

NORTHEAST CENTER FOR MARINE FISHERIES RESEARCH

National Marine Fisheries Service
Woods Hole Biological Laboratory
Woods Hole, Massachusetts 02543

Organization, Structure, Mission and Operation of the
Northeast Center for Marine Fisheries Research

1. The Northeast Center for Marine Fisheries Research is a component of the National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce.
2. The Center is composed of a Directorate, an associated centralized Administrative Unit, and six discipline-oriented research programs. The functional organization and physical inter-relationship between the Center components are demonstrated in the attached organizational table (Appendix I).
3. The Center Directorate is located at Woods Hole, Mass., and will consist of a Director, a Deputy Director, and a Secretary.
4. The individual research components of the Center and the location at which significant parts of the work will be carried out are given in the attached chart (Appendix II). The asterisk indicates the physical location of the program director for that particular research component. A narrative description of each major research category is given below:

Stock Identification and Racial Distribution

It has long been recognized by fishery biologists that rational and precise assessment requires knowledge about the number and discreteness of the independent units (variously called subpopulations, races, or unit stocks) that make up the populations being studied. Thus Marr in 1957 said, "In trying to identify and measure the causes of fluctuations in the abundance and distribution of a species of fish, it is essential that the number and identity of subpopulations, if any, within the species be established, since each subpopulation may have its own characteristic distribution, fecundity, natural mortality rate, growth rate, etc."

In the Northwest Atlantic, there are a number of species under intensive exploitation by mixed or separate domestic or international fishing fleets for which the population

structure in terms of various unit stocks involved is still too imprecisely known for assessments adequate to the management problems encountered. Probably the species with the most complicated stock structure and with assessment problems critical to international management and conservation is the Atlantic sea herring. This species is presently being heavily exploited by huge international fleets off our shores, as both juveniles and adults by several U.S. and Canadian fishing interests and fleets. Assessment and predictions required for rational management and reasonable allocation of this resource among the various competing users requires a more complete understanding of the number and distribution of the various populations involved. The problem has been investigated over the past decade but the situation is so complicated further intensive research on the problem must be given high priority.

Other important problems involve the relationships of inshore and offshore lobster populations, the relationships, if any, between Gulf of Maine and Georges Bank silver hake stocks. Stock identification problems important to international negotiations and management in the area also involve Atlantic salmon, yellowtail flounder, and a variety of marine gamefish species.

Methodology

Five approaches will be applied to the various stock identification and racial distribution problems in the fishery resources of the Northwest Atlantic. These are:

- i) A variety of biochemical and immunological methods will be used to search for genetically controlled characters that can serve as indicators of the genetic separateness of various stocks. When the distribution of these characters in the separate stocks or geographic races are established through the study of spawning populations, the origin of various juvenile and feeding aggregations can be established.
- ii) A number of parasitics of marine animals have been found, because of their complicated life history and the geographic isolation of essential intermediate hosts, to be efficient natural biological "tags" indicating the geographic origin of migratory groups of marine species. Studies of these natural tags will continue.

- iii) Traditional studies of fish populations have involved the use of meristic and morphometric characters. These methods will continue to play their traditional role in stock identification because of widely available and readily comparable data and because some of the problems that require study are so complicated as to require the use of all available methods.
- iv) Tagging methods are essential to complete understanding of migrations and the complex interrelationships of various unit stocks within a species. These methods also can provide essential estimates of various population parameters required in mathematical models for stock assessment.
- v) A variety of biological information collected in the Ecological Investigations can provide important supplementary information on stock structure. These include age composition of various stock elements, location and time of spawning, larval distribution and dispersal patterns, differences in growth rates, fecundity, etc. Thus close cooperation with the Ecological and Assessment Investigations will form essential aspects of the stock identification program and will provide for economic collection of samples and information.

Responsibilities of Investigation Chief

Stock Identification and Racial Distribution

- i) Serves as officer-in-charge Boothbay Harbor, Maine station. This involves coordinating the various research activities carried out at the station, working in close cooperation with the State of Maine Department of Sea and Shore Fisheries, the University of Maine, The Atlantic Sea-run Salmon Commission, and other conservation and research groups in New England. Implements-NOAA-NMFS and Center policy at Boothbay Station
- ii) In collaboration with other senior biologists of the North Atlantic Fisheries Research Center policy - selects high priority stock identification problems for study, and the most appropriate methods for their resolution. Assigns and directs research of subordinates on these problems.

- iii) Plans, directs and conducts research of stock identification problems using highly sophisticated biochemical and immunogenetic methods.
- iv) Regularly represents NMFS at meetings of the International Commission for the Northwest Atlantic Fisheries, and meetings of other international fishery commissions and scientific organizations.

Ecology of Benthic Invertebrates

Objectives of this program are to ascertain and disseminate biological and quantitative distributional information about all principal components of the offshore macrobenthic invertebrate fauna. This fauna will be studied and evaluated from the standpoint of containing individual species that are economically valuable (lobster, sea scallop, northern shrimp, etc.) as well as containing various components (species, genera, etc., including the total benthic biomass) that are vitally important in the dynamics and ecology of the whole marine ecosystem.

Some of the principal research goals will be:

- i) to complete the baseline quantitative inventory,
- ii) to study the life history of selected species,
- iii) conduct food-habits studies of the more common groundfish,
- iv) determine the effects of trawling on the macrobenthos,
- v) annually monitor the distribution, abundance, and size composition of some of the large common species (sea scallop, deep sea red crab, lobster, etc.)

Major sources of data for these studies will be special cruises of our research vessels and groundfish survey cruises.

Ecology of Demersal and Pelagic Fishes

The primary objective of this program is to acquire a basic understanding of the biotic and abiotic factors which control the abundance and distribution of marine fishes, so that we can make better long-term as well as short-term predictions of the effects of environmental factors and man's impact on the offshore marine fishery resources. The program is organized into the following three major activities:

- i) Demersal Fish Program
- ii) Pelagic Fish Program
- iii) Zooplankton Program

Each of these activities is further subdivided into projects corresponding to the main types of investigation and these are shown in the block diagram.

A major objective of the demersal and pelagic fish programs will be to carry out annual quantitative inventories of fish stocks by means of seasonal trawl surveys. These surveys will be designed to provide annual recruitment predictions and estimates of harvestable stock and mortality rates for major species to help assess effects of fishing, and to provide a measure of long-term changes in total fish biomass and recreational and commercial community structure in relation to environmental factors and exploitation. In addition to monitoring distribution, abundance and population structure (age and length) of stocks the surveys will provide a significant part of the necessary biological samples for critical life history studies. Aspects of life history to be emphasized in the Ecology Program will be recruitment processes, growth rates, and food chain studies, all of which are basic to an understanding of the productivity cycles in the marine ecosystem. Of particular concern in the case of the recruitment process are fecundity, spawning, stock-recruitment relations, and studies of the early life stages of major species in cooperation with the Ichthyoplankton group. Especially important will be the description of distribution, abundance, behavior and feeding habits, growth and mortality of postlarval and juvenile fish.

The Zooplankton Program is subdivided into two major activities, the Ichthyoplankton and Planktonic Invertebrates groups. The major objectives of these groups will be to investigate the ecology of the pelagic early life stages of fishes (eggs and larvae), and other zooplankton components particularly those representing larval food organisms or predators. Principal research and/or operational problems involve:

- i) Annual surveys to describe the large scale distribution and abundance of fish eggs, larvae, and other zooplankton components, and smaller-scale "zoom" studies for special distributional problems such as dispersion of larvae from spawning grounds.
- ii) Sorting center for initial processing of plankton samples.
- iii) Development of new and more rapid methods for sorting and enumerating plankton samples.
- iv) Identification of fish eggs and larvae and description of larval food habits.
- v) Rearing and other laboratory experiments to aid in taxonomic problems and to conduct basic studies on factors affecting feeding behavior, physiology, growth and mortality of fish eggs and larvae.

In all three major programs of the Ecology Program a critical phase of the research will involve close cooperation with the engineering group in the evaluation and development of sampling gear. From the standpoint of objectives and field operations as well as sampling gear, the Center Programs in Ecology and the MARMAP Programs are mutually complementary.

Fishery Oceanography

Objectives of this program are to provide short-term insitu and long-term time series physical and biological environmental information needed to understand ocean processes and phenomena pertinent to successful fisheries forecasting and to increase our understanding of environmental relationships to fisheries and productivity.

Environmental Monitoring

Objectives:

To investigate changes in the physical environment (including pollutants) in relation to changes in marine communities. Develop methods of monitoring key physical parameters on a continuing basis using remote sensing techniques and ships-of-opportunity.

Phytoplankton Ecology and Productivity

Objectives:

To monitor short-term and long-term fluctuations in primary productivity and in the abundance distribution, and species composition of phytoplankton.

Resource Assessment and Fishery Management

The primary mission is to conduct research on the dynamics of fishery exploitation in order to provide a scientific basis for proper national and international control and management of renewable marine resources. The program functions as the principle advisory service to the fishing industry, and national and international regulatory authorities on matters pertaining to conservation and management. Research studies are focused on the determination of harvestable surplus production in relation to population biomass and fishing intensity, and predictions of effects of fishing and resource abundance precision and accuracy of sampling and estimation of population parameters.

The program will synthesize data and information supplied by other programs, and will be responsible for assuring the collection of the proper kinds and amount of data from the commercial and sports fisheries, and for the analysis of such data to provide information on fishing intensity. A specialized age-reading unit will be maintained to provide for accurate and adequate ageing of samples from commercial, sport-fish, and research vessel catches.

The program will also be responsible for supervision, design and development of the Center's data processing facility.

The work of the program will be organized into four projects:

- i) Assessment and Management
- ii) Fishery Biostatistics
- iii) Age-reading
- iv) Data Processing

Engineering and Vessel Operations

Development testing and calibration of systems, gear and instruments for conduct of surveys of oceanic fishery populations, for taking precise, quantitative, and representative samples of such populations and for monitoring oceanic physical, chemical, and biological environmental parameters that influence biological productivity.

Analysis of problem areas, bottlenecks, etc. in laboratory handling and study of marine samples and specimens. Development, modification, and improvement of laboratory instrumentation and procedures as indicated and required.

Operation and maintenance of fishery research vessel(s); design, assembly and installation of special shipboard systems as required for oceanic collection and research activities.

Engineering and Vessel Operations

I. Engineering

A. Instrumentation

1. Automatic Data Logger
2. Hydroacoustics marine fishery resource detection and integration system (Remote Sensing)
3. Remote mensuration of operational (dynamic) parameter of population sampling gear
4. Improvement of Electronic Navigation Systems

B. Sampling Gear and tactics

1. Groundfish
2. Pelagic Fish
3. Molluscs
4. Crustacea

II. Vessel Operations

A. Albatross IV

B. Delaware II

C. Rorqual

D. Other

ENGINEERING AND VESSEL OPERATIONS

As indicated by the title this Unit has two major functions which are further subdivided into logical work areas or projects. Engineering Activities will include projects (1) in Instrumentation and (2) Sampling Gear and tactics. The current reorganization will permit increased emphasis on projects in these areas as work of exploratory fishing and fishery survey nature are phased out. This increased emphasis will effect several ongoing instrumentation projects.

INSTRUMENTATION

An Automatic Shipboard Data Logger system is now in a second prototype stage and is currently being installed aboard the Albatross IV. This system will record continuously or intermittently as desired the vessel operating parameters such as position, course, and speed; environmental observations--e.g. wind, speed, and direction, water salinity and temperature; and will accept manual input of survey station data. The data logger is being developed by the NASA Mississippi Test Facility under supervision of this Unit.

Hydroacoustic Assessment Systems for fishery resource surveys are under development at several NMFS installations. Liaison is maintained with these groups, advice, and assistance is provided as frequently requested. We propose to acquire an operational Hydroacoustic Assessment System for evaluation and use in the northern North Atlantic Ocean at the earliest date when an adequate operational system has been designed and proven reliable.

Remote Mensuration System for monitoring operational parameters of groundfish sampling gear (trawls) has been developed. Work is under way to acquire and put into use a wireless (acoustic link) system and to extend remote mensuration and monitoring systems to other sampling systems as required.

Electronic Navigation Systems Improvement. Work is currently in progress to adapt Loran C units for use aboard NMFS Research Vessels to provide greatly improved position fixing and navigation.

Instrumentation projects will be added and prosecuted within this unit as shipboard and laboratory needs and requirements are fully identified and specified.

SAMPLING GEAR AND TACTICS

Various units and systems are currently in use for sampling the various marine populations. Bottom trawls are used for groundfish, midwater trawls, gill nets, and seines are used for pelagic fish. Several types of dredges, traps "grabs" pots, etc. are used for collection of crustaceans, molluscs, and other benthic organisms. There is, however, to date a lack of adequately calibrated or in any degree standardized sampling gear and systems. Projects of this Unit will be designed to assess the present state of sampling gear and methods and to develop calibrated and standardized gear and systems as required.

VESSEL OPERATIONS

Research Vessel operation and maintenance will be the responsibility of this Unit. Currently attached to Center installations are the Albatross IV, 187 feet overall length, 1000 horsepower; Delaware II, 155 feet, 1000 horsepower; and Rorqual, 65 feet, 150 horsepower. Several smaller vessels and motorboats are operated at individual laboratories and will not be drawn into the "vessel pool" but will be administered locally for program work as required.

5. Administration

a. Research:

- 1) Inter-laboratory cooperation, coordination, and productivity will be assured through in-depth periodic reviews during site visits by Directorate personnel and by Resource and Research Progress Reviews to be held regularly at Woods Hole and to be attended by Directorate personnel and the Program Directors.
- 2) Research planning, for both current and future activities, will be done by a Research Council, chaired by the Director and composed of the Program Directors and the Deputy Director. The Executive Officer will be a member, ex officio, and will be responsible for the minutes of all meetings.
- 3) It is intended that full and free communication at all levels of each component of the Center will be encouraged through regular on-site Program and Project Leaders' Meetings.

b. Non-technical:

- 1) The non-technical administrative organization of the Center will consist of an Executive Officer and a clerk-typist.
- 2) Existing non-technical staffs at the Boothbay Harbor and Narragansett Laboratories will be retained.

- 3) An Executive Officer will be appointed and will perform as coordinator of all non-technical administrative activities. The Executive Officer will have primary responsibility for financial controls for the entire Center. Facility Administrative Assistants (officers) will be under his supervision and, at the same time, responsible to the individual designated as Officer-in-Charge at the respective facilities for proper execution of housekeeping and maintenance activities.
- 4) Responsibility for the initial preparation of all necessary forms (requisitions, personnel actions, etc.) remains with the facility Administrative Officers who will submit them to the Center Directorate for review and evaluation as to conformity with established staffing patterns, financial plans, etc.
- 5) Formal submission to the Central Office will be made only upon receipt of approval from the technical staff of the Directorate.

7. Delegations of Authority to Center Director

- a. Funds: As soon as is feasible, fund allocations and procurement authorities to the facilities comprising the Center will be delegated to the Center Director for his use in prosecuting the approved Center research program. All future allocations and authorities will be made to the Center Director.
- b. Hiring: Director has full authority to hire new employees without prior approval of the Central Office when such hiring is within the established and approved staffing pattern for the Center. In the event that a necessary hire exceeds or is outside the staffing ceiling, the Center Director will consult with the Central Office.
- c. Contract Authority: The Center Director is authorized to approve contracts with academic institutions for research and development programs for up to \$25,000. Contracts exceeding \$25,000 in cost will be cleared with the Central Office.

- d. Attendance at Meetings: The Center Director is authorized to approve attendance at all domestic scientific and trade-association meetings except those specifically reserved by the Central Office. A list of such reserved meetings will be made available.
- e. Travel Authorization: The Center Director is authorized to approve travel throughout the 50 states.
- f. Foreign-Travel Approval: The Center Director will submit all requests for foreign travel to the Central Office for appropriate further action.
- g. Training Assignments: The Center Director will endorse training assignment documents and submit them to the Central Office for approval and processing.
- h. Detail of Personnel: The Center Director, within limits established by the Civil Service Commission, Department of Commerce, NOAA and NMFS, is authorized to detail Center personnel for service elsewhere than at his permanent station.

8. Center Director

The Center Director is responsible for the direction of the research programs in conformity with policies laid down by the Associate Director for Resource Research and for informing him of progress and any needed changes in direction and emphasis. He, and such members of his staff as he may designate, acts as advisor to NMFS or NOAA delegations to State, National, or International meetings concerned with the management, protection, or enhancement of the living marine resources of the Northwest Atlantic.

He is also responsible for the operation and maintenance of the physical facilities and vessels of the NMFS now located at Woods Hole, Massachusetts; Boothbay Harbor, Maine; and Narragansett, Rhode Island, as well as the administration of such personnel, budget, procurement, and accounting matters as may be delegated to him.

9. Deputy Center Director

The Deputy Center Director is responsible for all of the above duties in the absence of the Center Director.

10. MARMAP Program Coordinator

The MARMAP Program Coordinator acts as liaison between the Center Director and the MARMAP program office for all activities which are part of the national MARMAP program.

11. Public Information and Liaison

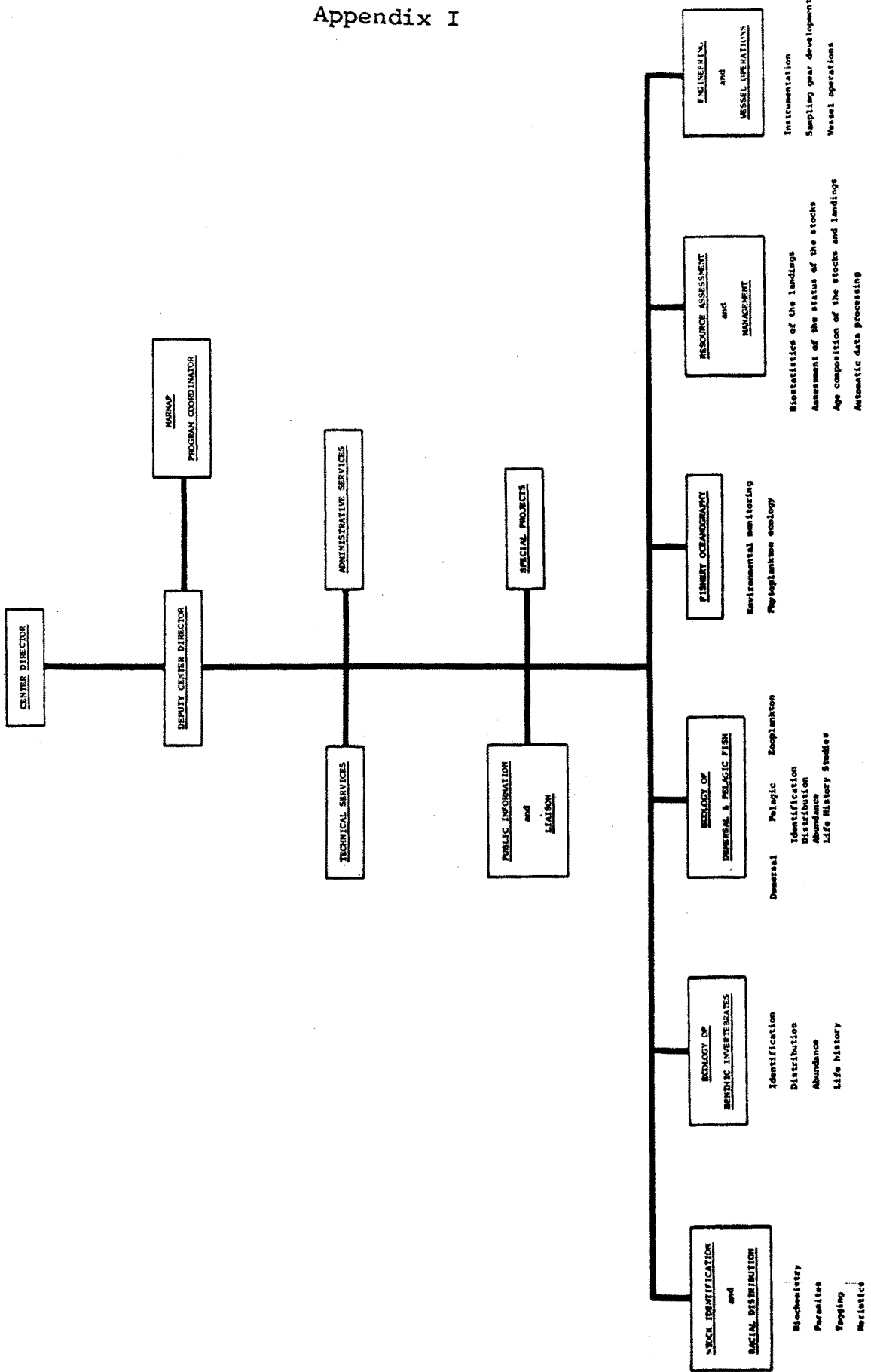
The Public Information and Liaison Group is responsible for the final processing of publications, routine and special reports, responding to inquiries from the public, for press releases, facility tours, talks to local organizations, etc. The Aquarium at Woods Hole is included in this group.

12. Special Projects

The Special Projects Office will be activated as needed to execute ad hoc projects which do not clearly belong in the ongoing research programs. An example is the man in the sea proposal for the study of larval herring which is being reviewed but not yet funded.

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Appendix I



APPENDIX II

Program	Location			
	Woods Hole	Boothbay Harbor	Narragansett	
Vessel Operation and Engineering	* ✓	-	-	
Stock Identification	✓	* ✓		
Ecology of Demersal and Pelagic Fish	* ✓	✓	✓	
Ecology of Benthic Invertebrates	* ✓	✓	✓	
Fishery Oceanography	* ✓	✓	✓	
Resource Assessment	* ✓	✓	-	