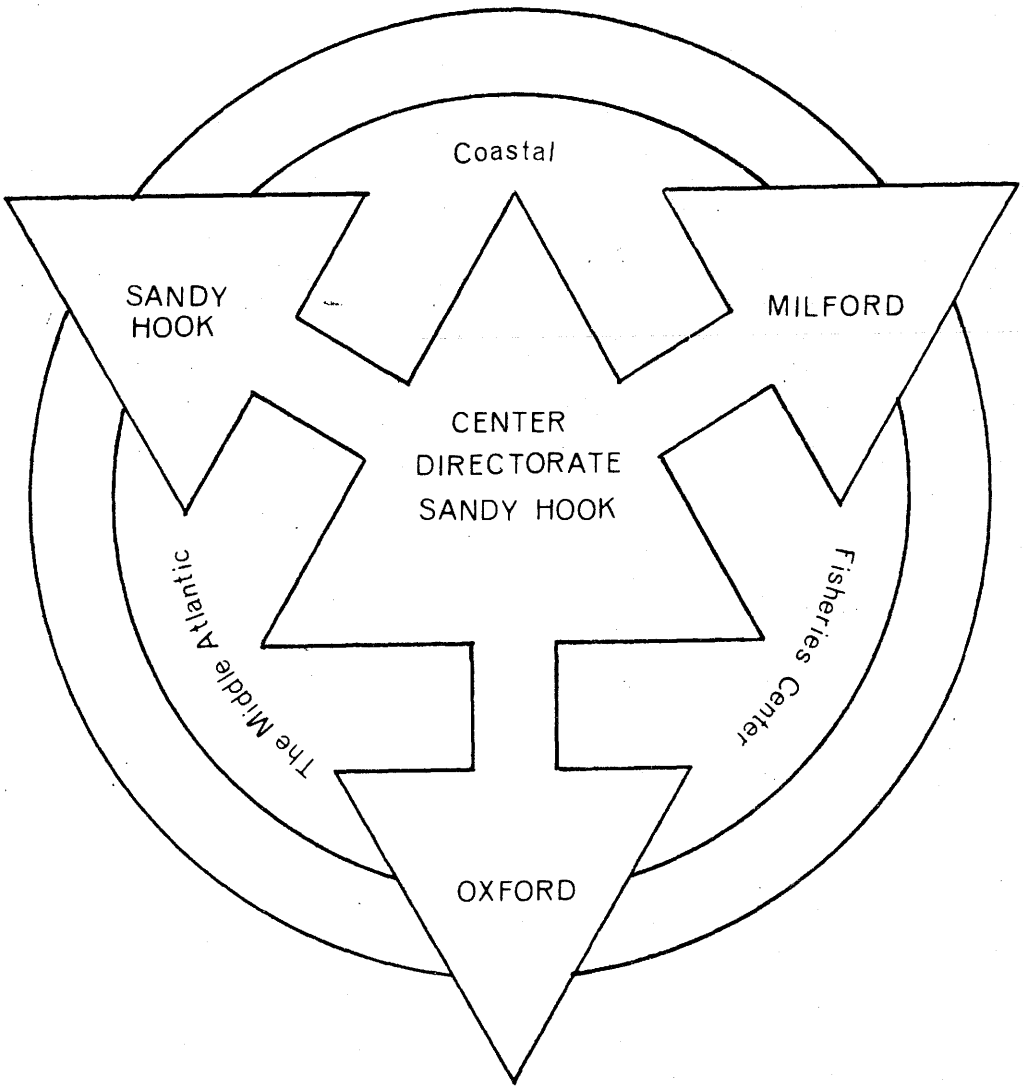
ANNUAL REPORT ON MESA-FUNDED RESEARCH IN THE NEW YORK BIGHT - JULY 1973 - JUNE 1974

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

MIDDLE ATLANTIC COASTAL FISHERIES CENTER



Informal Report No. 30

July 12, 1974

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NOAA-NMFS

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INTRODUCTION

Although written as a proposal, Middle Atlantic Coastal Fisheries Center Informal Report No. 21 of March 8, 1974, entitled "Biological Studies in the New York Bight: A Proposal by the Middle Atlantic Coastal Fisheries Center, NMFS, to NOAA-MESA for Funding in FY 1975" contains the best available overall description of MESA-funded biological studies of FY 1974. The proposal was written after several months of actual studies, hence its descriptions of research tasks were realistic.

We have adopted the outline of Informal Report No. 21 for this brief annual report of MESA-funded biological research in FY 1974, as follows:

Task No. 1.	Statistical Design and Analysis
Task No. 2.	ADP Format and Operations
Task No. 3.	Benthic Respirometry
Task No. 4.	Benthic Macrofauna
Task No. 5.	Meiofauna
Task No. 6.	Microbiology
Task No. 7.	Plankton and Primary Productivity
Task No. 8.	Resource Distribution and Abundance
Task No. 9.	Contaminant Analysis
Task No. 10.	Sediment Analysis

The last page of this report is a budget summary.

Task No. 1. STATISTICAL DESIGN AND ANALYSIS

Because the organisms inhabiting sediments are excellent indicators of the ability of overlying waters and sediments to support life, and also because the reproducibility of samples of organisms and contaminants from sediments must be known in order to interpret field results, we elected to have our sampling results analyzed by a qualified biometrician. The contractor has submitted two reports based on two sets of data: 1) previous research on the benthos, and 2) reconnaissance sampling of heavy metals in sediments.

Previous research on the benthos demonstrated that usually less than 20 samples taken by the Smith-McIntyre grab provided meaningful results within acceptable limits of sampling variability. The contractor's report was incorporated in our report to the MESA-New York Bight Office for the second quarter of FY 1974.

Reconnaissance sampling of heavy metals in the New York Bight demonstrated that about five replicates are required. The contractor's complete report is being processed as part of our report to MESA for the fourth quarter of FY 1974.

In June, we sent the complete biological results of reconnaissance sampling of benthic organisms to the contractor, discussed below under Task No. 4.

Task No. 2. ADP FORMAT AND OPERATIONS

This task has five objectives. In abbreviated form they are: 1) to tape all biology and biology-related data of the project; 2) to analyze the data selectively, e.g., for limits of confidence, regression, etc.; 3) to list the data in convenient form for subsequent analyses; 4) to fulfill NOAA/MESA data-archiving obligations through NODC; and 5) to produce appropriate SYMAP displays of the data.

We have made progress toward four of the five goals. On Goal 1, we organized, compiled, and edited historical temperature-salinity data, and we developed standardized data-processing forms for storage and retrieval of MESA-related data. On Goal 2, we have located, evaluated, and modified several programs used in SYMAP displays and in standard statistical analyses, including multivariate analyses. On Goal 3, we have key-punched, verified, edited, and produced listings of MESA-related data. On Goal 4, we have submitted National Marine Data Inventory (NAMDI) forms to NODC on all MESA cruises (Table 1). On Goal 5, no SYMAPs were prepared because the data are still being generated.

Table 1 - Summary of MESA, N.Y. Bight NAMDI's Submitted to NODC by Ecosystems Investigations for MESA, N.Y. Bight Studies

I. Cruises to Apex of New York Bight

Cruise	Date	Oxygen	Temp.	Grabs	Sediment Analysis	Biol. Poll.	Zoo. benthos	Micro-organisms	Respir-ometry
R-73-1	3/20/73 - 3/27/73	6	6	30	X	6	6	-	-
R-73-2	5/30/73 - 6/01/73	9	9	45	X	9	9	-	-
AT-73-1	6/05/73 - 6/14/73	29	29	265	X	29	29	5	-
R-73-3	6/18/73 - 6/18/73	3	3	15	X	3	3	-	-
A-73-1	8/02/73 - 8/06/73	64	64	320	X	64	64	5	-
0-73-1	10/19/73 - 10/26/73	91	91	455	X	91	91	8	-
A-74-1	1/22/74 - 1/30/74	103	103	515	X	103	103	7	45
0-74-1	3/21/74 - 4/04/74	103	103	515	X	103	103	20	57
		408	408	2160	X	408	408	45	102

II. Cruises in estuary (Raritan, Lower & Sandy Hook Bays) leading to Apex.

Cruise	Date	D.O.	PO_4	NO_3	NO_2	pH	Alk.	Trans.	Temp.	Prim. Prod.	Pigm.	Phytopl.	Sal.	Biol. Poll.
R-73-11	11/11-14/73	9	9	9	9	9	9	9	9	3	9	9	9	-
R-73-12	12/4-7/73	10	10	10	10	4	3	10	10	3	10	10	10	-
R-74-01	1/8-9/74	8	8	8	8	8	5	8	8	5	8	8	8	-
R-74-02	2/12-13/74	12	12	12	12	12	12	12	12	11	12	12	12	1
R-74-03	3/6-7/74	12	12	12	12	12	12	12	12	12	12	12	12	-
R-74-04	4/10-11/74	12	12	12	12	12	12	12	12	12	12	12	12	-
R-74-05	5/8-9/74	12	12	12	12	12	12	12	12	12	12	12	12	-
R-74-06	6/5-7/74	12	12	12	12	12	12	12	12	12	12	12	12	-
		87	87	87	87	81	77	87	87	77	87	87	87	1

Task No. 3. BENTHIC RESPIROMETRY

Because one of the major pollution problems in the New York Bight is the large input of organic wastes (sewage sludge and dredge spoils) to the benthos of these waters, some understanding of the net difference between rates of input and rates of disappearance of these organic wastes is deemed necessary in order to determine their impact on the local marine environment. The purpose of this task is 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 in the apex of the Bight.

To date, two quarterly baseline cruises have been accomplished in the apex examining oxygen consumption by cores from 45 and 57 stations, respectively. Variability in the sewage sludge and dredge spoil disposal areas was high. As a result, on the second cruise, twelve cores instead of the usual four cores per station were taken at two stations, one near the center of the sewage sludge area and one near the center of the dredge spoil area, to examine the variability problem. With the assistance of RAYDIST, all cores were taken within an area the size of a football field. Data from this cruise is still undergoing analysis. However, it does appear that variability in these areas is high. From a distribution stand point, the highest rates of oxygen consumption in winter seem to occur over the sewage sludge disposal area. Further discussion of the seasonal and distributional pattern is premature.

Task No. 4. BENTHIC MACROFAUNA

Development of Field Sampling Design. In our proposal for MESA related work in FY 75 (MACFC Informal Report No. 21) we indicate that our contracted statistical analyses of historical (existing) benthic macrofaunal data would be completed by the end of the fourth quarter, FY 73. We also proposed that the data from the reconnaissance cruises would be analyzed by the end of the second quarter, FY 74. The purpose of both analyses was to establish confidence limits for benthic sampling in the Bight which would be applicable to past and future benthic studies and baseline operations involving benthic grab sampling following established protocol. The analyses of historical data (186 samples from 24 stations) by the contractor, based on a negative binomial distribution, revealed that "...a relatively small number of samples (usually less than 20) are required for testing simple hypotheses of the differences between means in two strata utilizing reasonable alpha and beta risks."

All reconnaissance data were furnished to the contractor in June 74 and most of the analyses are completed although we have not yet received a report on these data. The reconnaissance data are, unlike the historical data, replicated and synoptic; twenty grab samples were taken at each of eight stations which may be representative of distinct sampling strata. Preliminary results of the analyses of these reconnaissance data suggest that far fewer samples will have to be considered than was indicated in the analyses of the historical data. In terms of benthic meiofauna species only "...about 3 replicates were required to detect differences of $\pm 50\% \bar{X}$."

With the completion of the reconnaissance analyses it should be possible for benthic ecologists to establish a statistically valid sampling protocol in advance of actual field operations; this will represent a "first" in the field of marine benthic ecology.

Baseline Benthic Macrofaunal Distribution and Census. During FY 74, five cruises involving the fisheries research vessels R/V Albatross, Delaware II and Oregon II were made in the Bight. During four of these major cruises, Smith-McIntyre grab samples were taken at approximately 100 stations distributed over the standard MESA grid in the Bight apex. Five grab samples were collected at each station and aliquots were removed for analyses of heavy metal burdens, sediment type, total oxidizable organics and other physico-chemical parameters. The results of these latter analyses are treated in other sections of this report.

The fifth cruise involved benthic operations at the deep water dumping site designated as Site 106. A cruise report for this operation, as well as reports for operations in the Bight apex, are included in our quarterly reports.

It should also be noted that during the last quarter of FY 74, Ecosystems Investigations placed scientists aboard the R/V Venture and R/V Mt. Mitchell during cruises to the MESA-designated alternative dump sites and the Baltimore Canyon site proposed for offshore drilling, respectively. Both operations are closely related to the basic MESA missions in the New York Bight; benthic and contaminant and sediment data collected during these two cruises will have significant bearing on MESA objectives beyond the Bight apex.

Approximately 75 benthic grab samples were collected during the R/V Venture cruise to the alternative dumping sites and 150 grab samples were taken in the Baltimore Canyon area. Because of the urgency for data available from these collections (for EIS, permit issuance, etc.), the MESA sorting group is concentrating on sorting benthic samples collected from the alternative sites. Special funds have been requested outside MESA in order to sort and analyze the benthic macrofauna from the Deep Water Dump Site 106 and Baltimore Canyon.

MESA Sorting Center Activities and MESA Museum. During the FY 74, a total of 382 samples (34/month) were sorted and the benthic contents of 223 samples completely identified. Problems involving the procurement and training of sorters and identifiers kept productivity below that originally proposed. Many of these problems have been overcome and productivity was substantially increased during the last two quarters of FY 74.

New management practices (MB) have been instituted in the Sorting Center, principally in regard to establishing priorities for sorting and identification which enable us to begin to approach "real time" data output in regard to benthic studies. We are constantly seeking new ways to build esprit de corps within the Sorting Center, secondarily increasing productivity and facilitating real time data production.

Arrangements have been made with GSA to renovate the basement of building 22 so that we can accession and store all samples collected during the tenure of MESA; plans have been drawn and we await the contractors. The museum, as planned, will allow not only the storage of glass contained preserved specimens, but also the long term storage of frozen and dried samples and their preparation and processing.

Data Synthesis. We have reached a point where we have the capability to begin to correlate several data sets, i.e., having completed the sorting and identification of the reconnaissance benthic macrofauna data we can begin to correlate distributions of benthic organisms with sediment type, sediment organics, heavy metal burdens in sediments, coliform bacteria and other biological-physico-chemical parameters. The first such analyses are underway with heavy metal and benthic distributions using computer systems and statistical expertise of the contractor. Later we will generate data in a SYMAP format which can be used in computer generated correlations.

Task No. 5. MEIOFAUNA

Meiofauna are herein defined as those benthic organisms which pass through a sieve with a mesh opening of 0.500 mm and which are retained on a sieve with a mesh opening of 0.063 mm. Four stations in the New York Bight have been examined for within-station variability, and it has been shown that the mean abundance of the most dominant taxon, the free-living nematodes, can be estimated within fifty percent of the mean at the .05 alpha level with a sample size of n = 3. The New York Bight meiofauna were represented by a number (10-14) of major taxa which included nematodes, foraminifera and harpacticoid copepods as the most abundant. Densities thus far observed are not unusually high or low when compared with similar areas around the world.

Foraminifera. Benthic samples taken during June 1973 from various areas in the New York Bight have yielded significant numbers of live forams, sometimes numbering several thousand per 100 cm^3. Approximately fifteen species have been recognized of both live and dead forams, although only five species have been abundant. Tentative species identifications have been made and the species complex *Elphidium clavatum-incertum*, which has been found to predominate in polluted areas, has been recognized. Living planktonic forams although present have been found so far to be sparse and spasmodic in the New York Bight waters.

Ciliate Protozoa. For the past twelve months this study has investigated the feasibility of quantitative sampling for ciliates both from bottom sediments and from the water column over, near, and away from sites of dredging and sewage spoil. Samples have been collected on several cruises throughout the year in order that the seasonal and spatial variability of ciliate community compositions to the level of genera could be examined. Quantitative samples of ciliates have thus far been limited to those collected in 30-liter Nisken volume samples collected from various sites in the New York Bight and at differing depths. Analysis of these samples show: 1) typical profiles of ciliate populations with the largest peak within the euphotic zone of waters away from or within the dump sites; 2) atypical but consistent profiles of ciliate populations with two peaks, the smaller from the euphotic zone and the larger from below the euphotic zone in areas adjacent to or over the sewage and sludge spoil sites. Ciliates collected from below the euphotic zone are bacteria-eating scuticociliates: *Uronema nigricans*, *Cyclidium dimacronucleatum*, *Cyclidium polyschizonucleatum*, and *Uronema marinum*. Those ciliates collected from within the euphotic zone are microalgivorous tintinnids. Samples collected with Smith-McIntyre grabs from spoil and non-spoil sediments and processed by Uhlig sediment core extraction procedure show typical benthic populations of trachelocercids from non-spoil sediment and their absence from spoil sediments. Many scuticociliates can be recovered after allowing germination in Lackey Jars of resting cysts from spoil sediment samples.

Task No. 6. MICROBIOLOGY

All living things including man which inhabit the New York Bight and vicinity are exposed to pollution-associated diseases and contaminants. The bottom-dwelling fishes, especially flounders, exhibit a higher incidence of fin rot disease in the apex than elsewhere in the Bight. Studies are in progress to define its geographical boundaries, its seasonal changes, its etiology, the possible immunity of some fishes to it, and the distribution of benthic bacteria that are thought to be associated with it. Fin rot is a condition in which the fins appear eroded and tattered initially, then finally tend to disappear completely. Crabs and lobsters, as well, exhibit anomalies. Discoloration and erosion of the shell and gills are common in crustaceans of the apex.

Since the spring of 1973, we have monitored the prevalence of fin rot in the New York Bight in conjunction with coastal fish stock assessment cruises extending from Block Island to Cape Hatteras. In addition, monthly (or better) fin rot disease prevalence has been monitored since March 1973 in Sandy Hook Bay and Great Bay, New Jersey. Five species of flounder (*Limanda ferruginea*, *Paralichthys dentatus*, *Paralichthys oblongus*, *Pseudopleuronectes americanus*, *Scopthalmus aquosus*) were examined for fin rot disease. Winter flounder, *Pseudopleuronectes americanus*, from the New York Bight apex frequently exhibited the disease. The year-round prevalence of fin rot in winter flounder from the New York Bight apex was 16.3% (317/1944), outside the apex the prevalence was 2.3% (20/1209). Monthly cruises to Sandy Hook Bay and Great Bay revealed fin rot prevalences of 7.6% (170/2227) and 1.9% (19/964), respectively.

In late FY 1974 we funded continuation of a study of the resistance of bacteria to heavy metals and antibiotics in the New York Bight. The study is demonstrating not only the ability of certain bacteria to achieve resistance but also to transfer resistance to other bacteria during conjugation. The "other bacteria" can be other species and other genera, the significance being that resistant strains in dump sites can initiate a "chain reaction" of resistance-transfer leading conceivably to pathogens of fish, shellfish, and man. Another study involved investigation of the possible migration of sewage sludge to the beach areas of south Long Island. Sediments from 31 stations were analyzed for 7 heavy metals, and 20 stations for bacteria. Results of this study have been summarized in the Center Informal Report No. 22, included in our third quarterly report.

Task No. 7. PLANKTON AND PRIMARY PRODUCTIVITY

MESA-funded studies have proceeded throughout most of FY 1974 on plankton and primary productivity in the New York Bight and adjacent waters. The objectives of the first year's research are 1) to describe temporal and spatial variations in net-plankton and nanoplankton primary productivity and taxonomic composition; 2) to evaluate these variations in terms of standing crop, incident radiation, light penetration, temperature, and nutrient inputs; 3) to determine the importance of phytoplankton productivity as a source of organic matter; 4) to determine the major input of turbidity and nutrients; and 5) to evaluate the effects of current dumping practices on nano-plankton and netplankton productivity.

Sixteen stations were established in the lower Hudson Estuary and New York Bight apex. Ten three-day cruises have been made since September 1973 during which three to five depths were sampled at each station.

Spatial variations and productivity were due primarily to concurrent changes in standing crop. Temporal variations reflected both changes in standing crop and growth rate and were related to grazing, light and temperature patterns. No observable long term effects of dumping have been observed on phytoplankton growth rates or on light penetration and dumping (September 1973 to February 1974 only). Estuarine runoff accounted for most of nutrient and suspended material input during this period.

The absence of a persistent effect of dumping may be due to the lack of water column stratification and low winter productivity. The effects of dumping should be most pronounced during the summer months when estuarine runoff is minimal and the water column is thermally stratified.

A series of eight monthly cruises have been accomplished in Raritan, Lower and Sandy Hook Bays investigating the distribution and magnitude of primary productivity (particulate, dissolved and total under both natural and artificial light), standing stock of phytoplankton (via continuous underway and vertical profile fluorometry and discrete chlorophyll samples), and phytoplankton species, numbers, size, morphology, and diversity with respect to nutrients (including NO_3, NO_2, NH_H, PO_4, SiO_3), light, salinity, temperature, alkalinity, pH, dissolved oxygen and most recently seston associated heavy metals, particulate organic carbon and nitrogen, and total hydrocarbons. Interpretation of the data must await further analysis. However, initial inspection of the data demonstrate the relative effects of light, turbidity, and nutrients on the magnitude of primary productivity. Analyses to investigate the heavy metals burden of the seston appear feasible and significant.

Task No. 8. RESOURCE DISTRIBUTION AND ABUNDANCE

During the reporting period Resource Assessment Investigations at MACFC, conducted five trawl surveys in the Middle Atlantic Bight with emphasis in and around the MESA apex area. Table 2 lists survey dates and related cruise information. The joint purpose of the cruise series was to assess groundfish resources, collect finfish tissues for heavy metals and pesticide analyses and to observe the catch for the incidence of fin rot. In addition the data will be used to provide information on fish migration patterns, and to relate the impact of the stressed apex area on the distribution and relative abundance of important commercial and recreational stocks.

The October and April cruises were part of a regular series of spring and fall coastal assessment cruises along the entire Middle Atlantic Bight. We augmented these surveys with cruises in July and February in the New York Bight with emphasis on the apex area. The June survey was first of a monthly cruise series covering from Raritan Bay through the MESA apex to the head of Hudson Canyon. The monthly cruises are designed to especially supplement our knowledge of short-term movements and variations in population structure.

Preliminary catch results have been summarized in cruise reports and submitted to MESA staff.

Based on available bottom composition information and preliminary catch analyses some species of finfish avoid high carbon bottom in the New York Bight apex. Tables 3 and 4 relate catch results from two cruises to high and low carbon areas. These preliminary observations suggest that avoidance or reduced residence time in parts of the Bight by some species may be a real possibility.

Table 2. MESA Coastal Groundfish Assessment Cruises; July 4, 1974 - June 19, 1975

Date	Vessel	Total Number of Trawl Stations	Number of Trawl Stations in MESA Apex
July 29 - Aug. 6, 1973	Albatross IV	47	23
Oct. 1 - Nov. 7, 1973	Atlantic Twin	167	34
Feb. 1-5, 1974	Albatross IV	50	27
April 1-3, 28-29, 1974	Atlantic Twin - Delaware II	166	24
June 3-7, 1974	Delaware II	46	15

Table 3. Summary results of stations in MESA apex area. July 29 - Aug. 6, 1973 - Albatross IV

Station	No. of Fish Species	No. of Elasm. Species	No. of Invert. Species	Net Wt. Fish	Net Wt. Elasm.	Total Net Fish & Elasm.	Net Wt. Invert.	Total Net. Wt.
Tows in High Carbon Area								
1	4	1	3	8	17	25	50	75
2	4	1	2	11	7	18	33	51
3	2	1	3	4	13	17	12.5	29.5
16	10	2	2	40	28	68	2	70
20	8	1	3	40.5	17	57.5	60	117.5
21	4	1	3	3	12	15	25	40
22	4	2	3	6	6	12	8	20
23	7	2	3	15	16	31	18	49
25	3	3	2	7	76	83	23	106
26	4	2	3	7	16	23	14.5	37.5
27	5	2	3	6	19	25	34	59
Other Tows								
17	8	2	3	54	43	97	5.5	102.5
18	6	1	2	19	4	23	2.5	25.5
19	5	2	2	4.5	10	14.5	4	18.5
24	4	1	2	5	17	22	3.5	25.5
28	4	1	3	6.5	13	19.5	77	96.5
29	9	1	3	16	22	38	7	45
30	14	2	3	68	89	157	9.5	166.5
31	7	2	2	37.5	46	83.5	5.5	89
44	10	1	1	38	24	61	3	64
45	9	1	2	45.5	7	52.5	7	59.5
46	7	1	3	32.5	73	105.5	37.5	143
47	8	1	2	69	12	81	11	92
High Carbon Mean				13.4	20.6	34.0	25.5	59.5
Other Mean				33.0	30.0	62.9	14.4	77.3

Table 4. Summary results of stations in MESA apex area. Albatross IV - February 1-5, 1974

Station	No. of Fish Species	No. of Elasm. Species	No. of Invert. Species	Net Wt. Fish	Net Wt. Elasm.	Total Net Fish & Elasm.	Net Wt. Invert.	Total Net. Wt
Tows in High Carbon Area								
1	4	1	1	4.6	3	7.6	1	8.6
3	6	1	2	34.5	4	38.5	4.1	42.6
4	9	1	2	63.3	25	88.3	12	100.3
5	7	1	1	11.7	13	24.7	.5	25.2
7	5	1	1	11.7	24	35.7	2	37.7
8	7	1	1	33.2	23	56.2	2	58.2
9	9	1	1	61.6	4	65.6	1	66.6
11	9	1	2	17.3	7	24.3	1	25.3
26	5	1	1	7.6	18	25.6	.5	26.1
28	6	2	0	56.1	22	78.1	-	78.1
29	7	2	1	25.6	30	55.6	.5	56.1
Other Tows								
2	5	1	1	6.2	7	13.2	2	15.2
6	9	1	1	39.6	23	62.6	.5	63.1
10	9	2	1	149.4	50	199.4	2	201.4
25	9	1	1	20.4	22	42.4	.5	42.9
27	7	2	1	34.7	17	51.7	.5	52.2
30	10	1	2	24.6	8	32.6	2.5	35.1
31	9	1	1	27.1	9	36.1	.5	36.6
32	7	1	2	43.1	117	160.1	.6	160.7
33	9	2	2	109.2	67	176.2	1	177.2
34	8	1	2	41.2	9	50.2	14.5	64.7
35	12	1	1	44.9	14	58.9	3	61.9
46	10	1	1	76.1	13	89.1	5	94.1
47	7	-	2	14.6	-	14.6	24	38.6
48	2	1	-	2	.5	2.5	-	2.5
49	10	1	3	43.7	9	52.7	4	56.7
50	9	1	2	30.2	8	38.2	1	39.2
High Carbon Mean				29.8	15.7	45.5	2.2	47.7
Other Mean				44.2	23.3	67.5	3.9	71.4

Task No. 9. CONTAMINANT ANALYSIS

Two separate studies were funded this fiscal year to determine the trace metal levels in sediments of the New York Bight.

One study was conducted to determine the number of bottom grab samples needed to be analyzed at each station for statistical validity for the distribution of heavy metals at that location.

In this study, 20 grab samples were taken at each of eight stations and five grab samples were taken at about 20 other stations. About 40% of this data were sent to Dr. Saila of the University of Rhode Island for statistical analysis. Dr. Saila found that two grab samples only were needed per station for statistical validity for heavy metal distribution. The other 60% of this data was completed in March and the results have been submitted to Dr. Saila.

A second study involves the analysis of 500 sediment samples obtained from 250 stations within a preestablished MESA grid in the New York Bight. Analyses of 400 of these samples are being done at the Milford Laboratory of the MACFC, and the work is about 60% complete.

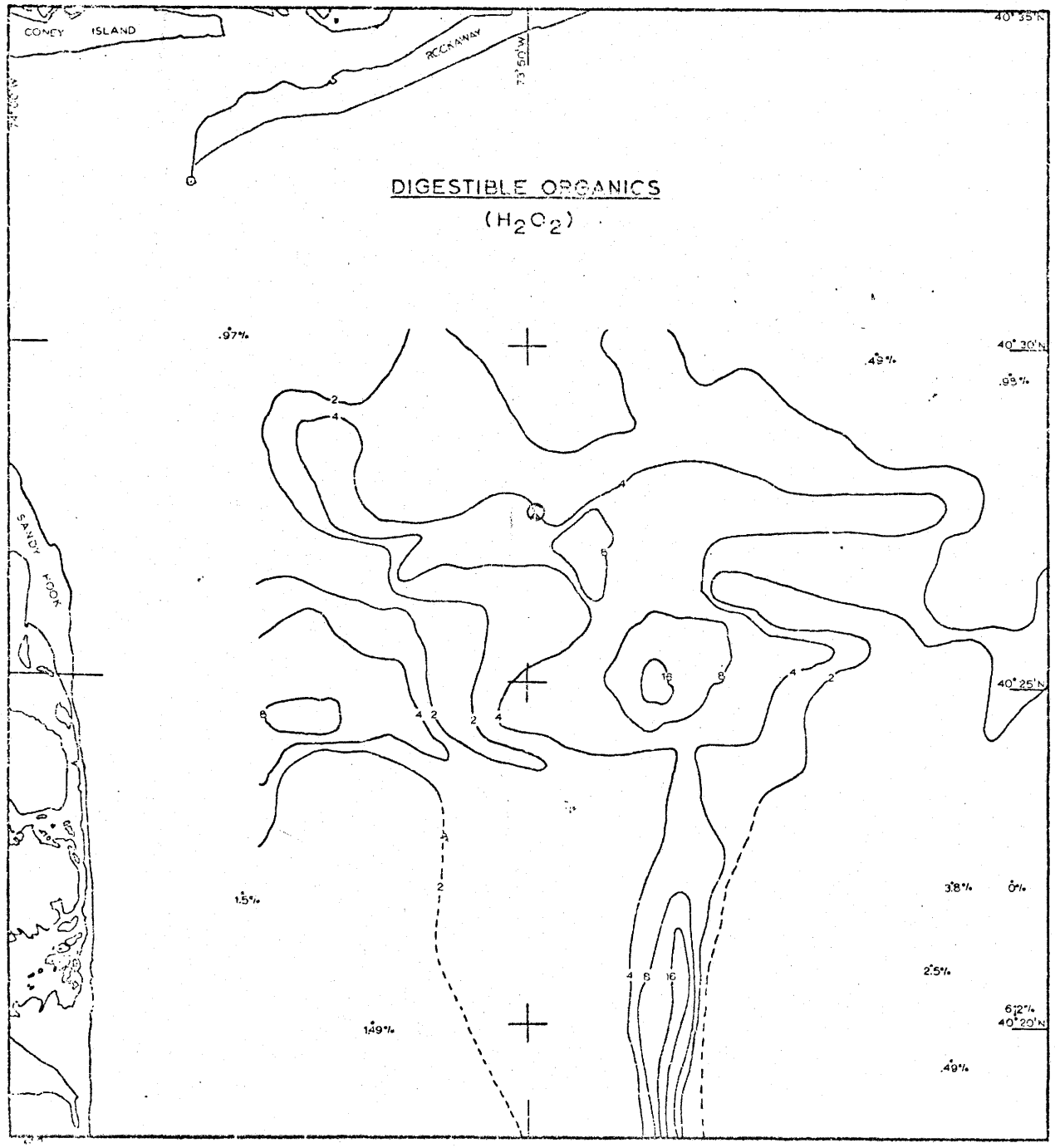
One hundred of these samples have been contracted to a private laboratory. The work by this laboratory is about 80% complete; a final report of this data will be available by mid-July.

Task No. 10. SEDIMENT ANALYSIS

The original university contract under which sediment analyses were initiated called for analysis of 2,000 bottom sediment samples for: a) digestible organics via H_2O_2 digestion methods, and b) grain size. Currently, 1,397 samples have been handled and routine analyses have been carried through to a data reduction stage. Although the original contract called for 1,000 samples per year, the contractor believes that he can complete analyses on all of the samples collected for the Sandy Hook benthic study by fall of 1974. This involves a total number of samples approaching 3,000, analyses of which will require additional funding.

The percentages of digestible organics in the New York Bight apex are still presently being computed. Preliminary results, however, indicate a range on the order of 10 to 18% within the sludge dumping areas. The variability decreases sharply towards the Long Island shore (see figure, next page).

There is considerably less variation within the basic grain size parameters. These include gravel-sand-mud ratios, graphic mean and median, sorting, skewness and kurtosis. Greatest range in these data occur in sediments that show the influence of human activity. Deviation from "normality", as expressed by curvatures or inflections in the cumulative frequency curves plotted against a probability ordinate, show varying degrees of departure from general sediment grain size in dump areas. We will be able to express this departure in toto when we complete analysis of the seasonal variation within sediments from the remaining stations.


CONEY ISLAND
ROCKAWAY
73°50'W
40°35'N
DIGESTIBLE ORGANICS
(H_2O_2)
.97%
.49%
40°30'N
.98%
SANDY HOOK
40°25'N
1.5%
3.8%
0%
2.5%
6.2%
40°20'N
1.49%
.49%

BUDGET SUMMARY FY 1974

	Thousands of Dollars	Percentage
Contracts	217.9	50.5
Personal Services	160.0	37.1
Supplies, travel, and equipment	53.8	12.4
Total	431.7	100.0