landings steadily increased from 2,475 mt in 1977, peaked at 6441 mt in 1984, and have subsequently declined to 3,217 mt in 1988. Exploitation ratios (F/Z), which averaged 0.33 during 1977-1980 and 0.44 during 1981-1986, have averaged 0.63 since 1986. Indices of abundance derived from research vessel surveys and commercial catch rates are currently at historic low values.

The population has responded dramatically to this increased exploitation. Mean lengths for ages 4 to 9 have increased by an average of 3.7 cm since 1980, and age at maturity has been reduced by about two years for both sexes. Annual indices of premature growth, defined as the ratio of median length at maturity to median age at maturity, were significantly correlated ($r = 0.90$, $p < 0.001$) with exploitation ratios, suggesting a direct link between fishing mortality and compensatory biological responses. Simulations using the Thompson-Bell yield per recruit model suggest that witch flounder in the Gulf of Maine region may have reached the limits of these compensatory responses.

Antibody Levels Against Bacterial Pathogens in the Sera of Winter Flounder from Long Island Sound

by

Diane Kapareiko
NEFC, Milford Laboratory

This study examines the production of antibodies against a panel of eight bacterial pathogens in the sera of winter flounder, *Pseudoplueronectes americanus*. All fish had been caught on a monthly basis by trawl net from several stations in the Long Island Sound from November 1986 to February 1990. Serum antibodies were precipitated with a cold, saturated solution of ammonium sulfate for preservation and storage at 4°C. Antibody levels were determined by agglutination reactions against formalin-fixed bacteria. Presence of antibodies (rather than nonspecific agglutinins) was confirmed by treating representative sera with 2-mercaptoethanol, an antibody-disrupting reagent. Results of antibody titers in sera of 832 winter flounder from Long Island Sound showed that 16 percent of these fish had been exposed recently to *Vibrio anguillarum*, a common fish pathogen. Although statistical comparisons are not yet complete, partial results indicate that antibody titers were higher in fish from degraded environments. This suggests that either fish are subjected to increased bacterial infections, or they come into contact with increased bacterial concentrations at these sites.

Prevalence and Intensity of Shell Disease in Lobsters from Eight Offshore Canyons: A Progress Report

by

NEFC, Regina L. Spallone
Milford Laboratory

Municipal sewage sludge dumping at the 106 Mile Deepwater Dumpsite (DWD106) has been reported by commercial fishermen to have caused an increase in the prevelance and intensity of shell disease in lobsters from canyons at the continental shelf break. This study was initiated to investigate shell disease in these lobsters as it relates to the potential area of influence surrounding DWD106. Sampling began in July, 1990.

Lobsters were collected from eight offshore canyons (Lydonia, Veatch, Block, Hudson, Tom's, Baltimore, Washington and Norfolk) and examined for the presence of shell disease (necrotic spots and shell lesions). Lobsters were collected by cooperating commercial fishermen and examined either on the fishing vessel or in a "pound" during the off-loading process. Sex, length, and shell hardness were noted for each animal. Total area affected was noted for each diseased lobster as a measure of intensity. Log 10 transformations were done to correct for outliers. Significant differences (P=0.05) in prevalence and intensity exist between some of the canyons, as well as within individual canyons from season to season, and between males and females. Continued sampling within these canyons should make any trends more clear.

Effect of Cadmium Exposure on Serum Vitellogenin Levels and Heptasomatic and Gonadosomatic Indices of Winter FLounder

by

J. J. Pereira, R. Mercaldo-Allen, C. Kuropat, D. Luedke, and G. Sennefelder
NEFC, Milford Laboratory

Vitellogenin (Vg) is an egg yolk precursor protein that is manufactured in the liver and transported to developing oocytes in the gonad by the blood. Contaminants in the environment may affect its production by the liver or its uptake by the gonad threatening the survival of winter flounder embryos or larvae. In order to study the effects of cadmium contamination on serum Vg levels (measured as alkali-labile phosphate or ALP), female winter flounder were exposed to 25 or 50 ppb cadmium in seawater for 71 days. The exposure began in early November when Vg production should be getting underway and ended in mid-January when Vg levels should be high.

At the end of the exposure period, blood samples were taken from each fish, refrigerated, and allowed to clot overnight. The sera were collected by centrifugation the following day and frozen. Weights of the liver, both gonads, and the entire fish were recorded for later calculation of hepatosomatic (HSI) and gonadosomatic indices (GSI) respectively. Liver samples were also taken for measurement of cadmium levels.

Serum ALP levels rose with increasing HSI. HSI and ALP both decreased with increasing cadmium concentration in the liver. The results suggest that cadmium lowers serum ALP by interfering with Vg production in the liver.

Winter Flounder: Living in a Hypoxic World

by

John J. Ziskowski and Jose Pereira
NEFC, Milford Laboratory
and
Don C. Miller and John Sewell
USEPA, Narragansett Laboratory

Summer hypoxic events are common in Long Island Sound and nearby estuaries resulting, at times, in escape reactions and mass mortalities of marine animals such as menhaden and lobster. Prolonged near-bottom (at 3 m depth) hypoxia, resulting in DO levels as low as 1.0 ppm, was recorded by underwater data loggers in Milford Harbor, Connecticut following menhaden "fish kills" in 1987 and 1988. This harbor is a nursery area for young-of-year and yearling winter flounder who were observed swimming at the surface during daytime while bottom DO levels were depressed.

An experimental apparatus, designed to expose winter flounder to any level of dissolved oxygen, is described. A series of 20 hr exposures, continuously monitored by underwater data logger was performed on yearling fish at 20°C. All mortality occurred within the DO range 1.1 to 1.5 ppm. However, flounder could withstand an 8 hr exposure in the DO range 1.2 to 1.4 ppm, allowing them to perhaps survive a sharp DO drop during an estuarine tidal cycle.

Cytogenetic and Cytologic State of Embryos of Winter Flounder, *Pseudopleuronectes americanus*, from Long Island Sound

by

Dean M. Perry, James B. Hughes and Andrew T. Hebert
NEFC, Milford Laboratory

An examination of the cytology/cytogenetics of developing embryos was conducted as part of a multifaceted study of the early reproductive success of winter flounder, *Pseudopleuronectes americanus*, in Long Island Sound. Two sites in Boston Harbor were used as comparison locations. Effort was focused on examination of blastula and tail-bud embryos of artificially spawned females. Abnormalities observed included evidence of cytotoxicity, and chromosome damage. Embryos of fish from New Haven were usually the most aberrant, while embryos from other sites, notably Hempstead, Shoreham and both Boston Harbor stations, showed subtle indications of abnormality.

An Alternative to Producing Hazardous Wastes When Analyzing for Contaminants in Fish: Supercritical Fluid Extraction

by

Thomas W. Finneran and Ashok D. Deshpande
NEFC, Sandy Hook Laboratory

As part of the 12-Mile Sewage Sludge Dumpsite Study, the analyses for organic contaminants were made on tissues from winter flounder and lobster. Preliminary results of this study indicated that the hepatic tissues of winter flounder and lobster from a station closer to the dumpsite had higher levels of PCBs than those from a reference station. The analytical protocol employed hazardous solvents and compounds in the extraction step. It is ironic that hazardous wastes were created in the analyses of other such compounds in fish. The use of such hazardous chemicals seems to be justified by the results; however, we suggest that these same samples could be analyzed using an alternative method that produces far less hazardous waste. This method is supercritical fluid extraction (SFE). A supercritcal fluid is a gas (*e.g.* CO_2) which, at its critical temperature and under high pressure, has solvation properties similar to the commonly used solvents. This makes it a preferable alternative to extractions using methylene chloride, for example, because SFE gases are relatively nontoxic. Tissues from the same study were extracted using SFE and the results demonstrated the potential of SFE for future work.

Paralytic Toxins in Atlantic Mackerel

by

Christopher Martin
NEFC, Gloucester Laboratory

Neurotoxins identical to those commonly associated with molluscan shellfish have been detected in liver tissues of Atlantic mackerel throughout much of its range in the western Atlantic. Analysis reveals wide variation in toxicity in this migratory species. The implications of these observations will be discussed with respect to toxin origin, retention and possible transfer to predators including marine mammals.

Fish and Ports: Are the Compatible? A Case History of Interagency Cooperation in the Delaware River Basin to Resolve Conflicts and Minimize Adverse Effects

by

Stan Gorski
NMFS Regional Office, Sandy Hook

Water quality improments in the Delaware River Basin are responsible in a large part for steady and significant increases in the basin's important finfish populations. Areas of the river previously uninhabitable to many species of fish now provide important spawning and nursery habitat. However, because Philadelphia, Camden, and Trenton remain vital commercial shipping ports, the federal navigation channel must be maintained at a minimun depth of 40 ft to accomodate ship traffic. Far deeper than natural river depths, the navigation channel frequently silts in and just as frequently requires maintenance dredging. Scientific literature describes many adverse effects of dredging on finfish. This paper describes an interagency effort to minimize those adverse effects.

Marine Mammals in Massachusetts and the Gulf of Maine

by

Douglas W. Beach
Northeast Regional Office, Gloucester

Maine mammals are important components of the Gulf of Maine ecosystem. Certain high-use areas are well known, and in some cases, overlap with human use of marine resources. Information about mammal distribution and abundance is presented, and areas of human conflict and subsequent research needs are discussed.

Sea Turtles in the Northwest Atlantic

by

Colleen C. Coogan
Northeast Regional Office, Gloucester

Relatively little is known about sea turtle distribution away from nesting beaches. The importance of the Northwest Atlantic as foraging habitat for giant leatherbacks has been documented. Recent private studies indicate that Atlantic embayments north to Cape Cod Bay may provide important developmental habitats for juveniles of three additional species of endangered sea turtles.

Scientific Information Use in the Bureaucratic Morass

by

Robert J. Pawlowski, CDR
NOAA Corps, NERO, Gloucester

NMFS, with its regional components, is constantly being asked by Congress, senior federal managers in the Department of Commerce, the Office of Management and Budget, and other federal and state agencies, as well as our public constituents, to clarify issues, explain policies, and prepare and justify budgets. To answer these requests, NMFS headquarters, Regional Office and Center personnel prepare responses that often depend on the knowledge of scientists conducting research programs established in prior year budget authorizations. This paper will discuss the eight goals of the NMFS Strategic Plan, the Northeast Regional Implementation Plan for the NMFS Strategic Plan, and the use of scientific information to address management, planning, and outyear budget submissions. Additional attention will be paid to the legislative agenda for NMFS and new legislation that will affect fisheries and fishery habitat management in the Northeast.

Fifth Annual NEFC Research Meeting Participants

Gloucester, MA

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Robert Learson
Donna Luedke
Christopher Martin
Stephen Mayfield
Robert Pawlowski
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Steve Edwards
Richard Greenfield
Marvin Grosslein
Dennis Hansford
Tamara Holzwarth
Josef Idoine
Steve Murawski
Robert Murchelano
John Nicolas
Joseph O'Gorman
Jack Pearce
Allen Peterson
Malcolm Silverman
Maureen Taylor

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Kenneth Sherman
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Gail Ferris
Ronald Goldberg
Diane Kapareiko
Catherine Kuropat
Renee Mercaldo-Allen
David Nelson
Dean Perry
Jose Pereira
Diane Rusanowsky
Barry Smith
John Ziskowski

Sandy Hook, NJ

Thomas Finneran
Stanley Gorski
Donna Johnson
J.E. O'Reilly
Robert Reid
Anne Studholme
Myron Silverman
Eileen Sokol MacHaffie
Linda Stehlik
Joseph Vitaliano
Stu Wilk
Christine Zetlin

Oxford, MD

E.J. Lewis
Shawn McLaughlin
Gretchen Messick

Washington, D.C.

Martha Nizinski
National Systematics Laboratory

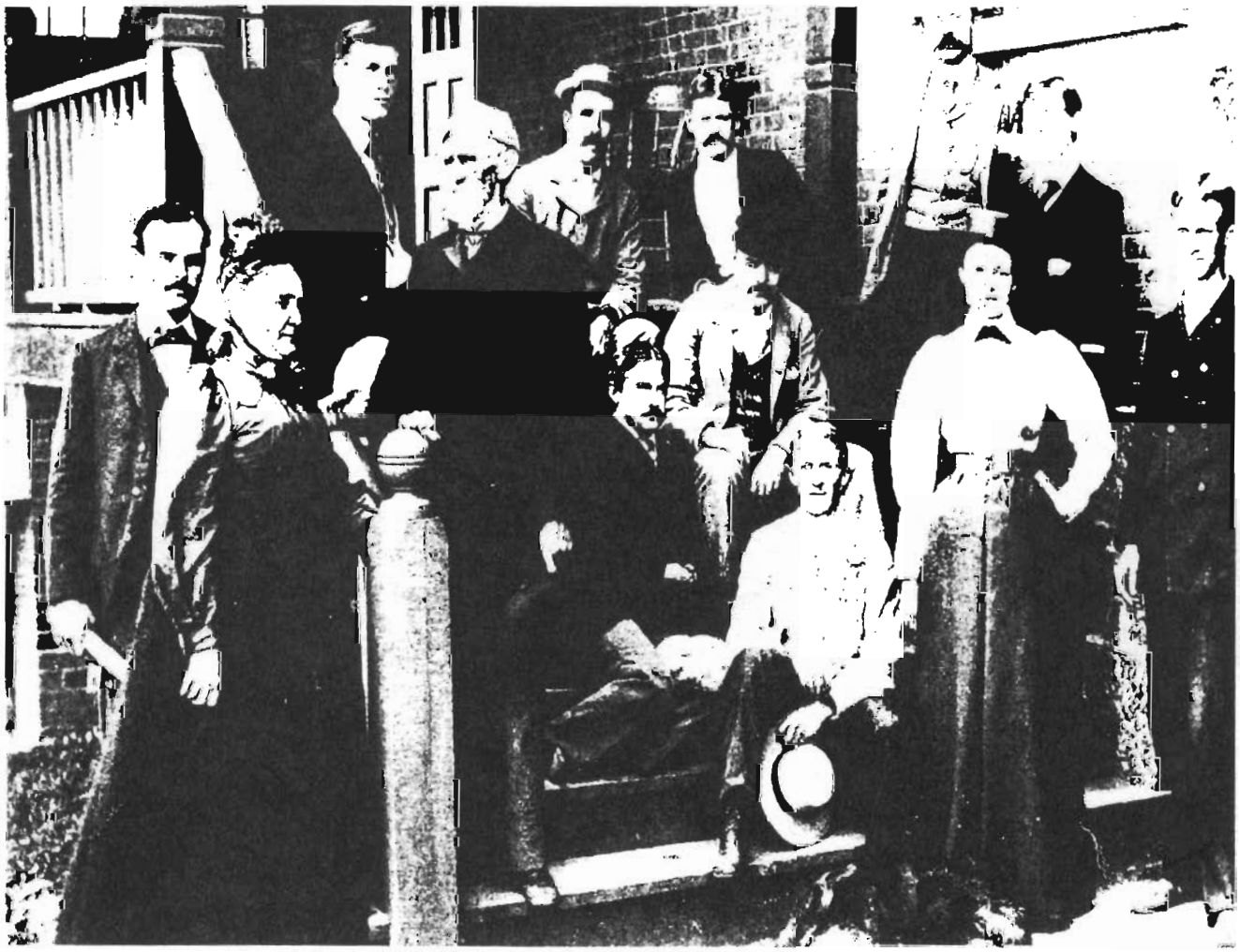
Michael Tillman
NMFS Headquarters

Sixth Science Symposium

of the

Northeast Fisheries Science Center

National Marine Fisheries Service, NOAA



May 7 - 9, 1996

Falmouth, Massachusetts

COVER: Staff and students on the front steps of the Woods Hole Laboratory in about 1885. Standing in the foreground, to the left, are Laboratory Director, Marshall McDonald, and Mary Churchill Baird.

SIXTH SCIENCE SYMPOSIUM
of the
Northeast Fisheries Science Center
National Marine Fisheries Service, NOAA

May 7 - 9, 1996
Quality Inn
Falmouth, Massachusetts

AGENDA

TUESDAY, MAY 7, 1996

8:00 - 8:30 **Registration**

8:30 - 8:55 **Opening Remarks**
Dr. Emory D. Anderson, Convener, Woods Hole Laboratory
Dr. Michael P. Sissenwine, Science and Research Director

SESSION I
Session Chair: Dr. Frederick P. Thurberg
Enhancement and Aquaculture Branch, EPD
Milford Laboratory

8:55 - 9:20 **Abundance and distribution of cod-haddock eggs and larvae on Georges Bank in relation to water column conditions 1993-1995**
Marie E. Kiladis, Woods Hole Laboratory

9:20 - 9:45 **In search of the optimal feeding strategies for bivalve mollusks**
Barry C. Smith, Milford Laboratory

9:45 - 10:10 **Overview of the 1994 Reauthorization of the Marine Mammal Protection Act and the 1995 stock assessments**
Gordon T. Waring, Woods Hole Laboratory

10:10 - 10:30 **BREAK**

10:30 - 10:55 Development of irradiation detection methods for foods containing polyunsaturated fatty acids
Evelyne DeGroote, H.Wan, and W.W. Nawar, University of Massachusetts at Amherst, Cooperative Marine Education and Research Program (CMER)

10:55 - 11:20 Molt-related changes in hemolymph calcium of postlarval American Lobsters (*Homarus americanus*)
Renee Mercado-Allen, Catherine A. Kuropat, James Widman, and Frederick P. Thurberg, Milford Laboratory

11:20 - 11:45 Potential effects of river-ocean transition temperatures on US Atlantic salmon stocks
John F. Kocik and Kevin D. Friedland, Woods Hole Laboratory

11:45 - 12:10 Line transect surveys for marine mammals
Debra Palka, Woods Hole Laboratory

12:10 - 1:30 LUNCH

SESSION II
Session Chair: Dr. R. Anne Richards
Population Dynamics Branch, CUD
Woods Hole Laboratory

1:30 - 1:55 Travels of a very young cod on Georges Bank in the spring of 1995
James P. Manning[1], Christopher Naimie[2], and R. Gregory Lough[1],
[1]Woods Hole Laboratory and [2]Dartmouth College

1:55 - 2:20 Density dependent growth and sexual maturity of silver hake in the Northwest Atlantic ocean
Thomas E. Helser, James J. Howard Marine Sciences Laboratory
Frank P. Almeida, Woods Hole Laboratory

2:20 - 2:45 Detectability of right whales in coastal waters of the southeastern United States with implications for the aerial monitoring program
James H.W. Hain, Woods Hole Laboratory
Sara L. Ellis, Dalhousie University

2:45 - 3:10 **12-Mile Dumpsite revisited: follow-up resampling and multivariate data analysis**
Joseph J. Vitaliano, Steven A. Fromm, Robert N. Reid, Dorothy Jeffress, and Linda Arlen, James J. Howard Marine Sciences Laboratory

3:10 - 3:30 **BREAK**

3:30 - 3:55 **Current assessment status of Georges Bank winter flounder**
Russell W. Brown, Woods Hole Laboratory

3:55 - 4:20 **PINGLE: a pen-based computer system for data entry on line transect surveys**
Nan Garrett-Logan, Woods Hole Laboratory

4:20 - 5:00 **Habitat specific use patterns and growth of young-of-the-year winter flounder and tautog in three northeastern estuaries**
Beth A. Phelan[1], Ronald Goldberg[2], Jose Pereira[2], Paul Clark[2], Allen J. Bejda[1], Jon T. Finn[1], Steven A. Fromm[1], Catherine Kuropat[2], and Renee Mercado-Allen[2], [1]James J. Howard Marine Sciences Laboratory, [2]Milford Laboratory

WEDNESDAY, MAY 8, 1996

8:00 - 8:30 Registration

SESSION III
Session Chair: Mr. Stuart Wilk
Fishery Ecology Branch, EPD
James J. Howard Marine Sciences Laboratory

8:30 - 8:55 Effectiveness of the Nordmore grade in reducing by-catch of finfish in the Gulf of Maine Northern shrimp fishery
Lisa C. Hendrickson and R. Anne Richards, Woods Hole Laboratory

8:55 - 9:20 Restoration activities in NEFSC under NOAA's Damage Assessment and Restoration Program
Robert N. Reid, James J. Howard Marine Sciences Laboratory

9:20 - 9:45 Possible causes for recruitment variability of yellowtail flounder
Donna L. Johnson, James J. Howard Marine Sciences Laboratory

9:45 - 10:10 Harbor porpoise bycatch, allowable removals and management approaches to reducing the bycatch in the Gulf of Maine sink gillnet fishery
Kathryn D. Bisack, Woods Hole Laboratory

10:10 - 10:30 BREAK

10:30 - 10:55 Seasonal movements, size-structure, and interannual abundance of searobins (Triglidae: *Prionotus*) in the temperate Northwestern Atlantic
J. Brian O'Gorman, Woods Hole Laboratory
Richard S. McBride, Florida Department of Environmental Protection
Kenneth W. Able, Rutgers University

10:55 - 11:20 **Species-specific identification of larval bivalves using an 18 S rDNA probe and RFLP analysis**
Janice L. Bell, Rutgers University, CMER

11:20 - 11:45 **The status of remnant Atlantic salmon populations in New England**
John F. Kocik, Woods Hole Laboratory

11:45 - 12:10 **The restoration of striped bass stocks: a case history of the recovery of an exploited population**
Gary Shepherd, Woods Hole Laboratory

12:10 - 1:30 **LUNCH**

SESSION IV
Session Chair: Dr. John F. Kocik
Population Dynamics Branch, CUD
Woods Hole Laboratory

1:30 - 1:55 **Patterns of sexual maturation in Atlantic salmon suggested by strontium /calcium ratios in otoliths and gonadosomal indices observed in Newfoundland**
Kevin D. Friedland[1], David G. Reddin[2], Nobu Shimizu[3], and Ruth E. Haas-Castro[1], [1]Woods Hole Laboratory, [2]Department of Fisheries and Oceans, Canada, [3]Woods Hole Oceanographic Institution

1:55 - 2:20 **Relative influence of spawning biomass and temperature on recruitment of northern shrimp, *Pandalus borealis***
R. Anne Richards and Stephen Clark, Woods Hole Laboratory

2:20 - 2:45 **Economic issues of fishing vessel buyout programs**
Andrew Kitts[1], Steven F. Edwards[1], Leo C. Erwin[2], Philip N. Logan[1], Ralph K. Mayo[1], and Eric M. Thunberg[1], Woods Hole Laboratory, [2]Northeast Regional Office

2:45 - 3:45 **POSTER/VIDEO SESSION**
BREAK

3:45 - 4:10 **Contagious dolphins: analysis of dolphin bycatch data from drift-net operations in the northern Pacific**
Michael R. Maxwell, Woods Hole Laboratory

4:10 - 4:35 **Image analysis applications in stock identification studies of Atlantic salmon**
Ruth E. Haas-Castro and Kevin D. Friedland, Woods Hole Laboratory

4:35 - 5:00 **Spatial analysis of groundfish distributions**
Loretta O'Brien, Woods Hole Laboratory

Dinner

Garden Room

6:30 PM Cash Bar
7:00 PM Dinner

Keynote Speaker: Dr. William W. Fox, NMFS Senior Scientist

THURSDAY, MAY 9, 1996

8:00 - 8:30 Registration

SESSION V
Session Chair: Mr. Frank P. Almeida
Population Biology Branch, CUD
Woods Hole Laboratory

8:30 - 8:55 Validation of daily ageing and investigations into the growth of larval winter flounder
Kathy L. Lang and Frank P. Almeida, Woods Hole Laboratory

8:55 - 9:20 To ping or not to ping ... That is the question
David C. Potter, Woods Hole Laboratory

9:20 - 9:45 Fish predator guilds for Georges Bank based on food habits data collected during NEFSC bottom trawl surveys 1981-1990
Rodney Rountree, Woods Hole Laboratory

9:45 - 10:10 Fecundity of the Atlantic herring, *Clupea harengus L.*, from Southwestern Gulf of Maine and Georges Bank from 1989 to 1993
Myron J. Silverman and Donna L. Johnson, James J. Howard Marine Sciences Laboratory

10:10 - 10:30 BREAK

10:30 - 10:55 Comparison of recruitment frequency and growth of surfclams, *Spisula solidissima*, in inshore habitats off New Jersey
Marnita P. Chintala, Rutgers University, CMER

10:55 - 11:20 Remote sensing of phytoplankton blooms
Christine Zetlin, James J. Howard Marine Sciences Laboratory
Sima Bagheri, New Jersey Institute of Technology

11:20 - 11:45 **Laboratory culture of tautog: a pilot study**
Dean M. Perry, Renee Mercaldo-Allen, Catherine Kuropat, and James Hughes, Milford Laboratory

11:45 - 12:10 **An overview: results of a biological and hydrological characterization of Newark Bay, New Jersey; May 1993 - April 1994**
Donald G. McMillan, James J. Howard Marine Sciences Laboratory

12:10 - 1:30 **LUNCH**

SESSION VI
Session Chair: Dr. Russell W. Brown
Population Dynamics Branch, CUD
Woods Hole Laboratory

1:30 - 1:55 **Predator/prey relationships at the LEO-15 site: the effects on surfclam recruitment**
Eric J. Weissberger and Judith P. Grassle, Rutgers University, CMER

1:55 - 2:20 **The mathematical relationship between carapace length and surface area of the American lobster (*Homarus americanus*)**
Diane Kapareiko, George R. Sennefelder, Richard A. Robohm, and John Ziskowski, Milford Laboratory

2:20 - 2:45 **The use of the Lorenz curve method to identify changes in concentrations of Georges Bank haddock**
Susan E. Wigley, Woods Hole Laboratory
Steve X. Cadrin, Massachusetts Division of Marine Fisheries

2:45 - 3:10 **Growth curves of the Atlantic surfclam, *Spisula solidissima*, from Southern New England and the Delmarva Peninsula, USA**
James R. Weinberg, Woods Hole Laboratory
Thomas E. Helser, James J. Howard Marine Sciences Laboratory

3:10 - 3:30 **BREAK**

3:30 - 3:55 **Comparing quantile and least squares regression techniques used to estimate the slopes of upper and lower bounds of scatter diagrams with applications to piscivorous fishes of the Northwest Atlantic**
Frederick S. Scharf, Francis Juanes, Michael Southerland, University of Massachusetts at Amherst, CMER and
Rodney Rountree, Woods Hole Laboratory

3:55 - 4:20 **Marine mammal necropsies or, What is all the stink about?**
John Nicolas, Woods Hole Laboratory

4:20 - 4:45 **Limited entry and days-at-sea: fishermen fears in the Northeast US**
Patricia Clay, Woods Hole Laboratory

4:45 - 4:50 **Closing**
Dr. Emory D. Anderson, Convener

POSTERS AND VIDEOS

Processing methods, analysis problems, and the future of ichthyoplankton data from Georges Bank using 1993 GLOBEC data as examples
Elizabeth Broughton, Woods Hole Laboratory

Effects of bottom fishing on the benthic megafauna of Georges Bank
Jeremy S. Collie, Galo A. Escanerol, University of Rhode Island, CMER
Page C. Valentine, U.S. Geological Survey

Validation of black sea bass ageing methods using chemical markers and marginal increment analysis
Richard Greenfield and Frank Almeida, Woods Hole Laboratory

Blood micronuclear levels in fish from New Haven Harbor
James B. Hughes, Milford Laboratory

Settlement of postlarval American lobsters: The influence of size and settlement time
M.J. James-Pirri and J. S. Cobb, University of Rhode Island, CMER

Sea-going data entry systems
William Kramer and Paul Kostovick, Woods Hole Laboratory

Seabird bycatch by U.S. commercial fisheries in the Northwest Atlantic Ocean
Heather M. Lanza and Curtice R. Griffin, University of Massachusetts, CMER

Pilot study: pupping and nursery grounds of the sandbar shark
Rebeka R. Merson and Harold L. Pratt, Narragansett Laboratory

Fishery Bulletin in Century 21
Kimberly Murray and Jack Pearce; Woods Hole Laboratory

The influence of physical and biological factors upon the interannual viability of zooplankton from southern New England Continental Shelf waters
Jerome Prezioso, Carol Meise, and Joseph Kane, Narragansett Laboratory

Almost first record of the ragged-tooth shark, *Odontaspis ferox*, from the Northwest Atlantic
Timothy F. Sheehan, Woods Hole Laboratory

Evidence for density-dependent changes in growth of Atlantic herring, *Clupea harengus*, during 1987-1995
Vaughn Silva and Frank Almeida, Woods Hole Laboratory

Video presentation on resource surveys
Malcolm J. Silverman, Woods Hole Laboratory

Where have all the fish gone?
Katherine A. Sosebee and Janet A. Fields, Woods Hole Laboratory

1995 hydrographic conditions on Georges Bank
Maureen Taylor, Woods Hole Laboratory

Preliminary observations of the burrowing and feeding habits of the polychaete, *Pherua affinis*, under laboratory conditions
Joseph Vitaliano, Vincent S. Zdanowicz, and Allen Bejda,
James J. Howard Marine Sciences Laboratory

An evaluation of bycatch rates of principal groundfish in Gulf of Maine
Susan E. Wigley, Lisa C. Hendrickson, and Ralph K. Mayo, Woods Hole Laboratory

Solubility of hydrophobic compounds in polysoap solutions: unusual behavior of benzophenone and related compounds
Vincent S. Zdanowicz and Ulrich P. Strauss, James J. Howard Marine Sciences Laboratory

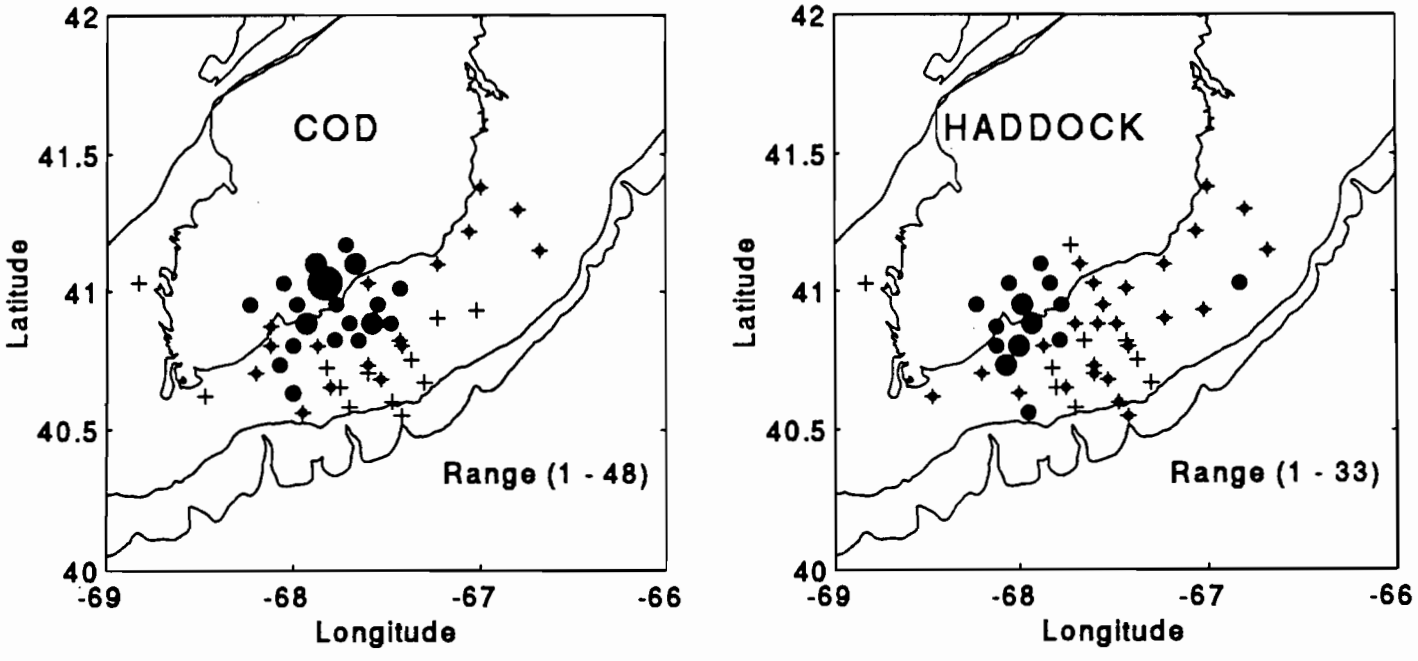
Elemental analysis of fish otoliths by inductively coupled plasma mass spectrometry
Vincent S. Zdanowicz, James J. Howard Marine Sciences Laboratory

Abstracts

ABUNDANCE AND DISTRIBUTION OF COD-HADDOCK EGGS AND LARVAE ON GEORGES BANK IN RELATION TO WATER COLUMN CONDITIONS 1993-1995

Marie E. Kiladis
Fishery Oceanography Investigation
Woods Hole Laboratory

A stratification study was conducted on Georges Bank in May of 1993 as part of a pilot project of the U.S. GLOBEC Northwest Atlantic Study. These data are compared with the intensive field studies of 1994 and 1995. In May of 1994, the presence of warm (>13°C), salty (>34PSU) water was observed encroaching on the Bank in the SW corner of the survey. Again, in May of 1995 a slope water intrusion was observed on the southern flank of the Bank due to the presence of a warm core ring just south of the Bank. Vertical distribution patterns of the larval fish are analyzed using the hydrographic oceanographic data from the years 1993, 1994, and 1995. Results indicate greater numbers of gadid eggs in the 1995 field season than in 1993 and 1994.



Larval cod and haddock distributions from the southern flank of Georges Bank.

IN SEARCH OF THE OPTIMAL FEEDING STRATEGIES FOR BIVALVE MOLLUSKS

Barry C. Smith, Gary H. Wikfors and Jennifer H. Alix
Reproductive Biology and Nutrition Investigation
Milford Laboratory
Mark Dixon
Marine Sciences and Technology Center
University of Connecticut

Production of microalgal feeds has been a major limiting factor in the development of the shellfish aquaculture industry. On a production scale, many grams per week of microalgal biomass may be required to feed shellfish. Knowledge of feeding regimes yielding the highest conversion efficiencies of algal feed to molluscan growth is required to maximize the return on an algal-culture investment.

We can use contemporary technology to help us control such things as feeding time and duration in investigations of shellfish nutrition. At the Milford Laboratory, specialized molluscan rearing chambers have been used to study shellfish nutritional requirements since 1982; these consist of twelve PVC chambers fitted with screens to hold the shellfish being studied. By manipulating several valves, a person could manually control seawater flow, volume of microalgal food, and feeding duration. A computer-controlled solenoid valve system has been added to these chambers and the system now can be programmed to control these parameters automatically. All the components of the system are "off-the-shelf" in that they are readily available. An object-oriented software package controls the outputs of a digital In-Out board; these output signals trigger relays which operate the solenoid valves. Each chamber has a solenoid valve for seawater flow, algal feeding, and chamber draining. The system runs independently until stopped, reducing labor requirements while adding experimental flexibility. Each chamber represents a miniature model for a programmed molluscan nursery system, permitting the investigation of twelve feeding strategies at once.

Initial results suggest that feeding young post-set bay scallops, *Argopecten irradians*, every six hours yields growth superior to feeding once daily. Subsequent experiments will work toward developing feeding standards for molluscan shellfish analogous to those employed routinely in agricultural animal husbandry.

OVERVIEW OF THE 1994 REAUTHORIZATION OF THE MARINE MAMMAL PROTECTION ACT AND THE 1995 STOCK ASSESSMENTS

Gordon T. Waring
Protected Species Branch
Woods Hole Laboratory

The 1994 reauthorization of the Marine Mammal Protection Act (1972) requires the National Marine Fisheries Service to develop new rules to govern marine mammal fishery interactions, and prepare stock assessments for all marine mammals in U.S. waters. The major goal of the Act is ensure that marine mammal stocks should not be permitted to decline below their optimum sustainable population, and that they remain a significant component of the ecosystem.

The principal management objective is to reduce the level of incidental marine mammal mortality in commercial fishing operations to insignificant levels approaching a zero mortality and serious injury rate. This goal can be addressed via management regulations (i.e., temporal and spatial fishery closures) and technological modifications to fishing gear (i.e., acoustic alarms).

Scientific requirements of stock assessments require NMFS to conduct studies (i.e., abundance surveys, stock identification, life history, etc,) to determine the status of each stock. Key components of the assessments are: the potential biological removal (PBR) determination, and fishery mortality estimates. These two elements help to determine the management status for each stock (strategic - non strategic), and the assignment of each fishery to management category (i.e., Category I, II, or III). The latter affect the level of fishery self-reporting and requirement for observer coverage.

MMPA ESA ZMRG PBR STRATEGIC CV's MMPA ESA PBR

Ten thousand model simulations should be sufficient to examine criteria for selection of PBR elements *Nmin, Rmax, and Fr.

DEVELOPMENT OF IRRADIATION DETECTION METHODS FOR FOODS CONTAINING POLYUNSATURATED FATTY ACIDS

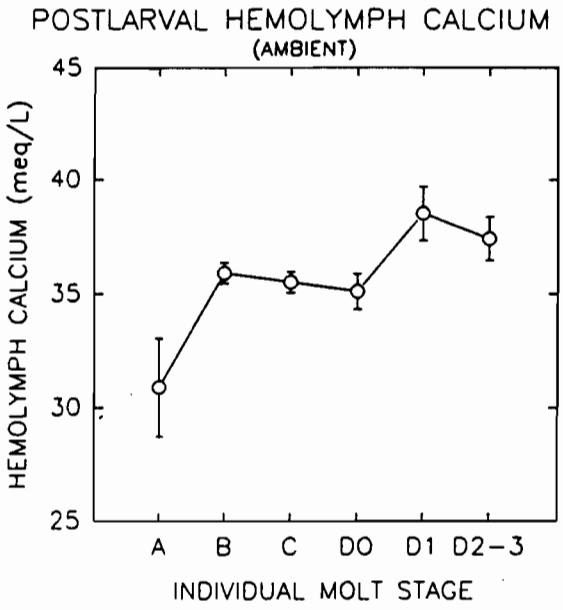
E. De Groote , H. Wan and W.W. Nawar
Dept. of Food Science
University of Massachusetts at Amherst, CMER

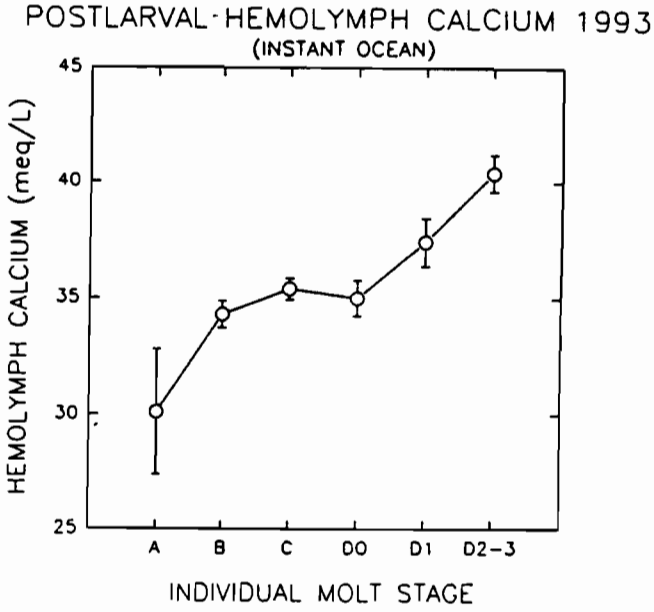
A technique, based on preferential radiolytic cleavage in the ester-carbonyl region of fatty acids, was developed in our laboratory for the detection of irradiation in lipid-containing foods. The key hydrocarbons used as markers were those arising form radiolysis of the saturated acids. The technique proved to be simple, sensitive, accurate and reproducible. However, application to foods containing polyunsaturated acids, e.g. seafood, spices, seed lipids met with several difficulties, including low yield of radiolytic products and interference from oxidation products. The purpose of the present work was to investigate the origin of these difficulties and to develop improved methodology. Series of triacylglycerols and methylesters of saturated, mono- and polyunsaturated fatty acids, seafood, spices, and seedoils were irradiated under controlled conditions and the polar and non-polar radiolytic products analyzed. Significant effects of chainlength and unsaturation were observed, e.g. the Cn-1 hydrocarbon form stearate, oleate, linoleate, and linolenate was 3.7, 1.4, 0.8, 0.4 microgram/gFA/kGy, respectively. This relationship was also observed in irradiated chicken, egg-yolk, spices and seafoods. The low yield may be due to the fact that unsaturated linkages act as centers of charge localization, thus competing with the carbonyl oxygen. Attemps were made, with moderate success, to reduce peak overlap by prefractionation using TLC, urea adduction, Li-soap solubility, HPLC and different GC stationary phases. We are also exploring potential markers in the polar radiolytic products. Results with linoleates and linolenates are promising. It is hoped that this work will provide a better understanding of the radiolysis of polyunsaturated systems which would lead to practical irradiation detection methodology.

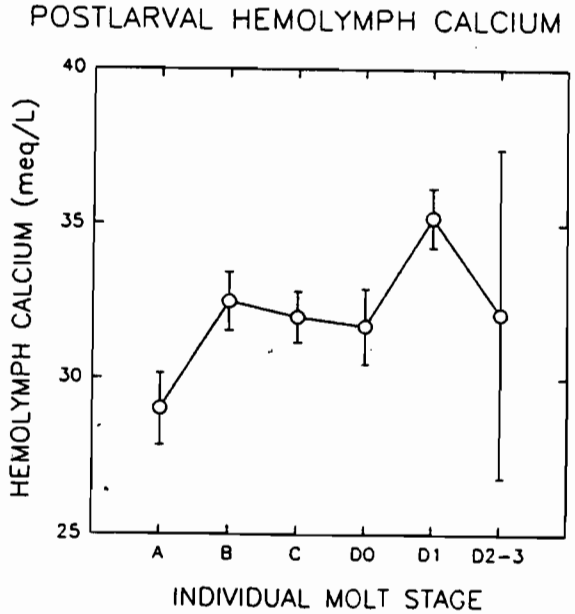
MOLT-RELATED CHANGES IN HEMOLYMPH CALCIUM OF POSTLARVAL AMERICAN LOBSTERS (*HOMARUS AMERICANUS*)

R. Mercaldo-Allen, C. A. Kuropat, J. Widman, and F. P. Thurberg
Reproductive Biology and Nutrition Investigation
Milford Laboratory

In a laboratory study, postlarval American lobsters experienced changes in hemolymph calcium concentrations over the molt cycle. Values were lowest immediately after molting and increased gradually through postmolt into intermolt and early premolt. Calcium concentrations peaked during mid- or late-premolt and usually declined just before the molt to fifth stage. This pattern is similar to that observed in adult American lobsters.







POTENTIAL EFFECTS OF RIVER-OCEAN TRANSITION TEMPERATURES ON US ATLANTIC SALMON STOCKS

John F. Kocik and Kevin D. Friedland
Coastal/Pelagic Resources Investigation
Woods Hole Laboratory

Salmonid strategies to facilitate the river-ocean transition of smolts are complex and rely on a diversity of cues. These strategies enable juveniles to enter the ocean under favorable conditions. Atlantic salmon face unique challenges in entering the ocean environment from southernmost U. S. salmon rivers. Recent data indicate that Penobscot River return rates are similar to Canadian hatchery stocks, while those of the more southern Connecticut River are lower. We compared temperatures in lower river reaches (RT) to surface temperatures in nearshore marine areas (SST) for these two systems from 1983 to 1994. Mean annual Connecticut RT was 3.82°C warmer and SST 3.08°C warmer than for the Penobscot. We studied the potential effect of differing temperatures on migration windows by examining a standardized period cued by RT. In the Penobscot River, a three-week migration window existed, starting at week 15. In the Connecticut River, the emigration window was four weeks long and began at week 13. In both systems, Atlantic salmon smolts encounter different transition challenges and oceanic thermal regimes. Penobscot SST (6.27°C) averaged 1.27°C colder than RT, while Connecticut SST (8.82°C) averaged 1.23°C warmer than RT. For Connecticut River Atlantic salmon, native stocks had either acclimated to warmer ocean-river temperatures or migrated earlier. Early migration seems the more plausible strategy based upon life-history flexibility throughout their range. Current outmigration timing of Connecticut River fish is similar to that of donor stocks but not projected optimal windows. This suggests a potential mismatch of migrational cues in restoration stocks to recent environmental conditions.

LINE TRANSECT SURVEYS FOR MARINE MAMMALS

Debra Palka
Protected Species Branch
Woods Hole Laboratory

The MMPA requires stock assessments for each marine mammal in US waters. The assessments involve abundance and bycatch estimates. To obtain abundance estimates, the Protected Species Branch of NEFSC conduct line transect sighting surveys. The best, unbiased, most precise abundance estimate results from taking in account of line transect assumptions and biology of the marine mammals. To demonstrate this, the design, implementation, and analysis of a typical line transect survey will be reviewed. Underlying assumptions will be discussed and examples will be provided that demonstrate how the field and analytical procedures implement the theory. In addition, ways that the marine mammal's biology (habitat preferences, prey distribution, and reproduction requirements) influence the design and implementation of the survey and influence what ancillary data are collected will also be described.

TRAVELS OF A VERY YOUNG COD ON GEORGES BANK IN THE SPRING OF 1995

J. P. Manning, C.Naimie, and R. G. Lough
Fishery Oceanography Investigation
Woods Hole Laboratory

The distribution of gadid larvae was determined from a series of cruises on Georges Bank in the spring of 1995. High concentrations of eggs were found on the northeast peak (66° 37'W, 90m) in March, early stage larvae were found on the southern flank (67° 22'W, 90m) in April, and older stage larvae were found further west (68°W, 65m) in May just inside an encroaching shelf/slope front. Records of velocity from moored and drifting instrumentation on the southern flank document a series of along-bank burst of wind-driven flow (15km/day) as well as periods of sluggish or, in some cases, reversed (eastward) subtidal advection. Extensive CTD surveys depict the foot of the shelf/slope front that encroached as far as the 65 meter isobath.

Did these low-frequency (2-5 day) flow events contribute significantly to the resultant advective pathways? Given a 3-d prognostic time stepping model with observations of real wind at a nearby NOAA buoys and climatological density fields, selected periods of advection have been hindcast over several tidal cycles. Near-surface modeled flows compare well with the GPS drifters drogued at 15 meters and Eulerian current observations (15m). The model demonstrates its ability and potential to simulate the advection of cod and haddock from the time and place of spawning through their early life stages.

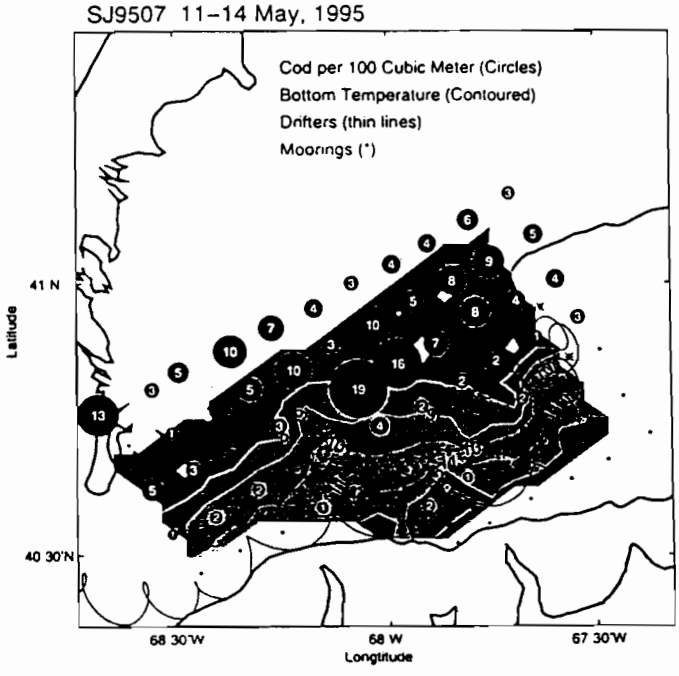
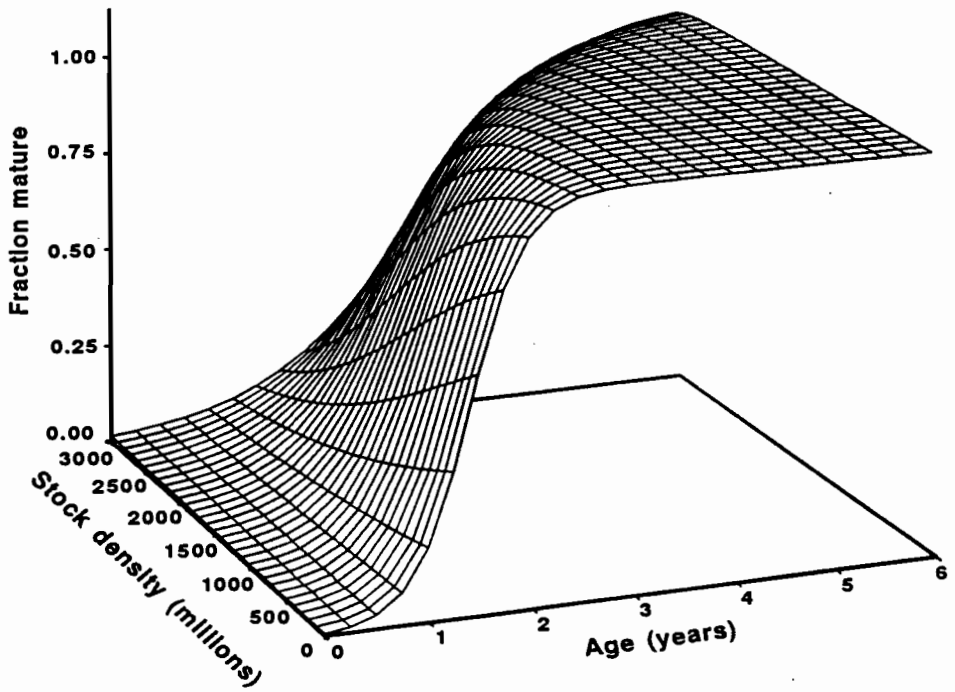


Figure. Distribution of cod (per $100m^3$) from 0.505mm bongo nets (circles), bottom temperature (deg.C) from Seabird CTD (contoured), and water parcel advections from GPS drifters drogue at 15m (thin lines). The 60, 100, and 200m isobath are included. Note the two drifters were deployed either side of the front.

DENSITY DEPENDENT GROWTH AND SEXUAL MATURITY OF SILVER HAKE (*MERLUCCIUS BILINEARIS*) IN THE NORTHWEST ATLANTIC OCEAN

Thomas E. Helser
Demersal Resources Investigation
James J. Howard Marine Sciences Laboratory
Frank Almeida
Fishery Biology Investigation
Woods Hole Laboratory

Life history parameters such as growth and age at first maturation of marine fish populations are adaptive, and their interdependence is implicit in the density dependent response of exploited stocks to fishing pressure. However, despite the strong density dependence revealed in the stock recruitment relationships of most marine fish stocks, the actual mechanisms through which these effects occur has been difficult to establish or confounded by environmental factors. In this study, we examined density dependent changes in growth and sexual maturity of northwest Atlantic silver hake (*Merluccius bilinearis*) during 1972-1992. Using multiple linear regression methods, we evaluated changes in growth, stock density, temperature and habitat association on the proportions of fish maturing at ages 2 and 3. The regression analyses were highly significant ($r^2 > 0.60, p < 0.01$); stock density accounted for most of the variation in the data ($p < 0.01$). We propose the negative relationship between stock density and maturation of age 2 and 3 fish ($r > -0.83, p < 0.01$) is mediated through intraspecific competition for food and reduced growth at age 1 ($r > -0.65, p < 0.01$). Silver hake are transitioning to a piscivorous diet at that age, and begin to mature in the second year of life. Since maturation ogives are important input for population level models, we also modeled silver hake maturation as a response surface to age and stock density using logistic regression. Modeling results were highly significant ($r^2 > 0.88, p < 0.001$) indicating that maturation is dependent on age, stock density and an age-density interaction.



DETECTABILITY OF RIGHT WHALES IN COASTAL WATERS OF THE SOUTHEASTERN UNITED STATES WITH IMPLICATIONS FOR THE AERIAL MONITORING PROGRAM

James H. W. Hain
Protected Species Branch
Woods Hole Laboratory
Sara L. Ellis
Dalhousie University

Right whales on their calving grounds in coastal waters of the southeastern United States are being struck by ships. As part of Recovery Plan implementation, daily aerial monitoring during the calving season has been instituted. These flights are designed to detect right whales, and through an Early Warning System, alert mariners so as to avoid ship strikes. If, however, whales are undetected, a report to the Early Warning System does not occur, jeopardy to whales is increased, and mitigation efforts are compromised. This report describes results to date on a study of right whale detection, evaluates the efficiency of the present monitoring program, and suggests how detection might be increased.

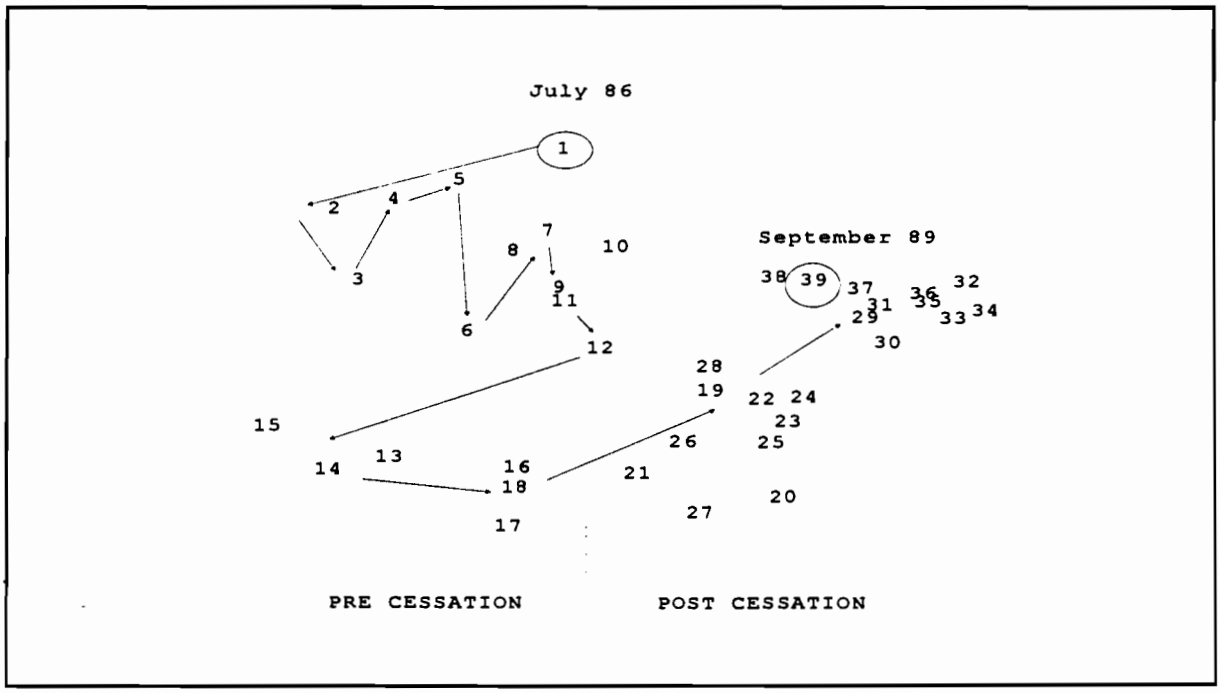
The whale behavioral data were recorded on audio- and videotape using airships (blimps) as research platforms. Percent surface time, along with dive and surface time, were used to calculate preliminary sighting probabilities at various distances from the trackline based on the view-field from a Cessna-182 aircraft (used in the aerial monitoring program), for three types of sightings. The view-field from the aircraft was shaped as the sector of a circle, with search time greatest at about 1 nmi from the trackline, and decreasing closer and farther. When aircraft view-field characteristics were merged with whale behavior data, overall maximal detection probabilities were highest for groups (94%), intermediate for mother/calf pairs (61%), and lowest for single juveniles (57%).

Because single juveniles are least likely to be sighted from both the monitoring aircraft as well as by transiting ships seeking to avoid them, jeopardy is increased. Secondly, because juveniles have likely been undersampled, demographic descriptions have been skewed. Research on this category is therefore a priority. Additionally, because two ship strikes have occurred on young calves, describing mother/calf behavior during the first weeks following birth is also a priority. Results from this study are being used to re-analyze existing data, refine aerial monitoring methodology, and improve effectiveness of the Early Warning System. Findings will also have application to aerial survey methodology for other endangered whale species.

12-MILE DUMPSITE REVISITED: FOLLOW UP RESAMPLING AND MULTIVARIATE DATA ANALYSES.

Joseph J.Vitaliano, Steven A. Fromm, Robert N. Reid, Dorothy Jeffress, and Linda Arlen
Habitat Evaluation and Restoration Investigation
James J. Howard Marine Sciences Laboratory

The 12-Mile Dumpsite Study was a multidisciplinary three year (1986-89) field experiment to follow the biological and chemical changes in the benthic ecosystem due to cessation of sewage sludge dumping in the New York Bight. Since the conclusion of the study, the 12-Mile Dumpsite has been resampled semiannually to look at recovery over the longer term. Data also exist from monitoring surveys from 1979 to 1985 for two of the three main study sites sampled during the 12-Mile study. Multivariate techniques were used to explore these data, with the biological and chemical data obtained during the intensive 12-Mile Dumpsite study as the focal point. Using a technique known as non-metric Multi-Dimensional Scaling (MDS) we were able to graphically illustrate the progression of changes in benthic macrofaunal assemblage patterns from the pre-cessation period through the post-cessation period. Multivariate techniques can be used to follow the recovery process which is still underway at the closed 12-Mile Dumpsite and also changes that may occur at other sites in the inner N.Y. Bight subjected to dredge spoils dumping.

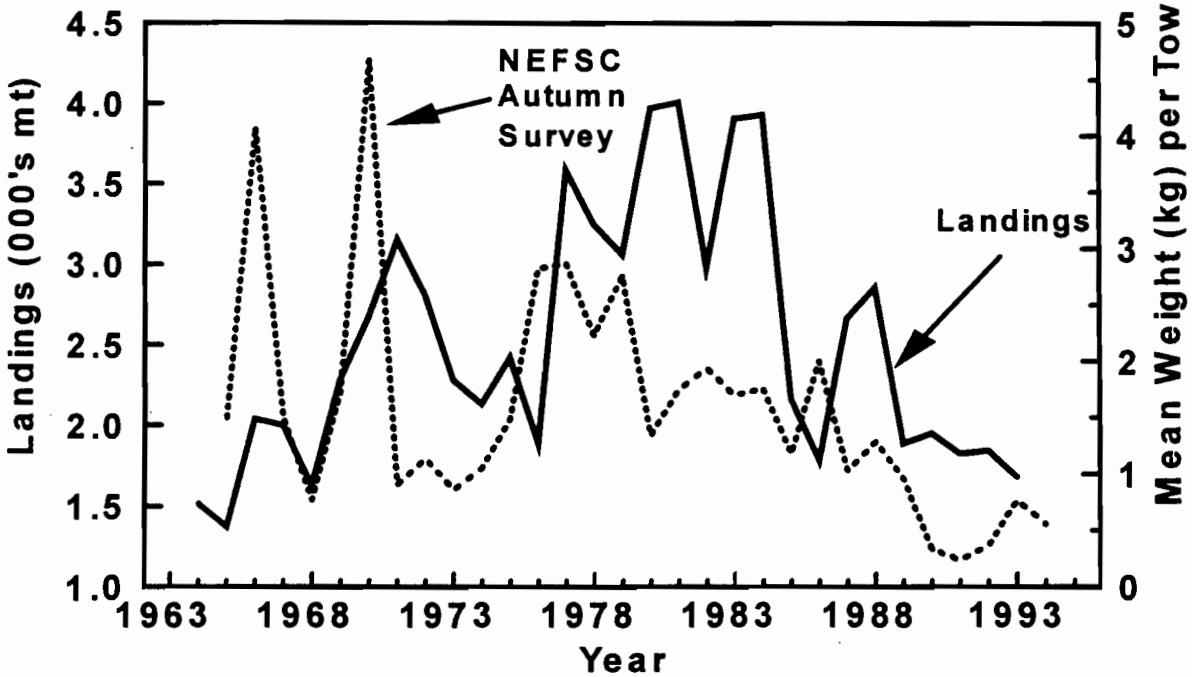


MDS plot of Bray-Curtis similarities for species abundances at the sludge site showing the progression of change over 39 months from July 1986 to September 1989 during the pre-cessation and post-cessation periods.

CURRENT ASSESSMENT STATUS OF GEORGES BANK WINTER FLOUNDER

Russell W. Brown
Demersal Resources Investigation
Woods Hole Laboratory

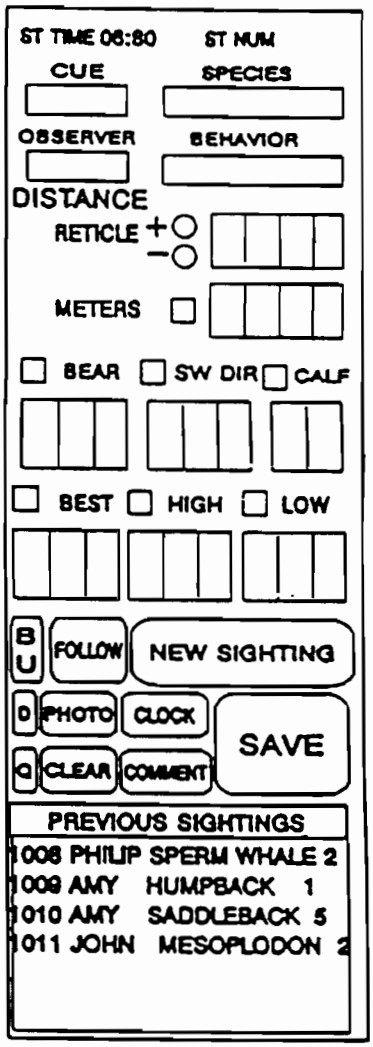
Winter flounder is a consistent component of the Georges Bank multispecies trawl fishery, accounting for 2,000 to 4,000 mt of annual landings by U.S. fishers. Tagging and meristic studies suggest that Georges Bank winter flounder represents a distinct stock from coastal populations occurring in inshore waters. An analysis of fishery dependent and independent indicators of stock abundance was performed to provide a current assessment of the condition of the Georges Bank stock. Commercial landings have exhibited a general declining trend since 1981, and 1993 landings (1700 mt) were the lowest recorded since 1968. Commercial landings per unit effort (LPUE) statistics indicate that LPUE has steadily declined since 1983, and were at a historic low in 1993 for directed, highly directed, and all trips landing winter flounder on Georges Bank. Discard estimates from 1985-1993 suggest that discards represent approximately 10% of total trawl catch. Landings at age indicate that age 2-5 fish have dominated commercial landings since 1985. Discard rates of winter flounder are lower than for inshore waters due to the fast growth rates of Georges Bank fish, large mesh sizes used in recent years, and lack of trawl effort in shallow shoal areas used as nursery areas. NEFSC spring and autumn survey indices have trended downward since the early 1980's and 1994 index values are among the lowest on record. Preliminary estimates of fishing mortality derived from survey data suggest that F exceeds overfishing definitions.



PINGLE: A PEN-BASED COMPUTER SYSTEM FOR DATA ENTRY ON LINE TRANSECT SURVEYS

Nan Garrett-Logan
Protected Species Branch
Woods Hole Laboratory

A description of the system developed at NEFSC for direct and immediate data entry by observers on line transect surveys, such as the Gulf of Maine Harbor Porpoise and Pelagic Delphinid Surveys. The hand-held pen-based unit running PenDOS uses a stylus for data entry through automated character recognition and menu selection. The program, developed using the Pen Pal application development system, accommodates the specific requirements for line transect surveys; data entered incudes time, species, estimated range and bearing, swim direction, group size, behavior, and free-format comments and diagrams. The system allows new sightings to be initiated while previous sightings are pending. Data fields can be filled in any order. All data fields for a sighting are displayed in a single screen, making incomplete records apparent; entries are checked for appropriate values. Data are recorded on removable PCMCIA memory cards, each capable of holding data for several days sightings. The system allows all team members to easily and reliably record sightings data with minimal interruption to scanning effort.



Sighting Display

HABITAT SPECIFIC USE PATTERNS AND GROWTH OF YOUNG-OF-THE-YEAR WINTER FLOUNDER AND TAUTOG IN THREE NORTHEASTERN ESTUARIES

B.A. Phelan[1], R. Goldberg[2], J. Pereira[2], P.Clark[2], A.J. Bejda[1], J.T. Finn[1], S.A. Fromm[1], C. Kuropat[2], and R. Mercaldo-Allen[2]
[1]Behavior Investigation
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A comparative study was designed to assess the quality of selected nursery habitats for juvenile fish in Connecticut and New Jersey. Habitat specific abundance, distribution and growth of young-of-the-year winter flounder (*Pleuronectes americanus*) and tautog (*Tautoga onitis*) was quantified in common nursery habitats. Habitat types selected for study were unattached macroalgae (*Ulva lactuca*), eelgrass (*Zostera marina*) and adjacent unvegetated areas and marsh creeks.

Habitat use patterns were determined quantitatively using a 1-meter beam trawl. Young-of-the-year winter flounder and tautog utilize primary settlement areas and disperse from them to a variety of vegetated and unvegetated habitats. Eelgrass habitat supported a greater number of winter flounder and tautog than other habitats.

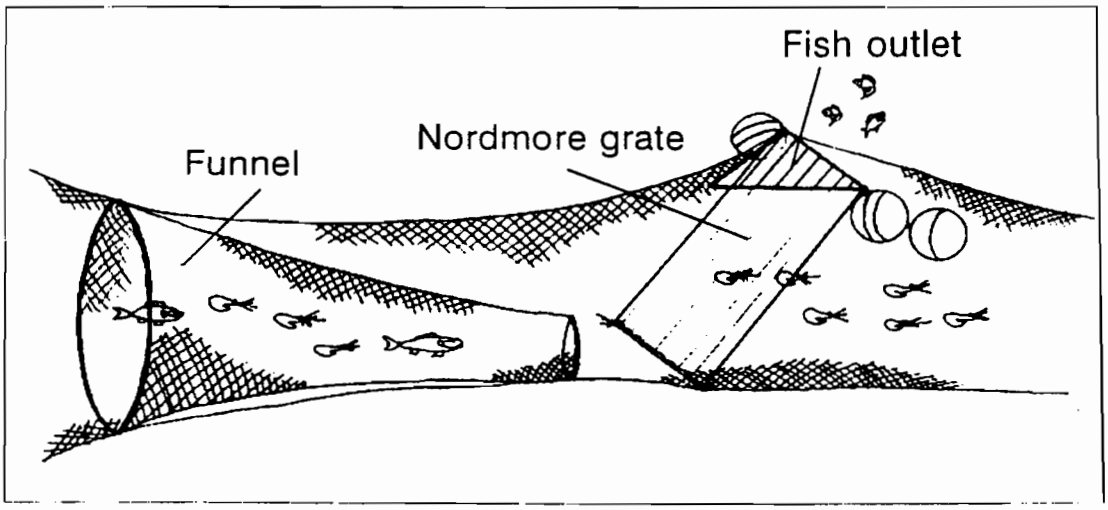
Survival and growth varied with habitat type. Growth was quantified by measuring increases in length and weight and RNA/protein levels of fish held in short term caging experiments. In salt marsh creeks, where dissolved oxygen levels were often very low, survival was poor. In macroalgae habitats with high biomass, survival was also poor. The greatest growth rates occurred for the smallest individuals and diminished with time. Comparison among habitats indicated growth to be similar except for marsh creeks, which were lower. These data suggest that eelgrass and macroalgae habitats are important as nurseries for juvenile fish especially when environmental conditions (i.e., dissolved oxygen and water temperatures) are favorable.

EFFECTIVENESS OF THE NORDMORE GRATE IN REDUCING BYCATCH OF FINFISH IN THE GULF OF MAINE NORTHERN SHRIMP FISHERY

Lisa Hendrickson and R. Anne Richards
Invertebrate Resources Investigation
Woods Hole Laboratory

Discard, by weight, of some commercially-important groundfish species in the Gulf of Maine Northern shrimp fishery has been estimated to equal or exceed shrimp landings in some years. Due to concerns about the impacts from high discard and bycatch mortality on groundfish populations, the Nordmore grate system, which is comprised of a funnel, excluder device and escape opening, has been required in shrimp trawls since April of 1992. Experiential testing of this excluder system demonstrated its effectiveness in releasing finfish while retaining shrimp, however, its performance in the fishery has not been evaluated.

Sea sampling has been conducted aboard commercial fishing vessels, since 1989, through the Sea Sampling Program of the Northeast Fisheries Science Center. Sea sampling data collected aboard shrimp trawlers allowed us to quantify catch, bycatch and discard rates (CPUE) in the Northern shrimp fishery. We used these data to evaluate the effectiveness of the Nordmore grate system in the fishery by comparing bycatch and discard rates of thirteen regulated groundfish species before and after the grate system became mandatory. The analyses incorporated research survey abundance indices to control the effects of abundance changes on the by catch rates of each species. The results showed a significant reduction in by catch rates of most of these species for vessels fishing with the Nordmore grate system.



RESTORATION ACTIVITIES IN NEFSC UNDER NOAA'S DAMAGE ASSESSMENT AND RESTORATION PROGRAM

Robert Reid
Habitat Evaluation and Restoration Investigation
James J. Howard Marine Sciences Laboratory

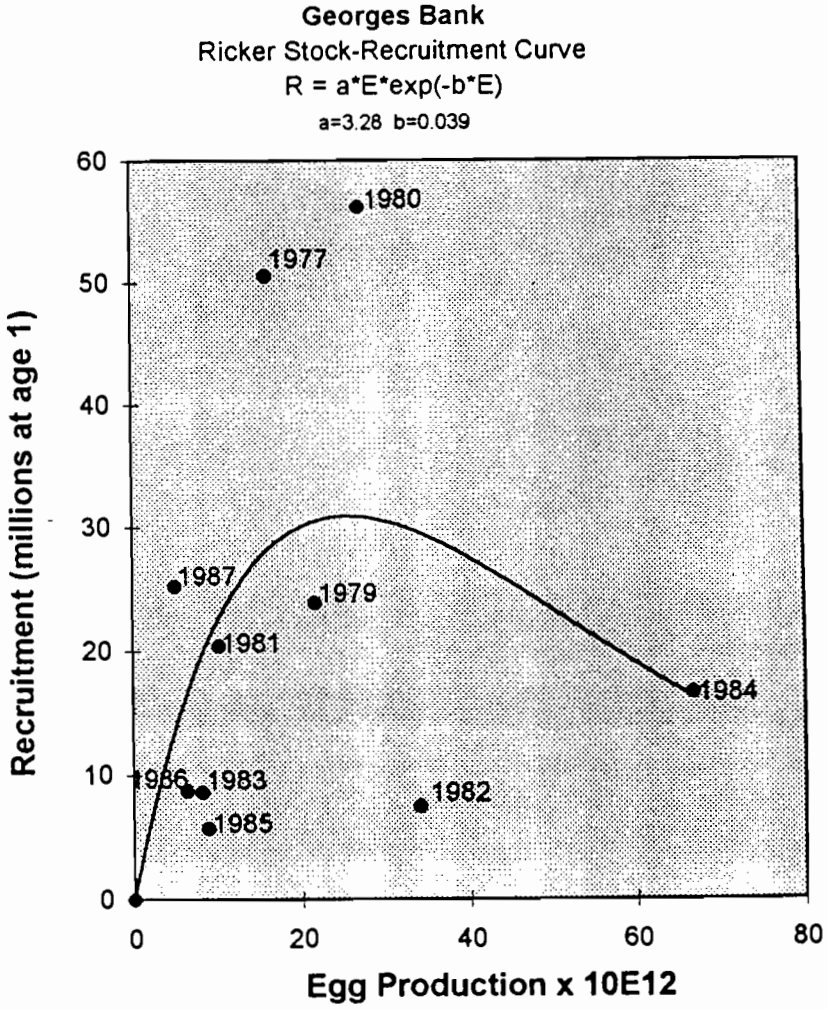
Restoration science has been conducted at the Center, particularly Milford Laboratory, for decades. We have been formally involved with NOAA's Damage Assessment and Restoration Program (DARP) only since 1991, however. DARP was begun in 1990, largely to meet NOAA mandates for dealing with releases of oil and hazardous materials under the Clean Water, Superfund, Oil Pollution, and National Marine Sanctuaries acts. These acts name NOAA to represent the public as a "trustee" for natural resources including commercial and recreational fishery species, anadromous species, endangered and threatened species, marine mammals, resources associated with national marine sanctuaries and estuarine research reserves, and the habitats of these species. When these resources are injured or threatened by spills, NOAA assesses injuries and plans and conducts activities intended to restore resources to pre-spill conditions. The work is done in concert with any other groups who are trustees for affected resources, i. e. other Federal agencies, state and sometimes local governments, and Indian tribes.

This incredibly boring presentation describes the organizational structure of DARP and the procedures involved in assessing injuries and planning and conducting restoration. Depending on the nature of the spill, injury assessment can be via computer models or field surveys. Monetary values of the injuries ("damages") are then calculated, and settlements with spillers are negotiated or litigated. Potential restoration alternatives are evaluated for technical feasibility, likelihood of success, and costs vs. benefits. Alternatives include not only direct restoration of injured resources, but also replacement with equivalent resources and acquisition of habitats important to the affected resources. Each alternative is associated with specific restoration options, e. g. replanting salt marsh vegetation, restoring anadromous fish runs, stocking affected species. Options included in a spill restoration plan for New York Harbor will be discussed, as will the small Center involvement in New Bedford (MA) and Narragansett Bay restorations. In the future, restoration activities may command an increasing share of NOAA's disappearing budget.

POSSIBLE CAUSES FOR RECRUITMENT VARIABILITY OF YELLOWTAIL FLOUNDER

Donna L. Johnson
Life History and Recruitment Investigation
James J. Howard Marine Sciences Laboratory

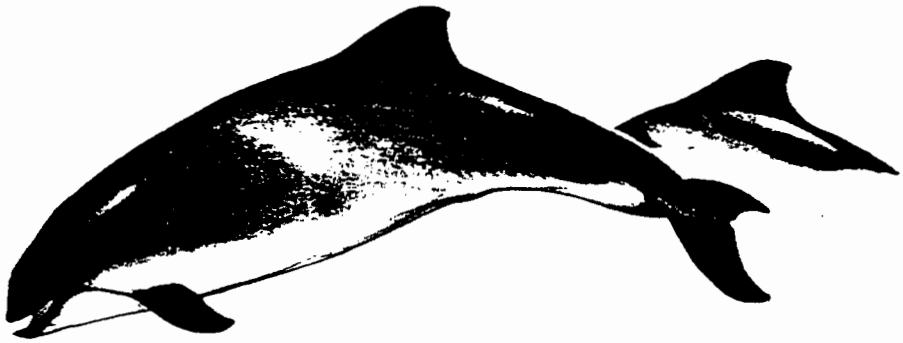
Variations in year-class strength may be determined during the early life stages of marine fish and is associated with fluctuations of various biotic and abiotic factors. Ichthyoplankton samples of *Pleuronectes ferrugineus*, yellowtail flounder, and zooplankton samples of *Calanus* sp. and *Pseudocalanus* sp. were investigated from concurrent collections from Georges Bank and Southern New England during 1977 through 1987. The match/mismatch hypothesis was tested by investigating the relationships between yellowtail flounder larvae and their zooplanktonic prey. Egg and larval abundances were positively correlated with zooplankton abundances in most years with strong recruitment. A multiple regression analysis was performed to investigate linkage of larval fish abundance with various meteorological and hydrographic factors. In the analysis, salinity and water column temperatures accounted for 46% of the recruitment variability in yellowtail flounder from the Southern New England area. Environmental variables accounted for less than 5% of the recruitment variability in Georges Bank. It is suggested that improvements in methods be applied to these hypotheses for advancement in predictive fisheries research.



HARBOR PORPOISE BYCATCH, ALLOWABLE REMOVALS AND MANAGEMENT APPROACHES TO REDUCING THE BYCATCH IN THE GULF OF MAINE SINK GILLNET FISHERY

Kathryn D. Bisack
Protected Species Branch
Woods Hole Laboratory

The bycatch of harbor porpoise in the New England sink gillnet fishery is perhaps the major marine mammal fishery interaction issue in this region. The 1994 take, estimated at 2000, exceeded the potential biological removal rate (PBR), set at 400 under the guidelines established by the 1994 Marine Mammal Protection Act (MMPA) amendments. The current management approach, to reducing the bycatch to allowable levels, is implementing area/season closures within the fishery. This provided an effective short-term solution. However, because harbor porpoise are a migratory species and there has typically been a data lag, area season closures may not always be optimally effective. An alternative approach may be developing individual transferable quotas (ITQs) for harbor porpoise, or individual transferable porpoise (ITPs). This management tool could either be a replacement or a complement to the current approach. With an ITQ system, vessel owners would be allocated quota that they could use or sell. They would decide when and where to fish based on their individual quota. The fishery should shut down naturally when large groups of harbor porpoises are moving through a fishing area. Therefore, ITQs may offer both biological and economic advantages over other management approaches to reducing the bycatch.



HARBOR PORPOISE
(Phocoena phocoena)

SEASONAL MOVEMENTS, SIZE-STRUCTURE, AND INTERANNUAL ABUNDANCE OF SEAROBINS (TRIGLIDAE: *PRIONOTUS*) IN THE TEMPERATE, NORTHWESTERN ATLANTIC

Joseph B. O'Gorman
Resource Surveys Investigation
Woods Hole Laboratory
Richard S. McBride
Department of Environmental Protection, Florida
Kenneth W. Able
Rutgers University

The northern searobin (*Prionotus carolinus*) and striped searobin (*P. evolans*) are common in the Mid-Atlantic Bight of the U.S. east coast, yet their ecology is poorly known. Data from three fishery-independent otter trawl surveys were examined to document abundance and size-structure variations between geographic subregions, seasons, and years. Northern searobins were more numerous than striped searobins but, owing to their smaller average size, they were not consistently more abundant by weight. Both species occurred year-round in the Mid-Atlantic Bight, but they migrated seasonally in an onshore-offshore as well as a north-south pattern. The timing of each species' seasonal movements was asynchronous so that striped searobins were equally or more abundant than northern searobins in nearshore habitats during autumn. In all seasons, northern searobins were distributed further north than striped searobins, a pattern consistent with postulated species-specific temperature preferences. The length-frequency of both species was polymodal during autumn, reflecting a young-of-the-year cohort as well as older year-classes. Both species constitute a considerable proportion of the trawl fishery by-catch and could be impacted by such fishing activities in the Mid-Atlantic. Across a 20-25 year period, there was modest annual variation in population size, but there was no clear indication of either dramatic declines (as has been noted for some commercially exploited species) or increases (as noted for some unexploited cartilaginous-fishes) in recent decades.

SPECIES-SPECIFIC IDENTIFICATION OF LARVAL BIVALVES USING AN 18 S RDNA PROBE AND RFLP ANALYSIS

J. L. Bell
Institute of Marine and Coastal Sciences, Rutgers University, CMER

As part of an ongoing study of surfclam (*Spisula solidissima*) settlement and recruitment at a Long-term Environmental Observatory (LEO-15) on the New Jersey shelf, a molecular DNA probe was designed to distinguish early-stage surfclam larvae from larvae of other common bivalve species in plankton samples. A critical aspect of this study is to be able to identify early-stage larvae of many bivalve species which cannot be distinguished by morphology. A combination of a probe and a restriction enzyme that targets variable regions in the nuclear (18S rRNA) genome was used to discriminate *S. solidissima* from other common bivalve species found at the LEO-15 site. The Polymerase Chain Reaction (PCR) was used to amplify a variable region of the 18S rRNA gene from individual larvae as small as 80 μm in shell length. The family identity of the larva from which the gene was amplified was determined with a DNA probe and the species identity with a restriction enzyme. These methods were used to correlate the supply of larvae collected from the plankton with summer upwelling events.

THE STATUS OF REMNANT ATLANTIC SALMON POPULATIONS IN NEW ENGLAND

John F. Kocik
Coastal/Pelagic Resources Investigation
Woods Hole Laboratory

In 1993, the National Marine Fisheries Service and U.S. Fish and Wildlife Service (collectively the 'Services') received a petition to list anadromous Atlantic salmon (*Salmo salar*) as 'endangered' throughout its native range in the U.S.A. under the Endangered Species Act of 1973 (ESA). The Services subsequently initiated a study of the status of U.S. Atlantic salmon populations, with particular reference to the ESA definition of a species (*"any subspecies of fish or wildlife or plants, and any distinct population segment [DPS] of any species of vertebrate fish or wildlife that interbreeds when mature")* and to the definition of an "Evolutionarily Significant Unit" (ESU) used in listing decisions involving Pacific salmon. Using the ESU approach as a practical framework for delineating DPSs of Atlantic salmon, the Services grouped historic U. S. Atlantic salmon populations into three units: (1) extirpated: 32 stocks, (2) DPS: seven stocks, and (3) candidate species: four stocks. The Atlantic salmon stocks that comprise the DPS of Atlantic salmon occur in seven Maine rivers: the Sheepscot, Ducktrap, Narraguagus, Pleasant, Machias, East Machias, and Dennys. We reviewed recent trends in abundance of the remnant DPS Atlantic salmon stocks and the estimated contribution of wild and hatchery fish to the runs in these seven Maine rivers. Wild fish have been predominant (79%) in these runs since 1970. However, documented returns of wild fish have declined markedly from a high of 520 Atlantic salmon in 1972 to 91 Atlantic salmon in 1994. Analyses of freshwater production and marine survival rates indicate that the DPS stocks are not replacing themselves. Rehabilitation of these stocks will require artificial propagation as a conservation tool, with safeguards to ensure that the existing genetic variability and distinctness of these species units is maintained.

THE RESTORATION OF STRIPED BASS STOCKS: A CASE HISTORY OF THE RECOVERY OF AN EXPLOITED POPULATION

Gary Shepherd
Coastal/Pelagic Resources Investigation
Woods Hole Laboratory

Striped bass were historically one of the most important commercial and recreational fisheries in coastal Atlantic states. Chesapeake Bay striped bass stocks, which contribute the greatest percentage of coastal migratory stocks, experienced severe management restrictions, backed by legislative actions, striped bass were declared a "recovered" stock as of 1995. The recovery has allowed easing of fishing restrictions that in turn has lead to a new suite of management problems. The current state of striped bass populations, how the recovery was accomplished and the future of striped bass management will be explored.

PATTERNS OF SEXUAL MATURATION IN ATLANTIC SALMON SUGGESTED BY STRONTIUM/CALCIUM RATIOS IN OTOLITHS AND GONADOSOMAL INDICES OBSERVED IN NEWFOUNDLAND

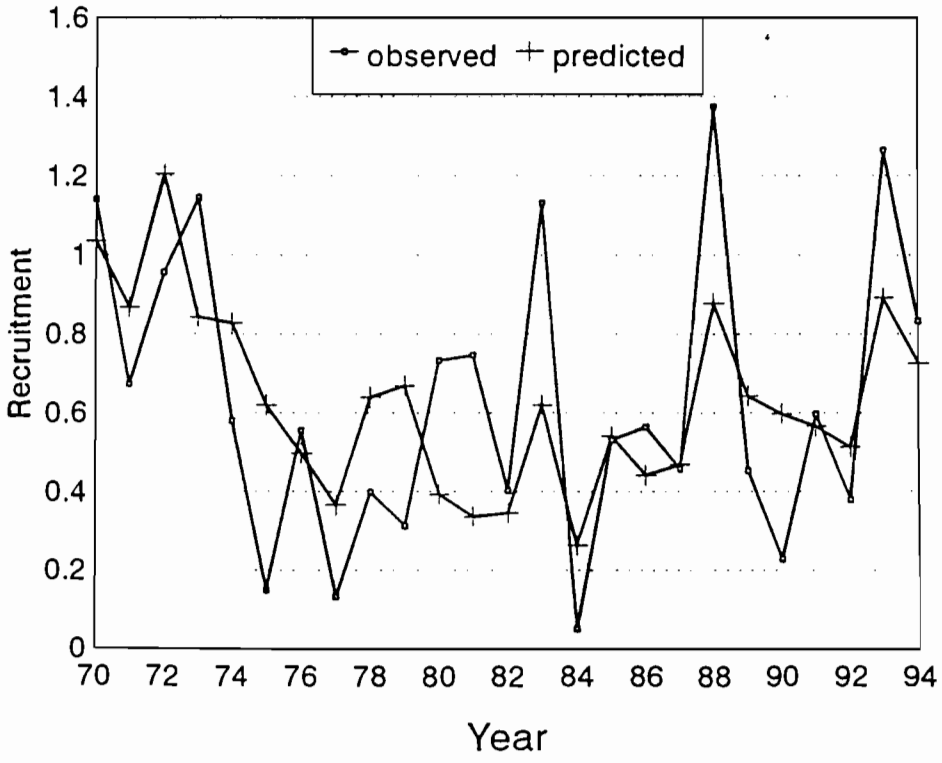
[1]Kevin D. Friedland, [2]David G. Reddin, [3]Nobu Shimizu, and [1]Ruth E. Haas-Castro
[1]Coastal/Pelagic Resources Investigation
Woods Hole Laboratory
[2]Department of Fisheries and Oceans, Canada
[3]Woods Hole Oceanographic Institution

Elements that are chronologically deposited in fish otoliths provide a record of physiological events during development and growth. The first interpretations of the elemental composition of fish otoliths ascribed variation in the elemental signal to environmental variation. However, recent studies suggest physical parameters may be less influential than physiological mechanisms such as maturation. The maturation mechanism in Atlantic salmon shows between population complexity and has important consequences on the productivity of most stocks. It is generally assumed that salmon that mature undergo physiological changes that separates them from the non-maturing component of the cohort. It is also assumed that the homing behaviors of salmon are specific since the homing ability is so precise. Therefore, the maturation process is likely related to the migration process in salmon. We examined the apparent maturation state of salmon migrating along the Newfoundland coast during summer and information on the Sr/Ca ratios for salmon that were captured in West Greenland as 1SW fish and for a group of 1SW fish ascending there natal river. The Sr/Ca ratio of Atlantic salmon otoliths appears to be a record of development and sexual maturation. The Sr content of otoliths from Greenland suggest fish were captured while they were in maturation regression from some higher level of development during the months prior to the fishery. We believe this pattern of development is also typical of fish in Canada. A hypothesis is suggested that fish that migrate more northerly after the first seawinter fail to receive cues related to sensing their home river and thus feed, grow, and regress in their maturation state. On the other hand, fish that take a more southerly route receive cues associated with their natal rivers and develop sexually, thus invoking other behaviors to find their spawning sites.

RELATIVE INFLUENCE OF SPAWNING BIOMASS AND TEMPERATURE ON RECRUITMENT OF NORTHERN SHRIMP, *PANDALUS BOREALIS*

R. Anne Richards
Coastal/Pelagic Resources Investigation
Stephen Clark
Conservation and Utilization Division
Woods Hole Laboratory

The Northern shrimp population in the Gulf of Maine is at the southern extent of the distribution of this circumboreal species, thus temperature might be expected to play an important role in its dynamics. The purpose of our study was to examine the relative importance of environmental (temperature) and biological (spawning biomass) factors in recruitment of Northern shrimp. We developed time series of population fecundity and recruitment indices from three fishery-independent surveys conduced in 1968-1994. Temperature data were surface and bottom temperature anomalies for the Western Gulf of Maine developed from NMFS spring and autumn bottom trawl surveys. We used multiple regression to examine the influence of temperature and population fecundity effects at several biologically feasible lags. Spring and fall bottom temperature anomalies were not significant, however a model including population fecundity and spring surface temperature was significant and explained 40% of the variance in recruitment. Recruitment was inversely related to spring surface temperature. The timing of the significant temperature effect corresponds to the period of planktonic larval development of Northern shrimp.



Observed recruitment versus recruitment predicted from a multiple regression model including spawning stock biomass and temperature.

ECONOMIC ISSUES OF FISHING VESSEL BUYOUT PROGRAMS

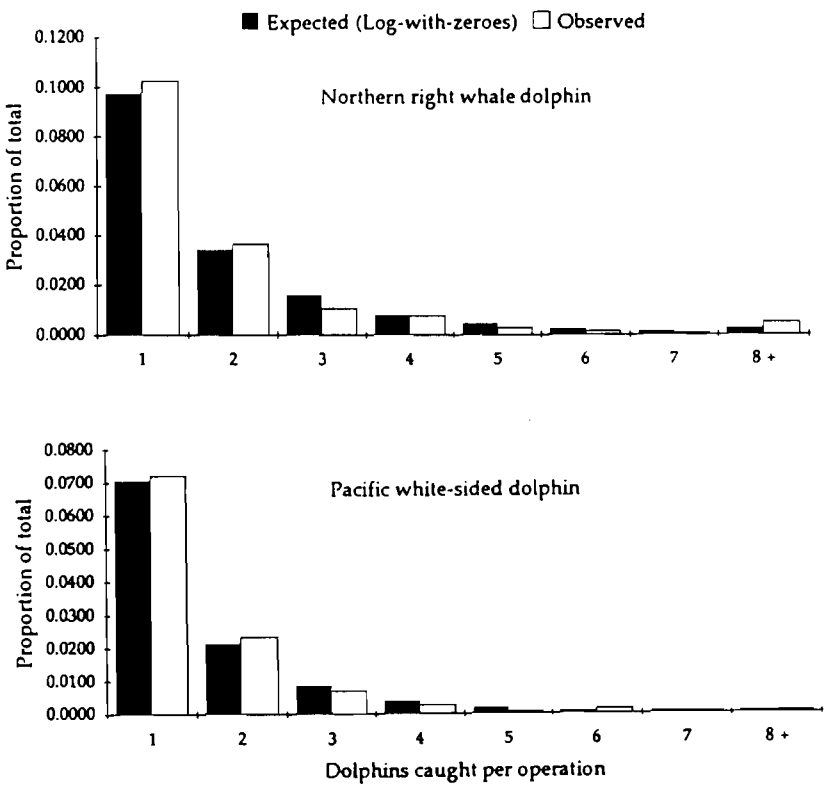
Andrew Kitts[1], Steven Edwards[1], Leo Erwin[2], Philip Logan[1], Ralph Mayo[3], and Eric Thunberg[1]
[1]Social Sciences Branch
Woods Hole Laboratory
[2]Northeast Regional Office
[3]Demersal Resources Investigation
Woods Hole Laboratory

Both the House and Senate bills re-authorizing the Magnuson Act contain language allowing for vessel buyout programs. A $2 million program has been initiated to test aspects of a larger buyout program. In addition, another $25 million has been committed for vessel buyouts. Still larger programs of up to $75 million, with funding coming from a landings tax, are being proposed. Econometric procedures were used to estimate functions that assess the probability of Northeast vessels submitting a bid to a vessel buyout program, and the expected level of submitted bids. Using these functions, various issues regarding the effect of a vessel buyout program are addressed such as the level of effort removed, groundfish revenue removed, and gear types and multispecies categories removed at different levels of program cost. Using expected landing streams under Amendment #7 of the Multispecies Fishery Management Plant (FMP), landings tax rates needed to fund a vessel buyout are calculated. Further issues such as the goals of a buyout program, consolidation of days at sea, and alternative uses of buyout dollars are discussed.

CONTAGIOUS DOLPHINS: ANALYSIS OF DOLPHIN BYCATCH DATA FROM DRIFTNET OPERATIONS

Michael R. Maxwell
Protected Species Branch
Woods Hole Laboratory

Information on the incidental catch, or bycatch, of cetaceans can provide insight into the spatial arrangement and ecology of these animals. I pursue this idea by examining the bycatch data of the northern right whale dolphin (*Lissodelphis borealis*) and the Pacific white-sided dolphin (*Lagenorhynchus obliquidens*) from Japanese driftnet operations in the northern Pacific in 1989. For each species, I conducted goodness-of-fit tests with the Poisson distribution and a set of aggregated ("contagious") distributions: negative binomial, logarithmic-with-zeroes, Poisson-Pascal, z-Poisson, Neyman's Type A, Thomas, Polya-Aeppli. Analysis reveals that the logarithmic-with-zeroes distribution best describes the observed data. This has ramifications for applied practices. For example, fishing operations conducted within the range of aggregated populations may result in the removal of entire social sub-units. The distribution of the bycatch data raises additional questions. In particular, the presence of singly-caught dolphins may reflect dispersal behavior, group spatial structure, or variation in sensory abilities between individuals.



Distribution of bycatch data (zeroes omitted).

IMAGE ANALYSIS APPLICATIONS IN STOCK IDENTIFICATION STUDIES OF ATLANTIC SALMON

R.E. Haas-Castro and K. D. Friedland
Coastal/Pelagic Investigation
Woods Hole Laboratory

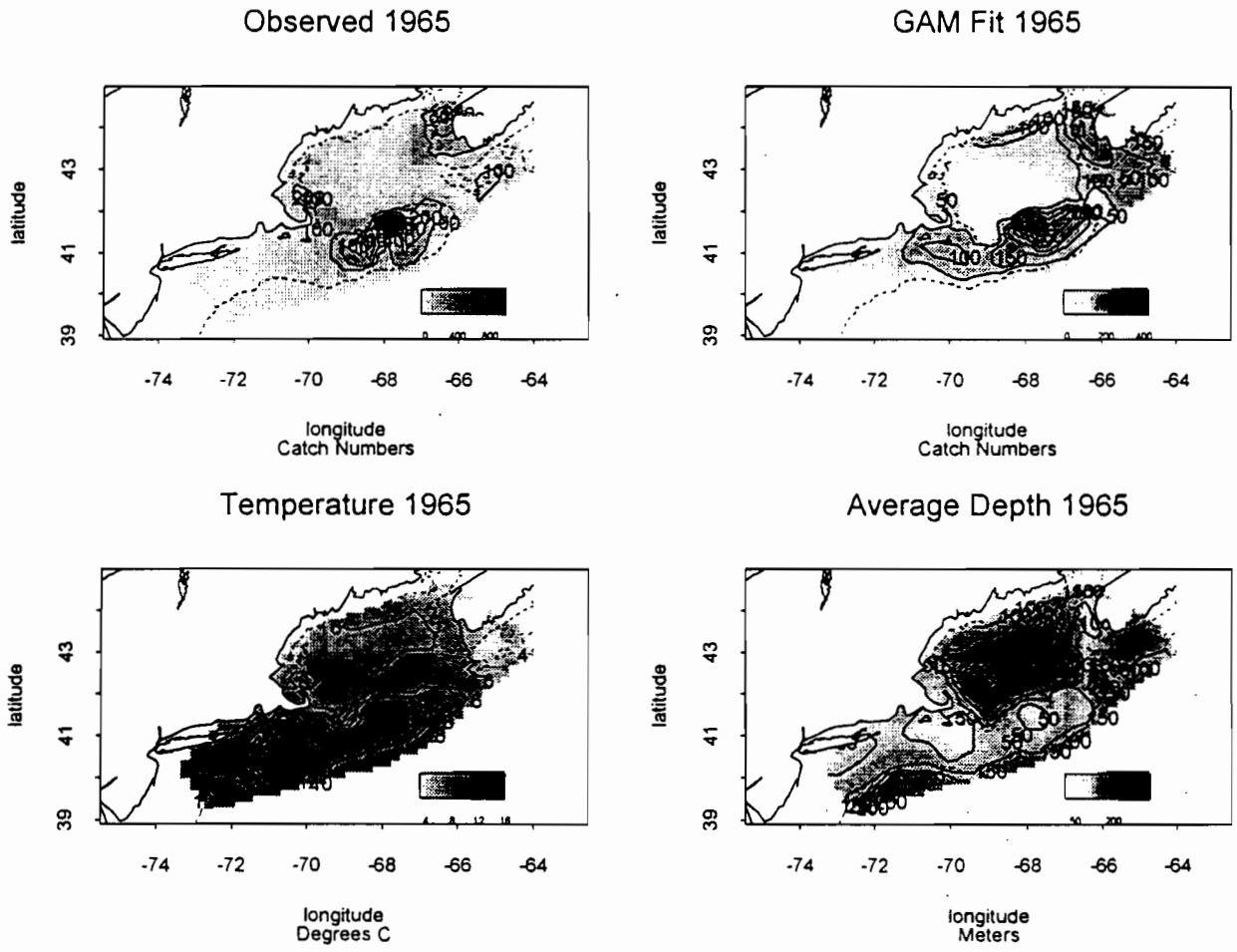
The use of image analysis allows for a variety of data to be generated from images acquired with a video camera or a scanner. Acquired images can then be enhanced by a variety of techniques to improve analysis or to correct problems. Data can be extracted directly into a spreadsheet or converted to a desired format. By using computer imaging, we are able to perform tasks which would otherwise be tedious and prone to human error. We can also extract quantitative data that we could not obtain with manual tools.

In Atlantic salmon (*Salmo salar*) stock identification studies at the NMFS Woods Hole Laboratory, we have used a computer image processing system for measuring scale circuli spacing, fish morphology, and otolith morphology. Scale circuli spacing measurements are routinely made for determining growth patterns of Atlantic salmon from different rivers or continents of origin, examining differences in growth patterns of wild versus hatchery origin fish, or to compare growth patterns during various stages in the life history of the salmon. Fish morphology data were obtained from a video, using the image analysis system to freeze an image from the video, trace the outline of the fish of interest, and extract data on rectangularity, circularity, breadth, and major axis length. The outline shapes of Atlantic salmon otoliths from Canada and West Greenland were analyzed to create discriminant function models for classification by continent and country of origin. The image analysis system was used to digitize the otolith outline, and calculate a complex Fourier transformation and indices of rectangularity and circularity.

SPATIAL ANALYSIS OF GROUNDFISH DISTRIBUTIONS

Loretta O'Brien
Demersal Resources Investigation
Woods Hole Laboratory

An analysis of the temporal and spatial trends in the distribution of haddock, redfish, and goosefish are examined using a nonparametric generalized additive model (GAM). The response variable of catch number is modelled using scatterplot smoothers with the environmental factors of depth and temperature, and with location. Estimates of average abundance and associated variances from the GAM and the random stratified sampling procedure are compared for each species.



An example of observed and GAM fitted catch numbers for haddock and average depth and bottom temperature in 1965.

VALIDATION OF DAILY AGEING AND INVESTIGATIONS INTO THE GROWTH OF LARVAL WINTER FLOUNDER

K.L. Lang and F.P. Almeida
Fishery Biology Investigation
Woods Hole Laboratory

There have been numerous investigations into the ages and growth rates of winter flounder, *Pleuronectes americanus*. Because this species can survive in many different habitats, ranging from clean to very polluted waters, their growth and development can be used as an indicator of environmental quality. Age and growth studies of winter flounder, however, have been limited by the uncertainty of growth increment formation on their otoliths. This study was conducted to test the hypothesis that increments are deposited daily on the otoliths of larval winter flounder and to provide an age-based estimate of their growth in a relatively clean environment. This information can then be used to model the early life history of this species and in comparative studies of habitat use.

In order to validate daily increment deposition, approximately 2,000 larvae were exposed to oxytetracycline (OTC) at 500 mg/l for 24 h and transferred to two floating 505 micron mesh cylindrical enclosures (1,000 larvae/ enclosure). The enclosures, which measured 1 m in diameter and 2.5 m in length, were deployed in Waquoit Bay, Mass for approximately one month. Water temperature of the bay was monitored daily, and several larvae were sacrificed weekly from each enclosure. Larvae were preserved in 95% ethanol, measured to the nearest mm TL, and dissected for otolith removal. Sagittal otoliths were mounted on glass slides, polished with 1200 grit paper, and aged whole at 1000X via a dissecting microscope/ image analysis system. Our results showed that larval winter flounder do deposit daily increments on their sagittal otoliths, and we calculated a daily growth rate of 0.12 mm/d. However, hyaline zone formation was found to be most strongly correlated with nights post oxytetracycline marking, suggesting that growth increments may be formed at night in this species.

To test the time of increment formation, we conducted another test in which winter flounder larvae were held in the laboratory under a twelve hour light cycle. Several larvae were sacrificed every two hours resulting in 12 samples over a 24 hour period. Otoliths (sagittae and lapilli) were removed, polished, etched with 5% EDTA, and examined with a scanning electron microscope for ring formation and/or additional deposition. The results of this part of the study confirmed that growth increments (hyaline zones) were formed during the night (between 0100 and 0300 hours) or approximately 6 hours after dark. The implications of these findings are that an age based strictly on hyaline zone formation could be off by one day as additional material deposited after the last increment may represent an additional day.

TO PING OR NOT TO PING.....THAT IS THE QUESTION

David Potter
Protected Species Branch
Woods Hole Laboratory

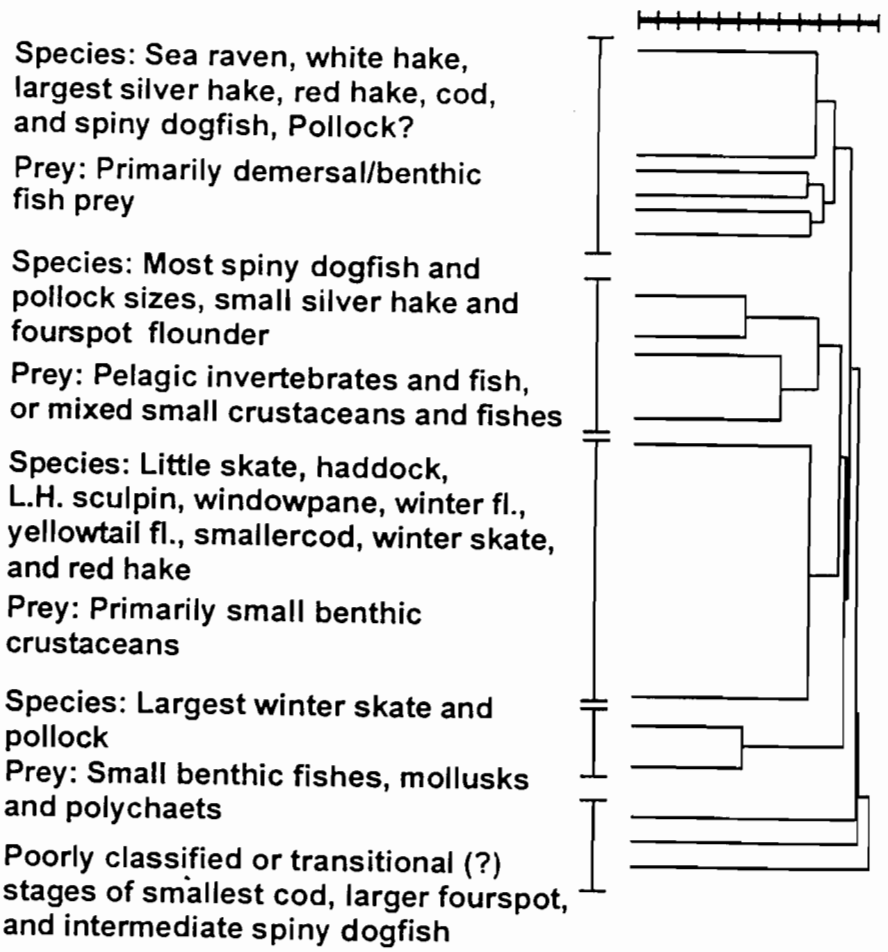
The use of 'pingers' or Acoustic Deterrent Devices (ADDs) may be a management alternative to large time/area closures in the Gulf of Maine Sink Gillnet Fishery to reduce the incidental take of harbor porpoise. A 1994 scientific experiment performed on Jeffries Ledge by Kraus (1995) et al. demonstrated a 90% reduction in harbor porpoise take in November and December. The following year during an experimental fishery using pingers there were no harbor porpoise taken in 134 trips during November and December 1995. These results, plus the deliberations of the 1996 Acoustics Workshop, offer management another approach to reducing by-catch to PBR in one year. The results of the 1994 Experiment, the 1995 Experimental Fishery and the Workshop are presented.

FISH PREDATOR GUILDS FOR GEORGES BANK BASED ON FOOD HABITS DATACOLLECTED DURING NEFSC BOTTOM TRAWL SURVEYS FROM 1981-1990

Rodney Rountree
Food Chain Dynamics Investigation
Woods Hole Laboratory

Food habits data collected on Northeast Fisheries Science Center groundfish surveys between 1981 and 1990 were analyzed to categorize abundant fish species into feeding guilds. Fishes examined included several species of Gadids, Pleuronectids, and elasmobranchs. To take into account expected large ontogenetic changes in diet, each species was divided into 10 cm size classes, which were analyzed separately. Most species clustered into two or more distinct intra-specific groups based on size, supporting the concept of "ecological species". Predator guilds bore little relation to taxonomic grouping, but were strongly influenced by predator size, habitat (pelagic, semi-pelagic, and benthic), extent of piscivory, and prey size. The identification of predator guilds on Georges Bank is an important first step in ongoing studies of competitive interactions among fishes in the Georges Bank groundfish community.

Georges Bank Spring 1981-90



COMPARISON OF RECRUITMENT FREQUENCY AND GROWTH OF SURFCLAMS, *SPISULA SOLIDISSIMA*, IN INSHORE HABITATS OFF NEW JERSEY

Marnita P. Chintala
Haskin Shellfish Research Laboratory
Rutgers University, CMER

Surfclam populations from the east coast EEZ reflect relatively infrequent recruitment events. An analysis of shell growth bands from surfclams collected in 1993 from 9 assessment zones within 3 miles of the New Jersey coast revealed the years of good recruitment, and subsequent growth rates of the clams. The 1989 year class predominated in most areas, comprising 53.5% of all clams aged, followed by the 1987 year class (8.3%) and the 1984 year class (5.0%). The three zones north of Barnegat Inlet had 3-5 additional year classes that represented 10% of the samples. The six zones south of Barnegat Inlet were dominated by the 1989 year class, which accounted for 45-95% of the clams within each zone. The temporal patterns of recruitment across mile zones, depth gradients, bottom types, or catch densities did not differ significantly. The fact that H_1 for the 1989 year class was the same throughout all zones suggests a single, widespread settlement event throughout all zones. An analysis of USEPA surface and bottom temperature data (1979-1991) indicated that summer temperatures in 1988 were, on average, lower than for all other years, suggesting that a good recruitment period may follow a cooler summer. In general, the findings on growth rates confirm earlier studies showing that surfclams farthest inshore grow more slowly and reach a smaller size-at-age than clams from farther offshore.

REMOTE SENSING OF PHYTOPLANKTON BLOOMS

Christine Zetlin
Habitat Evaluation and Restoration Investigation
James J. Howard Marine Sciences Laboratory
Sima Bagheri
New Jersey Institue of Technology

A project designed to use existing algorithms that relate spectral data generated by future satellites and phytoplankton pigments will be discussed. Existing satellite sensors lack the spectral capabilities to discriminate phytoplankton pigments. New satellite sensors (EOS, planned for 1998 and Sea WIFS, forthcoming) have narrow bandwidths that can provide detailed spectral resolution necessary to distinguish phytoplankton pigments provided calibrated sea truth data are available. Our objective is to provide sea truth through the development of a spectral library that can be used with satellite spectral data to identify kinds of phytoplankton present in waters examined. The spectral library currently contains several absorption spectra of phytoplankton grown in culture and phytoplankton collected from local waters during blooms. We are working on a mathematical model that can used to identify optimal wavelengths in absorption spectra that characterize pigment composition of phytoplankton commonly found in local waters. Samples from an Olisthodiscus bloom and cultures will be discussed. In the second phase of the project absorption spectra will be compared with results from a field spectroradiometer. These results will then be incorporated into image analysis of satellite data.

LABORATORY CULTURE OF TAUTOG: A PILOT STUDY

Dean M. Perry, Renee Mercaldo-Allen, and Catherine Kuropat
Reproductive Biology and Nutrition Investigation
James Hughes
Biotechnology and Water Quality Investigation
Milford Laboratory

Spawning of field-captured adult tautog (*Tautoga onitis*) was accomplished in the laboratory. The embryos were cultured to hatching and successfully raised through the difficult larval stage to juveniles. Static culture containers, changed twice a week, proved superior to flow-through seawater systems. Newly hatched larvae were fed protozoans for the first 4 days post-hatch, and then were fed rotifers and artemia that had been enriched with highly unsaturated fatty acids. Larval mortality was high until natural plankton was added to the diet. Laboratory cultured artemia, supplemented with natural plankton and an artificial food, Lansy, made an adequate diet for juvenile tautog.

AN OVERVIEW: RESULTS OF A BIOLOGICAL AND HYDROLOGICAL CHARACTERIZATION OF NEWARK BAY, NEW JERSEY; MAY 1993 - APRIL 1994

Donald G. McMillan
Habitat Evaluation and Restoration Investigation
James J. Howard Marine Sciences Laboratory

Under an Inter-Agency agreement with the U.S. Army Corps of Engineers, the Investigation conducted 16 intensive field sampling surveys of Newark Bay between May 1993 and April 1994. Sampling strategy included 8.5 m otter trawls (n=299), 4.9 m otter trawls (n=105), 45.7 m 6 panel gilnets (n=92), 20 cm bongo nets (n=75), Young modified VanVeen Benthic grab (n=100), and a *Surveyor 3 Hydrolab* (n=801).

Collections from the otter trawls and gillnets yielded 56 species representing 37 families of fish and megainvertebrates. Ichthyoplankton samples resulted in 20 species representing 17 families. The benthic sediment grabs produced 54 species representing 7 phyla.

Sampling design, collection, and the physical/commercial uniqueness of Newark Bay are discussed.

PREDATOR/PREY RELATIONSHIPS AT THE LEO-15 SITE: THE EFFECTS ON SURFCLAM RECRUITMENT

Eric J. Weissberger and Judith P. Grassle
Institute of Marine and Coastal Science
Rutgers University, CMER

Benthic core samples taken at Beach Haven ridge in New Jersey indicate that surfclam (*Spisula solidissima*) larvae settle in great but variable abundance in July, but that most of these individuals disappear from the population by winter. Predation on recently-settled clams may be responsible for their failure to recruit. Laboratory experiments indicate that predatory moonsnails (*Euspira heros*) prefer to eat clams over 3 mm in length, and consume an average of 0.64 clams per snail per day. Larger snails tended to eat larger clams. We used a regression of borehole size on moonsnail length from the laboratory experiments to estimate the size of moonsnails preying on surfclams in the field. Moonsnails appear to be predatory as soon as they settle from the plankton, and as they grow eat increasingly larger clams. Laboratory feeding experiments with starfish (*Asterias forbesi*) indicate that these predators are not size-selective over the range of clam sizes offered, and can consume clams less than 3 mm in length. Starfish ate an average of 0.62 clams per starfish per day. Extrapolations from feeding rates and densities suggest that moonsnails and starfish may substantially deplete cohorts of recently-settled surfclams. Other predators, such as crabs and shrimp, also appear to have substantial effects on recently-settled surfclams.

THE MATHEMATICAL RELATIONSHIP BETWEEN CARAPACE LENGTH AND SURFACE AREA OF THE AMERICAN LOBSTER (*HOMARUS AMERICANUS*)

Diane Kapareiko, George R. Sennefelder, Richard A. Robohm, and John Ziskowski
Biotechnology and Water Quality Investigation
Milford Laboratory

Measurements of carapace length and the diameters of chitinoclastic lesions (shell disease) were collected on 15,004 lobster from off-shore canyon sites along the continental slope of the northeastern United States. To evaluate the intensity of the disease at various sites, it was necessary to find the ratio of lesion area to the total lobster surface area. The present work is an attempt to determine the mathematical relationship between carapace length and total surface area for a range of lobster sizes.

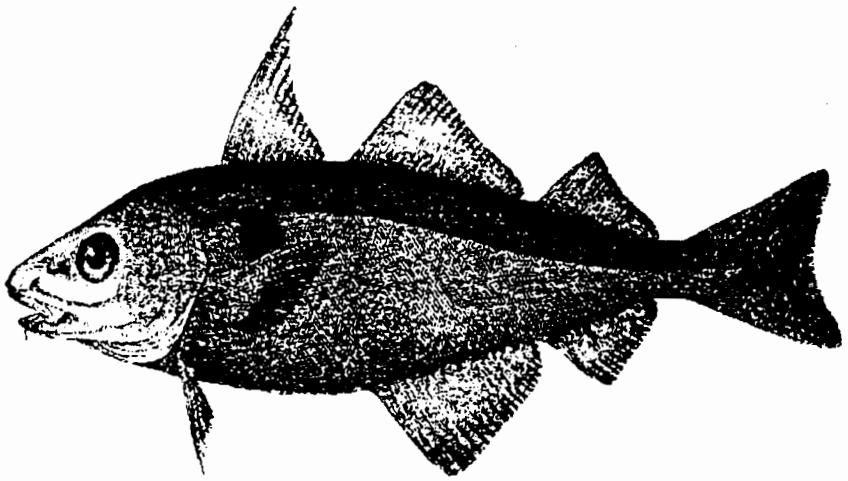
Nineteen healthy, intact female lobster were collected. Measurements included carapace length, volume displacement in seawater, weight in grams, and length, width and height measurements for each body part. Circumferences at 0.5 cm or 1.0 cm increments were calculated using the formula for the length of arc for a parabola. Two formulas which approximate the surface area between two equally-spaced parallel chords were then applied using the circumferences: Simpson's Rule was applied for even-numbered observations and the Trapezoid rule was applied for odd-numbered observations. These areas were summed to determine total surface area of each lobster in square centimeters.

Normality testing of the measured surface areas for the nineteen lobsters showed that they were distributed normally. Linear regression analysis of the data showed that a statistically valid linear relationship (r^2=0.9846) existed between carapace length and total surface area.

THE USE OF THE LORENZ CURVE METHOD TO IDENTIFY CHANGES IN CONCENTRATION OF GEORGES BANK HADDOCK

S.E. Wigley
Demersal Resources Investigation
Woods Hole Laboratory
S.X. Cadrin
Massachusetts Division of Marine Fisheries

The Lorenz curve method was applied to Northeast Fisheries Science Center research vessel survey data to identify changes in concentration of haddock (*Melanogrammus aeglefinus*) on Georges Bank over a 32 year period. The Lorenz curve is an econometric method originally developed to study the distribution of income among individuals using cumulative percentages. This method was adapted by Myers and Cadigan of the Department of Fish and Ocean, St. Johns NF, who applied this method to study the distribution of fish biomass over an area using research vessel survey data. In our study, a modification of the method was necessary to address unequal strata size in the NEFSC survey. Lorenz curves (ordered by biomass and by mean weight per tow were calculated for each NEFSC autumn bottom trawl survey between 1963 and 1994. The negative correlation between biomass and concentration index was stronger using the Lorenz curve ordered by mean weight per tow. Haddock distribution on Georges Bank has become more concentrated over the study period and there appears to be two phases of increasing concentration, with the later phase higher in concentration than the first.



GROWTH CURVES OF THE ATLANTIC SURFCLAM, *SPISULA SOLIDISSIMA*, FROM SOUTHERN NEW ENGLAND TO THE DELMARVA PENINSULA, USA

James R. Weinberg
Invertebrate Resources Investigation
Woods Hole Laboratory
Thomas E. Helser
Demersal Resources Investigation
James J. Howard Marine Sciences Laboratory

Age/shell length data for offshore surfclam, *Spisula solidissima* (Dillwyn 1817), populations were used to estimate the parameters of the von Bertalanffy growth model by time period and region. Randomization tests were used to compare curves. We tested the *a priori* hypothesis that growth curves would change over time in the "south" (i.e., New Jersey and Delmarva) but remain constant in the "north" (i.e., Long Island and S. New England). This hypothesis was proposed because surfclam population structure in the "south" had been altered by the anoxic event of 1976, and possibly by intense, longterm commercial harvesting. Northern regions, unaffected by these factors, served as natural controls. Based on a comparison of data collected in 1980 with that from 1989 and 1992, the hypothesis was supported. Both the growth coefficient and maximum shell length declined between two time periods in the two "southern" regions, while during the same time interval, no change occurred in the two "northern" regions. In a comparison of adjacent regions from Delmarva to S. New England, the growth parameter, k, increased from south to north. This could imply faster growth in cooler water, as well as little relationship between growth and primary productivity. An alternative hypothesis to explain this unexpected pattern involves size-selective mortality imposed by the commercial fishery.

COMPARING QUANTILE AND LEAST SQUARES REGRESSION TECHNIQUES USED TO ESTIMATE THE SLOPES OF UPPER AND LOWER BOUNDS OF SCATTER DIAGRAMS WITH APPLICATIONS TO PISCIVOROUS FISHES OF THE NORTHWEST ATLANTIC

Frederick Scharf, and Francis Juanes
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Michael Sutherland
Statistical Consulting Center
University of Massachusetts at Amherst, CMER
Rodney A. Rountree
Food Chain Dynamics Investigation
Woods Hole Laboratory

Scatter diagrams have proven useful in the study of associative relationships in ecology and have been especially important in the investigation of predator size-prey size interactions. However, until recently, consistent methods to quantify the boundaries of scatter diagrams have been underutilized. We estimated slopes of upper and lower bounds using regression techniques based on least squares and least absolute values models for several independent predator length-prey length scatter diagrams of piscivorous fishes. Estimated slopes were then tested for homogeneity across various modifications of each regression technique as well as across techniques. Our results indicated that least squares based regression techniques were particularly sensitive to outlying y-values and irregularities in the distribution of observations, and frequently produced inconsistent estimates of upper and lower bound slopes. In contrast, quantile regression techniques based on least absolute values models appeared robust to outlying y-values and sparseness within data sets, and provided relatively consistent estimates of upper and lower bound slopes. We then applied quantile regression techniques to several predator length-prey length scatter diagrams for piscivores of the Northwest Atlantic and observed similar ontogenetic increases in prey size range consumed by various predators. Our results indicate that quantile regression techniques are potentially useful in providing quantitative estimates of the boundaries of polygonal relationships and that such estimates may be relevant when examining various ecological interactions.

MARINE MAMMAL NECROPSIES OR, WHAT IS ALL THE STINK ABOUT?

John Nicolas
Protected Species Branch
Woods Hole Laboratory

Forty-seven harbor porpoise *Phocoena phocoena* were necropsied during four sessions at the Northeast Fisheries Science Center (NEFSC) in Woods Hole, Massachusetts. Several scientists representing a broad spectrum of research interests, both nationally and internationally, took part in these sessions. In addition to samples collected by researchers attending these sessions, many samples were taken to support other on-going research projects.

The subject animals were all incidentally caught during sink gillnet fishing operations in the Gulf of Maine. Most of the animals were taken from October through April of both years. The animals were of excellent specimen quality thus maximizing sample collection.

The goal of the necropsy sessions was to collect sufficient quantities of biological samples to support present and future research to develop a better understanding of the biological parameters of the species. A summary of the biological samples collected, and the research that they support are reported.

MORATORIA AND DAYS-AT-SEA: WHO WINS AND WHO LOSES?

Patricia Clay
Social Sciences Branch
Woods Hole Laboratory

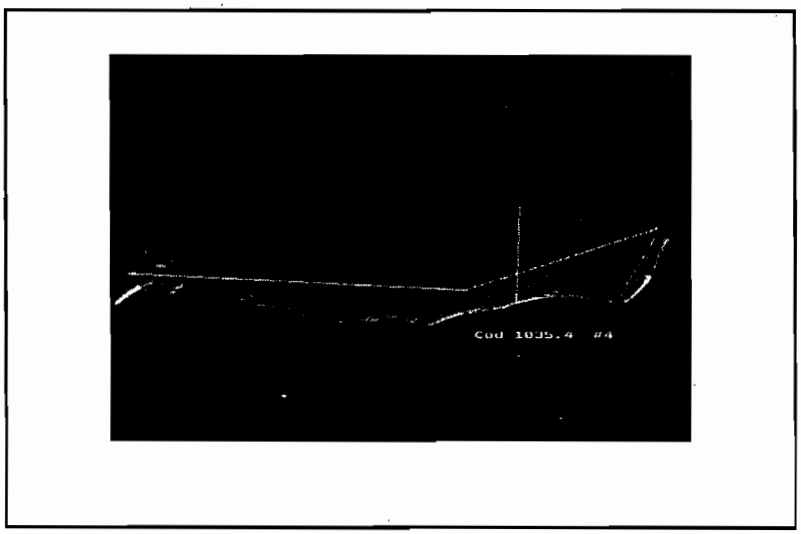
In the Northeast coast fisheries of the United States, limited entry is becoming a common management tool. It is always accompanied by additional effort limitation measures; in the groundfish and scallop fisheries a primary tool has been Days-at-Sea (DAS). Many fishermen have complained that the moratoria on entry and DAS limits differentially affect small versus large vessels. Since the programs are less than 5 years old, little data has been available against which to test these claims. Using data from the permit files and commercial landings database of the National Marine Fisheries Service, this paper examines what size classes of vessels received limited entry permits in the groundfish and scallop fisheries, and the degree to which different these different classes have been able to survive under limited entry and DAS. Because DAS were allocated through different mechanisms in the two fisheries, they offer the additional ability to judge which system best responds to size as a variable.

PROCESSING METHODS, ANALYSIS PROBLEMS, AND THE FUTURE OF ICHTHYOPLANKTON DATA FROM GEORGES BANK USING 1993 GLOBEC DATA AS EXAMPLES

(POSTER)

Elisabeth Broughton
Fishery Oceanography Investigation
Woods Hole Laboratory

In May of 1993 the R/V Albatross conducted a cruise on Georges Bank as part of a pilot project for the US GLOBEC Northwest Atlantic Study entitled: stratification variability on Georges Bank and it's effects on larval fish survival. As a part of this study repetitive MOCNESS hauls were conducted at a stratified site and a well mixed site on the Southern Flank of Georges Bank. Ichthyoplankton and selected zooplankton were sorted at sea for live experiments, biochemical analysis, and aging. On land, analysis of Gadid stomach contents and 1M and 1/4M prey fields was conducted for both sites. Each type of processing used different preservation and handling techniques but all required samples be preserved as rapidly as possible. An Optimas based image analysis system was utilized to speed shipboard operations and obtain morphometric measurements from animals destroyed by processing. Stomach content and prey field studies reveal differences between sites, depths, and species. It is often difficult to obtain paired 1M and 1/4M hauls from the same time frame and water body. 1m prey fields do not quantitatively show the smaller species and early lifestages of plankton and the 1/4M hauls may undersample larger juveniles and adults. Future studies include effects of turbulence on feeding success, comparison of feeding success with biochemical fitness, comparisons between early and late season prey availability, and interannual variability of feeding and preyfields.

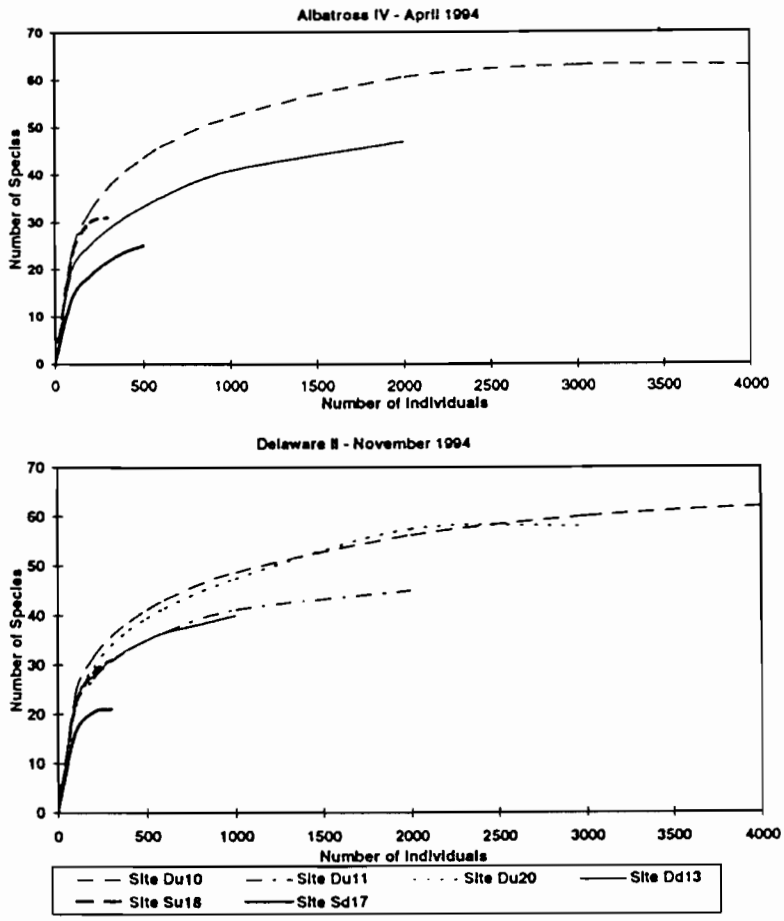


EFFECTS OF BOTTOM FISHING ON THE BENTHIC MEGAFAUNA OF GEORGES BANK

(POSTER)

Jeremy S. Collie and Galo A. Escanero
Graduate School of Oceanography, University of Rhode Island, CMER
Page C. Valentine, United States Geological Survey

This study addresses ongoing concerns over the effects of mobile fishing gear on benthic communities. Using side-scan sonar, bottom photographs and fishing records, we identified a set of dredged and undredged sites on the gravel pavement area of northern Georges Bank. Replicate samples of the megafauna were collected with a 1-m Naturalist dredge on two cruises in 1994. Compared with the dredged sites, the undredged sites had higher numbers of organisms, biomass, species richness and species diversity; evenness was higher at the dredged sites. Undredged sites were characterized by an abundance of bushy epifaunal taxa (bryozoans, hydroids, worm tubes) that provide a complex habitat for shrimps, polychaetes, brittle stars, mussels and small fish. Dredged sites were dominated by larger, hard-shelled molluscs, and scavenging crabs and echinoderms. Many of the megafaunal species in our samples have also been identified in stomach contents of demersal fish on Georges Bank; the abundances of at least some of these species were reduced by dredging.



Species richness derived by the rarefaction method from benthic megafauna of northeastern Georges Bank. On both cruises, and at both depths, dredged sites had a less diverse community and lower abundance. The site identifiers are: D-deep, S-shallow, u-undredged, d-dredged. More sites were sampled during Delaware II cruise.

VALIDATION OF BLACK SEA BASS AGEING METHODS USING CHEMICAL MARKERS AND MARGINAL INCREMENTAL ANALYSIS

(POSTER)

Richard Greenfield and Frank Almeida
Age and Growth Investigation
Woods Hole Laboratory

Black sea bass, *Centropristis striata,* age determination methods, as well as timing and periodicity of annulus formation, were examined using scales and sagittal otoliths collected from the US commercial fishery and research vessel bottom trawl surveys. Marginal increments of 1,283 scale samples collected during 1982-1984, 1986-1987, and 1989 were analyzed. Scales and otoliths from 55 individuals marked with oxytetracyline and sacrificed at regular intervals over a two year period were also examined.

Results of marginal increment analysis indicated that annulus formation takes place during summer (June-August) on scales. No other interannual marks appeared on the scales or otoliths of OTC injected individuals during the study period, indicating that the use of current age determination for these structures are valid.

BLOOD MICRONUCLEAR LEVELS IN FISH FROM NEW HAVEN HARBOR

(POSTER)

James B. Hughes
Biotechnology and Water Quality Investigation
Milford Laboratory

New Haven Harbor sediments are contaminated with a mixture of pollutants. Estuarine species of fish such as winter flounder (*Pleuronectes americanus)*, windowpane flounder (*Scopthalmus aquosus*), Atlantic silversides (*Menidia menidia*), bay anchovy (*Anchoa mitchilli*), and tautog (*Tautoga onitus*) are in frequent association with this contaminated environment.

Chromosomal breakage, rearrangement and misdivision events are relatively common in organisms living in habitats with high contaminant loads. Abnormal mitotic events can be indirectly monitored using the micronucleus test.

Monthly otter trawls were made in New Haven Harbor between May of 1994 through March of 1995 to collect the species listed above. Blood was collected through caudal artery punctures, smeared on glass slides, fixed with methyl alcohol and stained with Geimsa.

There was a statistically significant correlation between sample date and the level of micronucleation in the blood of Atlantic silversides, this was not true in the other species studied. In none of the five species examined was there any statistical significance found between micronuclear incidence and length or sex of the fish.

SETTLEMENT OF POSTLARVAL AMERICAN LOBSTERS: THE INFLUENCE OF SIZE AND SETTLEMENT TIME

(POSTER)

M.J. James-Pirri and J.S. Cobb,
Department of Biological Sciences
University of Rhode Island (CMER)

Many marine benthic crustaceans undergo an ontogenetic habitat shift within their life history, yet little attention has been paid to the potential of influence of size at , and time of habitat shift on future growth in these species. In this study, we investigate the influence of size and timing of settlement (developmental and seasonal) of postlarval lobsters (*Homarus americanus*) on 1) recapture rate and 2) size attained at the end of the growing season. The influence of size and delayed settlement (within the instar) was determined by the recapture rate of micro-wire tagged postlarvae and fifth instar that had been transplanted to the field one week prior. Influence of size and seasonal timing of settlement was determined by estimating growth trajectories during the first year for early- and late-season settling postlarvae. Larger sized postlarvae and fifth instar lobsters were recaptured significantly more frequently than their smaller counterparts. There was no difference in recapture rate with size for postlarvae that had delayed settlement. Lobsters settling in early- and mid-season were larger at each subsequent instar and had significantly different growth profiles from late-season settling postlarvae. The positive association of recapture success and size suggests that size may influence settlement success and, by inference, survival. we also observed that postlarvae present early in the season can be 30-50 percent larger and two to three instars older than late-season setting postlarvae by the end of the growing season. The combined effect of size and settlement may influence future survival rate, particularly if there is size dependent mortality.

SEA-GOING DATA ENTRY SYSTEMS

(POSTER)

W. Kramer and P. Kostovick
Rescource Surveys Investigation
Woods Hole Laboratory

Several pen based computer systems for gathering data aboard fisheries research vessels have been developed which potentially offers improved data quality and earlier access to the data when compared to the hand written log sheets used for many years by NMFS. The first system developed under PenPal for the PenDos operating system was loaded on Fujitsu's PoquetPad Plus unit. The software relied on lists, buttons, and handwriting recognition to gather station and catch data while underway. This system was tested during the 1993 NMFS Scallop Cruise. A second system based on the ScriptWriter from Data Entry Systems utilizes a digitizing pad to interpret characters as they are written on a paper form overlaying the digitizer. This system offers hard copy log sheets at the same time the data are interpreted and stored in data files. This system was tested during the 1995 gear comparison cruise. The latest system being developed is based on ORACLE Forms which returns to keyboard entry, but has many capabilities to make entry easier for the operator. This approach will be developed in three phases: 1) a shore-based system where log sheets received ashore are punched by knowledgeable users, 2) a seagoing phase where data are entered as soon as practical after a station is completed, and 3) a real-time entry phase. In this way, we hope to head off errors introduced by outside entry services, eliminate the need for lengthy correction of those errors and make data of higher quality available sooner to assessment biologists for analysis.

SEABIRD ENTANGLEMENT BY U.S. COMMERCIAL FISHERIES IN THE NORTHWEST ATLANTIC OCEAN

(POSTER)

Heather M. Lanza and Curtice R. Griffin
Department of Forestry and Wildlife
University of Massachusetts, CMER

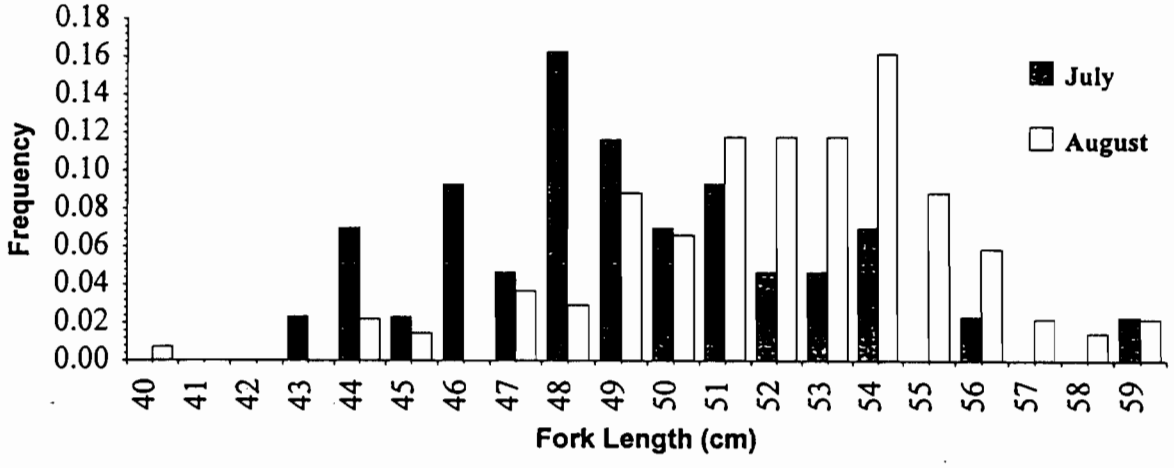
To what extent are seabirds entangled in commercial fishing gear in the northwest Atlantic? Records of seabird bycatch were collected by observers placed on domestic fishing vessels through the observer program coordinated by the Northeast Fisheries Science Center. These data provide information on species, gear type, date and location of observed incidents of seabird entanglement. At least fourteen species were captured by three gear types. Shearwater (Puffinus) species accounted for the greatest number of seabirds taken (n=768), followed by loons (Gavia) (n=45), cormorants (Phalacrocorax) (n=32), and gulls (Larus) (n=32). Of the four gear types observed to capture seabirds (sink gillnets, pelagic longlines, pelagic driftnets, and otter trawls), sink gillnets accounted for ninety-nine percent of seabird bycatch. Observers recorded bycatch for 13,785 sink gillnet sets from 1991 through 1993 (approximately five percent of the fishing effort during that time). Only three percent of the observed sets entangled seabirds, and of those, ninety percent caught less than five each. Further analyses include identification of seasons and locations in which seabird entanglement is most likely to occur. Northwest Atlantic fisheries appear to have minimal impacts on seabird populations, however, data collection protocol limit our ability to extrapolate bycatch numbers for the entire industry in this region.

PILOT STUDY: PUPPING AND NURSERY GROUNDS OF THE SAND BAR SHARK

(POSTER)

R. R. Merson and H. L. Pratt
Apex Predators Investigation
Narragansett Laboratory

A pilot study was conducted in Delaware Bay in 1995 to (1) establish sampling techniques for capturing neonates and juvenile sandbar sharks, *Carcharhinus plumbeus*, in their nursery habitat with minimal physical impact, (2) tag and release neonates and juveniles, (3) collect data to characterize the nursery, and (4) identify sampling stations for calculation of a relative index of abundance. A bottom-set monofilament gill net 750 feet long, 10 feet deep with 4 inch stretch mesh was continually fished for an average of 3.9 hours at 7 stations in July and 8 stations in August in 9 to 12 foot depth range. The 199 neonatal and juvenile sandbar sharks captured ranged in size from 40 to 94 cm fork length, and of these, 154 were tagged with small plastic dart spaghetti tags. Eight tagged sharks were recaptured by recreational fishermen before late September, 1995. We conclude that Delaware Bay is an essential nursery ground for the sandbar shark and should be carefully monitored for fishing pressure and habitat loss.



Delaware Bay young of the year sandbar shark length distribution.

FISHERY BULLETIN IN CENTURY 21

(POSTER)

Kimberly Murray and Jack Pearce
Fishery Bulletin Editorial Staff
Woods Hole Laboratory

Established as an official publication of the U.S. Government since 1881, *Fishery Bulletin* is a primary outlet for original research on fishery and marine science, engineering, and economics. Staff of the *Fishery Bulletin* hope to publish more ecologically-based articles in the coming years as it becomes increasingly important, in the face of declining resources, to try and understand complex environmental interactions. Scientific editing of the journal is administered out of the National Marine Fisheries Service's Science Center in Woods Hole, Massachusetts, and will rotate to a different Science Center in 1998.

Approximately 150 new manuscripts have been submitted to *Fishery Bulletin* each year. Papers are reviewed initially by the Scientific Editor and Editorial Assistant and then sent out for peer review. Peer review ensures the continuity of objective science. Since reviewers are at the center of the process, their participation is essential. All qualified scientists must play a role in the process. Perhaps the one most important element of editing is to ensure that adequate reviews are done by an outstanding group of identified reviewers.

Reviewer comments are then forwarded to the author for revision if the paper is deemed suitable for publication. Several stages of review and revision may be necessary before the manuscript is accepted. Forty-nine percent of the 126 manuscripts submitted in 1994 were accepted. One hundred thirty-three manuscripts were submitted in 1995 and, of those, 25 have been accepted so far.

Fishery Bulletin now has a home page at: http://www.whoi.edu/fishbull/fishbull.html, where one can access current and future contents, submission guidelines, and information on how to subscribe to the journal. We hope eventually that authors will be able to use the home page to access the status of papers submitted. The page would post when a manuscript went out for review, for either a new or revised manuscript, and how many reviews have returned. In the future, *Fishery Bulletin* may be published electronically, as many other scientific journals are today.

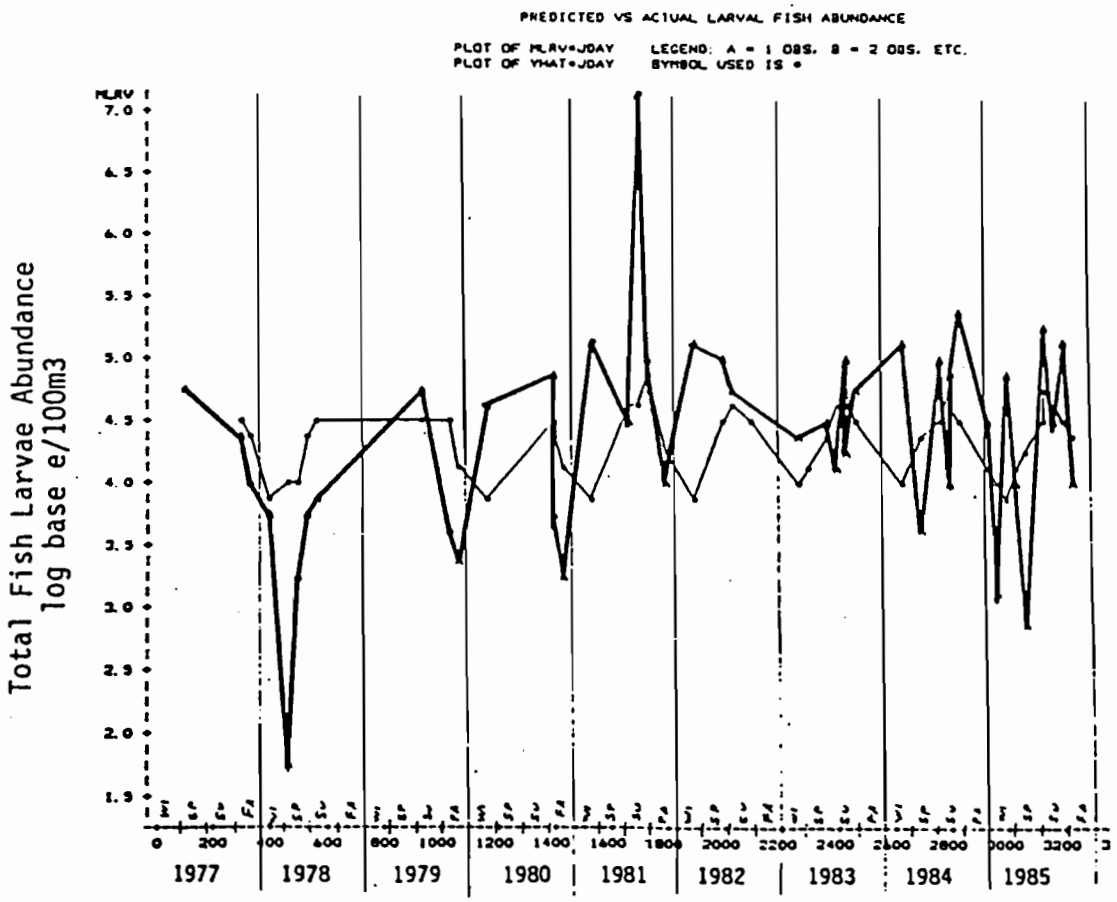
THE INFLUENCE OF PHYSICAL AND BIOLOGICAL FACTORS UPON THE INTERANNUAL VARIABILITY OF ZOOPLANKTON FROM SOUTHERN NEW ENGLAND CONTINENTAL SHELF WATERS

(POSTER)

Jerome Prezioso, Carol Meise, and Joseph Kane
Ecosystem Monitoring and Remote Sensing Investigation
Narragansett Laboratory

1977 to 1985 zooplankton abundance and 1977 to 1986 zooplankton biomass from MARMAP samples collected off Southern New England were correlated to physical and biological environmental parameters. Interannual variations in seasonal abundances of *Calanus finmarchicus, Pseudocalanus minutus, Centropages typicu*, and total zooplankton volume were analyzed in relation to water column and bottom temperature, wind stress, total fish larvae, and chlorophyll-*a* levels.

Interannual zooplankton pulses in abundance were most often correlated with temperature. In spring, summer and winter, positive correlations emerged between upper water column temperatures and the zooplankton. In the summer there was a positive correlation between zooplankton and larval fish abundance, and in the fall chlorophyll-*a* levels had a negative correlation with the zooplankton. There were no statistically significant effects of wind stress upon the interannual variability of zooplankton from this time series.



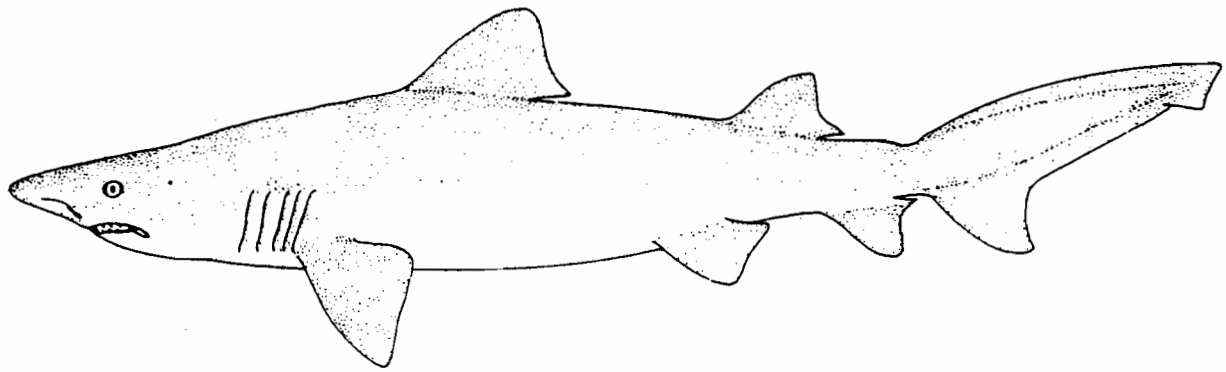
Total fish larvae abundance expected versus actual for 1977 - 1985.

FIRST RECORD OF THE RAGGED-TOOTH SHARK, *ODONTASPIS FEROX*, OFF THE ATLANTIC COAST OF THE UNITED STATES

(POSTER)

T.F. Sheehan
Fishery Biology Investigation
Woods Hole Laboratory

On September 11, 1994, a ragged-tooth shark, *Odontaspis ferox*, was captured during a NMFS, NEFSC bottom trawl survey. this was the first recorded occurrence of this species in Atlantic waters off the eastern United States. The shark was captured approximately 25 nm south-southeast of Cape Hatteras, NC (34o 51' N, 75o 26' W) at approximately 173 meters, with a bottom temperature of 17.8o C, and a salinity of 36.41 ppt. It measured 340 cm total length (273 cm fork length), weighed over 200 kg and was a female. Identification was primarily based on the presence of multi cusplet teeth. Additional identifying characteristics included: the presence of a symphyseal tooth row, two rows of large upper anterior teeth on each side of the symphysis, three rows of small intermediate teeth between the upper anterior and lateral tooth rows, and the origin of the second dorsal fin being slightly over/posterior to the insertion of the pelvic fins. The ragged-tooth shark is described as a rare inhabitant of deepish water, with a wide ranging distribution throughout the northeast Atlantic, Gulf of Mexico, West Indian, western Pacific and eastern Pacific Oceans. The capture of this specimen extends its known range into the Northwestern Atlantic and this sighting confirms *O. ferox* to be a tropical/cool temperate water species occurring worldwide.



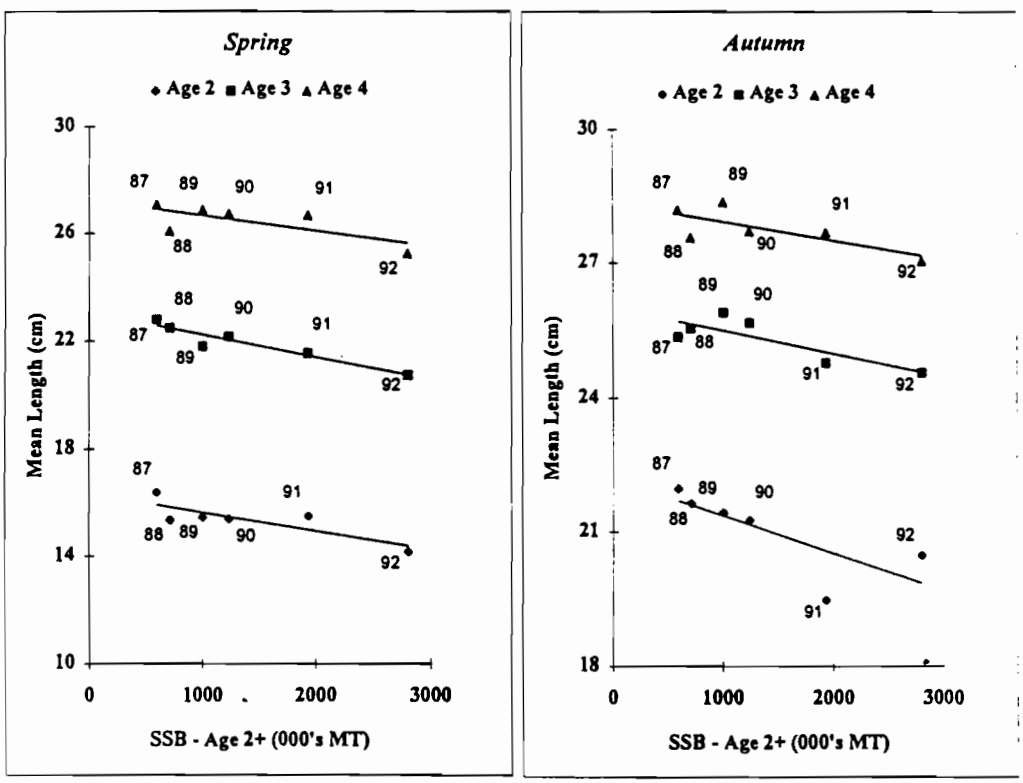
EVIDENCE FOR DENSITY-DEPENDENT CHANGES IN GROWTH OF ATLANTIC HERRING, *CLUPEA HARENGUS*, DURING 1987-1995

(POSTER)

Vaughn Silva and Frank Almeida
Age and Growth Investigation
Woods Hole Laboratory

Atlantic herring (*Clupea harengus*) is the object of an active commercial fishery in the coastal waters of the Gulf of Maine, and Massachusetts, with minor landings in southern New England and the mid-Atlantic region. With respect to the hypothesis that recent increases in stock abundance might have resulted in a density-dependent decrease in growth, age data for Atlantic herring collected on Northeast Fisheries Science Center spring and autumn bottom trawl surveys during the period 1987-1995 were examined for trends in mean sizes at age and cohort growth patterns. Spawning stock biomass (age 2+) of the coastal stock complex of herring increased more than threefold in numbers between 1987-1992, mostly due to exceptional 1989 and 1990 year classes.

Although interannual variability in growth rates was observed, several significant decreases (80% probability level) in mean size at age were detected between the early and latter portions of the study period, and age classes 2-6 were, on average, 1-2 cm smaller in recent years than during the late 1980s. Regression analyses of growth data for individual cohorts also suggested slower growth in more recent years. These observed changes in growth are consistent with classical fisheries theory, i.e. increases in stock size of a pelagic schooling fish will result in decreases in individual growth rate.

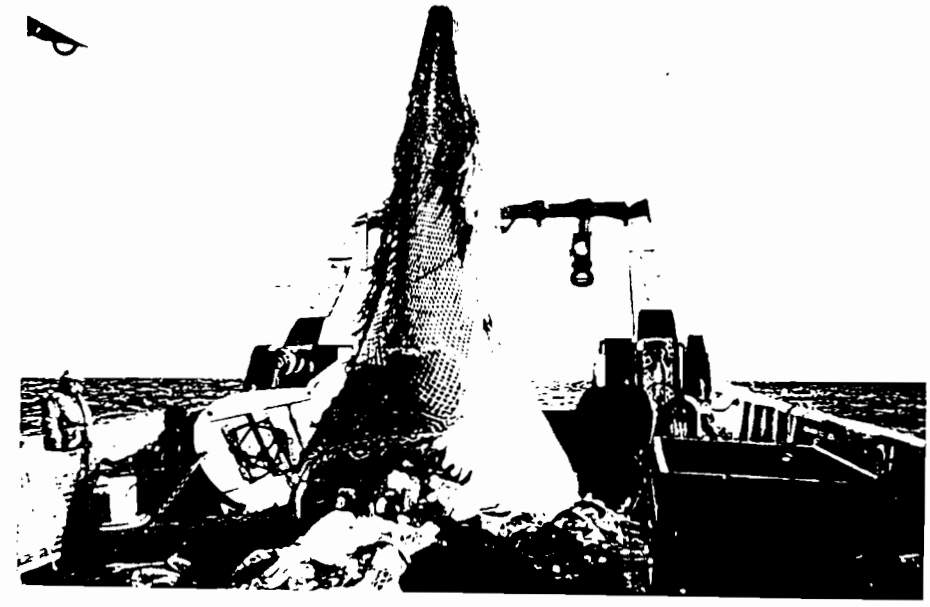


VIDEO PRESENTATION ON RESOURCE SURVEYS

(VIDEO)

Malcolm J. Silverman
Resource Surveys Investigation
Woods Hole Laboratory

A visual and historical synopsis from the start to the present of the Centers resource surveys time series on the R/Vs ALBATROSS IV and DELAWARE II. This visual excursion includes scenes from bottom trawl, sea scallop, and surf clam surveys showing the gear, methods, catch handling, and data processing, as well as participating scientists and crew.



WHERE HAVE ALL THE FISH GONE?

(POSTER)

Katherine A. Sosebee and Janet A. Fields
Demersal Resources Investigation
Woods Hole Laboratory

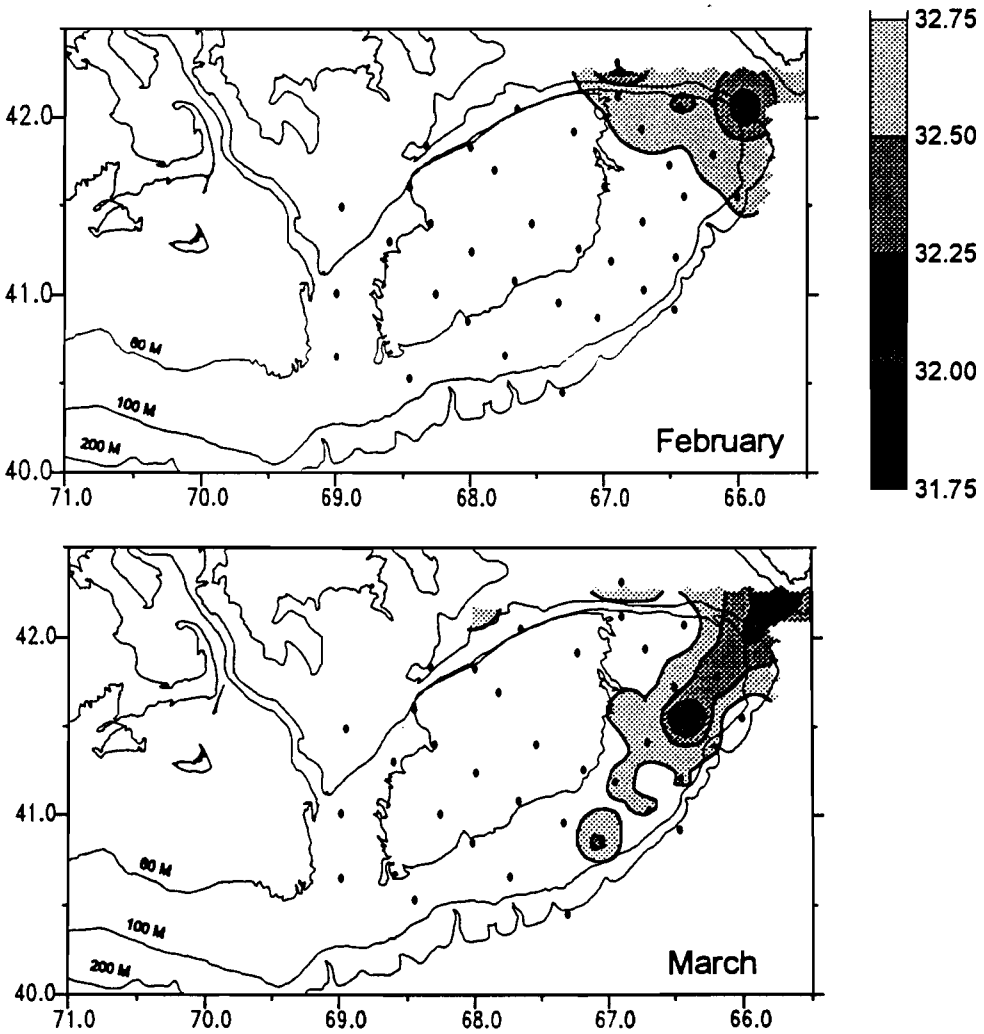
Changes in abundance and distribution of selected species of groundfish were analyzed using the National Marine Fisheries Service's (NMFS') bottom trawl survey data from 1963 through 1995. Distribution maps were made to determine differences in the population over the time period. To evaluate the fisheries, catch data from the NMFS commercial fisheries data base were plotted and compared with the survey maps.

1995 HYDROGRAPHIC CONDITIONS ON GEORGES BANK

(POSTER)

Maureen H. Taylor
Fishery Oceanography Investigation
Woods Hole Laboratory

There were 13 cruises conducted by investigators from the Northeast Fisheries Science Center that provided extensive hydrographic coverage on Georges Bank between February and July of 1995. The eastern portion of the Bank was influenced by an intrusion of Scotian Shelf water that resulted in cooler temperatures and fresher salinities than the historical mean conditions. A warm core ring, located just south of the Bank in May, caused the encroachment of slope water onto the southern flank during the time when cod and haddock larvae were expected to be found in highest concentration.



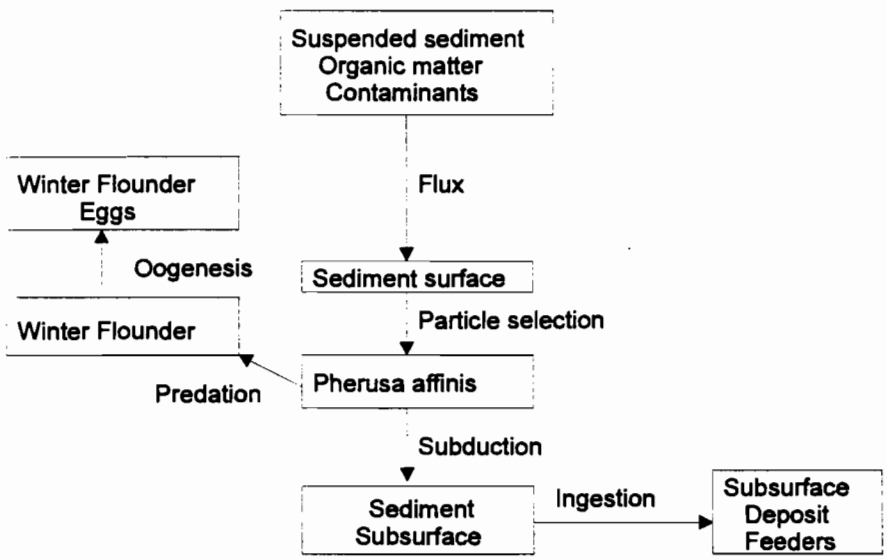
The figures above show the surface salinity distribution from two GLOBEC Broadscale surveys of Georges Bank during February and March, 1995. The March distribution shows the influence of Scotian Shelf water (salinity < 32.0 psu) that would persist in varying degree through June.

PRELIMINARY OBSERVATIONS OF THE BURROWING AND FEEDING HABITS OF THE POLYCHAETE *PHERUSA AFFINIS* ,UNDER LABORATORY CONDITIONS

(POSTER and VIDEO)

Joseph Vitaliano[1], Vincent Zdanowicz[2], and Allen Bejda[1]
[1]Behavior Investigation
[2]Analytical and Environmental Chemistry Investigation
James J. Howard Marine Sciences Laboratory

Pherusa affinis, a large flabelligerid polychaete, is found in dense patches in the silty fine sand areas of the Christiansen Basin and upper Hudson Shelf Valley in the N. Y. Bight. It lives upright in burrows and uses long palps to sweep the sediment surface around its burrow in search of food. *Pherusa affinis* ingests sediment and organic matter along with associated contaminants that are present in the vicinity of its burrow and deposits its waste products in pockets in subsurface sediment layers. Because *P. affinis* can extended its long branchiae into the water column, it does not have to use energy ventilating its burrow. This adaptation allows *P. affinis* to survive in areas where the sediment contains elevated levels of organic matter, and periodic hypoxia and hydrogen sulfide. These same areas may also contain elevated levels of contaminants. *Pherusa affinis* is used as prey by resource species including winter flounder and lobsters. These qualities make *P. affinis* desirable for use in experimental studies to model contaminant transfer to resource species and into sediments (see diagram below). Laboratory photographic and video observations will be presented documenting the burrowing, feeding, and bioturbation activities of this polychaete that are important in the study of contaminant movement through the benthic ecosystem in the NY Bight.



Model for the transfer of contaminants through the benthic ecosystem in the NY Bight.

AN EVALUATION OF BYCATCH RATES OF PRINCIPAL GROUNDFISH IN THE GULF OF MAINE

(POSTER)

S. E. Wigley[1], L. C. Hendrickson[2], and R. K. Mayo[1]

[1]Demersal Resources Investigation

[2]Invertebrate Resources Investigation

Woods Hole Laboratory

This study evaluates three small-mesh exemption areas proposed by the fishing industry. Under Framework 9 to Amendment 5 of the groundfish management plan, the Regional Director has the authority to add additional small-mesh fishery exemptions if it can be determined that the bycatch of regulated species in those fisheries are less that 5 percent (by weight) of the total catch. The ten regulated species are: cod, haddock, yellowtail, American plaice, witch flounder, winter flounder, windowpane, white hake, pollock and redfish. Data from the NEFSC Domestic Sea Sampling Program (DSSP) database, the NEFSC commercial weighout database, and the NEFSC research vessel survey database were utilized to derived bycatch rates and to display spatial and temporal fish distribution patterns.

SOLUBILITY OF HYDROPHOBIC COMPOUNDS IN POLYSOAP SOLUTIONS: UNUSUAL BEHAVIOR OF BENZOPHENONE AND RELATED COMPOUNDS

(POSTER)

Vincent S. Zdanowicz
Analytical and Environmental Chemistry Investigation
James J. Howard Marine Sciences Laboratory
Ulrich P. Strauss
Department of Chemistry
Rutgers University

In the course of a previous investigation concerning the size of the micelles suspended from polysoap molecules, some unusual solubilization behavior of uncharged organic molecules was observed. The polysoap was an alternating copolymer of maleic acid and hexyl vinyl ether in aqueous 0.1 M LiCl solution. It is known that the extent of micellization of the polysoap decreases with increasing pH due to electrostatic repulsion between charged carboxylate groups. Accordingly, the solubilization of pyrene and other water-insoluble compounds decreased with increasing pH. However, unexpectedly, the solubilization of benzophenone and several related compounds did not change with pH.

Since the lithium ion is known to be site-bound to the ionized polyacid, it was thought that some insight into this surprising solubilization behavior could be gained by replacing the lithium ion with tetramethylammonium ion, which is not site-bound by the dicarboxylate groups. Results of these experiments indicate that the pH dependence of the solubilization is no longer identical for the compounds in the pyrene group, while the compounds in the benzophenone group exhibit a solubilization maximum with increasing pH and decreasing extent of micellization.

These findings suggest that the extent of solubilization does not depend solely on the degree of micellization, but that other factors, very likely ionic and dipolar in nature, play a significant role. Moreover, the nature of the counterion appears to affect the specificity of the binding.

ELEMENTAL ANALYSIS OF FISH OTOLITHS BY INDUCTIVELY COUPLED PLASMA MASS SPECTROMETRY

(POSTER)

Vincent S. Zdanowicz
Analytical and Environmental Chemistry Investigation
James J. Howard Marine Sciences Laboratory

Fish otoliths are valuable research tools for fishery biologists. Since their structure provides a chronology of growth and life history transitions, they have become widely used in ageing studies employing the enumeration of annuli (growth rings).

Recently, a great degree of interest has developed in the elemental composition of otoliths. Based on the premise that differences in water chemistry between different aquatic environments are manifested in otoliths as differences in chemical composition, otolith chemistry has been used to probe various aspects of the life history of fish. For example, a 1995 paper reports that by dissolving whole otoliths and measuring concentrations of several metals, researchers were able to discriminate between two populations of Atlantic cod. In another study, Sr/Ca ratios were measured in specific annuli within an otolith in order to explore migration patterns of anadromous fish.

Because of its high sensitivity, wide working range and ability to measure multiple elements simultaneously, the method of choice for conducting these analyses is Inductively Coupled Plasma Mass Spectrometry (ICPMS) . An ICPMS facility has recently been established at the James J. Howard Marine Sciences Laboratory at Sandy Hook. It houses an ICPMS instrument, a Laser Ablation (LA) apparatus, for sampling solid substrates, and an Electro Thermal Vaporization (ETV) accessory, which can accommodate slurries or samples of extremely small mass or volume.

An initiative has been undertaken to develop methods of analysis of otliths using all the capabilities of this powerful technology in order to take full advantage of this important research tool and maximize its applicability to problems in fishery biology and stock assessment.

This poster will present examples of applications of otolith analysis from the literature and from our own limited data.

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Publications and Reports of the Northeast Fisheries Science Center

The mission of NOAA's National Marine Fisheries Service (NMFS) is "stewardship of living marine resources for the benefit of the nation through their science-based conservation and management and promotion of the health of their environment." As the research arm of the NMFS's Northeast Region, the Northeast Fisheries Science Center (NEFSC) supports the NMFS mission by "planning, developing, and managing multidisciplinary programs of basic and applied research to: (1) better understand the living marine resources (including marine mammals) of the Northwest Atlantic, and the environmental quality essential for their existence and continued productivity; and (2) describe and provide to management, industry, and the public, options for the utilization and conservation of living marine resources and maintenance of environmental quality which are consistent with national and regional goals and needs, and with international commitments." To assist itself in providing data, information, and advice to its constituents, the NEFSC issues publications and reports in three categories:

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