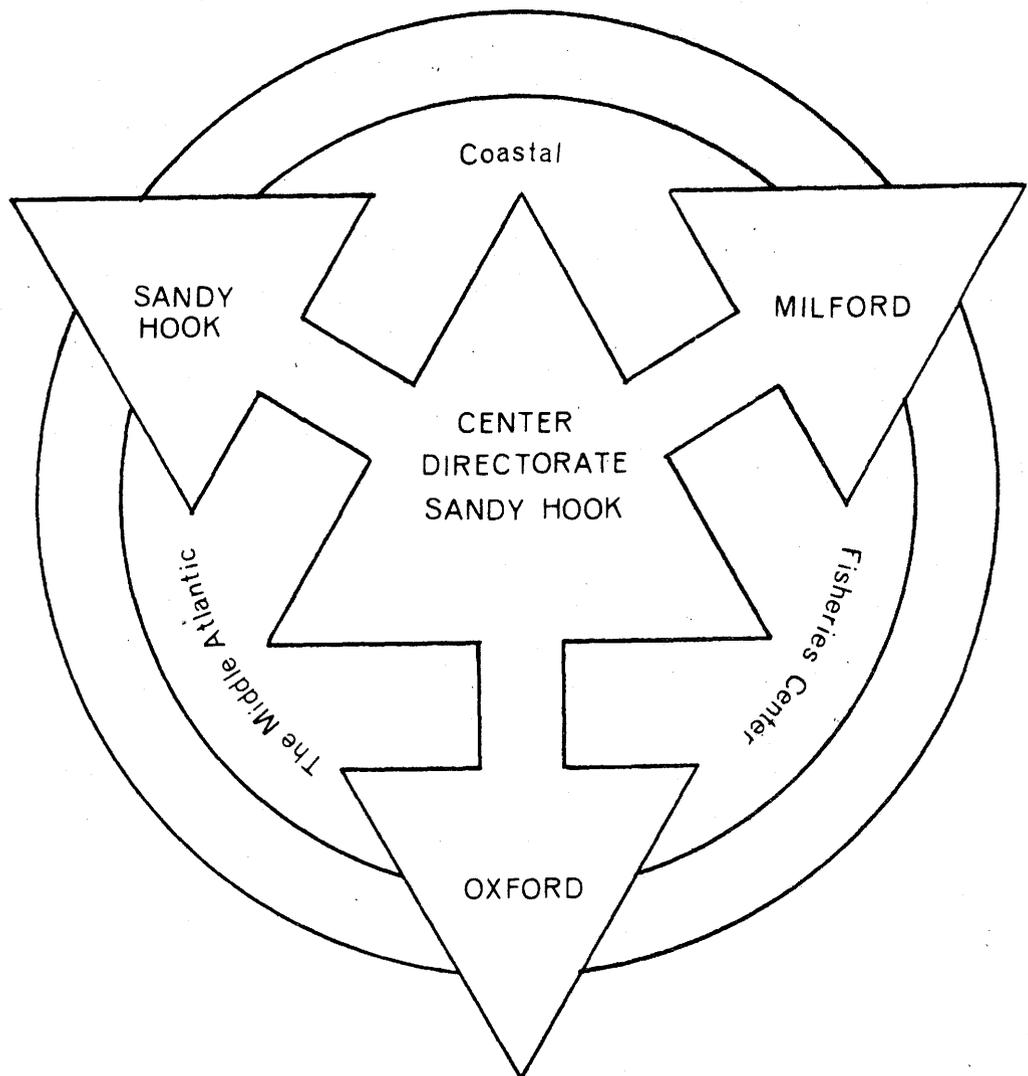


SUMMARIES FOR TASK DEVELOPMENT PLANS



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Northeast Region

MIDDLE ATLANTIC COASTAL FISHERIES CENTER



Informal Report No. 78

August 8, 1975

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MARMAP SII -- MULTISPECIES -- MIDDLE ATLANTIC BIGHT

Task #88A2P1 (MAC-002)

OBJECTIVES

1. To efficiently and effectively utilize the fishery resources of the Middle Atlantic.
2. To coordinate and conduct synoptic broad scale groundfish surveys.
3. Develop and deposit all information in a common data bank with other fishery Centers along the Atlantic Coast.
4. To provide user groups with adequate, accurate and timely fishery data through the publication of reports and scientific papers.

ABSTRACT

Management decisions concerning our fishery resources must be made from an adequate data base. Using standard trawl gear we conduct monthly surveys in the New York Bight and spring and fall surveys along the Middle Atlantic to estimate and monitor numbers and distribution of all benthic fish and selected shellfish species. Cooperative and coordinated surveys are carried on by Federal and State fishery laboratories both north and south of the Middle Atlantic States. These data are incorporated into a common data bank accessible to Federal groups and in-house personnel developing ICNAF, Bilateral and other managerial policies. State agencies, industry representatives and the public (recreational and conservational interests) are given requested information.

FISHERY ANALYSIS -- MIDDLE ATLANTIC SPORTFISH

Task #88F9P4 (MAC-005)

OBJECTIVES

Develop source information of the recreational harvest of sportfish in the Middle Atlantic with the goal of fulfilling the management of these stocks. Effort is directed to determining:

- a) extent of the fishery and its distribution
- b) biological characteristics of the catch
- c) estimation of the size of harvest.

Information on the effort, stock and stock size of landings will provide a basis for estimating present and future status of stocks and to judge what conservation measures are needed and feasible.

ABSTRACT

Fishery Analysis of Middle Atlantic Sportfish is determining appropriate sampling strategies. First efforts were directed to a single port analysis at Ocean City, Md. as a pilot study. Elements of the survey include distribution of the various sportfish components, i.e. bay, ocean, shore, boat by subareas, estimation of fishing effort from boat and airplane counts and interviews. Biological characteristics of the catch of both sportfish and commercial harvest in the area are regularly made to determine any differences in the exploited stock and describe the competitive aspects in the various fisheries. Samples are being summarized on a monthly basis and computer programs written for appropriate data processing.

ABSTRACT (FY 76 INCREASE)

The 40K increase of FY 76 permits development of a sportfish biometric sub-project. This will allow appropriate programs to be written for analysis of the survey data and accommodate the new survey area along the New Jersey coast. Some development of management information for target stocks of the Middle Atlantic Bight incorporating a sportfish emphasis will begin.

ABSTRACT (FY 77 INCREASE)

A 100K increase in FY 77 will allow a modest expansion of biometric capabilities and increase our geographic coverage for sportfish catch/effort data through State/Federal or other contracts. We anticipate breaking out a population dynamics task in 1978 to emphasize commercial/recreational impacts of the Middle Atlantic Bight fishery resource as our information base increases from pilot studies.

BEHAVIOR OF FISHES UNDER ENVIRONMENTAL STRESS
Task #88C2P1 (MAC-006)

OBJECTIVES

1. Determine normal patterns of behavior of marine fishes and compare with stress induced change(s) in behavior to assess impact of selected contaminants on a variety of finfish.

2. Report these results to the scientific community so that the data can be used by the scientific community and managers responsible for living marine resources.

ABSTRACT

The principal aim of this task is to define normal environmental requirements of various species of marine fish by studying the behavior and related life habits in both the field and laboratory. The norms which are established will then be employed directly in the design of experiments to assess and predict effects of selected environmental modifications which may be potentially stressful to marine species. Studies in the field will center on defining feeding habits, habitat requirements, and inter- and intraspecific relationships of winter flounder, tautog and cunner. Studies under controlled laboratory conditions will measure the effect of selected contaminant stresses on activity, feeding, schooling, reproduction and the various mediatory sensory modalities in tautog, cunner, hake, weakfish and bluefish.

IMPACT OF ENVIRONMENTAL CHANGE, MIDDLE ATLANTIC
Task #88C2P2 (MAC-007)

OBJECTIVES

1. Establish environmental baselines, especially for sediments and benthic macrofauna, in Raritan Bay, Long Island Sound, the New Jersey Coast and portions of the Baltimore Canyon Trough.
2. Periodically reoccupy selected stations in all survey areas to determine impacts of natural and man-induced environmental change upon the baseline characterizations. Especially interested in effects of oil exploration and mining activity on the benthos of Jersey Coast and Baltimore Canyon Trough.
3. Determine relationships among sediments, heavy metals and macrofauna, using advanced data analyses techniques (most pertinent to Raritan Bay studies).
4. Investigate relationships among benthic species, and effects of contaminants on community structure (Long Island Sound).

ABSTRACT

Environmental baseline surveys of sediments, benthic macrofauna and a number of water column parameters have been completed for Raritan Bay, Long Island Sound, the New Jersey Coast and portions of the Baltimore Canyon Trough. Data from the latter two surveys are combined for subsequent determination of impacts of oil exploration activities. In Raritan Bay, advanced data analysis techniques are being employed to determine relationships among sediments, heavy metals and macrofauna.

IMPACT OF ENVIRONMENTAL CHANGE, MIDDLE ATLANTIC
Task #88C2P2 (MAC-007)

The Long Island Sound project is investigating relationships among benthic species and contaminant effects on community structure. Periodic reoccupation of selected stations is projected for all survey areas to measure temporal changes from the established baselines.

BIOCHEMICAL MODELING, MIDDLE ATLANTIC
Task #88C2P3 (MAC-008)

OBJECTIVES

1. Measure concentrations of metals and organics in coastal and estuarine waters and determine their forms and interactions, including ionic, chelation, adsorption and other binding characteristics. Investigate cycling of these materials between water, suspended particulates, and benthic sediments.

2. Investigate effects of metals and metal-organics, in various forms, on physiological and biochemical systems in marine animals, particularly on crucial enzyme systems such as those involved in osmoregulation, respiration, and metabolism.

3. Develop Models incorporating information on metal-organic interactions, cycling in the marine environment, as well as effects of these contaminants on living marine resources. The models should provide a generalized understanding such that they can be used in prediction and assessment for managing and protecting the marine fisheries.

ABSTRACT

The Biochemical Modeling Investigation has two principal thrusts: The first is to understand the roles of contaminant metals and organics, and their interactions, in coastal waters and estuaries crucial to the survival and maintenance of the marine fisheries; concentrations of metals, in the water column, are being measured using extremely sensitive instrumentation and the relationships of the entrained metals to bottom

BIOCHEMICAL MODELING, MIDDLE ATLANTIC
Task #88C2P3 (MAC-008)

sediments and suspended materials are under investigation. The second phase of the investigation is to develop an understanding, and to model, impacts of contaminants on specific physiological and biochemical systems. At the present time the investigation concentrates on the impact of contaminants on the all important enzyme systems of brachyuran crabs which have an importance in the commercial fisheries as well as serving as elements of the food chains culminating in the demersal fin-fishes.

The Investigation interface closely with Experimental Biology, Environmental Chemistry and benthic ecology and seabed oxygen consumption tasks designed to provide laboratory and field data on the impact of contaminants on living marine resources.

ENVIRONMENTAL MICROBIOLOGY AND CHEMISTRY, MIDDLE ATLANTIC
Task #88C2P4 (MAC-009)

OBJECTIVES

1. To understand the distribution and abundance of organic and inorganic contaminants in the Middle Atlantic Bight relative to the sources of pollution.

2. To understand the distribution and abundance of indicator and pathogenic microorganisms in the Middle Atlantic Bight relative to sources of pollution.

3. To understand the impact, individually and synergistically, of contaminants and microorganisms on living marine resources including fin-fish and shellfish as well as their food chain organisms.

4. To develop first order models based on the distribution and abundance of contaminants and microorganisms useful in assessing the impact of ocean pollution and dumping in the Middle Atlantic Bight and contiguous waters including Long Island Sound.

5. To cooperate with other Center investigations involved with laboratory and field studies of fish diseases and the impact of contaminants on living marine resources.

ABSTRACT

The present task is concerned with the effects of man induced pollution, both chemical and microbial, on living marine resources and their environment. Various microbial species and chemicals have been identified in regards to diseases of the fisheries, food poisoning outbreaks, restricted use of the

ENVIRONMENTAL MICROBIOLOGY AND CHEMISTRY, MIDDLE ATLANTIC
Task #88C2P4 (MAC-009)

resource due to contamination and limitation on the use of the environment for recreation. The object of the task is to determine the presence of pollutant chemicals and disease producing microbes, their persistence in the environment, their cycling through food chain mechanisms and the possible inter-related microbial and chemical effects which act to the detriment of marine animals, their habitat and the use of the resource. The Environmental Microbiology and Chemistry Investigation consists of two subtasks, Microbiology and Chemistry.

The principal objective of the Microbiology subtask in regards to coastal contamination is to ascertain the degree of fecal contamination and presence of pathogens in sediments of the Middle Atlantic Coastal Waters in order to determine the potential presence of disease producing organisms which may induce diseases in marine animals or by contamination result in restricted use of the resource.

The objective of the Chemistry subtask is to determine the levels of elemental metal contamination (Ag, Ar, Cd, Cr, Cu, Hg, Mn, Ni, Pb, Zn) in the many animal species, water and sediments of the fisheries environment and food chain organisms. In addition to obtaining baseline levels of the chemicals in the marine environment, the Chemistry subtask has been working with the Physiological Effects of Pollutants Stress task in determining the uptake and distribution of select heavy metals in several marine animals under controlled laboratory exposures. Finally, the subtask is preparing for hydrocarbon studies which will require additional funds to complete the proposed research.

PHYSIOLOGICAL EFFECTS OF POLLUTANT STRESS
Task #B8C2P3 (MAC-015)

OBJECTIVES

1. Determine the lethal effects of a variety of heavy metals, individually and in combination, on the embryonic and larval stages of some mollusks and crustaceans in acute static systems.
2. Determine the long-term sublethal effects of exposure to a variety of heavy metals on the larval, juvenile and adult stages of mollusks, crustaceans and finfish in chronic, long-term exposure systems.
3. Define the physiological and biochemical pathways affected and relate them to the metabolic disorders, which result in death or permanent damage to the living marine organism.

ABSTRACT

To provide a basis for environmental management it is necessary to establish the precise levels of pollutants that cause mortalities of our living marine resources, as well as the physiological damage caused by sublethal levels of pollutants on the entire life cycle of these resources. Exposure to sublethal levels of pollutants may limit or alter their development, growth, reproduction, metabolism, or other physiological and biochemical processes. This task will examine in the laboratory, using physiological and biochemical techniques, a selected group of marine animals common to the mid-Atlantic Bight and determine the effects of pollutants on their normal life functions.

LIFE STUDIES: COMPARATIVE PATHOLOGY
Task #88C2Q2 (MAC-016)

OBJECTIVES

1. Understand and apply knowledge on the mechanisms and effects of disease toward the better management of fishery resources as well as the habitats they occupy.
2. Continue the program of histologic, diagnostic, and pathologic services to effectively assist Federal, State, university and private laboratories in the U. S. and abroad in understanding causes of mortalities and abnormalities in fishery resources.
3. To prevent the dissemination of diseases and noxious pests resulting from the indiscriminate or careless transfer of marine poikilotherms from disease enzootic to "disease free" locations.

ABSTRACT

Infectious and noninfectious diseases (including pollution effects) are paramount factors that limit the abundance, distribution, and availability of marine fish, crustaceans, and mollusks. The application of knowledge on the mechanisms and effects of disease, therefore, is fundamental for the successful management of fishery resources and the habitats they occupy. In this task, approaches to the study of marine diseases are primarily observational and are directed toward comparative histology, cytology, and epizootiology. Normal and abnormal organs,

tissues, and cells are studied intensively. Light and electron microscopy are used to describe pathologic conditions that may have been induced experimentally, found in nature in animals from diverse habitats, or found in aquacultured animals. Normal and pathologic conditions and micropathogen activities are defined and described quantitatively and qualitatively and infectious agents and microparasites are characterized and identified.

DISEASE AND ENVIRONMENTAL STRESS
Task #88C2P9 (MAC-017)

OBJECTIVES

1. Understand the actions and interactions of infectious and non-infectious disease (including pollution effects) as causes of "natural" fish and shellfish mortality (i.e., nonfishing mortality) in stressed fishery habitats.
2. Establish qualitative and quantitative pathologic effects, abnormalities, and mortalities on wild, captive, and laboratory held fishery resources, resulting from exposure or challenges to biotic and abiotic disease agents.
3. Establish a Registry of Marine Pathology that will serve as a central reference collection of clinical, illustrative, and published material related to diseases of marine and estuarine vertebrate and invertebrate poikilotherms.

ABSTRACT

Susceptibility of marine aquatic poikilotherms to disease and other factors which induce mortality is directly related to and influenced by environmental changes and the concomitant stresses to which the animals are exposed. Studies in this task, therefore, are directed toward understanding the pathologic effects on marine animals resulting from natural and man-induced changes to marine ecosystems (such as habitat modification or destruction and multiple use of the marine environment for energy

related programs, recreational activities, ocean waste disposal, and shipping and dredging activities). Field and laboratory studies are designed to establish causes of mortalities, abnormalities, and tissue and cellular pathoses (anatomical, physiological, and biochemical). The task also includes implementation of the Registry of Marine Pathology (ROMP) that will serve as a central reference collection of clinical illustrative and published material related to diseases of marine and estuarine vertebrate and invertebrate poikilotherms.

MARMAP SI -- BIOLOGICAL ASSESSMENT

Task #88A2P2 (MAC-053)

OBJECTIVES

1. Relate yearly fluctuations in abundance and distribution of larval fishes to environmental conditions and to adult spawning populations in the Middle Atlantic Bight.
2. Describe dispersal patterns of larvae from studies of diurnal movements and how they are affected by photoperiod, circulation, depth, temperature, salinity, seasonal thermocline and available food densities.
3. Maintain data management system to acquire, process and store information to support assessment research.
4. Provide outputs to user groups.

ABSTRACT

As part of the MACFC's Resource Assessment Investigations, information on the early life history of coastal fishes is compiled from coastal surveys and from studies designed to investigate the diurnal movements of young fishes. Using standard MARMAP gear and sampling procedures, semi-annual surveys of fish eggs and larvae are conducted in conjunction with finfish assessment surveys to monitor fluctuations in abundance and distribution. Concomitant measurements of the marine environment are recorded, incorporated with pertinent data from other sources, and integrated with all available biological data (historical and current) to evaluate the role of the environment in the transport and distribution of young fishes and to ascertain the environmental needs of specific fishes. Studies of diurnal movements provide data on associations of larval fishes to photoperiod, depth, temperature, salinity, and seasonal thermocline. A data management system is maintained to acquire,

process and store information needed to support assessment research and to provide outputs to user groups.

NMFS TASK DEVELOPMENT PLAN

(See Detailed Instructions)

1. DATE PREPARED
8/8/75

(Submit five copies by Jan. 2)

TO: Director, National Marine Fisheries Service, ATTN: Fx5 National Oceanic and Atmospheric Administration Washington, D.C. 20235

FMC's - Submit a separate Task Development Plan for each task beginning, continuing, or ending in the current year, budget year, or budget year + 1. Reimbursable funds are not to be mingled with appropriated funds on any programmatic TDP; separate TDP's must be prepared. Submit one TDP itemizing the administrative support cost (Management Fund) for the FMC.

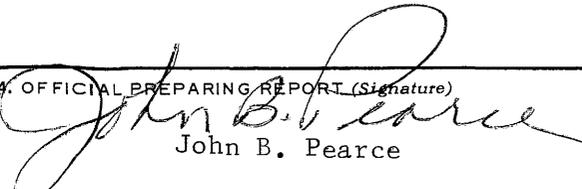
2. TDP NUMBER MAC-055-77-IE-R	3. OBJECTIVE CODES				4. RANK	
	A	B	C	D	BY TARGET	BY + 1 INC.

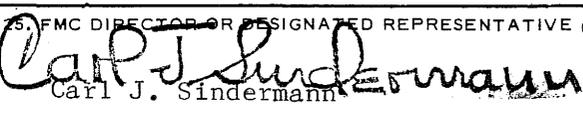
5. TASK NUMBER 871217	6. TASK TITLE MESA-NYB Biological Oceanography
--------------------------	---------------------------------------------------

7. ORGANIZATION CODE FB6000	8. ORGANIZATION TITLE (Responsible for execution of this task) Ecosystems Investigations	9. PRINCIPAL LOCATION City: Highlands State: N.J.
--------------------------------	---------------------------------------------------------------------------------------------	------------------------------------------------------

OBJECT CLASS <small>Lines 10-18. Enter all dollar values as thousands and tenths of thousands. Lines 21-22. Enter as man-years and tenths of man-years.</small>	C O R P O R A T I O N L I N E	CURRENT YEAR FY 19__		BUDGET YEAR FY 19__		BUDGET YEAR + 1 FY 19__	
		TARGET ALLOWANCE A	INCREASE B	TARGET ALLOWANCE C	INCREASE D	TARGET ALLOWANCE E	INCREASE F
10. Total Direct Labor	15	218.1					
11. Travel	19	10.5					
12. Rents, Communications, Utilities	21	24.5					
13. Contracts (To be let)	51 52	30.0					
14. Grants (Funds obligated)	58	---					
15. Supplies	53	80.9					
16. Capital Equipment	54	20.0					
17. Other (All other obligations)		25.8					
18. Total Direct Funds <small>(Add lines 10 through 17 above.)</small>		409.8					
19. Positions, Full-time permanent <small>(Number applicable to this Task. Also, complete NOAA Form 32-14C.)</small>		1					
20. Positions, Other <small>(Number applicable to this Task.)</small>		6					
21. Man-years, Permanent		9.3					
22. Man-years, Other		8.4					
23. Reimbursable Support <small>(Reimbursable agreements only)</small>							

REMARKS

24. OFFICIAL PREPARING REPORT (Signature)

John B. Pearce

25. FMC DIRECTOR OR DESIGNATED REPRESENTATIVE (Sig.)

Carl J. Sindermann

NMFS TASK DEVELOPMENT PLAN
28. FULL-TIME PERMANENT POSITIONS

TDP NUMBER

MAC-055-77-IE-R

Reference NOAA Form 32-14A, Item 19. Identify all full-time permanent positions related to this Task for the budget year and all positions requested for budget year + 1 increases. Do not include support personnel; they should appear in the appropriate support Task Development Plan.

POSITION TITLE	GS LEVEL	NAME OF INCUMBENT (If no incumbent, enter "Vacant")	% OF TIME SPENT ON THIS TASK
Director of Investigation	14	Dr. J. Pearce	20
Director of Investigation	14	Dr. A. Rosenfield	5
Director of Investigation	15	Dr. James Hanks	10
Fish. Biol. MESA Coordinator	14	Dr. K. McNulty	100
Parasitologist	13	Dr. T. Sawyer	25
Investig. Chief	13	Dr. R. Murchelano	35
Res. Geneticist	13	Dr. A. Congwell	75
Electron Microscopist	11	Dr. J. Bodammer	25
Fish. Biol. (Res.)	9	J. Ziskowski	100
Elect. Microsc. Tech.	7	J. Wade	10
Fish. Biol. (Res.)	7	S. MacLean	40
Genet. Tech.	7	Vacant	10
Biol. Tech. (Superv.)	6	J. Caracciolo	60
Histological Tech.	5	D. Wright	20
Biol. Aid	4	M. Halsey	50

CONTINUE on plain 8x10 1/2 paper. Identify "Page of Pages" and "TDP Number" in upper right corner. Comment on each of the following items, identifying by number. If item is not applicable, so indicate by entering "NA":

STATEMENT OF NEED

33. CRITERIA FOR TASK COMPLETION

ACTIVITY PLAN

TASK OUTPUTS AND BENEFITS

34. BACK-UP DOCUMENTATION

IMPACT OF TASK AUGMENTATION

- Detail Documentation (Provide one sentence description.)
- Related tasks and research presently being conducted.
- Indicate the Congressional legislative requirements.
- Indicate the Environmental Impact Statement (EIS) requirements.

- Current Year
- Budget Year
- Budget Year + 1

NMFS TASK DEVELOPMENT PLAN

26. ACTIVITY, EVENT, AND MILESTONE SCHEDULE

TDP NUMBER

MAC-055-77-IE-R

NUMBER EACH ACTIVITY, EVENT, OR MILESTONE
IDENTIFY BY ENTERING 'A' FOR ACTIVITY, 'E' FOR EVENT, OR 'M' FOR MILESTONE.

PLANNING PERIOD - Indicate by entering an "X" at the beginning and completion of subtask or selected operational activities that collectively define the task for the 7 year planning period. Connect "X's" with a solid bar. "Events" and "Milestones" occur at specific points in time. Indicate these significant achievements by placing an "X" in a single column.

NUMBER	A, E, OR M	NARRATIVE (Brief descriptive phrase of activity, event, or milestone)	78 BUDGET YEAR													
			CY 76		BY 77		+1		+2		+3		+4		+5	
			1	2	1	2	1	2	1	2	1	2	1	2	1	2
			A	B	C	D	E	F	G	H	I	J	K	L	M	N
2	A	Sort - identify macrofauna Oct. '73 cruise	X													
	E	Complete data report on 1	X													
3	A	Sort - identify macrofauna Jan. '74 cruise	X													
4	E	Complete data report on 3		X												
5	A	Sort - identify remaining macrofauna Aug. '73 cruise	X	X												
6	E	Complete data report on 5		X												
7	A	Obtain sediment grain - size, data, apex	X	X												
8	E	Complete data report on 7		X												
9	A	Analyze for heavy metals in sediments Aug. '74 cruise	X	X												
0	E	Complete five data reports on 9														
1	A	Determine macrofaunal sampling validity (saila)	X	X												
2	A	Perform macrofaunal cluster analysis	X	X												
3	A	Define strata of macrofaunal assemblages	X	X												
4	A	Perform multivariate analysis (CEDDA)		X												
5	E	Complete paper on 11-14			X											
6	A	Expose entrapped winter flounder in field	X	X												
7	A	Trawl monthly in Sandy Hook and Great Bays	X	X												
8	A	Trawl with R/V Delaware at 60 fathoms	X													
9	A	Examine commercial catch from Sandy Hook/Raritan Bays	X													
0	A	Perform statistical analyses on 16-19	X	X												
1	E	Complete papers on prevalence of fin rot (16-20)		X												
2	A	Compare epidermis of three species of flounder	X	X												
3	A	Examine aquarium - held fish daily for progression	X													
4	A	Examine aquarium - held fish daily for contagion	X													
5	E	Complete paper on 22-24		X												
6	A	Collect crustaceans with black gill disease	X													
7	A	Study associated histopathology, parasites, and epibionts	X	X												
8	E	Complete paper on black gill disease (26-27)		X												
9	A	Examine mutagenesis in WESTWARD samples	X													

7. OUT YEAR COMMENTS

(Check appropriate boxes and enter applicable percentage.)

*Increases usually come from reprogramming within your FMC.)

a. Continued at same level

b. Increase of ___% *

c. Reduction of ___%

d. Termination

"X" APPROPRIATE COLUMN

REMARKS MESA approval of proposals and funding is on a year-to-year basis. We plan to continue these studies in future years. Proposals for continued work are submitted annually based upon mutually agreed-upon plans made by MACFC and MESA.

NMFS TASK DEVELOPMENT PLAN

26. ACTIVITY, EVENT, AND MILESTONE SCHEDULE

TDP NUMBER

MAC-055-77-IE-R

NUMBER EACH ACTIVITY, EVENT,
OR MILESTONE

IDENTIFY BY ENTERING 'A' FOR
ACTIVITY, 'E' FOR EVENT, OR
'M' FOR MILESTONE.

PLANNING PERIOD - Indicate by entering an "X" at the beginning and completion of subtask or selected operational activities that collectively define the task for the 7 year planning period. Connect "X's" with a solid bar. "Events" and "Milestones" occur at specific points in time. Indicate these significant achievements by placing an "X" in a single column.

A, E, OR M	NARRATIVE (Brief descriptive phrase of activity, event, or milestone)	CY		BY		BUDGET YEAR										
						+1		+2		+3		+4		+5		
		1	2	1	2	1	2	1	2	1	2	1	2	1	2	
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	
0	A Examine mutagenesis in MACFC 1966-67 samples	X														
1	A Examine mutagenesis in spring 1976 samples		X													
2	E Complete paper on WESTWARD samples	X														
3	A Develop scoring system of anomalies	X	X													

OUT YEAR COMMENTS

(Check appropriate boxes and enter applicable percentage.)

*Increases usually come from reprogramming within your FMC.)

- a. Continued at same level
- b. Increase of ___% *
- c. Reduction of ___%
- d. Termination

"X"
APPROPRIATE
COLUMN

REMARKS

29. STATEMENT OF NEED

- A. The NMFS goal that best summarizes the need for this task is, "Determine the impact of environmental change in the Middle Atlantic Region" (Goal IV, Subgoal A, Objective 9, in memo from Mr. Schoning dated September 30, 1974.

This task also contributes to several NMFS goals pertaining to the environment that were promulgated on September 15, 1973, and to several reiterations and interpretations of them provided subsequently by Mr. Schoning, Dr. Hutton, Dr. Royce, and David Wallace, as referenced below:

NMFS GOALS, OBJECTIVES, SUBOBJECTIVES
Dated September 15, 1973

Goal II, Objective C, Subobjectives 1 and 4
Goal IV, Objective A, Subobjectives 1 and 5

MEMO FROM MR. SCHONING
Dated September 30, 1974

Goal IV, Subgoal A, Objective 9
Goal IV, Subgoal D

MEMO FROM DR. HUTTON TO DR. ROYCE
Dated October 7, 1974

Repopulation rates after ocean dumping of wastes

MEMO FROM DR. ROYCE
Dated November 27, 1974

Goal IV, Subgoal A, Environmental Investigations

MEMO FROM MR. SCHONING
Dated November 13, 1974

Habitat Protection

STATEMENT BY DAVID H. WALLACE BEFORE THE SENATE COMMERCE COMMITTEE, SUBCOMMITTEE, SUBCOMMITTEE ON OCEANS AND ATMOSPHERE RE NOAA'S ACTIVITIES UNDER THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT OF 1972 (P.L. 92-532).

A. 1) a. Statement of Problem

Coastal waters of the continental shelf from Montauk Point, New York, to Cape May, New Jersey (The New York Bight), have supported substantial fisheries from Colonial times to the present. Landings of commercial fish and shellfish in 1974 totalled about 91 thousand metric tons valued at \$42 million

and recreational fishermen spent an estimated \$250 million. The historical records of the fisheries documents an unmistakable decline in nearly all cases, due not so much to mismanagement as to the absence of effective management (McHugh, 1972 and unpublished manuscript on fisheries of the New York Bight). One contributory reason is the paucity of information on the effect of man-induced environmental changes on marine fishery resources. The human population of about 20 million people, some 17 million of whom live in metropolitan New York City alone, is the most concentrated in North America. Water and sediment quality are markedly degraded by the disposal of human and industrial wastes. At and near offshore dump sites of sewage sludge and dredge spoil, the distribution and abundance of benthic macro-invertebrates is markedly altered, and evidence exists of avoidance of these areas by demersal fish and crustaceans. Known pathological conditions include fin rot of fishes; exoskeletal erosion of lobsters, crabs, and shrimps; a "black gill" disease in crustaceans; and chromosomal aberrations in the pelagic eggs of fishes. NOAA's response is The Marine EcoSystems Analysis Program (MESA), New York Bight Project, which provides a multi-disciplined approach to understanding the biological and physical processes at work in the bight with emphasis on how man-induced environmental changes affect naturally-occurring processes. The project began in 1973 and is scheduled to continue through 1980.

- A. 1) b. Users of MESA-generated information meet formally at least once a year in a "Central Committee" and in three supporting panels. The four groups and their representation follow:

Central Committee -- The MESA New York Bight Advisory Central Committee collects, analyzes, and synthesizes information on the needs and uses for marine ecosystem information in the Bight, on scientific and technical efforts in and related to the Bight, and on the concerns and views of citizens and industrial organizations regarding the Bight.

Membership includes:

NOAA MESA New York Bight Project Manager, Chairman
Environmental Protection Agency
Army Corps of Engineers
Department of Interior
New Jersey Dept. of Environmental Protection
New York (State) Dept. of Environmental Conservation
Interstate Sanitation Commission
New York (City) Department of Water Resources

Information Users Panel -- The Information Users Panel advises the Committee on the needs and uses for marine ecosystem

information by Federal, state regional and local organizations which must make decisions, establish policies, or enforce decisions on matters affecting the Bight marine ecosystems and on the relevancy of Project plans and operations to such organizations.

Membership includes:

NOAA, Chairman
Environmental Protection Agency
Army Corps of Engineers
U. S. Coast Guard
Department of the Interior
Atomic Energy Commission
Health, Education and Welfare
Food and Drug Administration
New Jersey Dept. of Environmental Protection
New York (State) Dept. of Environmental Conservation
Interstate Sanitation Commission
New York (City) Department of Water Resources
Nassau-Suffolk (N. Y.) Regional Planning Board
Port of New York and New Jersey Authority
New York State Assembly Scientific Staff

Scientific and Technical Panel -- The Scientific and Technical Panel advises the Committee on the interrelationships between fields of research and investigation, on the coordination and merit of scientific and technical efforts, and on the common data, information, and operational requirements of such efforts.

Membership includes:

NOAA, Chairman
Environmental Protection Agency
Army Corps of Engineers
New York (State) Dept. of Environmental Conservation
Interstate Sanitation Commission
New York (City) Department of Water Resources
New York Ocean Sciences Laboratory
New York Sea Grant
Woods Hole Oceanography Institution
Lamont-Doherty Geological Observatory of Columbia Univ.
Atomic Energy Commission

Citizen and Industrial Panel -- The final panel, the Citizen and Industrial Panel, advises the Committee on participation by key citizen organizations concerned with conservation, protection, and uses of the New York Bight and of businesses which depend on the Bight for their business endeavors.

Membership includes:

NOAA, Chairman
American Institute of Merchant Shipping
American Petroleum Institute
Environmental Defense Fund
League of Women Voters
Long Island Environmental Council
National Boatman's Alliance
Sierra Club
Public Service (Gas and Electricity)
Consolidated Edison Co. of New York
Sport Fish Institute
Long Island Fishermen's Association

- A. 1) c. MESA-generated information can obviously contribute directly to Objective IV A-9, "Determine the impact of environmental change in the Middle Atlantic Region". The MESA investigators are aware of other studies both within and outside the MESA program and cooperate with other investigators as much as possible. The coverage is such that knowledge gained in the New York area will be applicable to similar environments and impacts throughout and perhaps beyond the Middle Atlantic Region. The results of MESA research also apply to the many future coastal development schemes that are receiving serious consideration in The New York Bight, including offshore drilling, deep-water ports, offshore islands, new refineries, petrochemical complexes, and floating nuclear power plants. The Middle Atlantic Coastal Fisheries Center (MACFC) recently submitted lengthy documents to the MESA-N.Y. Bight Project office which are inputs to the environmental impact statements being prepared by EPA on the proposal to move New York's ocean dump sites farther offshore (MACFC Informal Reports 66 and 72a).

D. ACTIVITY PLAN

A. SUBTASK: ANALYSIS OF EXISTING NEW YORK BIGHT APEX BENTHIC SAMPLES AND DATA

Five cruises have been made to standard MESA-N.Y. Bight apex stations on a quarterly basis (MACFC 1975a and b -- see back-up documentation). Five replicate grab samples were collected at each standard MESA-N.Y. Bight apex station. The first grab samples taken at each of the first 64 stations (stations 1-64) occupied in August 1973 and August 1974 have been sorted and identified and the data are being entered into the Center's ADP system using the MESA format adopted for benthic macrofaunal data.

All grab samples were taken at stations located with the RAYDIST navigational system which should eliminate one of the principal problems noted by Frankenburg and Leiper (1975), that of inaccurate

station location as a source of possible error in sampling benthic assemblages. The objectives of the proposed research are:

- (1) To sort and identify the first grab samples taken at standard MESA sampling stations during cruises held in (a) October 1973 (second quarterly cruise), (b) January 1974 (third quarterly cruise), and (c) March 1974 (fourth quarterly cruise).
- (2) To expedite the analyses of sediments that were collected concomitantly with the benthic macrofauna, for standard geological characteristics and heavy metal burdens. Priority for sorting and identification will be given to the January 1974 cruise.

The data resulting from the foregoing operations, along with similar data from the August 1973 (first quarterly cruise) and August 1974 (fifth quarterly cruise) cruises, will be subjected to statistical treatment using the Center ADP office and services. Center personnel will use the resulting relationships, derived from cluster analyses and other statistical treatment, to define sampling strata.

As sampling strata, defined on the basis of two or more sets of benthic cruise data, are developed, additional samples (replicates) collected from particular stations occupied during specific cruises will be sorted and identified and used to define the internal consistency of faunal and geological characteristics of a sampling strata. As stated in MACFC (1975a) this procedure should greatly reduce the number of stations required in future monitoring studies in the New York Bight apex and it should provide the data necessary to map within relatively more narrow confidence limits, the distribution and abundance of benthic macrofaunal assemblages in the Bight.

All data from the Bight apex will be considered in light of the variation noted in replicate samples collected at defined stations during the so-called "Reconnaissance Cruise" of 5-14 June, 1973. Bight-apex benthic data will also be compared with those data presently being developed for stations on the outer shelf, specifically at the EPA-designated interim alternate disposal sites.

B. SUBTASK: ABNORMALITIES IN FISH AND SHELLFISH WHICH MAY BE ASSOCIATED WITH OCEAN DUMPING

Recent studies by the Middle Atlantic Coastal Fisheries Center have disclosed significantly higher incidence and prevalences of "fin-rot" disease conditions in winter flounder from the apex of the New York Bight than from areas outside of the apex. These observations, although important in themselves, pose additional questions for which we propose to find answers. In addition, we have consistently observed so-called "black gill" disease in crustaceans from the apex. This observation also suggests further investigation.

B. 1) a. Fin-Rot Disease

Induction: Based on the higher prevalence of fin rot disease in winter flounder (Pseudopleuronectes americanus) from the New York Bight apex, it has been hypothesized that some biologic or abiologic factors within the apex initiate the disease. We propose to conduct field and laboratory studies to determine whether the degraded areas of the apex can induce fin rot disease in winter and summer flounder (Paralichthys dentatus).

Research Plan for FY 1976:

1. Entrapment studies with winter flounder in sewage sludge area

- a. Holding traps of appropriate size (5 x 4 x 2 feet) will be constructed for placement within the sewage sludge area of the New York Bight apex (coordinates provided by NOAA-AOML: 40°26.0'N, 73°47.5'W) and a control area on the south shore of eastern Long Island.
- b. Buoys provided by the MESA project office to locate submerged fish traps will be rigged for placement in the Bight apex and the control area.
- c. Long lines containing 2-3 cages with 5-10 winter flounder in each cage measuring no greater than 20 cm (2+ years) will be placed in the designated sludge area and control area for from 1-4 weeks during the summer, fall, and winter of FY 76.
- d. At the time of retrieval of the traps, the winter flounder will be examined for the presence of fin rot. Tissues from diseased fish will be fixed for histopathologic examination. The traps will be replenished with additional fish and returned to the selected sewage sludge site.
- e. Water temperature, salinity, and a bottom sediment samples will be obtained each time the traps are placed at the sewage sludge site.

B. 2) a. Fin rot incidence in summer flounder from Sandy Hook Bay and Great Bay, N. J.

1. Monthly trawl cruises to Sandy Hook Bay utilizing R/V Delaware II, R/V Xiphias, and R/V Rorqual will be conducted from July-November of FY/76 to determine the incidence of fin rot disease in summer flounder.
2. Monthly trawl cruises to Great Bay, N. J., utilizing charter vessels will be conducted from July-November of

FY/76 to determine if the incidence of fin rot disease in summer flounder.

3. Data will be examined statistically to determine if the incidence of fin rot disease in summer flounder (from July-November) is higher in Sandy Hook Bay than in Great Bay.
4. A trawl cruise utilizing the R/V Delaware II will be conducted during November offshore at 60 fathoms to determine fin rot disease prevalence in summer flounder which have summered in the New York Bight apex.

- B. 3) a. Progression and Contagion: It is not known conclusively whether lesions of flounder with fin rot disease ultimately resolve or progress causing the death of the animal or whether disease can be transmitted from fish to fish. We propose to conduct laboratory studies to determine disease progression and contagion.

Research Plan for FY 1976

1. Histologic and cytologic studies of normal and fin rot flounder epidermis

- a. Fin and somatic epidermis of two flounder species in which fin rot disease is prevalent (winter, summer flounder) and one in which the disease is very rarely observed (windowpane flounder, Scopthalmus aquosus) will be examined cytologically and histologically.
- b. Five to ten fish of each species of flounder will be sacrificed and tissues removed for histologic and cytologic study.
- c. The thickness and structure of the epidermis and the number of mucus cells will be determined employing stains such as H & E, PAS, and Mallory trichrome.
- d. Selected epidermal tissues will be examined with transmission and electron microscopy. The normal epidermis and the epidermis of fish with fin rot will be described.

B. 4) a. Fin rot disease progression in laboratory-held winter and summer flounder

1. Four large 4 x 4 foot, fibreglassed plywood aquaria will be constructed for holding winter and summer flounder in the laboratory.
2. Periodic collections of winter and summer flounder with acute fin rot disease will be made in Sandy Hook/Raritan Bay during the summer of FY 76.

3. Diseased fish (one fish/aquarium) will be placed in aquaria containing sand bottom and provided with running seawater.
4. All fish will be examined daily for disease progression and/or mortality and periodically photographed.
5. Selected fish tissues will be removed and fixed for histopathologic examination.

B. 5) a. Contagion in laboratory-held winter and summer flounder

1. Four apparently healthy and one fin rot diseased winter or summer flounders will be placed in a 4 x 4 aquarium with a sand bottom and provided with running seawater. Three other similar aquaria will contain 3 and 2, 2 and 3, and 1 and 4 healthy and disease (respectively) flounders.
2. All fish will be examined daily to determine if previously healthy flounders contract fin rot disease.
3. Selected fish tissues will be removed and fixed for histopathologic examination.

B. 6) a. Fin rot disease in pelagic fish from pound and fyke nets in Sandy Hook/Raritan Bay

1. Commercial landings of pelagic fishes will be examined for fin rot disease dockside at the Belford, N. J., Fisherman's Cooperative.
2. Appropriate subsamples of the commercial catch will be examined during the spring, summer, and fall season.
3. Fin rot disease prevalence will be collated by season, species, and trap location.

B. 7) a. Invertebrate Disease

In addition to fin rot in demersal finfish, a number of abnormalities have been observed in crustaceans of the New York Bight. Exoskeletal erosion in lobsters and shrimps has been observed and reported. More recently a syndrome known as "black gill" disease has been observed in crabs of the Bight apex. Because this may prove to be an important factor in crab mortalities, a study of the syndrome is warranted.

Research Plan for FY 1976:

1. Periodic cruises (to augment collections made to date) to obtain crabs (Cancer irroratus) will be made to predetermined sample locations in the New York Bight. Prevalences of black gill disease will be determined and

and histology of normal and diseased animals will be described. These observations should last for a period of at least one year.

2. Parasites and epibionts associated with black gill disease in selected crustacean species will be examined. Prevalence data and descriptions of fauna associated with black gill disease will be made.

C. SUBTASK: ENVIRONMENTALLY - INDUCED MUTAGENESIS IN MARINE FISH

Background: Some marine contaminants such as heavy metals and certain pesticides may be mutagenic. Recent work at the Milford laboratory of the Middle Atlantic Coastal Fisheries Center has shown that silver and cadmium have chromosome breaking and general radiomimetic effects on the chromosomes and cell division apparatus of the oyster. This was true with both chronic and acute exposures. Damage was still detectable at doses well below those which fail to have a lethal effect on the first stage larvae. Though only limited work has been done, it appears, on the basis of radiation research, that fish eggs are several orders more genetically sensitive than are eggs of invertebrates. Eggs of fish probably approach mammalian eggs in such sensitivity. Dominant lethal mutations induced in naked, unprotected pelagic fish eggs completing critical early cleavage divisions in a polluted environment could affect any spawning season's recruitment into the fisheries. Rarely should such eggs survive through the larval stages. Semi-dominant lethals could reduce vigor of the adult. Dominant lethal mutations are known to be accompanied by gross chromosome aberrations. Radiation and chemicals which break chromosomes very often induce a whole series of less specific effects on the chromosome apparatus of the dividing cells which lead to genetic disarray at the cellular level. In turn, simple cyto-toxic chemicals can cause disorderly distribution (and breakage too) of chromosomes, with genetic imbalance - often lethal - the result. It is difficult to suppose that such genetic aberrations would not reduce recruitment into the fisheries or produce an adverse effect on the vitality of individuals, resulting in greater mortality due to predation.

Working with fish eggs provided by the May 1974 Westward cruise, procedures were elaborated for studying the chromosomes and mitoses of fish embryos and early stage larvae from neuston and bongo net samples limited analysis of 17 sample stations in the New York Bight has shown that cyto-genetic abnormalities, similar to those that can be experimentally induced by recognized mutagens, do occur in eggs collected in the New York Bight. Furthermore, they occur at a very significant level. There is station variation. The full significance of this work to the fisheries, and its meaning in terms of the state of the marine environment can be determined only by further work. It seems that never before have the chromosomes and division apparatus been observed in blastodiscs of fish eggs directly out of the neuston. The Russian radio-ecologist Polikarpov has expounded on the importance of studies on the hypo-neuston. However, his group, the only other

one engaged in mutation studies on fish eggs, has used only experimentally spawned radionuclide-treated eggs.

General Research Plan: The longer-term objectives of this research are:

1. Determine whether there are more gross chromosomal aberrations (more indications of genetic damage) in fish eggs and early larvae collected from the heavily contaminated New York Bight apex than in eggs and early larvae collected from less contaminated ocean areas.
2. Determine experimentally which chromosomal aberrations are lethal to eggs and larvae of selected species; relate these to abnormalities found in samples collected in the New York Bight apex; and determine the impact of these abnormalities on fish populations.
3. Determine experimentally the ability of contaminant chemicals commonly found in the New York Bight apex to produce the chromosomal aberrations found in field samples from that area.

A research program of four years duration is considered necessary to provide information relevant to these objectives, with the first year's emphasis totally on objective (1). A longer narrative description of a four-year program is included as an appendix to this proposal.^{1/} Such a program would depend heavily on insights gained during the first year's study.

Research Plan for FY 1976:

1. Additional samples from the 1974 Westward cruise will be examined cytogenetically, emphasizing mackerel eggs and early larvae. Study of these samples will lead to establishment of an analytical methodology for this new area of research.
2. Samples taken in 1966 and 1967 during extensive synoptic egg and larval surveys conducted by the then Sandy Hook Marine Laboratory (now a component of this Center) will be examined cytogenetically concentrating on already identified eggs and early larvae of mackerel, summer flounder, and silver hake. Samples from transects nearest the apex will be compared with those from the transects remote from the apex.
3. An early spring 1976 cruise of 5 days will be carried out to obtain eggs and early larvae (emphasizing mackerel) for further comparison of apex levels of chromosomal aberrations with those from areas outside the apex.

^{1/}Appendix not included with TDP. See note in Section 27 -- Out Year Comments.

31. TASK OUTPUTS AND BENEFITS

A. SUBTASK: ANALYSIS OF EXISTING NEW YORK BIGHT APEX BENTHIC SAMPLES AND DATA

- A 1) a. A technical report concerned with the benthic macrofaunal species distribution and abundance for each set of data resulting from the workup of each of these quarterly cruises (three).
- 2) a. SYMAP presentations of sampling strata (as defined by cluster analyses, and similar statistical treatment and by two or more sets of cruise data).
- 3) a. Multivariate analyses of the macrofaunal data on a seasonal basis in relation to existing physical/chemical parameters as per programs used by Drs. Rozette and Saila.
- 4) a. SYMAP presentations of benthic macrofaunal data including numbers of individuals/station, number of taxa (>1.0 mm)/station, species diversity at given stations, and distribution patterns of dominant species.
- 5) a. A detailed comparison of data from all five quarterly cruises to determine seasonal variation in major and minor constituents of benthic assemblages in the Bight apex.

Trimester progress reports and technical data reports will be made on appropriately scheduled intervals and a final report will be available at the end of one year's research.

B. SUBTASK: ABNORMALITIES IN FISH AND SHELLFISH WHICH MAY BE ASSOCIATED WITH OCEAN DUMPING

- B. 1) a. Results of observations will be prepared for scientific publication within six months following completion of the study.
- 2) a. Three trimester reports will be submitted during the 12 month course of study.

C. SUBTASK: ENVIRONMENTALLY - INDUCED MUTAGENESIS IN MARINE FISH

- C. 1) a. Specific Products:
 1. A manuscript concerned with preliminary cytogenetic observations made on Westward samples will be completed early in FY 1976.
 2. Considering the number of variables to be considered (stage of egg development, species, categories and

degrees of abnormalities, season, etc.) an early determination of the statistical basis for sample examination must be made. We estimate that approximately 5000 blastodiscs (early larvae) can be examined and analyzed during the year. This means that careful selection must be made of samples to be studied.

3. Because this is a new area of cytogenetic research, scoring system, keys, and categories of anomalies must be developed for the kinds and severity of genetic damage. This work will serve also as a basis for all future experimental cytogenetic analyses.
4. Three trimester reports will be submitted each year.

The task is expected to satisfy the needs of the groups identified above by providing trimester reports three times each year, data reports consisting of machine read-outs accompanied by statements of how the data were gathered, and by scientific reports which will analyze and interpret the data.

32. IMPACT OF TASK AUGMENTATION

N/A

33. CRITERIA FOR TASK COMPLETION

34. BACK-UP DOCUMENTATION

A. Selected References

FRANKENBERG, D. AND A. S. LEIPER. 1975. Seasonal cycles in benthic communities of the Georgia continental shelf. Verbal presentation by A. S. Leiper at a symposium on ecology of marine benthic, May 9. Belle W. Baruch Institute for Marine Biology and Coastal Research University of South Carolina. B. C. Coull, convener.

Uncertainties of navigation by the methods used caused variability of results that could not accurately be assessed.

MIDDLE ATLANTIC COASTAL FISHERIES CENTER (MACFC). 1975a. MESA-NYB - funded biological research. Progress report July 1974 - February 1975. MACFC Informal Report 52, volumes 1-3, March 31. 74 pp, apps.

Summarizes MESA - funded biological research in the New York Bight from July 1974 - February 1975.

MACFC. 1975b. MESA-NYB funded biological research. Progress report March 1975 - June 1975. MACFC Informal Report 74, July 21. 48 pp, apps.

Summarizes MESA - funded biological research in the New York Bight from March - June 1975.

MACFC. 1975c. MESA interim alternate dump site narrative report. MACFC Informal Report 66, May 29. n.p.

Results of four major cruises to the proposed alternate dump site areas located about 60 nautical miles southeast of the transect from Rockaway Beach to Sandy Hook. Studies were made on benthos macroinvertebrates, heavy metals burden of sediments, particle size distribution of sediments, the winter rate of seabed oxygen consumption, and on selected bacteria.

MACFC. 1975d. Biological information submitted to MESA on July 3, 1975 for use in report to EPA on alternative dump sites in NYB (as revised July 21, 1975). MACFC Informal Report 72-A, July 21. 2 vols. 80 pp, apps.

A review of known damages to biota from ocean dumping, the endermis biota of the proposed alternate dump sites, and predictions of the effects of the cessation of dumping at the present sites and of beginning dumping at the proposed alternate dump sites.

McHUGH, V. L. 1972. Marine Fisheries of New York State. Fish. Bull. 70 (3): 585-510

The marine fisheries of New York have been declining since the early 1950's. The history of the fisheries is that effort has shifted constantly from one resource to another as the stocks of each have declined in turn.

NOAA, ENVIRONMENTAL RESEARCH LABORATORIES 1974a. Project development plan, MESA New York Bight Project. ERL, Boulder CO. August. 59 pp.

Describes procedures for acquiring, processing, storing and retrieving MESA data, and provided guidelines for NOAA MLC's cluding NMFS for the encouragement of MESA data.

YOUNG, J. S. AND J. B. PEARCE. 1975. Shell disease in crabs and lobsters from New York Bight. Marine Pollution Bulletin 6 (7): 101-105.

Crabs (Cancer irroratus) and lobsters (Homarus americanus) from the vicinity of dump sites... "most frequently showed skeletal erosions on the tips of the dactylopodites of the walking legs, on the ventral sides of the chelipeds, around areas of articulation where contaminated sediments could accumulate, and on parts of the exoskeleton that formed prolongahous or spines".

ZISKOWSKI, J. AND R. MURCHELANO. 1975. Fin erosion in winter flounder. Marine Pollution Bulletin 6 (2): 26-29.

The percentage of diseased winter flounder (Pseudopleuronectes

americanus) caught in 1973-74 in the New York Bight apex was 14.1 percent compared with 1.9 percent caught outside of the apex.

B. Significant Related Tasks

TDP MAC-002 Multispecies, Middle Atlantic
TDP MAC-005 Fishery Analysis, Middle Atlantic Sportfish
TDP MAC-006 Behavior of Fish Under Pollutant Stress
TDP MAC-007 Import of Environmental Change, Middle Atlantic
TDP MAC-008 Biochemical Modelling
TDP MAC-009 Microbiology and Chemistry
TDP MAC-014 Mutagenic Effects on Pollutants
TDP MAC-015 Physiological Effects on Pollutants
TDP MAC-016 Comparative Pathobiology
TDP MAC-017 Disease and Environmental Stress
TDP MAC-053 MARMAP SI -- Biological Assessment
TDP MAC-057 Nutrition of Mollusca
TDP MAC-060 Biological Assessment Sportfish
TDP MAC-063 Multispecies; Coastal Assessments
TDP MAC-064 Population Dynamics
TDP MAC-065 Larval Fish Studies -- AEC Reimbursable
TDP MAC-067 Primary Productivity and Pollutants
TDP MAC-069 Biological Effects of Dredging -- Navy Reimbursable
TDP MAC-070 Cell Disease in Mollusca -- FDS Reimbursable
TDP MAC-012 Contaminant Analysis - Rearing of Indicator Organisms
TDP MAC-013 Pollutants and Phyto-plankton Food-Chain Species
Continued MACFC study of seabed oxygen consumption
SURC study of heavy metals burdens in fish of the Middle Atlantic area
NEFC study entitled "Quantitative Distribution of Macrobenthic invertebrates off the Middle Atlantic Region - MESA reimbursable
Completion of study of foraminiferans of N. Y. Bight apex -- John Lee at CUNY
Continued study of resistance transfer phenomena of bacteria in N. Y. Bight apex -- L. Koditschek at Montclair State College
Baseline sediment analyses New York Bight - Adelphi U.
Marine bacteria and heavy metal findings - New York Bight - Columbia U.
Vibrio bacteria - New York Bight - Rutgers U.
Water mass transport and vertical circulation - New York Bight - Lamont-Doherty Geol. Observatory
Substrate monitoring program - New York Bight, AOML, Miami
Substrate variability program - New York Bight, AOML, Miami
Suspended sediments program - New York Bight, AOML, Miami
Sediments chemistry program - New York Bight, AOML, Miami
Substrate inventory program - New York Bight, AOML, Miami
Cyclesonde study - New York Bight, AOML, Miami
Boundary layer study - New York Bight, AOML, Miami
Radiosotope tracer study - New York Bight, AOML, Miami
Physical oceanography program - New York Bight, AOML, Miami
EPA environmental impact statement, proposed alternate dump sites
EPA monitoring efforts

U. S. Army Corps of Engineers
Exxon Research and Engineering

- C. Current task can be accomplished under existing legislation (see below) providing that the MESA Program in the New York Bight is adequately funded.
 - 1. Coastal Zone Management Act of 1972
 - 2. Marine Protection Research and Sanctuaries Act of 1972
- D. This TDP will not affect the environment and no Environmental Impact Statement is needed.

MESA-NEW YORK BIGHT BIOLOGICAL OCEANOGRAPHY
Task #871217 (MAC-055)

OBJECTIVES

1. To improve understanding of the impact of pollutants in the New York Bight on living marine resources, including commercially and recreationally important finfish and shellfish and the food chain organisms important to their life histories.

ABSTRACT

This is a study of the impact of pollutants on marine fisheries resources in waters that are flanked by the greatest density of human population in North America. Its three subtasks are: 1) ANALYSIS OF EXISTING NEW YORK BIGHT APEX BENTHIC SAMPLES AND DATA, concerned with natural and pollution-altered assemblages of benthic macroinvertebrates; 2) ABNORMALITIES IN FISH AND SHELLFISH ASSOCIATED WITH COASTAL POLLUTION, concerned with fin rot and black gill diseases of fish and crustaceans, respectively; and 3) ENVIRONMENTALLY-INDUCED MUTAGENESIS IN MARINE FISH, concerned with contaminants-linked chromosomal aberrations in ichthyoplankton.

AQUACULTURAL GENETICS
Task #B8E4P1 (MAC-056)

OBJECTIVES

1. Information on and demonstrations of progress by selective breeding - mostly oysters: other shellfish.
2. Information on and inbreeding demonstrations for industry application; also fundamental genetic information on results of inbreeding - mostly oysters: other shellfish.
3. Information on and demonstrations of the results of within species hybridization of oyster populations: other shellfish.
4. Information on and demonstration of and production of inter-species hybrids of oysters - including genera other than Crassostrea: other shellfish.
5. Studies in experimental mutation breeding as applicable to unique problems in shellfish breeding - mostly oysters: other shellfish.
6. Cryopreservation of male and female gametes of shellfish.
7. Conservation of important wild gene pools of shellfish for culture commercial use.

ABSTRACT

This task will develop the genetic information NMFS needs to answer specific questions industry poses concerning the development of their own hatchery strains of shellfish - strains which will enable them to realize a profit. This task will also enable NMFS to take the initiative in advising industry on certain aspects of breeding in advance of their request

for such. Special gene pools conserved in NMFS laboratories or under the Service's auspices would directly benefit industry. Industry and consumer alike would benefit from the improved management of wild shellfish beds that would be possible with increased knowledge of the genetic potential of different wild shellfish populations. The information gained can be applied by commercial shellfish growers, NMFS, and other federal and state agencies in managing and protecting economically valuable shellfish resources.

ASPECTS OF NUTRITIONAL REQUIREMENTS OF MOLLUSKS
Task #B8E4P2 (MAC-057)

OBJECTIVES

1. To maintain an extensive collection of pure strains of unicellular marine algal species on various types of growth medium.
2. To make available phytoplankton food source for "in-house" experimental and maintenance needs, as well as to investigators in commercial and academic aquaculture operations nationally and internationally.
3. To study various parameters of micro-algal culture that will provide information immediately useful to aquaculture that is now dependent on living food sources.
4. To develop a rigorous system for the culture of molluscan larvae that is suitable for nutritional investigation.
5. To evaluate nutritional factors needed for the support of larval growth using the rigorous culture system.

ABSTRACT

Commercial aquaculture operators uniformly agree that a high priority research emphasis must be placed on the problem of providing an economical, satisfactory nutritional support for animals being reared in aquaculture procedures. Assistance in problem solving, the introduction of innovative procedures, and basic research in phytoplankton foodchain organisms, as well as molluscan food utilization, are the overall supports all molluscan research in Experimental Biology Investigations by providing high quality algal food organisms in large volumes that allows research and maintenance of animals to take place.

AQUACULTURAL CONTROL OF MOLLUSCAN DISEASE
Task #88E4P3 (MAC-058)

OBJECTIVES

1. Develop and implement a research program for prevention, diagnosis, and control of disease in molluscan hatchery and nursery systems.
2. Develop and implement a system of inspection for routine diagnosis and identification of disease agents encountered in molluscan hatcheries.
3. Implement agreements and contracts for interdisciplinary research on the above in collaboration with universities, State, and Federal agencies both in the U. S. and abroad.

ABSTRACT

Disease is often the limiting factor to successful aquaculture. Research and development on the role of disease is needed so its affects can be predicted, prevented, minimized, or eliminated. Plans in this task call for 1) development and implementation of a research program for prevention, diagnosis, and control of disease, particularly in molluscan hatchery and nursery systems; 2) development and implementation of an inspection system for routine diagnosis and identification of disease agents encountered in molluscan hatcheries; 3) implementation of agreements and contracts for interdisciplinary research on 1 and 2 in collaboration with universities, State and Federal agencies. Research

methods are being devised to 1) monitor, isolate, identify, and culture the micropathogens present and characterize their pathologic effects; 2) determine mechanisms of micropathogen transmission, penetration, infectivity, and host specificity; 3) qualitatively and quantitatively test and measure micropathogen activity and host response using a variety of species and scientific disciplines.

SPAWNING AND REARING OF MOLLUSCS
Task #B8E4P4 (MAC-059)

OBJECTIVE

The objective of this task is to produce an integrated series of culture procedures which will allow commercial culturists to rear the bay scallop and the surf clam to market in sufficient quantity and at a price that will be economically feasible.

ABSTRACT

Standard methods available at Milford laboratory and in the literature which have proven successful for culturing the oyster will be used in attempts to develop hatchery culture methods for other bivalve species of known or potential commercial value. Because each species has certain unique requirements, these methods will be modified or new technical approaches developed. Attempts will be made in logical sequence (including gametogenesis, spawning the adults, rearing the larval stages, growing the post-set stage immediately after metamorphosis and, finally, growing the juveniles) to adapt proven techniques to the culture of new aquaculture candidates, modifying these techniques when necessary. Initially, the bay scallop and the surf clam will be considered for their potential as aquaculture candidates.

BIOLOGICAL ASSESSMENT -- SPORTFISH

Task #88F9P1 (MAC-060)

OBJECTIVES

1. Complete indepth analysis of coastal trawl data collected during 1968-72 from NEw York to Florida with special emphasis on recurrent group analysis.
2. Analyze biological materials to determine: age composition and rate of growth; sexual development, spawning season, and fecundity; and food and feeding habits of selected species.
3. Identify unit stocks of selected species by means of discriminant function analyses of morphometric and meristic variates.
4. Retrieve and analyze catalogued data for use in technical reports, scientific publications, and special problem areas.
5. Provide data requested by various user groups such as population and environmental analysts, NMFS research, industry, sportsmen, management, and regulatory activities.

ABSTRACT

Our basis biological knowledge of the life histories of many coastal fishes is inadequate for recommending immediate and sound national and international management. The purpose of this task is to provide the life history data base essential to determine recruitment, optimum levels of exploitation, and the impact of long-term natural fluctuations and man-induced change in the environment upon our fishery resources. In addition, these data will add in providing the scientific and technical base needed to properly manage our coastal fisheries and to encourage industrial initiatives.

NMFS TASK DEVELOPMENT PLAN

(See Detailed Instructions)

1. DATE PREPARED
7/30/75

(Submit five copies by Jan. 2)
TO: Director, National Marine Fisheries Service, ATTN: Fx5 National Oceanic and Atmospheric Administration Washington, D.C. 20235

FMC's - Submit a separate Task Development Plan for each task beginning, continuing, or ending in the current year, budget year, or budget year + 1. Reimbursable funds are not to be mingled with appropriated funds on any programmatic TDP; separate TDP's must be prepared. Submit one TDP itemizing the administrative support cost (Management Fund) for the FMC.

2. TDP NUMBER CAC-061-77-EI-R1		3. OBJECTIVE CODES A B C D				4. RANK BY TARGET BY + 1 INC.	
5. TASK NUMBER 8C201		6. TASK TITLE Behavior of Fishes under Temperature Stress - AEC Reimbursable					
7. ORGANIZATION CODE B6100		8. ORGANIZATION TITLE (Responsible for execution of this task) Ecosystems Investigations				9. PRINCIPAL LOCATION City: Highlands, State: NJ	

OBJECT CLASS <i>Lines 10-18. Enter all dollar values as thousands and tenths of thousands. Lines 21-22. Enter as man-years and tenths of man-years.</i>	LINE NO.	CURRENT YEAR FY 19 76		BUDGET YEAR FY 19		BUDGET YEAR + 1 FY 19	
		TARGET ALLOWANCE A	INCREASE B	TARGET ALLOWANCE C	INCREASE D	TARGET ALLOWANCE E	INCREASE F
10. Total Direct Labor	15	16.3					
11. Travel	19	2.5					
12. Rents, Communications, Utilities	21	1.1					
13. Contracts (To be let)	51	1.0					
14. Grants (Funds obligated)	52						
15. Supplies	53	10.4					
16. Capital Equipment	54						
17. Other (All other obligations)		2.9					
18. Total Direct Funds (Add lines 10 through 17 above.)		34.2					
19. Positions, Full-time permanent (Number applicable to this Task. Also, complete NOAA Form 32-14C.)		0					
20. Positions, Other (Number applicable to this Task.)		1					
21. Man-years, Permanent		0.9					
22. Man-years, Other		0.1					
23. Reimbursable Support (Reimbursable agreements only)		9.4					

REMARKS

24. OFFICIAL PREPARING REPORT (Signature)
John B. Pearce
John B. Pearce

25. FMC DIRECTOR OR DESIGNATED REPRESENTATIVE (Sig.)
Carl J. Sundermann

NMFS TASK DEVELOPMENT PLAN

26. ACTIVITY, EVENT, AND MILESTONE SCHEDULE

TDP NUMBER
MAC-061-77-EI-R-1

NUMBER EACH ACTIVITY, EVENT,
OR MILESTONE

PLANNING PERIOD - Indicate by entering an "X" at the beginning and completion of subtask or selected operational activities that collectively define the task for the 7 year planning period. Connect "X's" with a solid bar. "Events" and "Milestones" occur at specific points in time. Indicate these significant achievements by placing an "X" in a single column.

IDENTIFY BY ENTERING 'A' FOR ACTIVITY, 'E' FOR EVENT, OR 'M' FOR MILESTONE.

NARRATIVE (Brief descriptive phrase of activity, event, or milestone)	CY		BY		BUDGET YEAR									
					+1		+2		+3		+4		+5	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
All activities, events and milestones are directed toward determining the impact of environmental change in the Middle Atlantic region: NMFS Goal IV, Subgoal A; Objective 9.														
Thermal stress effects on established social patterns of mullet.	X	X												
Thermal stress effects on mullet feeding.	X	X	X											
Social, schooling and feeding responses of juvenile bluefish as related to visual and olfactory cues.	X	X	X											
Thermal stress effects on feeding and activity of adult tautog.		X	X	X										
Effects of temperature on activity, feeding and social behavior of cunner.		X	X	X	X									
(Field) Normal life habits and environmental requirements of juvenile winter flounder, <u>Pseudopleuronectes americanus</u> , juvenile tautog, <u>Tautoga onitis</u> , and juvenile cunner, <u>Tautogolabrus adspersus</u> .	X	X	X	X										
Establishment of standardized techniques for behavioral investigations on contaminant stress.				X										
Publication: The Effect of Temperature on the Behavior of Marine Fishes: A Comparison among Atlantic mackerel, <u>Scomber scombrus</u> , Bluefish, <u>Pomatomus saltatrix</u> , and Tautog, <u>Tautoga onitis</u> . (supported in part by these funds)	X													

BUDGET YEAR COMMENTS

(Check appropriate boxes and enter applicable percentage.)
(Increases usually come from programming within your FMC.)

- a. Continued at same level
- b. Increase of ___% *
- c. Reduction of ___%
- d. Termination

"X"
APPROPRIATE
COLUMN

REMARKS

NMFS TASK DEVELOPMENT PLAN
28. FULL-TIME PERMANENT POSITIONS

3 | 9
TDP NUMBER
MAC-061-77-EI-R-1

Reference NOAA Form 32-14A, Item 19. Identify all full-time permanent positions related to this Task for the budget year and all positions requested for budget year + 1 increases. Do not include support personnel; they should appear in the appropriate support Task Development Plan.

POSITION TITLE	GS LEVEL	NAME OF INCUMBENT <i>(If no Incumbent, enter "Vacant")</i>	% OF TIME SPENT ON THIS TASK

CONTINUE on plain 8x10 1/2 paper. Identify "Page of Pages" and "TDP Number" in upper right corner. Comment on each of the following items, identifying by number. If item is not applicable, so indicate by entering "NA":

STATEMENT OF NEED

33. CRITERIA FOR TASK COMPLETION

ACTIVITY PLAN

TASK OUTPUTS AND BENEFITS

34. BACK-UP DOCUMENTATION

IMPACT OF TASK AUGMENTATION

- a. Detail Documentation *(Provide one sentence description.)*
- b. Related tasks and research presently being conducted.
- c. Indicate the Congressional legislative requirements.
- d. Indicate the Environmental Impact Statement (EIS) requirements.

Current Year

Budget Year

Budget Year + 1

STATEMENT OF NEED

At a time when the activities of man continue to impinge on and disrupt the natural homeostasis of the marine ecosystem, it is essential that the level of confidence in assessing and predicting the effects of such activities be improved. It is only through such efforts that rational planning of action for preserving the environment may be implemented. One approach to the problem is to study the response capabilities of selected marine organisms to specific contaminant stresses.

In recent years the need for more comprehensive measures of pollutant effects on aquatic organisms has stimulated the development of methodology in a variety of disciplines including animal behavior.

The most important advantage of using behavior as a measure of stress is that the results often lend themselves to direct interpretation regarding environmental quality as related to the possible consequences at both population and ecosystem levels. The complex of biochemical and physiological responses which are integrated by the animal internally are manifested in directly observable acts. These behaviors reflect not only the internal state but also how an animal responds to and consequently may survive, a particular stress situation. By using the normal behaviors of the animals as baseline measures, the effect of given levels of potentially detrimental stress can be determined and the results extrapolated to predict the impact on or degree of change within a given natural community.

There is a critical need for providing information concerning the life habits, behaviors, and habitat and feeding requirements of marine species residing in environments which are potentially susceptible to man-induced change. Environmental modeling and EIS ultimately require information of this sort since realistic models or predictions cannot be developed if there is insufficient data from the natural environment. In addition, there is considerable interest in developing behavioral baseline measures of normality for species used as indicator organisms in contaminant testing by a variety of industrial, state and federal agencies (EPA, ERDA).

LABORATORY ACTIVITIES PLAN

Laboratory studies conducted under controlled conditions will center on the measurement of normal behavioral responses of selected marine fish species, including juvenile mullet, cunner, and adult tautog, and how these behaviors are affected by selected contaminant stresses, currently temperature.

The focal point of the laboratory studies in which mullet comprise the test species is a 180-liter tank, constructed from non-reflective glass which is surrounded by 4 adjacent tanks of similar size. This entire experimental system is equipped with controlled light and temperature system as well as a specialized filtration system.

In the experimental procedure, a single fish located in the central tank is allowed visual contact with a group of fish in one of the adjacent tanks although it is physically separated from them and hence is deprived of all other sensory stimuli. The initial phase of the study will establish normal behavior under preferred conditions of light, temperature and salinity. Quantitative measurements are made on a single fish as it responds to its species mates or to a different species group in an adjacent tank. Data of this kind afford specific baseline information on the strength of the motivation of the fish to aggregate during short and long-term exposures and can be readily compared with any deviations in the normal schooling responses occurring during periods of induced stress.

Feeding behavior of mullet is also tested in the same experimental apparatus and quantitative measurements are made on the readiness to feed and on long term feeding motivation of test fish, which again are receiving only visual cues from their species mates. Through this system of testing, an analysis and quantification of feeding behavior will provide the capability to detect changes in feeding motivation caused by temperature.

Studies in which cunner and adult tautog are the test species will be conducted in specialized experimental systems each equipped with controlled light and temperature and filtration systems, and in which the animal's substrate and habitat requirements are approximated.

The initial phase of each study will establish for cunner and adult tautog under conditions corresponding to seasonal fluctuations of temperature, salinity, light, normal patterns of territoriality, activity, feeding and social interactions. These behaviors will be quantified for comparison with behaviors observed during periods of contaminant stress. The data, analyzed daily by statistical methods developed specifically for the program, will allow day-to-day evaluation of experimental results. Contaminant levels will be monitored regularly.

In conjunction with ongoing laboratory research, field studies focus on cunner, tautog, and winter flounder to describe homesite, shelter requirements and distribution patterns in relation to various parameters such as time of day, season, tidal and thermal changes, maturation and growth, and substrate. Food habits and forage species' abundance will be defined to indicate diversity shifts in feeding preference, changes with age and interspecific feeding relationships. Measurements of the habits of these species are gathered primarily by means of direct underwater observation as well as by ultrasonic tracking techniques and examination of digestive tract contents.

FY 75-76 - Normal social, schooling and feeding response of juvenile bluefish will be measured as related to olfactory and visual cues. Effects of temperature stress on established social and feeding patterns of mullet will be determined.

TASK OUTPUTS AND BENEFITS

The primary output of this Task will be the utilization of established normal life habits and behaviors of representative marine fish species to determine the effects of selected contaminant stress (temperature). This information will result in an increase in the ability to assess and predict potential effects of contaminants within particular ecosystems and aid in developing ecosystem guidelines to be used in all types of ecological modeling efforts.

The need for such guidelines and the important role the Behavior Investigation has played in pioneering this type of effort are exemplified by the following: 1) a workshop on "Behavioral Measures of Environmental Stress" sponsored by the Marine Technology Society; and 2) a forthcoming session, "The Use of Behavior to Measure Stress in the Marine Environment", at the Third International Estuarine Research Federation Conference. Both of these projects, organized, chaired and edited by B.L. Olla, Senior Investigator of this Task, illustrate the national importance of this Task's efforts. The results of such projects receive wide distribution and are important to both private concerns and government agencies engaged in assessing water quality and setting permissible limits.

The inadequacies and limitations of standard test techniques which are being applied on a world-wide basis, have necessitated more comprehensive identification of organismic response to contaminants. The development, by this Task, of methodologies which are generic in nature and can be used in the laboratory or field, or applied in and of themselves to predicting the effects of stress, are contributing significantly to the improvement of standard testing procedures. The actual data gathered by this Task can be used by a variety of concerned groups including private industrial firms, state and various government agencies (EPA, CEQ, ERDA).

IMPACT OF TASK AUGMENTATION

No potential increases are anticipated.

CRITERIA FOR TASK COMPLETION

BACK-UP DOCUMENTATION

Coutant, C.C. 1970. Biological aspects of thermal pollution. I. Entrainment and discharge canal effects. Publ. No. 383, Ecol. Sci. Div. Oak Ridge Nat. Lab: 341-381.
This article reviews and evaluates the effects of thermal discharges on biological processes.

- Krenkel, P.A. and F.L. Parker (ed.). 1969. Biological Aspects of Thermal Pollution; Proceedings. Vanderbilt University Press, Nashville, Tenn. 407 p.
This paper reviews the various sources of thermal pollution and the resulting problems in the environment.
- Lyman, H. 1974. Successful Bluefishing. International Marine Publishing Co., Camden, Maine. 112p.
The findings of the studies on bluefish feeding and activity are used in a book of interest to sportfishermen.
- Olla, B.L. 1971. I. The effect of temperature on the activity of adult Atlantic mackerel, Scomber scombrus. AEC Report (49-7) 3045: 1971.
This report summarizes the effects of rapid continual increases of temperature to lethal levels as well as several gradual step increases.
- Olla, B.L. 1972. II. The effect of temperature on the activity of adult Atlantic mackerel, Scomber scombrus. AEC Report (49-7) 3045: 1972.
This report summarizes the effects of high temperature acclimation followed by two gradual step increases to upper incipient lethal levels and the resultant changes in feeding levels.
- Olla, B.L. 1973. III. The effect of temperature on the activity and feeding of adult Atlantic mackerel, Scomber scombrus. Some factors to be considered in the conduct of finfish bioassays. AEC Report (49-7) 3045.
This study reports (1) the effects of identical temperature increases within preferred ranges on activity and feeding patterns of mackerel at different seasons and (2) summarizes the experimental study of behavior in light of the need for changes in bioassay methodology.
- Olla, B.L. 1974. (1) Comparative studies on the responses of young tautog, Tautoga onitis and juvenile bluefish, Pomatomus saltatrix to increasing temperatures. (2) The effect of temperature on fish-to-fish attraction in an inshore schooling species, striped mullet, Mugil cephalus. (3) The activity, habitat preference, home range and feeding in the cunner, Tautogolabrus adspersus. AEC Report (49-7) 3045.
This study reports (1) the differences in response capability of representative pelagic and demersal species types; (2) the reduction in fish-to-fish response at high sublethal temperatures; (3) the normal environmental requirements of an inshore demersal species, cunner.
- Olla, B.L. (ed.). 1975. Behavioral measures of environmental stress. p. 1-31. In: G.V. Cox (Chairman). Proceedings of a Workshop on Marine Bioassays. Marine Technology Society, Washington, D.C.
This chapter details the need for and use of behavioral measures in bioassay tests on marine organisms.
- Olla, B.L., A.J. Bejda and A.D. Martin. 1974. Daily activity, movements, feeding and seasonal occurrence in the tautog, Tautoga onitis. Fish. Bull., U.S. 72: 27-35.
This paper describes the life habits and environmental requirements, derived from in situ observations, of the tautog.

Olla, B.L., A.J. Bejda and A.D. Martin. 1975. Activity, movements and feeding behavior of the cunner, Tautogolabrus adspersus, and comparison of food habits with the coresident tautog, Tautoga onitis. Fish. Bull., U.S. In press.

This paper describes the life habits and environmental requirements of cunner and feeding interrelationship with tautog.

Olla, B.L., H.M. Katz and A.L. Studholme. 1970. Prey capture and feeding motivation in the bluefish, Pomatomus saltatrix. Copeia 1970: 360-362. This study describes the different phases of the feeding response and the effect of prey size on feeding motivation.

Olla, B.L. and C. Samet. 1974. Fish-to-fish attraction and the facilitation of feeding behavior as mediated by visual stimuli in striped mullet, Mugil cephalus. J. Fish. Res. Board Can. 31: 1621-1630.

This paper describes the role of vision in social attraction and feeding behavior of striped mullet.

Olla, B.L. and C. Samet. 1975. Behavior of marine organisms as a measure of petroleum contamination. p. 437-450. In: Proceedings of Estuarine Research Federation Outer Continental Shelf Conference and Workshop on Marine Environmental Implications of Offshore Oil and Gas Development in the Baltimore Canyon Region of the Mid-Atlantic Coast. Dec. 2-4, 1974; College Park, Maryland.

This paper reviews important behavioral patterns in variety of marine organisms and discusses how these behaviors can be used in assessing pollution effects.

Olla, B.L., C.E. Samet, and A.L. Studholme. 1972. Activity and feeding behavior of the summer flounder (Paralichthys dentatus) under controlled laboratory conditions. Fish. Bull., U.S. 70: 1127-1136.

This paper describes activity cycles, feeding and swimming patterns of adult flounder under controlled laboratory conditions.

Olla, B.L. and A.L. Studholme. 1971. The effect of temperature on the activity of bluefish, Pomatomus saltatrix L. Biol. Bull. 141: 337-349. This paper describes the effects of thermal stress on activity, feeding and schooling in bluefish.

Olla, B.L. and A.L. Studholme. 1972. Daily and seasonal rhythms of activity in the bluefish (Pomatomus saltatrix). In: H.E. Winn and B.L. Olla (eds.). Behavior of Marine Animals: Current Perspectives in Research. Vol. 2, p. 305-325. Plenum Press, New York.

This paper describes the normal daily and seasonal activity, feeding and schooling behavior of bluefish under controlled laboratory conditions.

- Olla, B.L. and A.L. Studholme. 1975. The effect of temperature on the behavior of young tautog, Tautoga onitis (L.). Proceedings of the Ninth European Symposium on Marine Biology. pp. 75-93.
This paper describes changes in activity, territoriality, feeding and shelter - dependence of young tautog at elevated, sublethal temperature.
- Olla, B.L., A.L. Studholme, A.J. Bejda, C. Samet, and A.D. Martin. 1975. The effect of temperature on the behavior of marine fishes: A comparison among Atlantic mackerel, Scomber scombrus, bluefish, Pomatomus saltatrix, and tautog, Tautoga onitis. In: Proceedings of IAEA Symposium on the Combined Effects on the Environment of Radioactive, Chemical and Thermal Releases from the Nuclear Industry, Stockholm, Sweden, June 2-6, 1975. This paper compares the effects of thermal stress between pelagic and demersal species and points out the importance of understanding the life habits of each species when predicting pollution effects.
- Olla, B.L., R. Wicklund and S. Wilk. 1969. Behavior of winter flounder in a natural habitat. Trans. Amer. Fish. Soc. 98: 717-720.
This study describes field observations of winter flounder activity and feeding at different times of the day and at different ambient temperatures.
- Parker, F.L. and P.A. Krenkel. 1970. Physical and engineering aspects of thermal pollution. CRC Press, Cleveland, Ohio.
This paper reports specific demands on aquatic environments due to the increased cooling water requirements for both thermonuclear and fossil-fueled steam electric power plants.
- Ricciuti, E.R. 1973. Killers of the Seas. Walker Inc. N.Y. 308 p.
The information on bluefish feeding behavior and prey-size discrimination is used in this book written for the general public.
- Sosin, M. 1973. How long can the bluefish last? pp. 66-70. In: Sportfishing 9 (1), Yachting Publishing Corp., New York.
This article uses the research results of this Task in a popularized report on bluefish life habits.
- Sprague, J.B. 1971. Measurement of pollutant toxicity to fish. III. Sublethal effect and "safe" concentrations. Water Research 1971. 5: 245-266.
This paper points up need for change in bioassay methodology particularly with respect to incorporating behavioral measures.
- Thermal pollution of water. Panel discussion, Fourteenth Annual Conservation Conference, National Wildlife Federation, Washington, D.C., December 1967. This paper is an analysis of problems imposed upon different environmental communities from effects of thermal additions.
- U.S. Atomic Energy Commission. Nuclear reactors built, being built or planned in the United States as of June 30, 1968.
This study reports the status of thermonuclear power plants, both established and anticipated.

BEHAVIORAL MEASURES OF ENVIRONMENTAL STRESS IN MARINE FISHES:
FIELD AND LABORATORY STUDIES
Task #R8C201 (MAC-061)

OBJECTIVES

1. Determine normal patterns of behavior in the field and laboratory as well as life habits of marine fish in order to assess the effects of thermal stress on selected species.

2. Report these results to the scientific community so that the data can be used by various government agencies and scientists interested in the impact of thermal stress on living resources.

ABSTRACT

The proposed investigations will center principally on studying the behavior and life habits of selected marine fish species in the field and laboratory to use in measuring the effects of sublethal thermal stress. The information gathered from the field studies on the life habits and environmental requirements of various species will form the basis for subsequent laboratory studies. The laboratory studies will concentrate on measuring thermal stress effects on behaviors such as agonistic responses, feeding, schooling, and activity in cunner, juvenile bluefish and mullet.

MARMAP II -- MULTISPECIES, COASTAL ASSESSMENT

(No Task # Assigned) (MAC-063)

OBJECTIVES (FY 1977 INCREASE)

1. To coordinate and develop a cooperative State-Federal estuarine sampling program for groundfish.
2. To provide quantitative data to public officials in report from delineating the role and importances of estuaries to offshore fishery stocks.
3. Provide supplemental data to populations dynamics unit for added precision of population estimates.

ABSTRACT (FY 1977 INCREASE)

The role and contribution of estuaries as nursery areas to the maintenance of marine fish stocks is of primary interest to the entire fishing community. We plan to contract states to provide larval and groundfish survey information from the major Middle Atlantic estuaries. These data will be used to interpret more precisely the significance of changes to fish stocks appearing in offshore waters.

MARMAP FA -- POPULATION DYNAMICS

(No Task # Assigned) (MAC#064)

OBJECTIVES (FY 1977 INCREASE)

The proposed project will allow development of a statistical-biometrics analysis unit to determine impacts on exploited and developing fisheries of the Middle Atlantic area. Computing isopleth yields and isopleth functions for allocation decisions will bear directly on the demands for information relating to extended jurisdiction. Exploration for energy reserves below shelf waters also will increase demands in responding to impacts of such operations on living marine resources.

ABSTRACT (FY 1977 INCREASE)

The population dynamics task unit will incorporate data bank and historical information for providing management advice to fishery industries, State and international groups charged with conservation and allocation of renewable marine resources. Cruise survey landing data and biological data on recruitment and mortality are used to determine status of stocks and further developed into yield estimates. A new approach will be to obtain for a mixed fishery needed for a functional exploitation policy.

ABSTRACT (FY 1978 INCREASE)

An increase of 225K for FY 78 would allow staffing for maintaining and analyzing fishery data for some 15 of the principal species which would include aspects of recruitment, mortality, growth parameters, estimating MSY's and upgrading estimates of commercial and recreational effort. Back-up would include development of an aging subgroup for principal species. Development of analytical techniques for mixed fisheries problems of international involvement is required as is increased feedback from results of estuarine surveys. Anticipated staffing would include: aging (2), computer applications (2), biometrics (2), technical aides (2).

NMFS TASK DEVELOPMENT PLAN

(See Detailed Instructions)

1. DATE PREPARED

July 30, 1975

(Submit five copies by Jan. 2)

TO: Director, National Marine Fisheries Service, ATTN: Fx5 National Oceanic and Atmospheric Administration Washington, D.C. 20235

FMC's - Submit a separate Task Development Plan for each task beginning, continuing, or ending in the current year, budget year, or budget year + 1. Reimbursable funds are not to be mingled with appropriated funds on any programmatic TDP; separate TDP's must be prepared. Submit one TDP itemizing the administrative support cost (Management Fund) for the FMC.

2. TDP NUMBER		3. OBJECTIVE CODES				4. RANK	
MAC-065-77-SI-R-1		A	B	C	D	BY TARGET	BY + 1 INC.
5. TASK NUMBER		6. TASK TITLE					
38A203		MARMAP SI: Larval Fish Studies - AEC Reimbursable					
7. ORGANIZATION CODE		8. ORGANIZATION TITLE (Responsible for execution of this task)				9. PRINCIPAL LOCATION	
FB6200		Resource Assessment Investigations				City: Highlands, State: N J	

OBJECT CLASS <small>Lines 10-18. Enter all dollar values as thousands and tenths of thousands. Lines 21-22. Enter as man-years and tenths of man-years.</small>	LINE NO.	CURRENT YEAR FY 19 <u>76</u>		BUDGET YEAR FY 19 <u> </u>		BUDGET YEAR + 1 FY 19 <u> </u>	
		TARGET ALLOWANCE A	INCREASE B	TARGET ALLOWANCE C	INCREASE D	TARGET ALLOWANCE E	INCREASE F
10. Total Direct Labor	15	65.2					
11. Travel	19	10.5					
12. Rents, Communications, Utilities	21	4.6					
13. Contracts (To be let)	51						
14. Grants (Funds obligated)	52	36.1					
15. Supplies	53	20.0					
16. Capital Equipment	54						
17. Other (All other obligations)		5.9					
18. Total Direct Funds (Add lines 10 through 17 above.)		142.3					
19. Positions, Full-time permanent (Number applicable to this Task. Also, complete NOAA Form 32-14C.)		0					
20. Positions, Other (Number applicable to this Task.)		4					
21. Man-years, Permanent		2.0					
22. Man-years, Other		4.0					
23. Reimbursable Support (Reimbursable agreements only)		37.8					

REMARKS

24. OFFICIAL PREPARING REPORT (Signature) <i>Arthur S. Merrill</i>	25. FMC DIRECTOR OR DESIGNATED REPRESENTATIVE (Sig.) Carl J. Sindermann
-----------------------------------------------------------------------	----------------------------------------------------------------------------

MARMAP SI -- LARVAL FISH STUDIES (ERDA REIMBURSABLE)

Task #B8A203 (MAC-065)

OBJECTIVES

1. Publish an atlas of historical ichthyoplankton data from an extensive survey of the Middle Atlantic Bight.
2. Provide detailed information and analysis on the vertical-diel distribution of eggs and larvae of selected species of fish from cruises conducted by the Center.
3. Conduct a series of cruises to investigate the seasonal, vertical and onshore-offshore distribution of ichthyoplankton in the New York Bight.

ABSTRACT

As part of the Energy Research and Development Administration's need to investigate siting of nuclear power plants, Brookhaven National Laboratory is studying processes on the continental shelf of the east coast of the United States. BNL has mounted an extensive program studying the physical and biological oceanography of the shelf, concentrating in the New York Bight. Basic questions about the dynamics of the area are being addressed. As a result of several meetings with BNL personnel and their collaborators, the Center has developed a program aimed at augmenting these investigations and enhancing the Center's ichthyoplankton investigations.

NMFS TASK DEVELOPMENT PLAN

(See Detailed Instructions)

1. DATE PREPARED

July 1975

(Submit five copies by Jan. 2)

TO: Director, National Marine Fisheries Service, ATTN: Fx5 National Oceanic and Atmospheric Administration Washington, D.C. 20235

FMC's - Submit a separate Task Development Plan for each task beginning, continuing, or ending in the current year, budget year, or budget year + 1. Reimbursable funds are not to be mingled with appropriated funds on any programmatic TDP; separate TDP's must be prepared. Submit one TDP itemizing the administrative support cost (Management Fund) for the FMC.

TDP NUMBER	3. OBJECTIVE CODES				4. RANK	
	A	B	C	D	BY TARGET	BY + 1 INC.
AC-067-77-EI-A-1	1	B	13	14		

TASK NUMBER	6. TASK TITLE
88C2Q1	Primary Productivity and its Relationship to Pollution and Coastal Fisheries

ORGANIZATION CODE	8. ORGANIZATION TITLE (Responsible for execution of this task)	9. PRINCIPAL LOCATION	
FB6100	Ecosystems Investigations	City Sandy Hook	State N.J.

OBJECT CLASS <small>Lines 10-18. Enter all dollar values as thousands and tenths of thousands. Lines 21-22. Enter as man-years and tenths of man-years.</small>	COOP. LINE	CURRENT YEAR FY 19__		BUDGET YEAR FY 19__		BUDGET YEAR + 1 FY 19__	
		TARGET ALLOWANCE	INCREASE	TARGET ALLOWANCE	INCREASE	TARGET ALLOWANCE	INCREASE
		A	B	C	D	E	F
10. Total Direct Labor	15						
11. Travel	19						
12. Rents, Communications, Utilities	21						
13. Contracts (To be let)	51 52						
14. Grants (Funds obligated)	58						
15. Supplies	53						
16. Capital Equipment	54						
17. Other (All other obligations)							
18. Total Direct Funds <small>(Add lines 10 through 17 above.)</small>							
19. Positions, Full-time permanent <small>(Number applicable to this Task. Also, complete NOAA Form 32-14C.)</small>							
20. Positions, Other <small>(Number applicable to this Task.)</small>							
21. Man-years, Permanent							
22. Man-years, Other							
23. Reimbursable Support <small>(Reimbursable agreements only)</small>							

REMARKS

24. OFFICIAL PREPARING REPORT (Signature)	25. FMC DIRECTOR OR DESIGNATED REPRESENTATIVE (Sig.)
-------------------------------------------	------------------------------------------------------

NMFS TASK DEVELOPMENT PLAN

26. ACTIVITY, EVENT, AND MILESTONE SCHEDULE

TDP NUMBER
MAC-067-77-EI-A-1

A, E, OR M	NARRATIVE (Brief descriptive phrase of activity, event, or milestone)	CY		BY		BUDGET YEAR									
						+1		+2		+3		+4		+5	
		1	2	1	2	1	2	1	2	1	2	1	2	1	2
		A	B	C	D	E	F	G	H	I	J	K	L	M	N
A	Work up Raritan Bay - phytoplankton	x	x												
E	SYMAP's - Raritan Bay - phytoplankton	x	x												
M	Report - Raritan Bay - phytoplankton		x												
A	Sample design - Lower Hudson Estuary - carbon cycle	x													
A	Procure and test - Lower Hudson Estuary - carbon cycle	x													
A	Sampling - Lower Hudson Estuary - carbon cycle		x	x	x										
A	Work up - Lower Hudson - carbon cycle		x	x	x	x									
E	SYMAP's - Lower Hudson - carbon cycle					x									
M	Report - Lower Hudson - carbon cycle						x								
A	Work up - seabed O ₂ consumpt - Apex	x													
E	SYMAP's - seabed O ₂ consumpt. - Apex	x													
M	Report - seabed O ₂ consumpt. - Apex	x	x												
A	Sample seabed oxygen consumption - NYBA, Hudson Valley	x	x												
A	Work up - seabed O ₂ consumpt. - Hudson Valley	x	x	x											
M	Report - seabed O ₂ consumpt. - Valley, adjacent Shelf			x											
A	Monitor - seabed O ₂ consumpt. - Apex	x	x	x	x	x		x	x			x		x	
A	Work up - seabed O ₂ consumpt. - Apex Monitor	x	x	x	x	x		x	x			x		x	
M	Report - seabed O ₂ consumpt. - Apex Monitor						x								x
A	Sample - seabed O ₂ consumpt. - Raritan, Lower Hudson			x	x	x									
A	Workup - seabed O ₂ consumpt. - Raritan, Lower Hudson			x	x	x	x								
E	SYMAP's - seabed O ₂ consumpt. - Raritan, Lower Hudson					x	x								
M	Report - seabed O ₂ consumpt. - Raritan, Lower Hudson						x								
A	Sample - seabed O ₂ consumpt. - Greater N.Y. Bight			x	x										
A	Work up - seabed O ₂ consumpt. - Greater N.Y. Bight				x	x									
E	SYMAP's - seabed O ₂ consumpt. - Greater N.Y. Bight					x									
M	Report - seabed O ₂ consumpt. - Greater N.Y. Bight						x								

7. OUT YEAR COMMENTS
(Check appropriate boxes and enter applicable percentage.)
*Increases usually come from reprogramming within your FMC.)

- a. Continued at same level
- b. Increase of ___% *
- c. Reduction of ___%
- d. Termination

"X"
APPROPRIATE
COLUMN

REMARKS

NMFS SUBTASK PLAN
26. ACTIVITY SCHEDULE AND EVENTS

MAC-067-77-IE-A-01

NUMBER EACH ACTIVITY OR EVENT. PLANNING PERIOD Indicate by entering an "x" the beginning and completion of selected operational activities that collectively define the subtask for the 18 month planning period. Connect "x's" with a solid bar. "Events" occur at specific points in time. Indicate these significant achievements by placing an "x" in a single column.

IDENTIFY BY ENTERING "A" FOR ACTIVITY OR "E" FOR EVENT.

NARRATIVE (Brief descriptive phrase of activity or event)	Fiscal Year 1975												Fiscal Year 1976					
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6
Ability of spp. to utilize variety of inorganic and organic N, P and C compounds; work completed.	X																	
Manuscript in draft, final form.																		X
Salinity tolerance studies; work completed.	X																	
Manuscript in draft, final draft.												X						
Importance of variety of inorganic and organic N and P compounds in spp. growth stimulation.	X											X						
Vitamin requirements; critical levels of vitamin B ₁₂ .	X											X						
Temperature effects on spp. growth.	X											X						
Optimal photoperiod studies.	X											X						
Optimal light intensity studies.	X											X						
First draft of paper concerned with numbers 5, 6, 7.																		X
Effects of metals on growth and tolerance to variety of metals; initial work completed, to be resumed.																X		
Effects of external metabolites on bloom development and species dominance; dependent on equipment acquisition.												X						
Concentrations of various critical nutrients required in blooms, continuous culture facilities required; work dependent upon equipment acquisition.												X						
Phytoplankton succession/nutrient water chemistry survey. (In cooperation with N. J. Department of Environmental Protection).	X																	
Manuscript preparation, previous studies (fish disease).	X																	

NMFS TASK DEVELOPMENT PLAN
28. FULL-TIME PERMANENT POSITIONS

TDP NUMBER

MAC-067-77-EI-A-1

Reference NOAA Form 32-14A, Item 19. Identify all full-time permanent positions related to this Task for the budget year and all positions requested for budget year + 1 increases. Do not include support personnel; they should appear in the appropriate support Task Development Plan.

POSITION TITLE	GS LEVEL	NAME OF INCUMBENT <i>(If no incumbent, enter "Vacant")</i>	% OF TIME SPENT ON THIS TASK
Fishery Biologist	12/4	Thomas, James	100%
Fishery Biologist (Research)	12/2	Mahoney, John	100%
Botanist	7/4	Evans, Christine	100%
Fishery Biologist (General)	9/2	O'Reilly, John	100%
Oceanographer	9/5	Phoel, William - academic leave	
Fishery Biologist	11/1		100%

CONTINUE on plain 8x10 1/2 paper. Identify "Page of Pages" and "TDP Number" in upper right corner. Comment on each of the following items, identifying by number. If item is not applicable, so indicate by entering "NA":

STATEMENT OF NEED

33. CRITERIA FOR TASK COMPLETION

ACTIVITY PLAN

TASK OUTPUTS AND BENEFITS

34. BACK-UP DOCUMENTATION

IMPACT OF TASK AUGMENTATION

- a. Current Year
- b. Budget Year
- c. Budget Year + 1

- a. Detail Documentation *(Provide one sentence description.)*
- b. Related tasks and research presently being conducted.
- c. Indicate the Congressional legislative requirements.
- d. Indicate the Environmental Impact Statement (EIS) requirements.

29. STATEMENT OF NEED

A. Principal objective to which this Task contributes:
NMFS Goal IV, Subgoal A, Objective 9 - "Determine the impact of environmental change in the Middle Atlantic region."

A. 1) a. Need or Problem:

The waters of the New York Bight and adjunct embayments and estuaries are subject to the demands of many competing users. The general public, sport and commercial fishermen and others utilize these waters for their recreational activities as well as for their livelihood. They require a relatively clean environment with waters in which they can swim safely and which will also support a sufficient quantity and quality of life to make sport and commercial fishing worthwhile. In addition, industries and municipalities utilize these waters to dispose of their waste products. They require only that these waters assimilate or carry away the wastes dumped into them. Between these two ends of a spectrum are individuals regulating the activities of each. These individuals are the policy makers, grantors of licenses and permits, etc., and they must be concerned about the rights and needs of both ends of the spectrum. These policy makers and managers require precise quantitative information about the environment on which to base their decisions in regulating the various user groups of the New York Bight.

It appears that an imbalance has already occurred in certain portions of the New York Bight as evidenced by values of low diversity and the presence of toxic red tides.

Raritan, Lower and Sandy Hook Bays and the Navesink-Shrewsbury estuary are among these waters and contribute to the ecological condition of the near shore coastal waters of the New York Bight due to net transport. Because these waters are grossly polluted and heavily utilized by the surrounding megalopolis, because the area once supported major shellfisheries and probably still has the potential to support them again, and because the area still does support major finfisheries (menhaden), it is important to understand the ecology of the area to provide basic support to studies of these fisheries and to understand what controls or regulates their food sources and/or contributes to their contamination. This requires that a broad knowledge be acquired on the distributions and biomasses of the communities and supporting food chains presently living in these waters and of the fluxes of materials passing through them, so that the effects of man-induced changes on the living marine resources can be determined.

The history of the decline of the once great shellfishery in Raritan Bay is well documented (Campbell, 1964). The decline continues; only last year the remaining areas for harvesting shellfish in Sandy Hook Bay were closed (Red Bank Register, 27 Mar. 73). Such closing has affected the local economy. Shellfish from the Bay have been described as tasting as if they were contaminated with oil (Hoff et al., 1967).

Most recently the issue of diseased finfish in the Bay has been (Mahoney et al., 1973), for the area is still important for both juvenile and adult fisheries (McHugh, 1966; Walford, 1970; Steimle and Geer, 1974; Wilk, unpubl. ms.). Benthic macrofaunal densities in the bay are greatly depressed (McGrath, 1973). However, there is some hint that these populations might be able to recover following pollution abatement as did the benthic fauna of the Raritan River (Dean and Haskins, 1964). In addition toxic red tides occur throughout the area nearly every summer causing additional stress to the system, including living resources and the human population.

The relationship of primary productivity and phytoplankton to fisheries is becoming better established. Several key papers have been published in recent years: Parsons et al., (1969) have demonstrated the importance to a growing zooplankton populations in the Fraser River Estuary of adequate concentrations of the right size and shape of phytoplankton. In a succeeding paper Le Brasseur et al. (1969) present presumptive evidence on the importance of these zooplankton populations as food for larval and juvenile salmon in the same estuary. Ryther (1969) suggests that the yield of fish is greater from a marine ecosystem predominated by phytoplankton with large cells. A shift from large to small phytoplankton cells was blamed as the principal cause of the failure of the oyster industry in Great South Bay (Ryther, 1954). Most recently Durbin (1975) has shown that menhaden feed only on particles greater than 12 μ . The causes for such shifts are believed to be controlled both by the environment and by the physiological responses of the phytoplankton (Parsons and Takahashi, 1973). Such size shifts do occur in the Raritan system between the large phytoplankton diatom, Skeletonema, and the small chlorophyte, Nannochloris (Patten, 1962). Environmental and physiological-nutritional variables which control these communities are being investigated.

A. 1) b. Rationale for NMFS involvement

1) Under a mandate to NOAA, NMFS has ongoing concern with the effects of waste disposal on living marine resources to provide data suitable for coastal zone management.

2) The area has known and still does have fishery resource importance for adult and juvenile individuals which must make use of these waters for at least a part of their life cycle.

3) MACFC of NMFS has been involved in extensive baseline studies of this area and is now in the process of building on the information derived from these studies to develop understanding of the structural and functional aspects of this ecosystem. Congress has appropriated special funds for the study of plankton ecology and the causes of phytoplankton blooms such as the "red tide".

- A. 2) Primary recipient of the information will be policy makers and managers, grantors of licenses and permits, etc. who require precise quantitative information about the environment on which to base their decisions in regulating the various user groups of the New York Bight. These include the EPA, U.S. Army Corps of Engineers and the Environmental Assessment Division, NMFS.
- A. 3) This information can obviously contribute directly to Objective VIB(2) "Determine the impact of environmental change..." as regards the effects of waste disposal on living marine resources. The investigators are cooperating closely with other studies both within and outside the MESA Program. The coverage is such that knowledge gained in the New York area will be applicable to similar environments and impacts throughout and perhaps beyond the Middle Atlantic region.
- B. The Task contributes to NMFS Goal 1., Line item B, Objective 13 and 14 - "Provide descriptions and analyses of marine organic production systems and of biological, physical, and chemical environmental conditions and define their influence on the abundance and distribution of living marine resources." The various physical, chemical and biological investigations which have been and will be conducted over an extended time frame will add greatly to our knowledge of the waters of the New York area, their living marine resources and the extent to which natural and man-induced changes affect these resources.
- C. The Task appears to pertain to NMFS Goal 6, Line item A, Objective 1 - "Assure full participation in the decision-making related to proposed alteration of the marine environment...", perhaps that portion concerning Objective 1, Coastal Zone Management. MBO 6 A 1 was considered by the Coordinator, Water Resources Division, to give NMFS lead-agency responsibility for the monitoring survey (by memorandum of 22 April 1974 to Chief, WRD).

30. ACTIVITIES PLAN

Subtask: Phytoplankton, primary productivity and the carbon cycle in Raritan, Lower, Upper and Sandy Hook Bays and Navesink estuary.

Pollutants enter the waters of the New York Bight areas as both particulate and dissolved material. Thus particulates that remain suspended in the water column and the dissolved substances that remain in solution have the potential to attract planktonic marine resources (including larval stages of sport and commercial species, and their food sources) as well as taxa at higher trophic levels. Ultimately, man or his domestic animals could be affected through their transfer through and concentration of pollutants within the food web.

Many of the pollutants that enter the New York Bight are highly organic (petrochemicals, pesticides, sewage wastes, etc.). As such they may provide an additional food source for certain organisms. However, they may instead inhibit the growth and development of these organisms. One of several parameters that should indicate the effect of these compounds on the living system is the measurement of the consumption of oxygen by planktonic organisms living in the water column or the production of carbon dioxide from the oxidation of organic carbon. In areas where there is a high organic input and respiration is high, oxidizing nearly all the incoming organic matter, we know that such systems are capable of handling high organic loads. Where, however, an imbalance occurs between inputs of organic matter and the oxidation of that matter we know that the system may be receiving too much organic matter. Depressed oxygen values in the water column would indicate that the system is operating at or near capacity; such low DO values are frequently observed in metropolitan waters. In any case ecosystems that are not overloaded should respond actively to increases in the supply of organic matter and ecosystems that are overloaded should no longer respond to additional inputs. In addition, Japanese researchers (Mori et al., personal communication) report that eutrophication has direct effects on many marine organisms, i.e., interfere with normal reproduction in forms such as oysters.

To this end the subtask proposes to investigate the 1) seasonal variations in the distribution and magnitude of oxygen consumption and organic carbon oxidation at selected stations in the water column; 2) standing stocks of organic matter, and 3) inputs of organic matter to the system, to determine whether the plankton ecosystems are capable of assimilating the present levels of dissolved and particulate organic matter entering the system. The following parameters will be measured: water column respiration rates, net zooplankton carbon, particulate inorganic material, primary productivity - particulate and dissolved, phytoplankton-species volume and number, ratio of detritus to phytoplankton, dissolved organic carbon (Menzel and Vaccaro, 1964), and, if present data demonstrates the importance of dissolved organic matter, we will measure assimilation and oxidation rates of dissolved organic matter as well as salinity, temperature, pH, and dissolved oxygen. (See Hobbie et al., 1972. A study of the distribution and activity of microorganisms in ocean water. *Limnol. Oceanogr.* 17(4): 544-555).

Subtask: Ecology of chronically occurring phytoplankton blooms in the New York Bight, including Lower New York Harbor and Adjacent Waters.

Our second phase of the study of phytoflagellate blooms is underway. Current nutrient studies provide information on the relative importance of inorganic nitrogen and phosphorous compounds in blooms, these will be completed in FY 1975-6. The effects of physiological factors on growth of the organisms are also being studied; tests of effects of salinity on growth were completed and investigations on the effects of temperature, photoperiod and light intensity are underway. This work will be completed in FY 1976.

Phytoplankters listed in the literature and suspected of being toxic to man include Heterocapsa trigueta, Peridinium troichoideum and Prorocentrum micans; these are found in this area and have been dominant or at least prominent in various local blooms. Because of this potentially hazardous situation and because toxicity of particular species may vary depending on the geographical location, we continue to isolate suspect species from local waters; we project studies of their toxicity.

Subtask: Seabed oxygen consumption - Raritan, Lower and Sandy Hook Bays (FY 77) and in the New York Bight. This subtask is proposed to measure seabed oxygen consumption and map the present rates of decomposition of organic wastes occurring as a result of biological and non-biological processes. These studies will be related to primary productivity (nutrient regeneration) and the distribution of benthic invertebrates, and demersal fish.

Continuing measurements in and around the waste disposal areas in the apex will be made. Comparisons will be made between seabed oxygen consumption values in the Hudson Shelf Valley and neighboring continental shelf to see if there is any indication that organic wastes are being transported down the Hudson Shelf Valley.

From the results of this study and additional information concerning the extent of organic wastes in the Bight and the rates of input and export by physical means, the following will be determined: 1) the rate at which organic wastes are accumulating or disappearing in certain areas; 2) the quantity of organic input various areas of the New York Bight can accommodate without deleterious effects to the living marine resources, and 3) the time required for the sediments to return to a homeostatic condition capable of accommodating predictable, but as yet unknown, quantities of organic matter. Baseline decomposition rates will be mapped to monitor the spread of pollutants in the future and to provide policy makers with usable information on quantities of organic matter that delineated areas of the Bight could accommodate temporarily without deleterious effects.

The following parameters will be measured: seabed oxygen consumption (Pamatmat, 1971a, b), dissolved oxygen, salinity and temperature.

31. TASK OUTPUTS AND BENEFITS

A. Measurements and SYMAPs of the distributions (seasonally) and magnitudes of:

- 1) Oxygen consumption by the planktonic organisms in the water column of Raritan, Lower, Upper, and Sandy Hook Bays compared with standing stocks and inputs of organic matter into the system and heavy metals associated with particulate matter and zooplankton.

These activities will provide information which will be used to determine whether or not the planktonic system (Raritan, Lower, Upper and Sandy Hook Bays) is capable of assimilating present levels of dissolved and suspended organic input for each season of the year.

Measurements as data and SYMAPs will be incorporated into periodic and topical data reports, and formal publications concerned with rigorously analyzed data and observations and special atlases and publications which graphically indicate baselines and temporal changes observed in the Bight and adjunct waters.

- B. Studies in Raritan, Lower, Upper and Sandy Hook Bays in which we are measuring oxygen consumption by planktonic organisms in the water column will be terminated when sufficient successful measurements are obtained to adequately describe conditions over an annual cycle and determine whether or not the system is capable of assimilating present or increased levels of organic loading.

The Task outputs will provide the quantitative information required by policy makers to: 1) make decisions, 2) educate the public to support their decisions, and 3) allow them to originate legislation to regulate the many competing activities in the New York Bight area, so that not only would the environment for marine life be prevented from being degraded further, but also that it would be improved and protected. We are actively cooperating with the State of New Jersey in providing data and surveillance in connection with phytoflagellate blooms along the Jersey-New York coastal waters. In addition we provide training to state personnel in regard to bloom surveillance.

User groups for this information would include: New York City Commission of Water Resources; various metropolitan municipalities including Passaic Valley Sewer Authority; state agencies including the New York, New Jersey, Connecticut and Rhode Island conservation and fishery organizations; U. S. Environmental Protection Agency; and other user-management groups including organizations with interests in recreational and commercial fisheries.

The State of New Jersey is particularly concerned with regard to the continuation of our phytoflagellate ecology and surveillance program.

32. IMPACT OF TASK AUGMENTATION

No potential increases, outside of the 5% per year suggested for planning purposes are anticipated.

33. CRITERIA FOR TASK COMPLETION

N/A

34. BACK-UP DOCUMENTATION

- A. Cohn, M. S. and D. Van de Sande. 1974. Red tides in the New York-New Jersey Coastal area. *Underwater Nat.*, 8(3):12-21.

Hobbie, J. E., O. Holm-Hansen, T. T. Packard, L. R. Pomeroy, R. W. Sheldon, J. P. Thomas and W. J. Wiebe. 1972. A study of the distribution and activity of microorganisms in ocean water. *Limnol. Oceanogr.* 17(4): 544-555.

Holme, N. and A. McIntyre. 1971. *Methods for the study of marine benthos.* IBP Handbook No. 16. Blackwell Scientific Publ., Oxford. 334 p.

Jansson, B. and H. Odum. 1972. *Ecosystem approach to the Baltic problem.* Bulletins from the Ecological Research Committee, No. 16. Swedish Natural Science Research Council, Stockholm. 82 pp.

Lenhard, G., L. D. Nourse, and H. M. Schwarts. 1965. The measurement of dehydrogenase activity of activated sludge, p. 105-127. In: J. K. Boars (Ed.), *Advan. Water Pollut. Res. (Proc. Int. Water Pollut. Res. Conf., Tokyo, 1964)*, v. 2.

Menzel, D. W. and R. T. Vaccaro. 1964. The measurement of dissolved organic and particulate carbon in seawater. *Limnol. Oceanogr.* 9: 138-142.

Middle Atlantic Coastal Fisheries Center, National Marine Fisheries Service. 1972. Cooperative Study of Contaminants in the Coastal Environment and their Effect on Living Marine Resources: Summary Report, 1971-1972.

National Academy of Sciences. 1970. Wastes management concepts for the coastal zone: Requirements for research and investigation.

NAS, Washington. 126 pp.

In particular note chapters 5 (Biological effects), 6 (Recommended research and investigation for effective coastal wastes management) and 7 (Suggested priorities and estimated minimum effort required).

National Academy of Sciences. 1971. Marine environmental quality: Suggested research programs for understanding man's effect on the oceans. NAS, Washington. 107 pp.

In particular note chapter 5 (The effects on marine organisms; selecting organisms and systems for study, p. 66; importance of a conceptual framework, p. 67).

National Marine Fisheries Service. 1972. Ocean fisheries and living marine resources, Program memorandum FY 1974 - 1978.

In particular see pp. II: 3 - 9.

Packard, T. T. and F. A. Richards. 1971. Vertical distribution of the respiratory electron transport system in marine plankton. *Limnol. Oceanogr.* 16: 60-70.

Pamatmat, M. M. 1971a. Oxygen consumption by the seabed, IV. *Limnol. Oceanogr.* 16: 536-550.

Pamatmat, M. M. 1971b. Oxygen consumption by the seabed, VI. *Int. Rev. Gesamten Hydrobiol.* 56: 675-699.

Sandy Hook Laboratory, National Marine Fisheries Service. 1972. The effects of waste disposal in the New York Bight, Final Report.

B. Significant related tasks:

- 1) Microbiology (fish disease) New York Bight - NMFS/MACFC, Milford, Oxford.
- 2) Baseline finfish distribution - New York Bight - MACFC/Sandy Hook.
- 3) Baseline contaminants (heavy metals) New York Bight - NMFS/MACFC, Milford.
- 4) Baseline sediment analyses New York Bight - Adelphi U.
- 5) Marine bacteria and heavy metal findings - New York Bight - Columbia U.

- 6) Vibrio bacteria - New York Bight - Rutgers U.
- 7) Water mass transport and vertical circulation - New York Bight - Lamont-Doherty Geol. Observatory.
- 8) Substrate monitoring program - New York Bight - AOML, Miami.
- 9) Substrate variability program - New York Bight - AOML, Miami.
- 10) Suspended sediments program - New York Bight - AOML, Miami.
- 11) Sediments chemistry program - New York Bight - AOML, Miami.
- 12) Substrate inventory program - New York Bight - AOML, Miami.
- 13) Cyclesende study - New York Bight - AOML, Miami.
- 14) Boundary layer study - New York Bight - AOML, Miami.
- 15) Radioisotope tracer study - New York Bight - AOML, Miami.
- 16) Physical oceanography program - New York Bight - AOML, Miami.
- 17) Algology Investigations, MACFC, Milford Laboratory.
- 18) U. S. Army Corps of Engineers
- 19) Exxon Research and Engineering Company.

B. Current task can be accomplished under existing legislation (see below).

- 1) Coastal Zone Management Act of 1972.
- 2) Marine Protection Research and Sanctuaries Act of 1972.

D. This TDP will not affect the environment and no Environmental Impact Statement is needed.

VESSEL REQUIREMENTS:

Operations are normally conducted from vessels under 65 feet operated by MACFC and scheduled as needed by the Officer-in-Charge.

PRIMARY PRODUCTIVITY AND ITS RELATIONSHIP
TO POLLUTION AND COASTAL FISHERIES
Task #88C2Q1 (MAC-067)

OBJECTIVES

Objectives of our productivity investigation are:

1. To provide descriptive baseline data and analysis of marine organic production in the Middle Atlantic Bight.
2. Describe biological, physical and chemical environmental conditions and their influence on living marine resources in the Middle Atlantic Bight.
3. Provide data useful for the rational management of Middle Atlantic Bight and its living marine resources.
4. Provide data for predictive model of ecosystems to be used in management.
5. Determine potential role of net and nannoplankton in marine food web.
6. To determine the roles of organic and inorganic nutrients in the blooms of certain toxic phytoplankton species.
7. To monitor the development and extent of blooms.

The objectives of our seabed oxygen consumption investigation are to:

1. Measure and map baseline values of seabed oxygen consumption over annual cycle.
2. Determine the quantity of organic matter oxidized per unit area per unit time.
3. Determine the quantity of energy or nutrients released per unit area per unit time.

PRIMARY PRODUCTIVITY AND ITS RELATIONSHIP
TO POLLUTION AND COASTAL FISHERIES
Task #88C2Q1 (MAC-067)

4. Determine which variables regulate seabed oxygen consumption in the N.Y.B.A. and how they function.
5. Establish methods for monitoring seabed oxygen consumption in the N.Y.B.A. which are economical in terms of effort, time, and money.
6. Provide data and information to decision makers concerned with resource management and the regulation of man's activities.

ABSTRACT

The task is investigating the lower trophic levels of the carbon cycle and the energy transfers involved, including the production and decomposition of organic carbon. The magnitude and distribution of these processes are being examined in the Lower Hudson Estuary and New York Bight, an area highly impacted upon by pollution and yet of great importance to coastal fisheries. The long range goal is to provide the information required for the rational management of the Middle Atlantic Bight and its living marine resources.

The rapidly changeable and sometimes short-lived nature of phytoplankton "blooms" requires that they be studied intensely to achieve an understanding of their history. Definitive work on the possible toxicity of phytoplankters which bloom in this area is lacking but several of them are considered in the literature to be potentially dangerous. Government agencies in this area, including F.D.A., EPA and N.J. D.E.P., continue

PRIMARY PRODUCTIVITY AND ITS RELATIONSHIP
TO POLLUTION AND COASTAL FISHERIES
Task #88C2Q1 (MAC-067)

to look to the Center for leadership in toxicity determinations which cannot be forthcoming without additional personnel. Much of the subtask's ongoing studies of various nutritional and physiological parameters influencing growth of phytoplankters causing local red tides is nearing completion or will be completed in approximately a year. Planned work including determination of critical concentrations of essential nutrients in the promotion of blooms cannot proceed without additional equipment.

NMFS TASK DEVELOPMENT PLAN

(See Detailed Instructions)

1. DATE PREPARED

8/8/75

(Submit five copies by Jan. 2)

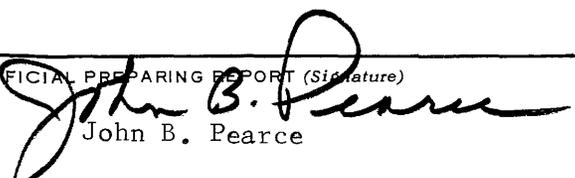
TO: Director, National Marine Fisheries Service, ATTN: Fx5 National Oceanic and Atmospheric Administration Washington, D.C. 20235

FMC's - Submit a separate Task Development Plan for each task beginning, continuing, or ending in the current year, budget year, or budget year + 1. Reimbursable funds are not to be mingled with appropriated funds on any programmatic TDP; separate TDP's must be prepared. Submit one TDP itemizing the administrative support cost (Management Fund) for the FMC.

2. TDP NUMBER MAC-069-77-EI-R1		3. OBJECTIVE CODES A B C D				4. RANK BY TARGET BY + 1 INC.	
5. TASK NUMBER R8C204		6. TASK TITLE Biological Effects of Dredging and Spoil Disposal, New London, Ct.					
7. ORGANIZATION CODE FB6100		8. ORGANIZATION TITLE (Responsible for execution of this task) Ecosystems Investigations				9. PRINCIPAL LOCATION City Highlands State N.J.	

OBJECT CLASS <small>Lines 10-18. Enter all dollar values as thousands and tenths of thousands. Lines 21-22. Enter as man-years and tenths of man-years.</small>	COP. LINE	CURRENT YEAR FY 1976		BUDGET YEAR FY 19__		BUDGET YEAR + 1 FY 19__	
		TARGET ALLOWANCE A	INCREASE B	TARGET ALLOWANCE C	INCREASE D	TARGET ALLOWANCE E	INCREASE F
10. Total Direct Labor	15	75.7					
11. Travel	19	9.0					
12. Rents, Communications, Utilities	21	5.3					
13. Contracts (To be let)	51 52						
14. Grants (Funds obligated)	58						
15. Supplies	53	13.6					
16. Capital Equipment	54						
17. Other (All other obligations)		2.0 6.9					
18. Total Direct Funds (Add lines 10 through 17 above.)		112.5					
19. Positions, Full-time permanent (Number applicable to this Task. Also, complete NOAA Form 32-14C.)		0					
20. Positions, Other (Number applicable to this Task.)		7					
21. Man-years, Permanent		1.6					
22. Man-years, Other		7.0					
23. Reimbursable Support (Reimbursable agreements only)		43.8					

REMARKS

24. OFFICIAL PREPARING REPORT (Signature)

John B. Pearce

25. FMC DIRECTOR OR DESIGNATED REPRESENTATIVE (Sig.)

Carl J. Sundermann

NMFS TASK DEVELOPMENT PLAN

26. ACTIVITY, EVENT, AND MILESTONE SCHEDULE

TDP NUMBER

MAC-069-77-EI-R-1

NUMBER EACH ACTIVITY, EVENT,
OR MILESTONE

PLANNING PERIOD - Indicate by entering an "X" at the beginning and completion of subtask or selected operational activities that collectively define the task for the 7 year planning period. Connect "X's" with a solid bar. "Events" and "Milestones" occur at specific points in time. Indicate these significant achievements by placing an "X" in a single column.

IDENTIFY BY ENTERING 'A' FOR ACTIVITY, 'E' FOR EVENT, OR 'M' FOR MILESTONE.

A, E, OR M	NARRATIVE (Brief descriptive phrase of activity, event, or milestone)	CY		BY		BUDGET YEAR													
						+1		+2		+3		+4		+5					
		1	2	1	2	1	2	1	2	1	2	1	2	1	2				
		A	B	C	D	E	F	G	H	I	J	K	L	M	N				
A	Baseline field survey					X	X												
A	Quarterly monitoring during Phase I dredging-dumping (tentatively Sept.-Oct. 1974; January, April, July, 1975).					X	X	X											
A	Post-Phase I field survey (October 1975).																		
E	Quarterly reports to Navy, Crops of Engineers and Interagency Scientific Subcommittee on Ocean Dumping and Spoiling (1 November 1974; 1 February, 1 May, 1 August, 1 November 1975; 1 February, 1 May, 1 August 1976).					X	X	X	X										
E	Final reports received from subcontractors (end of contract period, 30 June 1976).																		
M	Final report to Navy, Corps, Subcommittee on dredging-dumping effects (January 1977).																		
A	Follow-up field surveys (October 1976, 1977, 1978).																		
A	Comprehensive analysis of spoiling effects on benthic macrofauna, and recolonization studies.																		
A	Field surveys of alternate disposal area ("East Hole", Block Island Sound - March and June 1975).																		
E	Interim report to Navy on biological characteristics of East Hole area (July 1975).																		
E	Final report on same (September 1975).																		

OUT YEAR COMMENTS

(Check appropriate boxes and enter applicable percentage.)

*Increases usually come from reprogramming within your FMC.)

- a. Continued at same level
- b. Increase of ___% *
- c. Reduction of ___%
- d. Termination

"X"
APPROPRIATE
COLUMN

REMARKS

**NMFS TASK DEVELOPMENT PLAN
28. FULL-TIME PERMANENT POSITIONS**

TDP NUMBER

MAC-069-77-EI-R-1

Reference NOAA Form 32-14A, Item 19. Identify all full-time permanent positions related to this Task for the budget year and all positions requested for budget year + 1 increases. Do not include support personnel; they should appear in the appropriate support Task Development Plan.

POSITION TITLE	GS LEVEL	NAME OF INCUMBENT <i>(If no incumbent, enter "Vacant")</i>	% OF TIME SPENT ON THIS TASK

CONTINUE on plain 8x10½ paper. Identify "Page of Pages" and "TDP Number" in upper right corner. Comment on each of the following items, identifying by number. If item is not applicable, so indicate by entering "NA":

- 29. STATEMENT OF NEED
- 30. ACTIVITY PLAN
- 31. TASK OUTPUTS AND BENEFITS
- 32. IMPACT OF TASK AUGMENTATION
 - a. Current Year
 - b. Budget Year
 - c. Budget Year + 1
- 33. CRITERIA FOR TASK COMPLETION
- 34. BACK-UP DOCUMENTATION
 - a. Detail Documentation *(Provide one sentence description.)*
 - b. Related tasks and research presently being conducted.
 - c. Indicate the Congressional legislative requirements.
 - d. Indicate the Environmental Impact Statement (EIS) requirements.

29. STATEMENT OF NEED

A. Principal objective to which this Task contributes:

NMFS Goal IV, Subgoal A, Objective 9 - "Determine the impact of environmental change in the Middle Atlantic region".

1. a. Need or Problem: The U.S. Navy, to provide navigable water depths for a new class of nuclear submarines, must dredge 2.8 million cubic yards of spoils from the Thames River, Ct. Plans are to dispose of these spoils on the New London designated dumping ground, 2-3 miles south of Thames' mouth. The Thames River contains populations of oysters and hard clams. The dumping area itself supports a moderate lobster fishery and abundant winter flounder, as well as high standing crops of valuable food web species. Within six miles to the north and west are the Niantic Bay scallop fishery and an important winter flounder nursery area. The Race, two miles south of the disposal point, is extremely popular for recreational fishing. The waters in the general area are also heavily used for recreational boating and swimming.

Not enough information is yet available to accurately predict the effect of ocean spoil disposal in general. In particular, the impacts of dumping these large amounts of Thames River spoil (polluted, by EPA criteria) in the rather shallow, high energy environment of the New London dumping ground can only be guessed at. For this reason, EPA has issued the dredging permit with the stipulation (among others) that the Navy fund a monitoring survey to thoroughly assess effects of the spoil disposal on the area's resources.

For the first time, a set of criteria has been developed to determine whether the dredging-disposal operation is causing significant environmental harm. The monitoring program addresses itself to these criteria. Any violations, as well as any findings of significant damage outside of the criteria, shall be immediately reported to the Interagency Scientific Advisory Subcommittee on Ocean Dredging and Spoiling (ISASODS) and the Policy Coordinating Committee, and thus to the Navy. The Navy has agreed to halt dumping until an alternate site or method of disposal is agreed on if any such environmental harm is found.

[Note: since original submission of this TDP, an alternate site has been tentatively identified. This site is a depression known as the East Hole, six miles SE of Fishers Island, in Block Island Sound. The Navy has requested and accepted a MACFC proposal for a study of the sediments,

benthic macrofauna and demersal finfish of the East Hole area. This information will be used to assess the suitability of this site as an alternate disposal ground for Thames River and perhaps other spoils. If the East Hole is used for spoil disposal, our studies will contribute to the predisposal characterization of the area needed to determine subsequent environmental impacts. The studies are thus responsive to Objective IV-A-9, "Determine the impact of environmental change in the Middle Atlantic region". Since existing knowledge of the chemical and biological environment of Block Island Sound is generally sparse, our studies will also contribute to Subgoal II-D (See 29B below). Rationale for NMFS involvement, and recipients of the information, are the same as for the primary disposal site studies.]

We anticipate continuation of reimbursable funding beyond the present contract period, in order to examine long-term effects of dredging and spoil disposal on the area's benthic ecology, as well as rates and patterns of recolonization. This is in reality the most critical information requirement, both for the present project and for ocean disposal generally. The Environmental Assessment Division of NMFS has requested repopulation rate studies by MACFC as an investigation of national interest.

- A. 1. b. Rationale for NMFS involvement is threefold: 1) Under a mandate to NOAA, NMFS has an ongoing concern with the effects of ocean dredging and spoiling; 2) the area has known fishery resource importance, and 3) MACFC of NMFS has been involved in an extensive baseline study throughout Long Island Sound since 1972. More intensive surveys in areas of possible impacts are considered an important outgrowth of this baseline study, especially in response to the needs of the NMFS, Environmental Assessment Division.
- A. 2. Primary recipient of the information will be the general public, in the form of those people who place recreational demands upon the area's resources and whose interests the monitoring survey is intended to protect. Other, direct recipients of the information include: the U.S. Navy, COE, ISASODS, EPA and the Environmental Assessment Division, NMFS.
- A. 3. This information can obviously contribute directly to Objective IV-A-9, "Determine the impact of environmental change..." as regards the effects of dredging and spoil disposal in eastern Long Island Sound. The investigators themselves are closely and thoroughly monitoring for impacts; their findings will in turn be assessed by ISASODS and others to determine whether any significant harm is occurring. The studies are thought

comprehensive enough that knowledge gained can be applied to similar environments and impacts throughout and perhaps beyond the Middle Atlantic region. Further, the Task is unique in having the potential to prevent adverse impacts in that disposal will be modified or halted if ISASODS determines that the criteria are being violated or other substantive damage is taking place.

- B. The Task also contributes to NMFS Goal II, Subgoal D - "Provide descriptions and analyses of marine organic production systems and of biological, physical, and chemical environmental conditions and define their influence on the abundance and distribution of living marine resources." The various physical, chemical and biological investigations, conducted over an extended time frame, will add greatly to our knowledge of the waters of eastern Long Island Sound, the marine resources there, and influences of natural and man-induced changes on these resources. Our contribution here will not be detailed at this time, as no objective has yet been designated for MACFC within Subgoal II D.
- C. The Task appears to pertain to NMFS Goal IV, Subgoal C - "Assure full participation in the decision-making related to proposed alteration of the marine environment...", perhaps that portion concerning Objective 4, Coastal Zone Management. MBO IV-c-4 was considered by the Coordinator, Water Resources Division, to give NMFS lead-agency responsibility for the monitoring survey (by memorandum of 22 April 1974 to Chief, WRD). Again, this objective had not been fully developed at the time of TDP preparation.

30. ACTIVITY PLAN

The total study has been partitioned in the following manner: MACFC has contracted with the New York Ocean Science Laboratory to study finfish, physical and chemical oceanography of the dump site; and with the University of Connecticut to investigate physical and chemical characteristics of the Thames River, dredging effects on phytoplankton and shellfish, and dump site lobster populations. MACFC is examining sediment characteristics, microbiology and benthic macrofauna both in the river and on the dump site.

All parties have completed baseline surveys to determine pre-dredging characteristics of river and dump site. During - dredging surveys have been initiated and will be repeated on a quarterly basis at MACFC, and more frequently for several of the contract investigations. A post - dredging survey will be carried out near the end of the contract period. Complete details of parameters examined, methodologies and scheduling for all groups are given in the monitoring proposal (MACFC 1974).

Relationship of Activities and Events is as follows: The comprehensive field studies are separated into three Activities (#1, 2 and 3) corresponding to the pre-, during and post-dredging surveys. Quarterly reports will be prepared describing field activities on these surveys and available results from laboratory analyses. Issuance of the quarterly reports to the Navy, COE and ISASODS is considered an Event (#4). Another Event (#5) will be the submission to MACFC (at the end of the contract period) of contractor's final reports on their overall investigations. MACFC's final report to the interested agencies will be the definitive treatment of the monitoring survey, and thus should be considered a Milestone(#6). Activity #7 consists of yearly field surveys from 1976-78 to assess longer-term effects of dredging and spoil disposal. Activity #8 is an in-depth analysis of effects on benthic macrofauna and related sediment parameters, based on samples collected during Activities 1-3 and 7; and also a study of benthic recolonization, from the samples of Activities #7.

It is not yet known whether Activity #9, the study of alternative disposal sites, will be required. If so, reimbursable funding will be supplied for the necessary surveys, sample processing and data analysis. Needs, methodology, outputs and benefits would be the same as those for the present study.

[Field surveys to characterize sediments and benthic macrofauna of the proposed alternate site ("East Hole") were carried out in March-April and June-July 1975 (Activity #9). Details of the program for sampling and analysis are similar to those for the primary disposal site, and are given in our alternate site study proposal (MACFC, 1975A). A preliminary report (Event #10 - MACFC 1975B), presenting findings of the March-April cruise, was submitted to the Navy in July. A final report (Event #11) is scheduled for September 1975. Surveying and reporting are still subject to change, depending partly on whether the East Hole site becomes an active disposal area.]

31. TASK OUTPUTS AND BENEFITS

A. 1. Significant outputs: quarterly and final reports to ISADOS, the Navy and the Corps of Engineers concerning the activities and findings of the monitoring program. The immediate reporting of any substantial environmental impacts should also be considered a significant output. Other anticipated outputs are research papers in the more specialized areas of interest of each investigator.

A. 2. Relation to needs and recipient: The reports will fulfill the above stated needs to 1) gather information on the effects of the dredging-disposal operation, and 2) protect the area's resources by leading to change or curtailment of the operation if significant impacts are discovered. Reports and publications will also contribute to longer-term knowledge of dumping effects in general, and perhaps to future policy decisions on coastal spoil disposal. Reports will be submitted to the direct recipients (ISASODS, COE and Navy) for evaluation and determination of environmental impact. The general public will be the beneficiary of increased knowledge concerning disposal effects, and, will also benefit from the protective clauses of the project's environmental criteria.

B. Benefits: The Task should satisfy 80% or more of the need to determine impacts of the dredging operation under consideration. There is a possibility that some impacts (for example, increase in PCBs) will not be measured. If the Task is assumed effective in detecting impacts, it will totally satisfy the need to protect the area's resources, by leading to a modification or halt in dumping if any such impacts are found.

32. IMPACT OF TASK AUGMENTATION

Not applicable, in that Task is contract-funded and no augmentation is anticipated unless a study of alternate disposal sites is required. Renewal of contract funds at a level comparable to that for FY 76 is anticipated, and will be necessary to complete long-term studies of dredging-disposal effects and repopulation rates.

33. CRITERIA FOR TASK COMPLETION

N/A, as per instructions.

34. BACK-UP DOCUMENTATION

- A. Documentation:
- 1) Middle Atlantic Coastal Fisheries Center. 1974. A Proposal for an Environmental Survey of Effects of Dredging and Spoil Disposal in the Thames River and New London Dumping Ground. Submitted to U. S. Army Corps of Engineers. 98 p. - describes overall research plan, individual projects of each investigator, schedules and budgets.

- 2) Corps of Engineers. 1974. Criteria for monitoring Thames River dredging and dumping - ISASODS document file. - lists nine parameters to be examined by monitoring study. If criteria for any of these are exceeded, dumping method or site will be changed.
- 3) Middle Atlantic Coastal Fisheries Center. 1974. An Environmental Survey of Effects of Dredging and Spoil Disposal, New London, Connecticut: 1st Quarterly Report. Informal Report No. 40. 17 p. - details field activities and results available as of 1 November 1974. Includes as appendices contractors' reports on activities and findings as of 1 October 1974.
- 4) Middle Atlantic Coastal Fisheries Center. 1975A. A Proposal for Biological Survey of an Alternate Site for Disposal of Dredging Spoils from Thames River, Connecticut. Informal Report No. 50. 13 p.
- 5) Middle Atlantic Coastal Fisheries Center. 1975B. Survey of Sediments, Benthic Macrofauna and Demersal Finfish of an Alternate Disposal Site for the Thames River (Ct.) Dredging Project. Preliminary Report. MACFC Informal Report No. 68. 10 p.

B. 1) Related Tasks

- a. Impact of Environmental Change, New York Bight (Sandy Hook), is conducting similar investigations, on effects of spoil and waste disposal in the New York Bight.
- b. Impact of Environmental Change, Middle Atlantic (Sandy Hook), is examining water quality and benthic communities throughout Long Island Sound, as well as in Raritan Bay and along the New Jersey coast.
- c. Environmental Chemistry and Microbiology (Milford), is investigating microbiology and metals in sediments and organisms at New London dredging site.
- d. Biochemical Modeling (Sandy Hook), is studying forms and effects of heavy metals in the environment. This includes use of sediment traps at the New London dump site to determine sedimentation rates and sediment composition.
- e. Resource Assessment Investigations, MACFC, are studying the demersal finfish of the alternate site area. Cruises and reporting are carried out cooperatively with RAI. Demersal finfish gut contents provided by RAI will be analysed to determine the value of the benthic macrofauna in the region's food webs, and to identify important forage species for more intensive studies.

B. 2) Related Research

- a. Several universities and other groups are undertaking a cooperative study of spoil disposal off New Haven in central Long Island Sound.
 - b. The Corps of Engineers is also leading a study of disposal effects in mid-western Long Island Sound (Eaton's Neck).
 - c. The University of Connecticut and New York Ocean Science Laboratory are both conducting other physical, chemical and biological studies in eastern Long Island Sound.
 - d. UCONN and NYOSL, as well as ACE and the Naval Underwater Systems Center, are studying the hydrography and sediments of the East Hole to determine its suitability as a disposal area.
- C. The proposed Task can be carried out within existing legislation.
- D. The proposed Task has no direct impact on the environment, and no Environmental Impact Statement is required.

VESSEL REQUIREMENTS

Operations are normally conducted from vessels under 65 feet operated by MACFC and scheduled as needed by the Officer-in-Charge.

BIOLOGICAL EFFECTS OF DREDGING AND SPOIL DISPOSAL, NEW LONDON, CT.
Task #R86204 (MAC-069)

OBJECTIVES

1. Define predisposal condition of benthos of Thames River, Ct., and New London Dumping Ground, and measure impacts of dredging and spoiling on these areas.
2. Determine types and rates of recolonization of the New London spoils area.
3. Study a second area ("East Hole" in Block Island Sound) to characterize existing sediments and macrofauna and to assess the area's suitability as an alternate disposal site.
4. (Tentative) Analyse the productivity of the dominant macrobenthos at New London and East Hole, and their importance in the diets of resource species, so that long-term effects of spoiling on these resources can be estimated.

ABSTRACT

Smith-McIntyre quantitative benthic grab samples were used to obtain "baseline" characterizations of sediments and benthic macrofauna in the Thames River, Ct., the adjacent New London dumping ground, and a proposed alternate disposal area in Block Island Sound. Quarterly monitoring surveys are being conducted to determine impacts of dredging in the Thames and spoil disposal at the New London site.

BIOLOGICAL EFFECTS OF DREDGING AND SPOIL DISPOSAL, NEW LONDON, CT.
Task #R86204 (MAC-069)

Research is also being completed under contract to provide data on: current movement and transport of suspended materials at the dredging and spoiling sites, heavy metal loading of the sediment and biota, and increases in suspended matter due to dredging and spoiling. Diving observations are also being conducted to determine in situ change in spoils and ambient sediments as well as recolonization of spoils.

Finfish populations are being investigated to assess their seasonal diversity, distribution and abundance.

Quarterly reports are submitted to the U.S. Navy on survey findings. A final report to the Navy is scheduled for January 1977; studies on long-term spoiling effects and dump site recolonization will extend beyond this date.

PROLIFERATIVE CELL DISEASE IN MOLLUSKS
Task #R8C207 (MAC-070)

OBJECTIVES

1. Examine the possible causes for epizootic neoplasia in selected species of marine bivalves from degraded or polluted marine and estuarine environments.
2. Undertake carefully controlled experiments to induce neoplasia in selected bivalve species.

ABSTRACT

The etiologic agent(s) responsible for induction of neoplasia in wild populations of marine poikilotherms are not known. Some reports, however, implicate biotic agents, physical agents, or various chemical substances, particularly fossil fuels and synthetic compounds. Recently viruses also have been found in shellfish which may play a role in carcinogenesis. This task examines the possible causes for neoplasia in selected species of marine bivalves. Activities involve collaborative research with the Food and Drug Administration, Smithsonian Institution (Tumor Registry), Maryland Department of Natural Resources, National Cancer Institute, and Department of Pathobiology of Johns Hopkins University. Research includes 1) epizootiologic studies of neoplasms in Macoma balthica and other mollusk species from Chesapeake Bay; 2) virological studies (herpesvirus and papillomavirus) with oysters. Other major studies in the task are 1) comparative electron microscopy of neoplasms in bivalve mollusks; 2) induction of neoplasia with chlorinated hydrocarbons.

RECREATIONAL FISHERIES -- FORAGE FISH-PREDATOR RELATIONS

(No Task # Assigned) (MAC-071)

OBJECTIVES (FY 1977 INCREASE)

1. Determine ~~re~~relative abundance, seasonality, and distribution of forage species in selected geographic areas.
2. Determine seasonality and variability of predator diet items.
3. Determine changes in diet with age of predator, day vs. night feeding, inshore-offshore feeding grounds, and latitudinal variations.
4. Establish predator food items inventory from catches of commercial and recreational fisheries and from research cruises.
5. Identify diet species to the lowest taxa possible, size preferences, and relative volume.

ABSTRACT (FY 1977 INCREASE)

Periodically conflicts develop on the effects of commercial harvesting of forage species (i.e., menhaden) upon the availability of predator species (i.e. bluefish and striped bass) to recreational fishermen. In general, this task will examine the relationships between abundance of forage species and seasonality and variability of predator diet items.

NMFS TASK DEVELOPMENT PLAN

(See Detailed Instructions)

1. DATE PREPARED

7/30/75

(Submit five copies by Jan. 2)

TO: Director, National Marine Fisheries Service, ATTN: Fx5 National Oceanic and Atmospheric Administration Washington, D.C. 20235

FMC's - Submit a separate Task Development Plan for each task beginning, continuing, or ending in the current year, budget year, or budget year + 1. Reimbursable funds are not to be mingled with appropriated funds on any programmatic TDP; separate TDP's must be prepared. Submit one TDP itemizing the administrative support cost (Management Fund) for the FMC.

2. TDP NUMBER MAC-073-EI-RL	3. OBJECTIVE CODES				4. RANK	
	A	B	C	D	BY TARGET	BY + 1 INC.

5. TASK NUMBER 38C267	6. TASK TITLE Effect of Temperature on the Behavior of Marine Invertebrates
--------------------------	--------------------------------------------------------------------------------

7. ORGANIZATION CODE FB6100	8. ORGANIZATION TITLE (Responsible for execution of this task) Ecosystems Investigations	9. PRINCIPAL LOCATION City: Highlands, State: NJ
--------------------------------	---------------------------------------------------------------------------------------------	-----------------------------------------------------

OBJECT CLASS <small>Lines 10-18. Enter all dollar values as thousands and tenths of thousands. Lines 21-22. Enter as man-years and tenths of man-years.</small>	COP LINE	CURRENT YEAR FY 19 ⁷⁶		BUDGET YEAR FY 19		BUDGET YEAR + 1 FY 19	
		TARGET ALLOWANCE A	INCREASE B	TARGET ALLOWANCE C	INCREASE D	TARGET ALLOWANCE E	INCREASE F
10. Total Direct Labor	15	18.1					
11. Travel	19						
12. Rents, Communications, Utilities	21	1.3					
13. Contracts (To be let)	51 52						
14. Grants (Funds obligated)	58						
15. Supplies	53	1.4					
16. Capital Equipment	54						
17. Other (All other obligations)		1.6					
18. Total Direct Funds (Add lines 10 through 17 above.)		22.4					
19. Positions, Full-time permanent (Number applicable to this Task. Also, complete NOAA Form 32-14C.)		0					
20. Positions, Other (Number applicable to this Task.)		1					
21. Man-years, Permanent		0.2					
22. Man-years, Other		0.9					
23. Reimbursable Support (Reimbursable agreements only)		10.5					

REMARKS

24. OFFICIAL PREPARING REPORT (Signature)
John B. Pearce
John B. Pearce

25. FMC DIRECTOR OR DESIGNATED REPRESENTATIVE (Sig.)
Carl J. ...
Carl J. ...

NMFS TASK DEVELOPMENT PLAN

26. ACTIVITY, EVENT, AND MILESTONE SCHEDULE

TDP NUMBER

MAC-073-77-EI-R-1

NUMBER EACH ACTIVITY, EVENT,
OR MILESTONE

PLANNING PERIOD - Indicate by entering an "X" at the beginning and completion of subtask or selected operational activities that collectively define the task for the 7 year planning period. Connect "X's" with a solid bar. "Events" and "Milestones" occur at specific points in time. Indicate these significant achievements by placing an "X" in a single column.

IDENTIFY BY ENTERING 'A' FOR ACTIVITY, 'E' FOR EVENT, OR 'M' FOR MILESTONE.

A, E, OR M	NARRATIVE (Brief descriptive phrase of activity, event, or milestone)	CY		BY		BUDGET YEAR										
						+1		+2		+3		+4		+5		
		1	2	1	2	1	2	1	2	1	2	1	2	1	2	
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	
	All activities, events, and milestones are directed toward determining the impact of environmental changes in the Middle Atlantic region: NMFS Goal IV Subgoal A, Objective 9.															
A	Normal activity and feeding in blue crabs, <u>Callinectes sapidus</u> .			X	X											
A	Normal social interactions, including aggression, territoriality, dominance, reproduction and competition for food and space in blue crabs.			X	X	X										
A	Normal relation to shelter and/or substrate in blue crabs.			X	X	X										
M	Establishment of behavioral baselines for use in assessing sublethal thermal stress effects on blue crabs.					X										
A	Short-term sublethal thermal stress effects on normal feeding, activity, shelter dependence, social interactions of blue crabs.					X	X	X								
A	Chronic thermal stress effects on established behavioral baselines of blue crabs.					X	X	X								

OUT YEAR COMMENTS
(Check appropriate boxes and enter applicable percentage.)
*Increases usually come from reprogramming within your FMC.)

- a. Continued at same level
- b. Increase of ___% *
- c. Reduction of ___%
- d. Termination

"X"
APPROPRIATE
COLUMN

REMARKS

STATEMENT OF NEED

At a time when the activities of man continue to impinge on and disrupt the natural homeostasis of the marine ecosystem, it is essential that the level of confidence in assessing and predicting the effects of such activities be improved. It is only through such efforts that rational planning of action for preserving the environment may be implemented. One approach to the problem is to study the response capabilities of selected marine organisms to specific contaminant stresses.

In recent years, the need for more comprehensive measures of pollutant effects on aquatic organisms has stimulated the development of methodology in a variety of disciplines including animal behavior.

The most important advantage of using behavior as a measure of stress is that the results often lend themselves to direct interpretation regarding environmental quality as related to the possible consequences at both population and ecosystem levels. The complex of biochemical and physiological responses which are integrated by the animal internally are manifested in directly observable acts. These behaviors reflect not only the internal state but also how an animal responds to and consequently may survive, a particular stress situation. By using the normal behaviors of the animals as baseline measures, the effect of given levels of potentially detrimental stress can be determined and the results extrapolated to predict the impact on or degree of change within a given natural community.

There is a critical need for providing information concerning the life habits, behaviors, and habitat and feeding requirements of marine species residing in environments which are potentially susceptible to man-induced change. Environmental modeling and EIS ultimately require information of this sort since realistic models or predictions cannot be developed if there is insufficient data from the natural environment. In addition, there is considerable interest in developing behavioral baseline measures of normality for species used as indicator organisms in contaminant testing by a variety of industrial, state and federal agencies (EPA, ERDA).

LABORATORY ACTIVITIES PLAN

The principal aim of the laboratory studies will be on the measurement, under controlled conditions, of normal behavioral responses of selected marine invertebrate species and how these behaviors are affected by selected contaminant stress, primarily temperature. The work will begin with observations to define normal patterns of behavior which will serve as baseline, diagnostic indicators for measuring the effects of thermal stress.

At the outset, the studies will focus on the blue crab, Callinectes sapidus. To determine normal baselines, adult blue crabs will be established in small groups (size and number to be determined by the territorial behavior of the animals) in aquaria at temperatures within preferred limits for this species,

under a simulated natural photoperiod. Fluorescent lamps will be used for daytime lighting while incandescent bulbs will provide low-level night illumination. Water quality will be maintained by aeration and filtration through sand and gravel filters which will also provide a natural substrate for the animal. Salinity, oxygen and pH will be continually controlled and regulated as required.

Depending upon the particular parameter to be observed, direct observations will be made using event and tape recorders, cine and still photography and closed circuit TV.

Studies to establish normal would include observations of the following:

- 1) Locomotor activity including correlation with solar and/or tidal cues;
- 2) Feeding behavior including measures of feeding motivation, e.g. latency to feed, satiation and the various sensory modalities employed in the detection of prey or other food;
- 3) Social interactions including various aspects of territoriality, aggression, dominance, reproduction and competition for food and space;
- 4) Predator avoidance;
- 5) Relation to shelter or substrate.

Following the establishment of normal baselines, studies will focus on the effects of elevated sublethal temperature. The procedure will be as follows: Starting at acclimation, the temperature will be raised (rates to vary between sets of tests) until significant changes in baseline measures of activity, feeding, social interactions are detected. Maintain temperature at this level to determine whether animals can adapt (either by returning to normal or stabilizing at the new level). Depending on the nature of the response, continue increase until the level is reached at which adaptation no longer occurs or return to acclimation levels to assess recovery potential. Rates of increase and temperature levels at which significant behavioral changes occur can be correlated to indicate upper behavioral limits.

Another series of experiments will include increasing temperature at rates which will permit acclimation and then hold temperature at different levels to examine the effect of chronic, sublethal exposure on established behavior norms determined under acclimation.

TASK OUTPUTS AND BENEFITS

The primary output of this Task will be the utilization of established normal life habits and behaviors of representative marine invertebrate species to determine the effects of selected contaminant stresses, e.g. temperature.

Extrapolation of these results to the natural environment will enable us to assess and predict not only the capacity for a particular species to survive certain thermal regimes, but also its capability to avoid or escape potentially lethal elevations. Many marine invertebrates, while important target organisms because of their commercial and recreational importance, also form important links in the food chain, the distribution of which may influence a variety of species depending on the particular position in the chain. This information will result in an increase in the ability to assess and predict potential effects of contaminants within particular ecosystems and aid in developing ecosystem guidelines to be used in all types of ecological modeling efforts. The need for such guidelines and the important role the Behavior Investigation has played in pioneering this type of effort are exemplified by the following: 1) a workshop on "Behavioral Measures of Environmental Stress" sponsored by the Marine Technology Society; and 2) a forthcoming session, "The Use of Behavior to Measure Stress in the Marine Environment", at the Third International Estuarine Research Federation Conference. Both of these projects, organized, chaired and edited by B.L. Olla, Senior Investigator of this Task, illustrate the national importance of this Task's efforts. The results of such projects receive wide distribution and are important to both private concerns and government agencies engaged in assessing water quality and setting permissible limits.

The inadequacies and limitations of standard test techniques, which are being applied on a world-wide basis, have necessitated more comprehensive identification of organismic response to contaminants. The development, by this Task, of methodologies which are generic in nature and can be used in the laboratory or field, or applied in and of themselves to predicting the effects of stress, are contributing significantly to the improvement of standard testing procedures. The actual data gathered by this Task can be used by a variety of concerned groups including private industrial firms, state and various government agencies (EPA, CEQ, ERDA).

IMPACT OF TASK AUGUMENTATION

No potential increases are anticipated.

CRITERIA FOR TASK COMPLETION

BACK-UP DOCUMENTATION

Atema, J., S. Jacobson, J. Todd and D. Boylan. 1973. The importance of chemical signals in stimulating behavior of marine organisms: effects of altered environmental chemistry on animal communication, p. 177-197. In: G.E. Glass (ed.) Bioassay Techniques and Environmental Chemistry. Ann Arbor Science Publishers Inc., Ann Arbor, Michigan. This paper reviews the effects of a pollutant on feeding attraction to food and homing in various marine invertebrates.

Atema, J. and L. Stein. 1974. Effects of crude oil on the feeding behavior of the lobster Homarus americanus. Environ. Pollut. 6: 77-86. This paper describes interference by a pollutant with chemosensory behaviors of lobster during feeding.

- Coutant, C.C. 1970. Biological aspects of thermal pollution. I. Entrainment and discharge canal effects. Publ. No. 383, Ecol. Sci. Div. Oak Ridge Nat. Lab: 341-381.
This article reviews and evaluates the effects of thermal discharges on biological processes.
- Krenkel, P.A. and F.L. Parker (ed.). 1969. Biological Aspects of Thermal Pollution; Proceedings. Vanderbilt University Press, Nashville, Tenn. 407 p.
This paper reviews the various sources of thermal pollution and the resulting problems in the environment.
- Olla, B.L. 1971. I. The effect of temperature on the activity of adult Atlantic mackerel, Scomber scombrus. AEC Report (49-7) 3045: 1971.
This report summarized the effects of rapid, continual increases of temperature to lethal levels as well as several gradual step increases.
- Olla, B.L. 1972. II. The effect of temperature on the activity of adult Atlantic mackerel, Scomber scombrus. AEC Report (49-7) 3045: 1972.
This report summarizes the effects of high temperature acclimation followed by two gradual step increases to upper incipient lethal levels and the resultant changes in feeding levels.
- Olla, B.L. 1973. III. The effect of temperature on the activity and feeding of adult Atlantic mackerel, Scomber scombrus. Some factors to be considered in the conduct of finfish bioassays. AEC Report (49-7) 3045.
This study reports (1) the effects of identical temperature increases within preferred ranges on activity and feeding patterns of mackerel at different seasons and (2) summarized the experimental study of behavior in light of the need for changes in bioassay methodology.
- Olla, B.L. 1974. (1) Comparative studies on the responses of young tautog, Tautoga onitis and juvenile bluefish, Pomatomus saltatrix to increasing temperatures. (2) The effect of temperature on fish-to-fish attraction in an inshore schooling species, striped mullet, Mugil cephalus. (3) The activity, habitat preference, home range and feeding in the cunner, Tautoglabrus adspersus. AEC Report (49-7) 3045. This study reports (1) the differences in response capability of representative pelagic and demersal species types; (2) the reduction in fish-to-fish response at high sublethal temperatures; (3) the normal environmental requirements of an inshore demersal species, cunner.
- Olla, B.L. (ed.). 1975. Behavioral measures of environmental stress. p. 1-31. In: G.V. Cox (Chairman). Proceedings of a Workshop on Marine Bioassays. Marine Technology Society, Washington, D.C.
This chapter details the need for and use of behavioral measures in bioassay tests on marine organisms.

- Olla, B.L., A.J. Bejda and A.D. Martin. 1974. Daily activity, movements, feeding and seasonal occurrence in the tautog, Tautoga onitis. Fish. Bull., U.S. 72: 27-35.
This paper describes the life habits and environmental requirements, derived from in situ observations of the tautog.
- Olla, B.L., A.J. Bejda and A.D. Martin. 1975. Activity, movements and feeding behavior of the cunner, Tautogolabrus adspersus, and comparison of food habits with the coresident tautog, Tautoga onitis. Fish. Bull., U.S. In Press.
This paper describes the life habits and environmental requirements of cunner and feeding interrelationship with tautog.
- Olla, B.L., H.M. Katz and A.L. Studholme. 1970. Prey capture and feeding motivation in the bluefish, Pomatomus saltatrix. Copeia 1970: 360-362.
This study describes the different phases of the feeding response and the effect of prey size on feeding motivation.
- Olla, B.L. and C. Samet. 1974. Fish-to-fish attraction and the facilitation of feeding behavior as mediated by visual stimuli in striped mullet, Mugil cephalus. J. Fish. Res. Board Can. 31: 1621-1630.
This paper describes the role of vision in social attraction and feeding behavior of striped mullet.
- Olla, B.L. and C. Samet. 1975. Behavior of marine organisms as a measure of petroleum contamination. p. 437-450. In: Proceedings of Estuarine Research Federation Outer Continental Shelf Conference and Workshop on Marine Environmental Implications of Offshore Oil and Gas Development in the Baltimore Canyon Region of the Mid-Atlantic Coast. Dec. 2-4, 1974; College Park, Maryland.
This paper reviews important behavioral patterns in a variety of marine organisms and discusses how these behaviors can be used in assessing pollution effects.
- Olla, B.L., C.E. Samet, and A.L. Studholme. 1972. Activity and feeding behavior of the summer flounder (Paralichthys dentatus) under controlled laboratory conditions. Fish. Bull., U.S. 70: 1127-1136.
This paper describes activity cycles, feeding and swimming patterns of adult flounder under controlled laboratory conditions.
- Olla, B.L. and A.L. Studholme. 1971. The effect of temperature on the activity of bluefish, Pomatomus saltatrix L. Biol. Bull. 141: 337-349.
This paper describes the effects of thermal stress on activity, feeding and schooling in bluefish.
- Olla, B.L. and A.L. Studholme. 1972. Daily and seasonal rhythms of activity in the bluefish (Pomatomus saltatrix). In: H.E. Winn and B.L. Olla (eds.). Behavior of Marine Animals: Current Perspectives in Research. Vol. 2, p. 305-325. Plenum Press, New York.
This paper describes the normal daily and seasonal activity, feeding and schooling behavior of bluefish under controlled laboratory conditions.

- Olla, B.L. and A.L. Studholme. 1975. The effect of temperature on the behavior of young tautog, Tautoga onitis (L.). Proceedings of the Ninth European Symposium on Marine Biology. pp. 75-93.
This paper describes changes in activity, territoriality, feeding and shelter - dependence of young tautog at elevated, sublethal temperature.
- Olla, B.L., A.L. Studholme, A.J. Bejda, C. Samet, and A.D. Martin. 1975. The effect of temperature on the behavior of marine fishes: A comparison among Atlantic mackerel, Scomber scombrus, bluefish, Pomatomus saltatrix, and tautog, Tautoga onitis. In: Proceedings of IAEA Symposium on the Combined Effects on the Environment of Radioactive, Chemical and Thermal Releases from the Nuclear Industry. Stockholm, Sweden, June 2-6, 1975. This paper compares the effects of thermal stress between pelagic and demersal species and points out the importance of understanding the life habits of each species when predicting pollution effects.
- Olla, B.L., R. Wicklund and S. Wilk. 1969. Behavior of winter flounder in a natural habitat. Trans. Amer. Fish. Soc. 98: 717-720.
This study describes field observations of winter flounder activity and feeding at different times of the day and at different ambient temperatures.
- Parker, F.L. and P. A. Krenkel. 1970. Physical and engineering aspects of thermal pollution. CRC Press, Cleveland, Ohio.
This paper reports specific demands on aquatic environments due to the increased cooling water requirements for both thermonuclear and fossil-fueled steam electric power plants.
- Sprague, J.B. 1971. Measurement of pollutant toxicity to fish. III. Sublethal effect and "safe" concentrations. Water Research 1971. 5: 245-266.
This paper points up need for change in bioassay methodology particularly with respect to incorporating behavioral measures.
- Swedmark, M., A. Grammo and S. Kolberg. 1973. Effects of oil dispersants and oil emulsions on marine animals. Water Research 7: 1649-1672.
This paper summarizes the results of a comparative study of the toxicity of a number of dispersants to a variety of marine animals.
- Takahashi, F.T. and J.S. Kittredge. 1973. Sublethal Effects of the Water Soluble Component of Oil: Chemical Communication in the Marine Environment in the Microbial Degradation of Oil Pollutants, D.G. Ahearn and S.P. Meyers (eds.). Center for Wetland Resources, Louisiana State University, Publication No. LSU-SG-73-01, pp. 259-264.
This paper discusses the effects of a pollutant on sexual and feeding in behavior, as mediated by chemoreception in the lined shore crab, Pachygrapsus crassipes.

Thermal pollution of water. Panel discussion, Fourteenth Annual Conservation Conference, National Wildlife Federation, Washington, D.C., December 1967. This paper is an analysis of problems imposed upon different environmental communities from effects of thermal additions.

U.S. Atomic Energy Commission. Nuclear reactors built, being built or planned in the United States as of June 30, 1968. This study reports the status of thermonuclear power plants, both established and anticipated.

EFFECT OF TEMPERATURE ON THE BEHAVIOR OF MARINE INVERTEBRATES
Task #R8C267 (MAC-073)

OBJECTIVIES

1. Determine how normal behavioral responses of marine invertebrates are affected by thermal and contaminant stress.
2. Establish the sublethal levels of stress which mediate change in basis behavior.
3. Report the data to the scientific community so that the data is available to government agencies and scientists interested in the impact of sublethal stress on invertebrate animals, important in marine food chains and commercially.

ABSTRACT

The principal aim of this task will be to measure, under controlled laboratory conditions, how normal behavioral responses of selected marine invertebrate species are affected by selected environmental stresses, especially at the outset of temperature. Observations will be made to define normal patterns of behavior, including daily rhythms of locomotor activity, feeding habits, territoriality, aggression, reproduction, intraspecific competition and relation to shelter or substrate. These, in turn, will serve as baseline diagnostic indicators for measuring the effects of sublethal temperature stress. Emphasis will be placed on comparative aspects, studying species which possess contrasting life habits and ecological requirements.

NMFS TASK DEVELOPMENT PLAN

(See Detailed Instructions)

1. DATE PREPARED

8/8/75

(Submit five copies by Jan. 2)

TO: Director, National Marine Fisheries Service, ATTN: Fx5 National Oceanic and Atmospheric Administration Washington, D.C. 20235

FMC's - Submit a separate Task Development Plan for each task beginning, continuing, or ending in the current year, budget year, or budget year + 1. Reimbursable funds are not to be mingled with appropriated funds on any programmatic TDP; separate TDP's must be prepared. Submit one TDP itemizing the administrative support cost (Management Fund) for the FMC.

2. TDP NUMBER MAC-074-77-E1-R1	3. OBJECTIVE CODES				4. RANK	
	A	B	C	D	BY TARGET	BY + 1 INC.

5. TASK NUMBER R71211	6. TASK TITLE Ecological Baselines of the Outer Continental Shelf
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7. ORGANIZATION CODE FB6100	8. ORGANIZATION TITLE (Responsible for execution of this task) Ecosystems Investigations	9. PRINCIPAL LOCATION City: Highlands, State: NJ	
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OBJECT CLASS <small>Lines 10-18. Enter all dollar values as thousands and tenths of thousands. Lines 21-22. Enter as man-years and tenths of man-years.</small>	LINE NUMBER	CURRENT YEAR FY 19 76		BUDGET YEAR FY 19		BUDGET YEAR + 1 FY 19	
		TARGET ALLOWANCE A	INCREASE B	TARGET ALLOWANCE C	INCREASE D	TARGET ALLOWANCE E	INCREASE F
10. Total Direct Labor	15	6.8					
11. Travel	19	2.0					
12. Rents, Communications, Utilities	21	0.5					
13. Contracts (To be let)	51 52						
14. Grants (Funds obligated)	58						
15. Supplies	53	13.1					
16. Capital Equipment	54						
17. Other (All other obligations)		2.6					
18. Total Direct Funds <small>(Add lines 10 through 17 above.)</small>		25.0					
19. Positions, Full-time permanent <small>(Number applicable to this Task. Also, complete NOAA Form 32-14C.)</small>		0					
20. Positions, Other <small>(Number applicable to this Task.)</small>		1					
21. Man-years, Permanent		0					
22. Man-years, Other		1.0					
23. Reimbursable Support <small>(Reimbursable agreements only)</small>		3.9					

REMARKS

24. OFFICIAL PREPARING REPORT (Signature) <i>John B. Pearce</i> John B. Pearce, Director Ecosystems Invest.	25. FMC DIRECTOR OR DESIGNATED REPRESENTATIVE (Sig.) <i>Carl J. Sindermann</i> Carl J. Sindermann Center Director
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NMFS TASK DEVELOPMENT PLAN

TDP NUMBER
MAC-074-76-R-1

26. ACTIVITY, EVENT, AND MILESTONE SCHEDULE

NUMBER EACH ACTIVITY, EVENT, OR MILESTONE

IDENTIFY BY ENTERING 'A' FOR ACTIVITY, 'E' FOR EVENT, OR 'M' FOR MILESTONE.

PLANNING PERIOD - Indicate by entering an "X" at the beginning and completion of subtask or selected operational activities that collectively define the task for the 7 year planning period. Connect "X's" with a solid bar. "Events" and "Milestones" occur at specific points in time. Indicate these significant achievements by placing an "X" in a single column.

A, E, OR M	NARRATIVE (Brief descriptive phrase of activity, event, or milestone)	CY		BY		BUDGET YEAR										
						+1		+2		+3		+4		+5		
		1	2	1	2	1	2	1	2	1	2	1	2	1	2	
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	
A	Compile information for report to MESA	X														
E	Submit report to MESA	X														
A	Review MESA's draft input to EPA	X														
E	Submit comments on draft to MESA	X														
A	Review EPA's draft EIS	X	X													
E	Submit comments on draft to EPA/MESA		X													

7. OUT YEAR COMMENTS

(Check appropriate boxes and enter applicable percentage.)

*Increases usually come from reprogramming within your FMC.)

a. Continued at same level

b. Increase of ___% *

c. Reduction of ___%

d. Termination

"X" APPROPRIATE COLUMN

REMARKS

STATEMENT OF NEED

- A. Principal Objective to which this Task Contributes: NMFS Goal IV, Subgoal A, Objective 9 -- "Determine the impact of environmental change in the Middle Atlantic region".

1). Need or Problem: Sewage sludge from metropolitan New York City has been dumped in the Atlantic ocean about 10 n mi. east of Sandy Hook, N.J., and about the same distance south of Long Island, since 1924. Approximately 5.6 million cubic yards ($4.3 \times 10^6 \text{ m}^3$) of sludge from sewage treatment plants serving 11 million people were dumped in 1973, and that quantity is expected to increase as population, industrialization, and treatment capacity grow. Large quantities of dredge spoil, industrial acid wastes, and excavated materials are also dumped near the sewage sludge dump site. Known adverse effects on marine fisheries resources include marked alteration of the background distribution and abundance of benthic macroinvertebrates, evidence that demersal fish and crustaceans avoid the dump sites, fin-rot disease of fishes, exoskeletal erosion in lobsters, crabs and shrimps, a "black gill" disease in crustaceans, and possibly chromosomal aberrations in ichthyoplankton. Shellfish harvesting within a 6-mile radius of the center of dumping was prohibited in 1972 and the prohibited area was expanded in 1974 by another 50 square miles. Scientific and public concern has increased over the past few years, one major concern being the potential hazard to beaches. EPA has responded by announcing its intention to phase out ocean dumping in the New York Bight by 1981, but that as an interim measure consideration was being given to relocation of the sludge dump site farther offshore, effective 1 July 1976. At EPA's request, NOAA provided information to aid in the designation of two alternate sites which are a minimum of 25 n mi. from the Long Island and New Jersey shorelines, 10' n mi. from the axis of the Hudson Shelf Valley, and no more than 65 n mi. from the center of the Sandy Hook - Rockaway Point transect. EPA is now preparing an environmental impact statement on these two areas with the help of NOAA's Marine EcoSystems Analysis (MESA) project. The MACFC has agreed to provide input to this effort within its areas of expertise and responsibility for protection of marine fisheries resources.

2). Rationale for NMFS Involvement: Because NMFS is the living marine resources agency within NOAA, it has distinct statutory responsibilities under the Marine Protection, Research, and Sanctuaries Act of 1972 (P.L. 92-532 -- The Ocean Dumping bill). NOAA actively works with the agencies which have regulatory functions "...by providing advice and comments in the formulation of regulations, by commenting on ocean dumping permit requests within the context of the Fish and Wildlife

Coordination Act, as amended, and by providing environmental assessments of existing or proposed dumpsites through the use of our scientific and technical expertise". (Statement by David H. Wallace before the Senate Commerce Committee, Subcommittee on Oceans and Atmosphere, re P.L. 92-532 -- May 20, 1975). By participating in the environmental assessment of potential new dump sites, NMFS is performing both its statutory responsibilities and is using its professional expertise gained over many years in the public interest.

B. Primary Recipient of the Information

The data and review materials generated by MACFC are to be sent to the MESA-N.Y. Bight Project office where they will be rearranged, combined with information from other MLC's and edited before being forwarded to EPA.

ACTIVITY PLAN

EPA requires essentially a review of the state of knowledge of the biological oceanography at the existing and proposed alternate dump sites. Accordingly, the report to MESA for transfer to EPA must include information on the following subjects:

- Phytoplankton and primary productivity
- Zooplankton
- Benthic macroinvertebrate communities
- Benthic microbial populations
- Seabed oxygen consumption
- Finfishes
- Shellfish
- Ichthyoplankton
- Pathology of marine organisms

The report must also contain sections evaluating existing impacts of dumped materials on the ecosystem, existing uses and possible future uses of the offshore areas, implications of dumped materials on public health, and conclusions and recommendations regarding continued use of the existing sites and relocation of them farther offshore.

We anticipate reviewing both MESA's draft input to EPA and the draft EIS assembled by EPA.

TASK OUTPUTS AND BENEFITS

The report to MESA containing the results of our investigations is the major output. However, our reviews of MESA's draft report and of the final draft EIS constitute substantial outputs by providing quality control.

Benefits will include updating and organizing into useful knowledge virtually all that is known about the offshore biological oceanography of the New York Bight. This information is vitally needed in view of NMFS's anticipated new responsibilities under extended jurisdiction.

IMPACT OF TASK AUGMENTATION

Not applicable.

CRITERIA FOR TASK COMPLETION

BACK-UP DOCUMENTATION

A. References

- Middle Atlantic Coastal Fisheries Center. 1974. Living resource-related aspects of ocean dumping in the New York Bight. MACFC Informal Report 35, August 21.
- Middle Atlantic Coastal Fisheries Center. 1975. MESA-NYB-funded biological research. Progress Report. March 1975 - June 1975. MACFC Informal Report 74, July 18.
- Middle Atlantic Coastal Fisheries Center. 1975. MESA interim alternate dump site narrative report. MACFC Informal Report 66, May 29.
- Middle Atlantic Coastal Fisheries Center. 1975. Biological information submitted to MESA on July 3, 1975, for use in a report to EPA on alternative dump sites in NYB. (as revised July 21, 1975.) MACFC Informal Report 72-A, July 21. 2 vols.
- Manhattan College. 1975. Contaminant inputs to the New York Bight. Report to MESA on Grant No. 04-4-002-34. Mueller, J.A., and J.S. Jeris, prime investigators. March. 360 pp.
- MESA. 1975. Ocean dumping in the New York Bight. NOAA Tech. Rep. ERL 321-MESA 2. March. U.S. Gov. Printing Office, Washington, D.C. 78 pp.
- Swanson, R.L. 1974. Memo re: letter of agreement between NOAA and EPA (on investigations to be undertaken for preparation of EPA's environmental impact statement on the alternative sewage sludge dump site). Nov. 6. 32 pp.

U.S.E.P.A., Region II, Surveillance & Analysis Div. 1974. Briefing report. Ocean Dumping in the New York Bight since 1973. April. 47 pp.

U.S.E.P.A., Region II, Surveillance & Analysis Div. 1974. Ocean disposal in the New York Bight. Technical Briefing Report No. 1. July.

U.S.E.P.A., Region II, Surveillance & Analysis Div. 1975. Ocean disposal in the New York Bight. Technical Briefing Report No. 2. April. 86 pp.

Wallace, David H. 1975. Statement before the Senate Commerce Committee, Subcommittee on Oceans, and Atmosphere re: NOAA's activities under the Marine Protection Research, and Sanctuaries Act of 1972 (P.L. 92-532). May 20. 13 pp.

- C. Current task can be accomplished under existing legislation (see below) providing that the MESA Program in the New York Bight is adequately funded.
- 1) Coastal Zone Management Act of 1972.
 - 2) Marine Protection Research and Sanctuaries Act of 1972.
- D. This TDP will not affect the environment and no Environmental Impact Statement is needed.

ECOLOGICAL BASELINES OF THE OUTER CONTINENTAL SHELF
Task #R71211 (MAC-074-76-R-1)

OBJECTIVES

1. Determine the impact of environmental change in the Middle Atlantic region.

ABSTRACT

MACFC will provide to EPA through the MESA-N.Y. Bight project office a review of the state of knowledge of biological oceanography at existing dump sites and at proposed alternate dump sites for use by EPA in the preparation of an EIS on the proposed relocation of metropolitan New York City's ocean dump sites to new areas farther offshore. MACFC will also review both the draft report from MESA to EPA and the draft EIS by EPA.