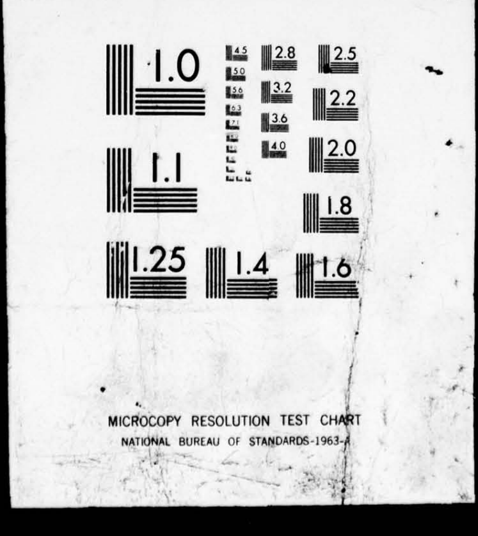
AD-A045 310   NEW YORK OCEAN SCIENCE LAB MONTAUK   F/G 13/2
AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SIT--ETC(U)
SEP 77   R I CAPLAN   DACW51-75-C-0016
UNCLASSIFIED   WES-TR-D-77-6-APP-F   NL

1 OF 2
AD
A045310

1 OF 2

AD
A045310



T. R. D-77-6 AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND APP. E SEPT. 1977

DREDGED MATERIAL RESEARCH PROGRAM

TECHNICAL REPORT D-77-6

AQUATIC DISPOSAL FIELD INVESTIGATIONS EATONS NECK DISPOSAL SITE LONG ISLAND SOUND

APPENDIX E: PREDISPOSAL BASELINE CONDITIONS OF ZOOPLANKTON ASSEMBLAGES

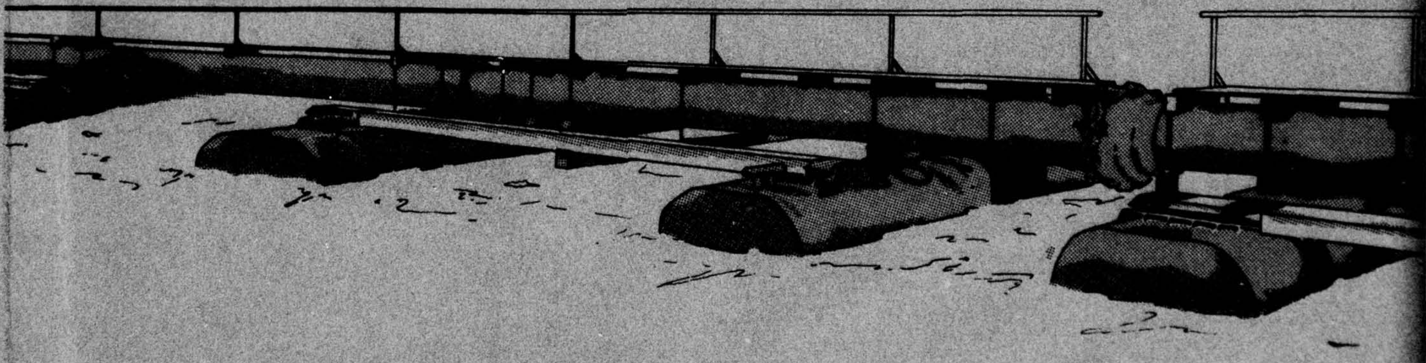
by

Ronald I. Caplan

New York Ocean Science Laboratory
Montauk, New York

September 1977
Final Report

Approved For Public Release; Distribution Unlimited



Prepared for Office, Chief of Engineers, U. S. Army
Washington, D. C. 20314

Under Contract No. DACW51-75-C-0016
(DMRP Work Unit 1A06C)

Monitored by Environmental Effects Laboratory
U. S. Army Engineer Waterways Experiment Station
P. O. Box 631, Vicksburg, Miss. 39180

T. R. D-77-6 AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND APP. E SEPT. 1977

AQUATIC DISPOSAL FIELD INVESTIGATIONS
EATONS NECK DISPOSAL SITE
LONG ISLAND SOUND

Appendix A: Hydraulic Regime and Physical Characteristics of Bottom Sediment

Appendix B: Water-Quality Parameters and Physicochemical Sediment Parameters

Appendix C: Baseline Studies of Plankton, Nekton, and Benthic Invertebrate Populations

Appendix D: Predisposal Baseline Conditions of Demersal Fish Assemblages

Appendix E: Predisposal Baseline Conditions of Zooplankton Assemblages

Appendix F: Predisposal Baseline Conditions of Phytoplankton Assemblages

DEPARTMENT OF DEFENSE UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
WATERWAYS EXPERIMENT STATION, CORPS OF ENGINEERS
P. O. BOX 631
VICKSBURG, MISSISSIPPI 39180

IN REPLY REFER TO: WESYV

7 September 1977

SUBJECT: Transmittal of Technical Report D-77-6 (Appendix E)

TO: All Report Recipients

1. The technical report transmitted herewith represents the results of one of several research efforts (Work Units) undertaken as part of Task 1A, Aquatic Disposal Field Investigations of the Corps of Engineers' Dredged Material Research Program. Task 1A is a part of the Environmental Impacts and Criteria Development Project (EICDP), which has as a general objective determination of the magnitude and extent of effects of disposal sites on organisms and the quality of surrounding water, and the rate, diversity, and extent such sites are recolonized by benthic flora and fauna. The study reported on herein was an integral part of a series of research contracts jointly developed to achieve the EICDP general objective at the Eatons Neck Disposal Site, one of five sites located in several geographical regions of the United States. Consequently, this report presents results and interpretations of but one of several closely interrelated efforts and should be used only in conjunction with and consideration of the other related reports for this site.

2. This report, Appendix E: Predisposal Baseline Conditions of Zooplankton Assemblages, is one of six contractor-prepared reports that are appended to the Waterways Experiment Station Technical Report D-77-6 entitled: *Aquatic Disposal Field Investigations*, Eatons Neck Disposal Site, Long Island Sound. The titles of the appendices of this series are listed on the inside front cover of this report. The technical report provides additional results, interpretations, and conclusions not found in the individual appendices and provides a comprehensive summary and synthesis overview of the entire project.

3. The purpose of this report, conducted as Work Unit 1A06C, was to determine the baseline conditions of the zooplankton at an established disposal site off Eatons Neck, Long Island, New York, and the surrounding area. The study was to provide a precise estimate of the distribution and abundance of zooplankton, and ichthyoplankton. The exact depth distribution of these components was of less importance than the variation associated with determinations of their absolute abundance on a seasonal and annual basis. The variation of abundance was deemed necessary and sufficient for establishing a baseline to which comparisons could be made during and subsequent to disposal operations.

4. This report gives the major species of zooplankton and ichthyoplankton located at Eatons Neck disposal area and a reference area. There appears to be little change in densities or type of organisms from that reported in the literature. One significant concept in the report is that of copepod resting eggs which are at present being investigated as an important reproductive strategy in marine copepods. It is possible that in future disposal operations that numbers of resting eggs in the sediments of a disposal area should be considered as to possible habitat loss prior to disposal operations.

5. The baseline evaluations at all of the EICDP field sites were developed to determine the base or ambient physical, chemical, and biological conditions at the respective sites from which to determine impacts due to the subsequent disposal operations. Where the dump sites had historical usage, the long-term impacts of dumping at these sites could also be ascertained. Controlled disposal operations at the Eatons Neck site, however, did not occur due to local opposition to research activities and even though the Eatons Neck project was terminated after completion of the baseline, this information will be useful in evaluating the impacts of past disposal at this site. The results of this study are particularly important in determining placement of dredged material for open-water disposal. Reference studies, as well as the ones summarized in this report, will aid in determining the optimum disposal conditions and site selection in relation to the zooplankton assemblages of the historical dump site and surrounding areas.

JOHN L. CANNON
Colonel, Corps of Engineers
Commander and Director

3/0
3/3

Unclassified
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS
BEFORE COMPLETING FORM

1. REPORT NUMBER
Technical Report D-77-6

2. GOVT ACCESSION NO.

3. RECIPIENT'S CATALOG NUMBER
⑨

4. TITLE (and Subtitle)
⑥ AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND, APPENDIX E. PREDISPOSAL BASELINE CONDITIONS OF ZOOPLANKTON ASSEMBLAGES.

5. TYPE OF REPORT & PERIOD COVERED
Final report.

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)
⑩ Ronald I. Caplan

8. CONTRACT OR GRANT NUMBER(s)
⑮ DACW51-75-C-0016

9. PERFORMING ORGANIZATION NAME AND ADDRESS
New York Ocean Science Laboratory
Montauk, New York

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
DMRP Work ~~Unit No.~~ 1A06C

11. CONTROLLING OFFICE NAME AND ADDRESS
Office, Chief of Engineers, U. S. Army
Washington, D. C. 20314

12. REPORT DATE
⑪ Sep~~tember~~ 1977

13. NUMBER OF PAGES
104

14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)
U. S. Army Engineer Waterways Experiment Station
Environmental Effects Laboratory
P. O. Box 631, Vicksburg, Miss. 39180

15. SECURITY CLASS. (of this report)
Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

⑫ 110p.

16. DISTRIBUTION STATEMENT (of this Report)
Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)
⑱ WES ⑲ TR-D-77-6-App-E

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Aquatic microorganisms	Field investigations	Zooplankton
Disposal areas	Fisheries	
Dredged material disposal	Fishes	
Eatons Neck disposal site	Sampling	

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A zooplankton and ichthyoplankton study was initiated in October 1974 for the purpose of establishing a baseline data bank at the Eatons Neck disposal site. A control site was also studied. During the 9-month study (October 1974 through June 1975), a total of 147 samples were taken at each of three stations (two disposal sites and one control) consisting of multi-depth tows utilizing 60-cm Bongo samplers (363 and 202 μ mesh nets). Concomitantly, temperature and salinity profiling was done. (Continued)

micron

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

Unclassified
SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

390 574

LB

20. ABSTRACT (Continued).

Acartia tonsa was common throughout the first 6 months of the study with densities as high as 500,000 individuals/1000 m^3 observed in March 1975. A plankton bloom occurred in populations of several copepods (including copepodids) in December 1974, e.g., *Acartia clausii*, *Temora longicornis*, and *Acartia* spp. copepodids. Meroplanktonic Crustacea, Caridia (shrimp), and Brachyura (crabs) became abundant (greater than 100,000 individuals/1000 m^3) in March and April 1975, respectively. Meroplanktonic Mollusca, Gastropoda, and Bivalvea became abundant (greater than 1000 individuals/1000 m^3) in April and May 1975, respectively. There were two blooms of Cladocera during 1975, one in February (1000 individuals/1000 m^3) and one in June (1,000,000 individuals/1000 m^3). *Evadne* sp. dominated the first bloom, and *Podon* sp. the second. Polychaeta larvae were not common at any time during the study.

The first fish eggs obtained in this study were collected in February 1975 at both control and disposal sites. They belonged to the four-bearded rockling, *Enchelyopus cimbrius*. Larvae of the winter flounder, *Pseudopleuronectes americanus*, and the sand lance, *Ammodytes hexapterus*, were also collected with the former being present at the control site only. The spring pattern of ichthyoplankton abundance included the eggs of *Enchelyopus cimbrius*, *Scomber scombrus*, and *Scopthalmus aquosus*. *Myoxocephalus* spp. and *Pseudopleuronectes americanus* larvae were also collected. The summer ichthyoplankton fauna included nine species of eggs and larvae with the first appearance of the butterfish, *Peprilus triacanthus*.

The winter patterns of copepod abundance indicated two important findings:

a. There was a copepod bloom in December 1974, 6 weeks before the spring diatom bloom.

b. Copepod densities were maximum at depth during the November diurnal, indicating a reproductive strategy not previously reported.

PREFACE

This report presents the results of an investigation designed to determine the baseline conditions of the zooplankton at an established disposal site off Eatons Neck, Long Island. The study was prepared for the Office, Chief of Engineers, and supported by the U.S. Army Engineer Waterways Experiment Station (WES), Environmental Effects Laboratory (EEL), Vicksburg, Mississippi, under Contract No. DACW39-73-C-0016 to the New York Ocean Science Laboratory, Montauk, New York. The report forms part of the EEL Dredged Material Research Program (DMRP).

Contracting was handled by the New York District (NYD); COL Thomas C. [illegible], CE, NYD, was Contracting Officer. The report was written by [illegible] [illegible], Assistant [illegible] [illegible] of the New York Ocean Science Laboratory [illegible] [illegible] Hurley, [illegible] [illegible], CAPT Howard [illegible] [illegible] [illegible], Kim [illegible], Bruce [illegible], Susan [illegible], and Lee [illegible].

The study was conducted under the direction of the following EEL personnel: Dr. R. M. Engler, Environmental Impacts and Criteria Development Project Manager, and J. H. [illegible], Site Manager. The contract was managed by [illegible] [illegible] Environmental Monitoring and Assessment Branch of EEL under the supervision of Mr. [illegible] [illegible], Branch Chief, and Dr. R. L. Eley, Chief, Environmental Resources Division, EEL. The study was under the general supervision of Dr. John Harrison, Chief, EEL. The Commanders and Directors of WES during the study and preparation of this report were COL G. H. Hilt, CE, and COL J. L. Cannon, CE. Technical Director was Mr. F. R. Brown.

PREFACE

This report presents the results of an investigation designed to determine the baseline conditions of the zooplankton at an established disposal site off Eatons Neck, Long Island. The study was prepared for the Office, Chief of Engineers, and supported by the U.S. Army Engineer Waterways Experiment Station (WES), Environmental Effects Laboratory (EEL), Vicksburg, Mississippi, under Contract No. DACW51-75-C-0016 to the New York Ocean Science Laboratory, Montauk, New York. The report forms part of the EEL Dredged Material Research Program (DMRP).

Contracting was handled by the New York District (NYD); COL Thomas C. Hunter, CE, NYD, was Contracting Officer. The report was written by Ronald I. Caplan, Assistant Research Scientist. The following New York Ocean Science Laboratory personnel assisted in the study: Barbara Butler, Tullio Croce, CAPT Howard DeCastro, Gail Erskine, William Felix, Kim Larson, Bruce Mundy, Susan Perritt, and Ken Tighe.

The study was conducted under the direction of the following EEL personnel: Dr. R. M. Engler, Environmental Impacts and Criteria Development, Project Manager, and J. R. Reese, Site Manager. The contract was managed by J. R. Reese, Environmental Monitoring and Assessment Branch at EEL under the supervision of Mr. R. C. Solomon, Branch Chief, and Dr. C. J. Kirby, Chief, Environmental Resources Division, EEL. The study was under the general supervision of Dr. John Harrison, Chief, EEL. The Commanders and Directors of WES during the study and preparation of this report were COL G. H. Hilt, CE, and COL J. L. Cannon, CE. Technical Director was Mr. F. R. Brown.

CONTENTS

LIST OF FIGURES

LIST OF TABLES

CONVERSION FACTORS, U.S. CUSTOMARY TO METRIC (SI) UNITS OF MEASUREMENT

U.S. customary units of measurement used in this report can be converted to metric (SI) units as follows:

Multiply	By	To Obtain
miles (U. S. statute)	1.609344	kilometers
quarts (U. S. liquid)	0.0009463	cubic meters

AQUATIC DISPOSAL FIELD INVESTIGATIONS

EATONS NECK DISPOSAL SITE, LONG ISLAND SOUND

APPENDIX E: PREDISPOSAL BASELINE CONDITIONS OF ZOOPLANKTON ASSEMBLAGES

PART I: INTRODUCTION

Background

1. The primary objective of this study was to provide the Corps of Engineers with baseline data in a region of potential impact due to the introduction of dredged material. In order to complete this task, the following question was asked as a framework for this study:

> What is the distribution and abundance of zooplankton and ichthyoplankton at the Eatons Neck Disposal Site as compared to the control region?

Data Base

2. The aim of the study was to provide a precise estimate of the distribution and abundance of zooplankton and ichthyoplankton: adult copepods (the major holoplanktonic component of the region); larval invertebrates (the major group determining recruitment with which to estimate the future of benthic populations); and ichthyoplankton (fish eggs and larvae). The exact depth distribution of

these three biological components was of less importance than the variation associated with determinations of their absolute abundance on a seasonal and annual basis. The variation of abundance is necessary and sufficient for establishing a baseline to which comparisons can be made during and subsequent to disposal operations.

3. This report includes data and preliminary analysis of samples collected from October 1974 through June 1975. The data are expressed as standing crop (number of individuals/1000 m^3) and percent standing crop (copepod fraction only).

4. A data base has a number of components, each of which is associated with the distribution and abundance of a natural population or subset of a population, e.g., egg, larvae, adult. The distribution of a population, which in this case is a biological population or group of actually interbreeding individuals, can be expressed in a number of dimensions including time and space but is not limited to these. The chemical and/or physical characteristics of the time and space set may be considered as subsets of the system or may define other sets of a distributional pattern. The form of the distributional pattern may be represented graphically or mathematically. Its utility, irrespective of form, lies in an understanding and potential prediction of similar patterns in adjacent regions and at a future date. The exact form of the present distributional patterns relate to the time series data of the major data set defined by space, i.e., location of stations and concomitant densities (#/1000 m^3 or #/liter).

Such distributional patterns presented in this manner describe the dimensions within which the data can be expected, with defined probabilities, to vary in a time and space set. The magnitude of the natural variations observed are, however, best characterized by patterns of numerical abundance.

Vertebrate and Invertebrate Taxa

5. Taxonomic divisions. The zooplankton can be further divided into holoplankton, ichthyoplankton, and invertebrate meroplankton.

6. Meroplankton and Ichthyoplankton. Meroplankton are the planktonic larval stages of organisms that spend a portion of their life cycle as nonplankton, i.e., benthic. This component includes eggs and larvae of both vertebrate and invertebrate taxa; the teleostean meroplankton are termed ichthyoplankton. The ichthyoplankton are representative of both the pelagic and benthic fish populations. They are the resource from which the adult populations must draw in order to sustain future populations. The ichthyoplankton portion of the Long Island Sound (LIS) waters represents a major component of the biological community susceptible to the potential impact by the proposed disposal of dredged material. The second component of the meroplankton considered here is that dealing with the invertebrate fraction; the larval forms are most germane as they, like their vertebrate counterparts, are an indication of the available resources for colonization and maintenance of benthic populations.

7. Holoplankton. The component, termed the holoplankton, does not appear to

have a direct link to the benthic populations. However, it also may be potentially adversely affected by dredged material in that its eggs are in the sediments.[1] This group provides all life stages of the plankton (eggs, larvae, and adult) and represents a possible indicator of the capacity of the physical/chemical environment to support its populations. The major taxon in LIS is the Copepoda, representing at least 90 percent of the biomass of all zooplankton.[2] Other crustacean groups are also important components of the holoplankton, e.g., Mysidacea and Cladocera, Chaetognatha, Coelenterata (medusae), and Ctenophora also occur in Sound holoplankton.

8. The importance of the holoplankton as baseline components lies in their value in the assessment and prediction of changes in the physical/chemical environment. Most of the important indicator species found in the Sound are members of the holoplankton. They, like the abundance data, characterize the levels of production in the Sound and indicate the influence of both internal and external components of the total biota. Consequently, although they do not contribute to the recruitment of benthic populations, they do define, better than the meroplankton, those conditions which are responsible for the success or failure of meroplankton components. These components are indeed interrelated in terms which define the data base for the Sound generally and for the benthic portions of the Sound specifically. The importance of zooplankton in cycling nutrients and energy to benthic populations, though documented, will not be con-

sidered in the present report.

Previous Investigations

9. LIS investigations began with Deevey[2] (zooplankton) and Richards[3] (ichthyoplankton). The periods of observation and distribution of studies are indicated in Table E1. All components of the zooplankton/ichthyoplankton are indicated therein. The next study was that of Caplan and Pastalove.[4] This 1971 investigation included only two periods, April and August, and further differed from all previous work in that a pumping system was used to collect plankton - the first time such a system was used in LIS. That same year, the National Marine Fisheries Service investigated the waters around Davids Island, N.Y.[5] This investigation included neuston as well as water column plankton.[1] Ichthyoplankton were not analyzed and remain to be analyzed. The coverage of this study included other parts of LIS as well as the Davids Island region located in the extreme western portion of the sound.

10. From January 1973 through June 1974, a study of LIS plankton was carried out under the direction of Dr. H. Austin (Shoreham) and Dr. R. Nuzzi (Jamesport). (The zooplankton portion has been reported elsewhere [References 6-8]). This investigation was located at the proposed sites of the Long Island Lighting Company's two nuclear generating facilities at Mattituck and Shoreham, L.I. (Table E1). Both ichthyoplankton and zooplankton were investigated.

PART II: METHODS

11. The present investigation at Eatons Neck (EN) was begun in October 1974 (Table E2). Stations were established at several sites within the old disposal ground that was enlarged at the request of State and Federal agencies. The region is approximately 2 miles square* (Figure E1 and E2). The frequency of sampling was approximately monthly (Table E2). Stations were changed as marker buoys became available to facilitate sampling at the same spot each month. Station ENA was sampled during the last three cruises to provide a wider pattern of samples. Station locations are indicated in Table E3 and Figure E2. Station field routine was as follows:

<u>a.</u> A 60-cm-diameter bongo frame with 202-μ and 363-μ mesh nets (net length/opening ratio 5:1) and equiped with flow meters mounted 1 within each net and 1 externally between the nets. The nets were towed at the surface and middepth for 5-10 min in a circular pattern around a buoy and middepth drogue. Sightings utilizing a hand-held compass (Model 2030) were taken on the drogue array to determine the drift of water during the sampling. A surface drogue was deployed at the same time as the middepth drogue. Each drogue was composed of a current cross at the correct depth. The drogue study representation was that of a Lagrangian format whereas the buoy format represented an Eulerian format. The purpose of the drogue-buoy format was to determine the time relationships

---

* A table for converting U.S. customary units to metric (SI) can be found on page 7.

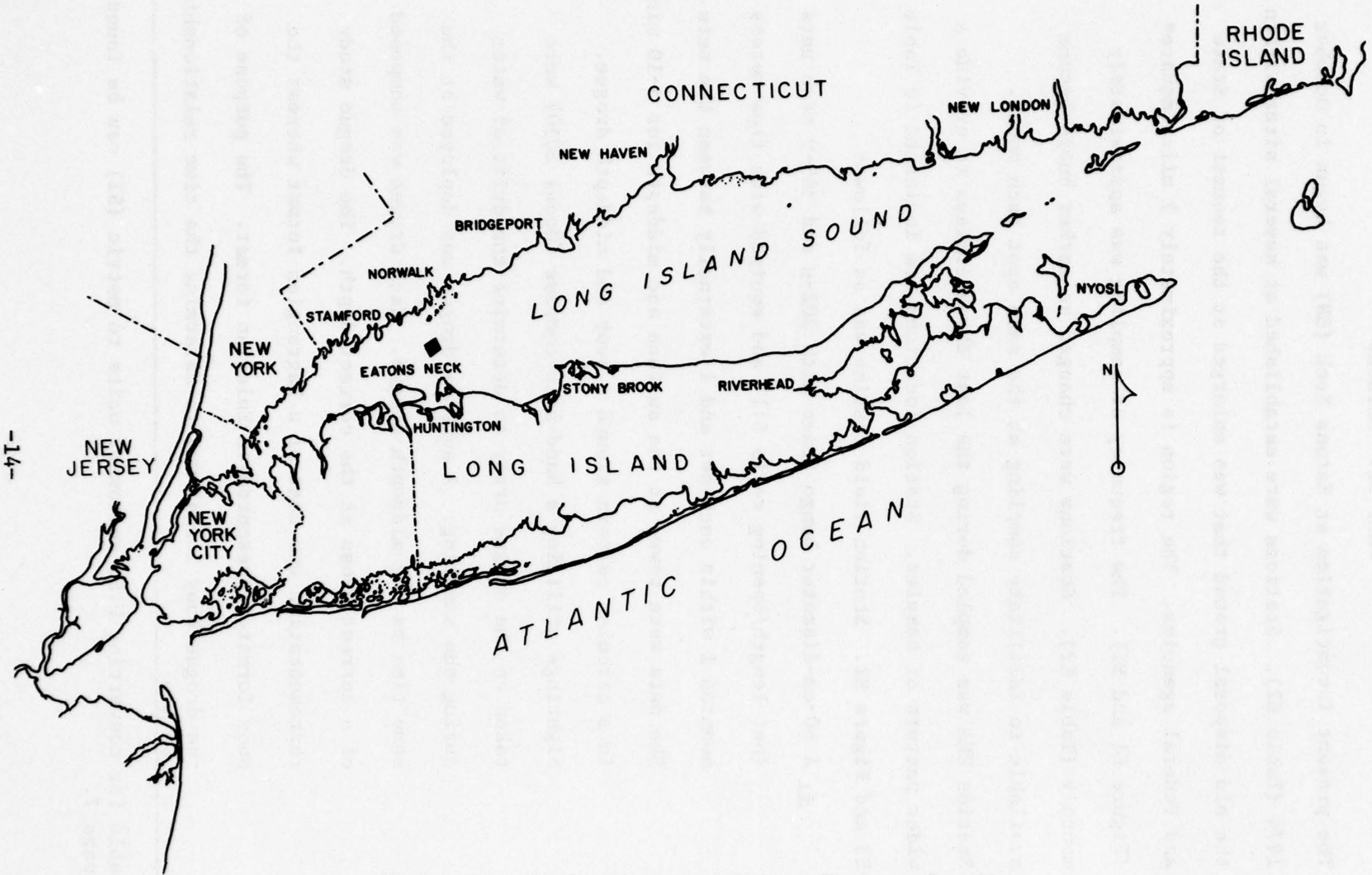


Figure E1. Regional map of Eatons Neck study site

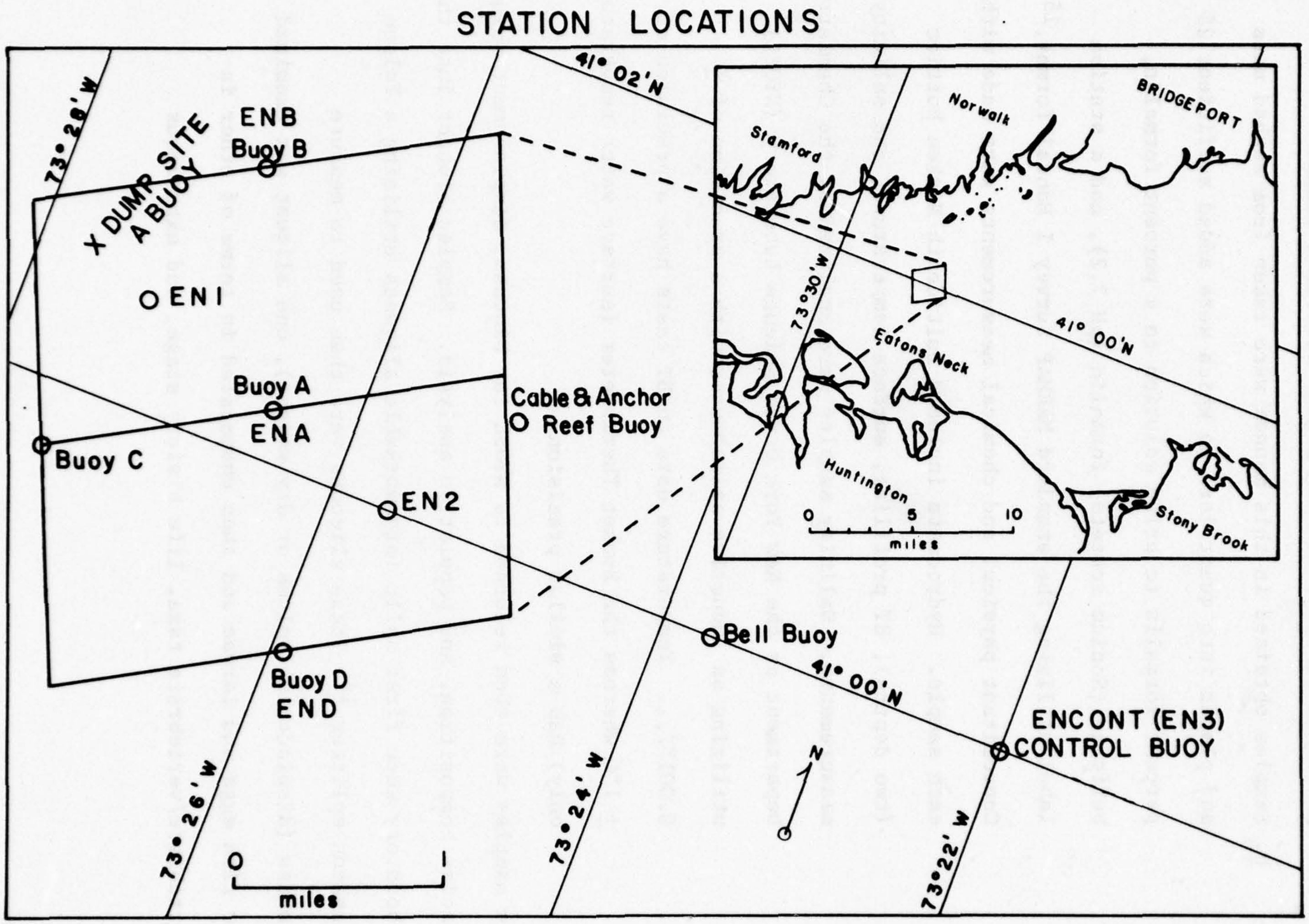


Figure E2. Study site of Eatons Neck disposal area between fixed and moving-point planktonic distributional patterns, Eulerian vs. Lagrangian reference frame.

b. Samples obtained in this manner were taken from washed nets and placed into quart jars to which were added sufficient 25 percent formalin to bring solution to 4 percent formalin, buffered (Sodium acetate) formalin (pH 7.2), and a station label utilizing the standard MARMAP Survey I Manual format.[15] Concomitant physical and chemical measurements were made with each sample. Hydrocasts included multidepth Nisken bottles (two depths), BT profiling, surface temperature, and salinity measurements. Salinity samples were analyzed by the Chemistry Department at the New York Ocean Science Laboratory (NYOSL) utilizing an inductive salinometer with a precision of ± 0.001°/oo. Temperature data on BT casts have a precision of ± 1°C whereas the Bucket Thermometer (surface water temperature only) has a similar precision.

12. The samples were then returned to NYOSL for biomass, displacement volume, species composition, and population analysis. Samples brought into the laboratory were first split into workable aliquots utilizing a Folsom plankton splitter.[16] These aliquots were then used to measure biomass (displacement volume or dry weight); one aliquot was examined for fish eggs and larvae and then enumerated in terms of other invertebrate/vertebrate taxa, life history stage, and extraneous

material (tar, debris, etc.). The National Marine Fisheries MARMAP Survey Manual I[15] has also been used as it relates to the ichthyoplankton sorting, identification, and enumeration.

13. Ichthyoplankton, eggs, and larvae were picked from the aliquots, counted, and placed in labeled vials. The eggs, at least 100 per sample, were then identified utilizing total diameter and oil droplet numbers and diameters. All of the invertebrate zooplankton, exclusive of copepods, were then counted. To determine the copepod density the sample was placed in a beaker and the volume brought to a constant volume, 100 or 200 milliliters. Five-milliliter aliquots were then removed with a stempel pipette. Sufficient 5-mℓ stempel pipette volumes were counted to provide at least 400 individuals for each sample. Each stempel pipette volume withdrawn from the aliquot was counted completely utilizing a glass petri dish with 1-centimeter grid. The samples were analyzed with a dissecting microscope at a power of 15X. The eye pieces of the dissecting microscopes were equipped with ocular micrometers to permit measurements of copepods and thereby facilitate species identification.

14. Biomass determinations were made on aliquots by drying the samples in weighted pans. The samples were dried in an oven for 3 hours at a temperature of 70°C. Weighings were done on a Mettler balance (Model H20T) with a precision of ±0.1 mg. Ash-free dry weight determinations were made by taking a subsample of the biomass and placing it in a preweighed crucible. The crucible was then placed in a

muffle furnace for 2 hours at a temperature of 500°C. The crucible was removed and cooled in a desiccator for 4 hours and then weighed on a Mettler balance (Model H20T) with a precision of ±0.1 mg.

15. The station codes used in this report include a three-part code as follows:

    a. The first part indicates the station (see Figure E2), e.g., EN1, ENA, ENCONT.

    b. The second part indicates the mesh of the net used, e.g., 363μ or 202μ.

    c. The third part of the code indicates the depth of the sample where A=surface, B=middepth, and C=bottom. The type of station (buoy or drogue) is indicated with the numeral 1 for buoy and 2 for drogue.

    The appropriate code for the tow around a buoy of a surface sample taken at station ENA with the 363μ net would be ENA-363-1A, whereas the two around a drogue of a bottom sample taken with the 202μ net at the control station was designated as ENCONT-202-2C. The only replicate tows made during this study were done during the December cruise. At that time only the surface samples were replicated, indicated by a 1 or 2 preceeding the sample depth, e.g., A only. The subsurface tows were not replicated.

16. Sampling at the Eatons Neck Disposal Site began on 30 October 1974. During this first cruise only 363μ mesh nets were available and therefore all the samples were collected with this type of gear. The

water, as would be expected for this time of the year, was full of ctenophores - gelatinous organisms which extensively clog the net and make determination of biomass and standing crop (density) difficult to assess. It was found that two methods could be employed to substantially reduce the quantity of ctenophores both obtained in the nets and retained in the fixed samples. Subsurface tows yielded a lower ctenophore fraction than surface tows; therefore, this strategy was employed during the October monthly cruise.

17. Further, once a sample was brought on board, it was placed in a bucket to which was added a small quantity of formalin (25 percent buffered). After 5 min the bucket was decanted and the ctenophore fraction (which remained at the top) was separated from the fraction containing copepods and larval invertebrates (located on the bottom).

18. Only two stations were sampled in October, EN1 and EN2 (Figure E2). Eleven of the 18 samples were retained for analysis with the remaining 7 samples being discarded due to the preponderance of ctenophores in spite of the preventive methods described above.

19. Zooplankton sampling at Eatons Neck in November was not hampered by the presence of ctenophores; consequently, larger quantities of material were obtained. This period marked the first diurnal sampling program at the disposal site. A diurnal sampling program is usually divided into two components, a spatial regime and a diurnal regime. The spatial regime is designed to establish the spatial pattern in the area of interest before the diurnal sampling begins. This spatial

sampling program is carried out as quickly as possible to determine synoptically a baseline for the subsequent diurnal sampling.

20. In November, two samples (middepth and bottom) were taken at three stations: EN1 and EN2 (disposal site) and EN3 (control site). Middepth and bottom depths were sampled since the zooplankton were concentrated at these levels during the time of sampling.

21. The monthly cruise in December required 2 days due to weather and vessel problems. During the first day (13 December 1974), Suffolk County Marine Division boat BRAVO assisted in the sampling of stations at Buoy B and Control Buoy EN3. Only surface tows were made during this cruise. Each surface tow consisted of pulling two 202μ mesh nets side by side.

22. The subsurface samples were obtained several days later (18 December 1974). Due to the time difference in the collection of the samples for this month, exact comparisons of differences in spatial patterns are not possible. However, the overall pattern of distribution can be interpreted in terms of the types and relative abundance of the organisms observed. During this cruise, the two types of nets (202μ mesh and 365μ mesh) were used for the first time enabling internet comparisons as these relate to the catchability of each net type.

23. Density values are presented as mean number of organisms/1000 m^3 ± one standard deviation or ± the coefficient of variation (CV) in percent. This expresses the percent variation as a function of the mean. The number of samples which was used to determine the mean is

indicated by the letter N. No statistical tests were run to quantify the differences in densities, therefore all statements relating to densities which are "higher" or "lower" are qualitative but usually reflect major differences in densities, e.g., greater than one order of magnitude. This was done because of the high variability of data and lack of replicate samples.

PART III: RESULTS

Winter Period*

October monthly cruise

24. Zooplankton. During this month, six species of adult copepods were collected. The percent standing crop of the dominant species, *Acartia tonsa*, averaged 97 ± 6.51 percent (N=4) for the surface tows; 98.46 ± 4 percent for the middepth tows; and 85 ± 36 percent (N=4) for the bottom tows. The average standing crop for this species at all depths was higher at EN1 ($196 \times 10^3 \pm 10^3/1000\ m^3$; N=4) than at EN2 ($34 \times 10^3 \pm 26 \times 10^3/1000\ m^3$; N=4)(Table E4). These observed densities at EN1 and EN2 are similar and lower than those reported for this species at Shoreham ($195 \times 10^3/1000\ m^3$) in 1974[7], respectively.

25. The remaining five species of adult copepods comprised less than 9 percent of the standing crop at both stations. This group included (in order of decreasing numerical abundance) *Pseudodiaptomus coronatus*, *Labidocera aestiva*, *Temora longicornis*, *Pseudocalanus minutus*, and *Acartia clausii*. The only evidence of vertical stratification in this group was found for *Pseudodiaptomus coronatus*, which predominately

---

* Winter period = 30 October 74 - 31 December 74.

occurred in middepth and bottom tows at both EN1 and EN2.

26. Relatively few noncopepod zooplankters were obtained in October 1974 (Table E5). The dominant adult form (holoplankton) was the mysid, *Neomysis americana*, which occurred in greatest numbers at middepths and along the bottom at EN1 (>100/1000 m^3). At EN2, the densities were low throughout the water column on the average (>100/1000 m^3). The presence of this species in October was reported for Shoreham in 1973[7] and represents the expected seasonal occurrence of mysids at depths during the day.[6,7] No other adult zooplankter (noncopepod) was obtained in October 1974.

27. The occurrence of invertebrate meroplankton was infrequent during the October sampling. However, there were some individuals present in the following groups: crab larvae, shrimp larvae, Polychaeta larvae, and molluscan larvae (veligers).

28. Ichthyoplankton. No fish larvae were collected and only 1 species of eggs, *Scophthalmus aquosus*, during this period.

November spatial and diurnal cruise

29. Zooplankton. The spatial pattern indicated a high concentration of *Acartia tonsa* at all stations (EN1, EN2, and EN3), with an average percent standing crop of 97 ± 6 percent (N=7) and an average density of $6.5 \times 10^3 \pm 5.7 \times 10^3$/1000 m^3 (N=7)(Table E4). Other species present were *Pseudodiaptomus coronatus* and *Labidocera aestiva* - each representing less than 3 percent of the total number of copepods sampled.

30. As was the case in October, the mysid *Neomysis americana* was the dominant noncopepod zooplanker present at Eatons Neck Disposal Site. The presence of substantial numbers of neligers (larval molluscs) indicated a change in the meroplankton from that observed in October 1974 (Table E5), whereas there appears to be a decrease in shrimp larvae.

31. The diurnal sampling program (not tabulated) began at 1900 hr on 19 November 1974. The pattern of depth distribution and abundance was similar to that indicated by the spatial pattern in terms of adult copepods. *Acartia tonsa* was the dominant copepod throughout the water column during the entire diurnal period of study (14 hr). Further, *Pseudodiaptomus coronatus* and *Labidocera aestiva* were also present. This pattern is similar to the expected pattern as indicated by previous diurnals in LIS.[6]

32. The pattern for larval invertebrates and other zooplankton (not tabulated) was similar to the pattern observed during the spatial portion of this study with mysids comprising the dominant form present throughout the water column. Veligers were the most numerous larval form during the diurnal with maximum surface densities at midnight (2300 hr) and concomitant maximum middepth densities at dusk (1900 hr) and dawn (0700 hr). This pattern indicates that the highest veliger densities vary diurnally. Consequently, sampling for this form should concentrate at middepths during the day or at the surface at night.

33. <u>Ichthyoplankton</u>. No fish eggs and larvae were collected during this period.

December monthly cruise

34. Zooplankton (copepods). The overall pattern of abundance at the surface was similar to the distribution observed in November (Table E4). *Acartia tonsa* was the dominant copepod, comprising more than 90 percent of the percent standing crop. In five of the nine samples in which both adults and copepodites were present, the copepodid stage was more abundant. This indicates a substantial recruitment of larval copepods. The next most numerous species at this time was *Paracalanus* sp., a small copepod (less than 1 mm), which was obtained in the smaller mesh net only.

35. Finally, several species were present that were found during the two previous months including (in order of largest percent standing crop) *Pseudodiaptomus coronatus* (1 percent), *Temora longicornis* (1 percent), and *Centropages* sp. (<1 percent).

36. Zooplankton (noncopepod fraction). The meroplankton component was dominated by polychaete larvae (Table E5). This group was present both as late larvae and trochophores, or early larvae. The trochophore stage is also present in other invertebrate phyla, e.g., Mollusca, and cannot be considered only as larval polychaetes. Larval polychaetes were more prevalent at the surface and at the disposal site than at depth or control stations.

37. Veligers were also present in December (Table E5). They were more common in surface samples than deep samples.

38. Crustacea and shrimp larvae, though present, were very rare. When present, however, they were more often obtained at the surface in the disposal site region (Table E5). The only other larval form present were the nauplii of barnacles. They were not found in the subsurface tows or at the control stations.

39. Mysids were the only holoplanktonic (noncopepod) form found during December 1974. They were present at substantially larger numbers at the disposal stations as compared with the control station. Further, they were less common at the surface than at depth (Table E5).

40. The present set of samples for October, November, and December 1974 indicate a pattern of distribution and abundance for both copepod and noncopepod fractions which is similar to that reported by Deevey[2] and Austin and Caplan.[7, 8]

41. Ichthyoplankton. Small quantities of 1 species of fish larvae *Ammodytes hexapterus* and the eggs of *Scophthalmus aquosus* were collected during the December cruise.

Spring Period*

42. This period as well as the previous one is defined in terms of the amount of plankton (nonichthyoplankton) in the water. The ichthyoplankton seasons are discussed later. The relatively warm surface water temperatures encountered during December 1974 (∿7.0°C) were substantially reduced in January to 3.5°C and reached a seasonal low in February of 2°C. During the March monthly cruise (1 April 1975), the surface water temperature had increased to 4.0°C.

---

* Spring period = 1 January 75 - 1 April 75.

January monthly cruise

43. Zooplankton. The copepod fraction of the plankton community in January consisted of three species, the dominant being *Acartia tonsa*, which was present at all stations and depths at an average of 58 percent standing crop (Table E4). The densities of this species were as high as was reported for December 1975, The density was over $10^6/1000\ m^3$ at most of the stations. The second major species was *Temora longicornis*, which averaged 34 percent of the total adult copepods observed in January. Approximate equal numbers of *T. longicornis* were found at the disposal and control sites (Table E4). There were, however, greater numbers of this species at depth. The third major species was *Acartia clausii* which averaged 5 percent of the total adult populations.

44. The dominant meroplankton were shrimp larvae and barnacle nauplii (Table E5). The shrimp larvae were more common at depth and at the control site. The barnacle larvae were common throughout the water column and tended to be more common at the control site (Table E5).

45. There was a decrease in the occurrence of both polychaete and gastropod larvae. Although the densities were similar to those found in December, they were present at only half the stations (Table E5). These groups, like the barnacle nauplii were more common at the control stations. No crab larvae were collected in January.

46. Ichthyoplankton. No fish eggs were collected during the January monthly cruise.

February monthly cruise

47. Zooplankton. *Acartia tonsa* was the dominant copepod during February (Table E4), although its average percent composition was reduced to 40 percent (a decrease of 18 percent). The second most numerous copepod was *Temora longicornis*. Its percent composition increased slightly from 34 to 39 percent. The most dramatic change was in the percent composition of *Acartia clausii*, which increased from 5 percent in January to 16 percent in February. *A. clausii* is the major component in the cold-water or spring community in LIS.[2]

48. The most common larvae present during this month were the larval stages of barnacles (Table E5). Both nauplii and cyprids were present, although the nauplii were present in higher numbers. These larvae were not stratified and occurred in both surface and middepth samples.

49. Polychaete larvae were relatively infrequent; they were found in only five of the twenty-one samples (Table E5). There appeared to be a higher concentration of these larvae in the disposal site than in the control site; they were evenly dispersed in the water column (Table E5).

50. Veligers and shrimp larvae were also not common in February, both groups being obtained only in middepth and bottom samples. The occurrence of veligers was about the same at both sites, whereas shrimp larvae were found at the disposal site exclusively.

51. Three holoplankton groups were obtained in February: Chaetognatha, Cladocera, and Mysida. The Chaetognatha and Mysida were more common

in subsurface samples, whereas the Cladocera were present throughout the water column. Mysida and Cladocera occurred in approximately equal numbers at both sites. Chaetognatha were more common at the disposal site, however.

52. Ichthyoplankton. The only fish eggs obtained this month were those of the fourbearded rockling, *Enchelyopus cimbrius* (Table E6). The eggs of this species were found at all stations and depths. The average number of eggs was 475 ± 1264/1000 m^3 (CV = 2.65)(N=18). Fish larvae obtained during this cruise included two species: the sculpin, *Myoxocephalus* spp., and the Pacific sand lance, *Ammodytes hexapterus* (Table E6). The former was predominant at the control station, whereas the latter was found at all stations. The average number of fish larvae was 50.33 ± 56.11/1000 m^3 (CV = 1.11)(N=18).

March monthly cruise

53. The month of March was difficult to work in due to poor weather conditions. The monthly cruise took place on 1 April 1975.

54. Zooplankton. The March pattern of copepods was typical of LIS in the spring.[2] The dominant species was *Acartia clausii*. It represented 57 percent of the total copepods obtained (Table E4). Copepodids were the second most common group with an average percent composition of about 20 ± 5 percent (N=20).

55. *Temora longicornis* and *Acartia tonsa* decreased in abundance during March. The average percent per sample of *T. longicornis* was 19 ± 6 percent (N=20), a decrease of 20 percent in one month. *Acartia tonsa*

comprised only 3 percent of the total copepods collected during March. There was a 20 percent decrease in the total number of copepods per sample from February to March. The average number of copepods per 1000 m^3 was $4.5 \times 10^6 \pm 3 \times 10^6$ (N=20) and $3.5 \times 10^6 \pm 2 \times 10^6$ copepods per 1000 m^3 (N=20) for February and March, respectively.

56. The meroplankton were dominated by barnacle larvae as all samples except one contained this larval type (Table E5). Polychaete larvae occurred in equal quantities at all depths and at both control and disposal sites.

57. Shrimp larvae occurred slightly more frequently than the bivalve veligers during March. They were concentrated in subsurface samples and were generally more common at the control station (Table E5). The bivalve veligers were present throughout the water column. There was no apparent difference in average occurrence between control and disposal site samples for this group.

58. Finally, holoplankters included Chaetognatha and Cladocera. Both groups were found in most of the samples. They were equally common at control and disposal sites. The Chaetognatha were concentrated in subsurface samples whereas the Cladocera were present throughout the water column (Table E5). Chaetognatha and Cladocera densities like copepod densities were lower in March than in February.

59. The observed quarterly pattern indicates a number of departures from that indicated by previous investigations.[2,7,17]

a. The *Acartia clausii* bloom occurred later (February-March) than previously reported.

b. *Acartia tonsa* was dominant in the plankton almost 2 months longer than previously reported.

c. Larval polychaetes and veligers appear to be more common than in previous years.

d. Cladocera, normally a summer group, have been found in the winter samples.

60. Ichthyoplankton. In March, the only fish eggs obtained were those of the fourbearded rockling, *Enchelyopus cimbrius*. They were found at all stations and depths at densities of 2757 ± 639/1000 m^3 (N=25) (CV = 0.23)(Table E6). Three species of fish larvae were found during this period: the winter flounder, *Pseudopleuronectes americanus*; the sculpin, *Myoxocephalus* spp.; and the Pacific sand lance, *Ammodytes hexapterus*. The flounder was present at all stations and depths, whereas the sculpin was common only at station END and the sand lance at station ENB (Table E6). The average density of fish larvae was 272 ± 281/1000 m^3 (N=25)(CV = 1.03).

April monthly cruise

61. During the April cruise on 28 April, the water column was still vertically mixed; the surface-to-bottom difference was about 1°C. The water was thermally stratified, however, during the next two monthly cruises: the mean temperature gradient was 7°C in May and 5°C in June. The surface temperature was approximately 10°C higher in May

and June (17°C) than in April (7°C). This general increase in temperature corresponded with the increase in the numbers of plankters.

62. Zooplankton. The copepod fraction was dominated by *Acartia clausii*. It comprised 87 percent of the standing crop for surface samples and 39 percent for middepth samples in the disposal site (Table E4). These percentages were slightly lower at the control station with the surface and middepth standing crop being 34 percent. *Temora longicornis* was the second most common adult copepod, both at the disposal site and control station. Its densities were always higher in the subsurface samples. However, *Acartia clausii* was usually more abundant in this middepth sample than *Temora longicornis* (Table E4). The third most common adult copepod was *Pseudodiaptomus coronatus*. Its maximum densities occurred in subsurface samples. The abundance of this species in these samples was about 1/10 that of *Temora longicornis*.

63. Of the larval copepods collected, *Acartia* spp. copepodids were the most numerous and represented more than 90 percent of all larval copepods collected (Table E4). These copepodids accounted for approximately 30 percent of all the copepods collected in April, adults and juveniles. However, they appeared to be equally abundant in surface and middepth samples (Table E4). Their densities were slightly higher in April than in March, an indication of potential increase in adult densities in May. *Temora* sp. copepodids were also collected. Their

abundance was highest in subsurface samples, a pattern similar to the adult distribution.

64. The April zooplankton contained larval polychaetes and mollusks. The most common larval form was barnacle nauplii which was more prevalent in surface samples than at depth (Table E5). Gastropod larvae were found at the disposal site only and primarily at station ENDSA. Here they appeared to be equally distributed throughout the water column (Table E5).

65. Larval crustaceans, both crabs (Brachyura) and shrimp (Caridea), were obtained in subsurface samples at both experimental and control stations. The observed densities represent an increase of the standing crop for these larvae.

66. The dominant noncopepod holoplankton present in April was a hydromedusae. It was common but not present in large numbers (less than 1000/1000 m^3)(Table E5). Cladocera were also present during April. Of the two species occurring, *Evadne* sp. was the more numerous and was taken at both surface and subsurface stations. *Podon leucartia*, when present, was found only in subsurface samples (Table E5). The apparent separation of these two similar species suggests a possible depth separation for their populations.

67. Ichthyoplankton. Three species of fish eggs were found during the April cruise (Table E6). The most common species was *Enchelyopus cimbrius*. It was present at all stations in the disposal site as well as the control area and represented approximately 95 percent

of all eggs collected during this time. The second species, *Scophthalmus aquosus*, was present at the proposed disposal site and the control site only. Finally, *Scomber scombrus* was found at the proposed disposal site but not any other station. The average density of fish eggs during this monthly was 5385 ± 4645 eggs/1000 m^3 (N=29)(CV = 0.86).

68. Four species of fish larvae were obtained in April (Table E6); the most common species was *E. cimbrius*, which was present at the disposal area and the control area and represented approximately 93 percent of all the larvae collected during April. Other species present were *Myoxocephalus* spp., *Ammodytes americanus*, and *Pseudopleuronectes americanus*. These three larval forms were predominant at the control site and their densities averaged less than 50/1000 m^3. The average number of larvae during April was 992 ± 2766/1000 m^3 (N=29)(CV = 2.78).

May monthly cruise

69. Zooplankton. The copepod pattern for May indicates substantial numbers of *Acartia clausii* at all surface stations (Table E4). The densities were higher than those observed in April. *A. clausii* averaged 93 ± 16 percent (N=12) of the standing crop at surface stations compared to 89 ± 10 percent (N=15) of the standing crop at surface stations the previous month. The density increase in May occurred in subsurface samples as well.

70. *T. longicornis* was the second most common adult copepod in May. Its densities averaged 50 ± 15 percent (N=11) of the standing crop

in subsurface samples. *Pseudocalanus minutus* was the third most common adult present during this time period. Like *T. longicornis* its densities increased in subsurface samples. The sample also contained *Centropages* spp. and *Paracalanus* spp. *Pseudodiaptomus coronatus* was less common than in the April samples (Table E4).

71. Three groups of copepodids were present in May: *Acartia* spp., *Temora longicornis*, and *Pseudocalanus minutus* (Table E4). The *Acartia* copepodids were most numerous, averaging 27 ± 10 percent (N=12) of the total standing crop at surface stations (adults and copepodids) and 20.9 ± 15 percent (N=11) of the total standing crop at subsurface stations. *T. longicornis* were the second most common juveniles. Their densities, like the adult counterpart, were greatest in subsurface samples. In the surface samples, the copepodids were more numerous than the adult distribution, indicating a more homogeneous distribution of juvenile forms. The copepodids of *Pseudocalanus minutus* were found in very few samples as compared with the other species. They were present in subsurface samples only and never in densities greater than the adults of other species.

72. The meroplankton pattern observed in May was similar to that reported in April but differed in that higher densities for all types were observed. The most numerous meroplankters were the crustacean larvae, crab (Brachyura), and shrimp (Caridea)(Table E5). Densities of these forms were at least an order of magnitude greater in May than in April, thus indicating the bloom of these larval forms in

the water column both at the disposal site and control areas. Larval gastropods and larval bivalves were also present. The latter pattern represented the first occurrence of larval bivalves in this study.

73. The pattern of holoplankton distribution in May was similar to that observed in April. Cladocera were present in large numbers at least an order of magnitude greater than in April further indicating the bloom of this form as well. *Podon* spp. was more numerous than *Evadne* spp. throughout this period of study (Table E5), a pattern which is indicative of LIS waters in June.[7]

74. Ichthyoplankton. All the samples taken during May contained large numbers of both fish eggs and larvae with densities at least an order of magnitude greater than those observed in the previous month (Table E6). There were approximately seven to ten species of fish eggs and five to nine species of fish larvae present during this time including those species listed above.

75. The predominant fish eggs were of the following species (in order of decreasing abundance: mackerel, *Scomber scombrus*; weakfish, *Cynoscion regalis*; cunner, *Tautogolabrus adspersus*; blackfish, *Tautoga onitis*; menhaden, *Brevoortia tyrannus*; windowpane flounder, *Scophthalmus aquosus*; fourbearded rockling, *Enchelyopus cimbrius*; smallmouth flounder, *Etropus microstomus*; and scup, *Stenotomus chrysops*. These species of eggs were found at all stations with an average density of 371,128 ± 351,198/1000 m^3 (N=23)(CV = .94).

76. A similar pattern of fish larvae was obtained including the same species listed above in terms of overall abundance. The average number of larvae was 128,460 ± 254,553/1000 m^3 (N=23)(CV = 1.91).

May diurnal cruise

77. Zooplankton. The diurnal samples were taken at station ENDSA (primary disposal site) for a period of four tidal cycles (24 hours). The results (Tables E7 and E8) of the diurnal study shown are summarized below:

a. *T. longicornis* densities increased at the surface at night and reached a maximum in the early morning, indicating some vertical migration.

b. *A. clausii* did not appear to migrate vertically.

c. *C. minutus*, thought common at middepth, migrated to the surface in small numbers at night.

d. Copepodids of *Acartia* spp. and *T. longicornis* did not appear to migrate vertically.

e. The increase in adult *P. coronatus* at depths during the night may be due to vexation and not vertical migration from the surface.

f. Crustaceans, *Podon* spp. and *Evadne* spp., did not appear to migrate vertically at night.

g. Invertebrate larvae (crustaceans, gastropods, and bivalves) did not appear to migrate vertically at night.

78. These patterns of vertical distribution are similar to those reported for LIS waters by a number of investigators.[2,4,6-8,18]

79. Ichthyoplankton. The pattern of ichthyoplankton abundance (Table E6) during this diurnal period indicates the following:

a. Fish eggs of all species reported were numerous in surface samples only.

b. Migration of fish larvae was noted for *S. scombrus* and *B. tyrannus* in that surface densities for these two species were greatest during the night (Table E6).

80. The average number of fish eggs present in the water column during the May diurnal cruise was (1.9 ± 5.3) x 10^9/1000 m^3 (N=16)(CV = 2.73). the average number of fish larvae in the water column was (.98 ± 3.9) x 10^9/1000 m^3 (N=16)(CV = 3.99).

June monthly cruise

81. Zooplankton. During this cruise, adult copepod densities were greatly increased over the previous month (Table E4). In May, the average surface density of *A. clausii* was (8.3 ± 5.4) x 10^6/1000 m^3 (N=12) whereas in June it was (29 ± 25) x 10^6/1000 m^3 (N=12). Similar increases were observed for *T. longicornis* and *P. minutus*, although the absolute densities for these two species were approximately an order of magnitude less than *A. clausii*. Copepodids were also numerous during this period, although most were *Acartia* spp.

82. The copepod pattern observed in June was similar to previous investigations.[2,4,6-8,18] As in the previous 2 months, *A. clausii* was the

dominant form in the water column. *T. longicornis* was common only at middepth at both control and disposal site stations (Table E4).

83. The meroplankton present during June followed a similar pattern described above for copepods. Crustacean larvae were an order of magnitude more dense in June than in May with the Brachyura (crab) three times as common as the Caridea (shrimp)(Table E5). This density pattern was exemplified in populations of Mollusca as well, including larval gastropods and bivalves. The bivalve larval abundance is particularly significant in that this abundance provides the stock by which adult populations are increased in the ensuing period. Finally, the numbers of Cladocera, *Podon* sp., and *Evadne* sp., decreased from the previous month's pattern (Table E5) indicating that a Cladocera bloom had ended by June, a pattern similar to that reported in previous work.[2,6-8]

84. Ichthyoplankton. Fish eggs and larvae collected during June monthly (Table E6) represented a pattern similar to that observed in May with the following exceptions:

a. The most numerous fish eggs present belonged to the *Anchoa mitchilli*.

b. *Stenotomus chrysops* and *Brevoortia tyrannus* were present in approximately equal quantities and are the second most abundant fish eggs.

c. Two species, *Brevoortia tyrannus* and *Scomber scombrus*, represented far more eggs than in the previous month.

d. The first occurrence of butterfish eggs, *Peprilus triacanthus*, was noted.

e. The pattern of fish larvae abundance was similar to that described for eggs in terms of the most dominant species present in the water column, the most numerous larvae being *Anchoa mitchilli*.

85. The average number of fish eggs present in the water column was 123,783 ± 74,829/1000 m^3 (N=24)(CV = .60). The average numer of fish larvae present in the water column was 123,783 ± 70,323/1000 m^3 (N=24) (CV = 1.65). In general this pattern of egg and larvae distribution has been reported by other investigators of LIS.[3,11]

Biomass

86. For the purpose of this study biomass (dry weight) includes mainly zooplankton, but some phytoplankton and detritus are present as well. However, it is expected that at least 95 percent of the dry weight biomass is represented by the zooplankton fraction.[2,4,6-8] The biomass pattern for the entire study period is given in Figure E3.

87. Low levels of biomass in October 1974 (Table E9) are indicative of LIS waters.[2,6] There is both a relative decrease in biomass at this time due to the preponderance of Ctenophora (comb jellies) as well as an absolute decrease in the abundance of total zooplankton following the summer bloom. This typical fall pattern showed that zooplankton were found in the water in numbers greater than expected and that these zooplanktoners were present primarily in the lower portions of

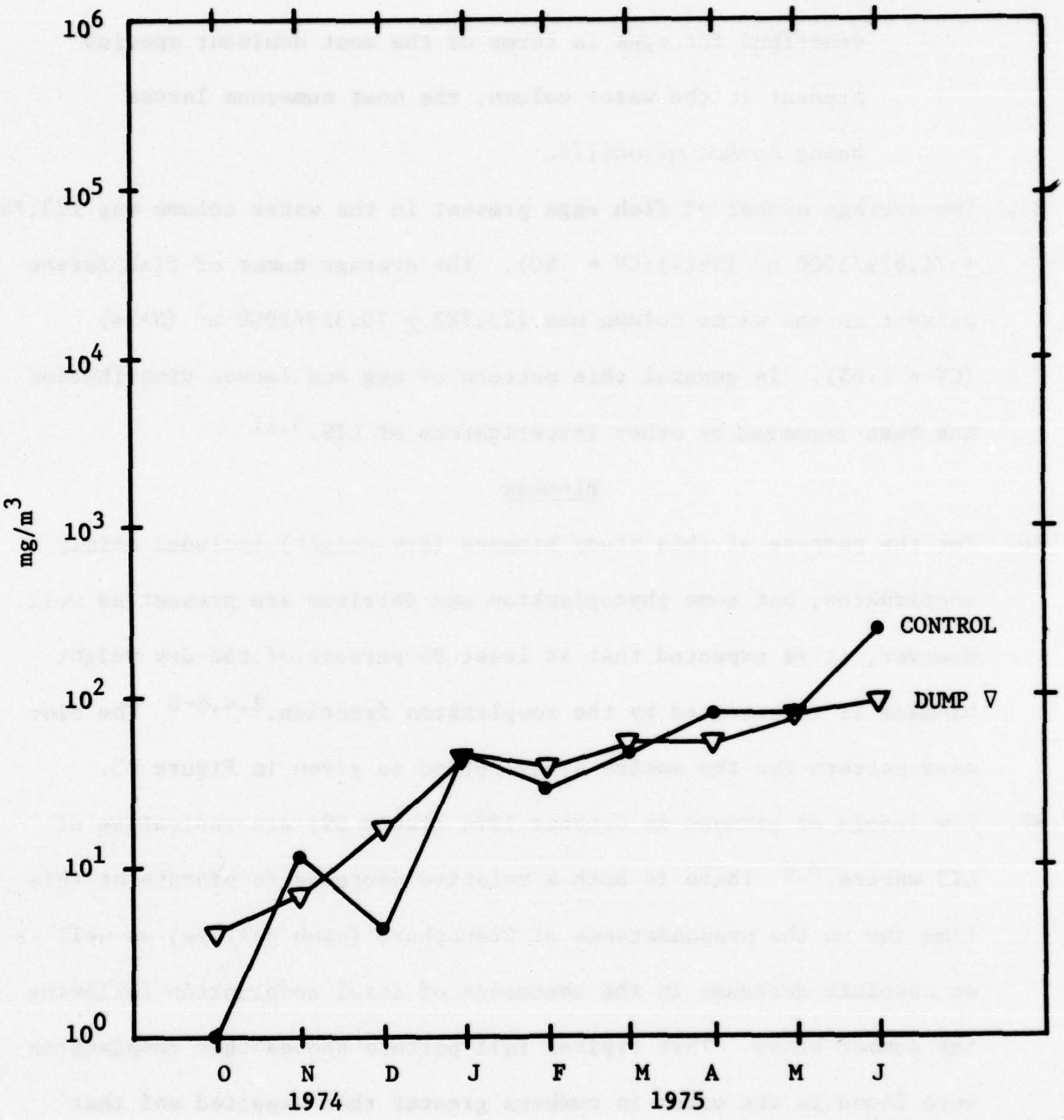


Figure E3. Biomass levels at control and disposal area in Eatons Neck Disposal Site the water column. Separation of the Ctenophora/Copepoda fractions utilizing methods previously described indicates this pattern.

88. Increase in biomass throughout the winter (November 1974 through January 1975)(Tables E10-13) are indicative of zooplankton blooms which apparently occur in LIS several weeks before the phytoplankton bloom.[6,7,8] This pattern of zooplankton bloom in the Sound occurring before the classical phytoplankton bloom has taken place was first reported by Caplan and Austin.[6,8] The mean biomass (water column) for this period increased from 2.51 ± 2.26 mg/m^3 (N=27)(November 1974) to 44.07 ± 37.09 mg/m^3 (N=22)(January 1975). This increase in biomass was accompanied by a concomitant increase in species composition (Copepoda) and density of total zooplankton.

89. The spatial pattern of increase indicated that the disposal site stations had a higher biomass in December 1974 (30 mg/m^3) than did the control station (5 mg/m^3)(Figure E3). This is indicative of plankton distribution patterns in estuaries as influenced by tidal transport, the primary advective force in LIS.[19]

90. The general increase in biomass from February through June (Table E14) indicates that the typical spring bloom pattern occurred during this period. The levels of biomass, reaching a maximum mean of 149 ± 132 mg/m^3 (N=24) in June 1975, represent an increase over values for this period previously reported.[6]

PART IV: DISCUSSION

91. The pattern of zooplankton and ichthyoplankton distribution observed

during the 9 months of the present study is similar to patterns reported by previous authors.[2,4,6] These patterns can be discussed in terms of several time periods: diurnal, seasonal, and annual. For each time period, the following taxa will be compared to previous investigations:

<u>a.</u> Invertebrate holoplankton: Copepoda, Crustacea (Cladocera, Mysidacea, etc.), Chaetognatha, Ctenophora.

<u>b.</u> Invertebrate meroplankton: Crustacea (Brachyura and Caridea), Mollusca (Gastropoda and Bivalves), Polychaeta.

<u>c.</u> Vertebrate meroplankton: Teleostei.

Invertebrate Holoplankton

Copepoda

92. Migration patterns. The diurnal pattern of Copepoda during both November 1974 and May 1975 indicated that the species which migrate vertically to the surface at night have higher densities at depth during the day, e.g., *Temora longicornis, Pseudocalanus minutus,* and *Pseudodiaptomus coronatus*. Other species do not migrate, although their distribution with depth may be stratified with higher densities at the surface throughout a daily cycle (*Acartia tonsa* or *Acartia clausii*) or at depth (*Labidocera aestiva* or *Centropages typicus*). Caplan and Austin[6] have reported the relationship between this type of distribution and concomitant physical/chemical parameters (temperature and salinity). During the present study it did not appear that the distribution of migrating species was correlated with either

thermal or pycnal stratification.

93. There appears to be a seasonal aspect to the propensity for a species to migrate. In 1974, *Acartia clausii* was observed to migrate to the surface at night during May at Jamesport, but did not migrate at night during February. This behavioral modification of vertical migration patterns is based on a number of factors, e.g., energy utilization, gamete production, and physiological adaptation to specific environmental conditions. All these factors characterize the adaptative strategies utilized by adult copepods to ensure reproductive success. The data which indicate that differential patterns in seasonal diurnal migration exists were first reported for Eatons Neck during the November 1975 diurnal cruise when it was noted that there was a preponderance of plankton (90 percent copepods by dry weight) at depth throughout the period of the cruise. There was no evidence of vertical migration to the surface at night as measured by the low surface densities of copepods ($<10^4$ individuals/1000 m^3). This pattern was also reflected in biomass data which indicated that surface biomass was approximately one-fourth that at depth throughout the diurnal.

94. Copepoda blooms. The implications of the preceding adaptive strategies in describing the distribution and abundance of invertebrate holoplankton in a system like LIS are significant. They explain the patterns observed for over a 20-yr period of studies (Table E1) which relate to the following:

a. A shift in dominance of the winter species (*Acartia clausii*, *Temora longicornis*, and *Pseudocalanus minutus*) to the summer species (*Acartia tonsa*, *Labidocera aestiva*, and *Oithona similis*) as documented by a number of authors, specifically by Jeffries[21] for East Coast estuaries and by Zimmerman[22] and Johnson and Miller[23] for West Coast estuaries.

b. The apparent spontaneous appearance of large numbers of adult copepods in Long Island Sound is explained by the hatching and subsequent development of larval stages under the cueing temperature regimes. It is ecologically wise to remain eggs until the temperature conditions portend larval success (physiologically, but also nutritionally) i.e., certain temperature regimes correlate with high phytoplankton densities.

95. The paradox in this approach is that for 2 yrs in a row there have been apparent blooms of copepods which have preceded the apparent phytoplankton blooms by as much as 6 to 8 weeks. Caplan and Austin[6] first reported a bloom of adult copepods for LIS waters under conditions of low phytoplankton densities (less than 1000 cells/liter) during the 1973 winter (November-December). A similar pattern was observed at Eatons Neck in the 1974 winter (Figures E4 and E6) with a similar pattern of low phytoplankton density (Tables E15 and E16).

96. The number of observations is sufficient to reject the hypothesis

that overt sampling error has produced the pattern observed; the lack of sufficient samples in the winter is indeed the reason that this pattern was not reported previously. Deevey's sampling was much too restrictive to indicate a winter bloom, if one did occur in 1952-53.[2] In general, sampling LIS plankton in the winter is usually not feasible; the lack of a pattern, therefore, may be due to omission. It is equally probable that the bloom was due to an increase in individuals originating in the sound and stimulated by some increase in nannoplankton, a group not sampled effectively with a net with mesh greater than 100μ.

97. A number of authors have indicated that Copepoda feed selectively in that they filter the most numerous food available.[1] Consequently, one would expect that if copepods were feeding on small particles (less than 100μ nannoplankton), that this might account for a bloom if it were accompanied by an increase in larval stages as well. This was the case at Eatons Neck where the use of smaller mesh nets (202μ mesh) yielded samples containing large numbers of copepodids in the winter (Figure E6). Further, the change in distributional patterns associated with seasonal warming trends also indicated more plankton in the water column.

98. The test is to obtain sediment samples and incubate them in the laboratory to confirm hatching of the copepodids. Further, nets with 100μ mesh or less should be used to accurately assess the phytoplankton concentrations in LIS in the winter. In any case, the fact that copepods, which may originate from eggs in the sediment, are an

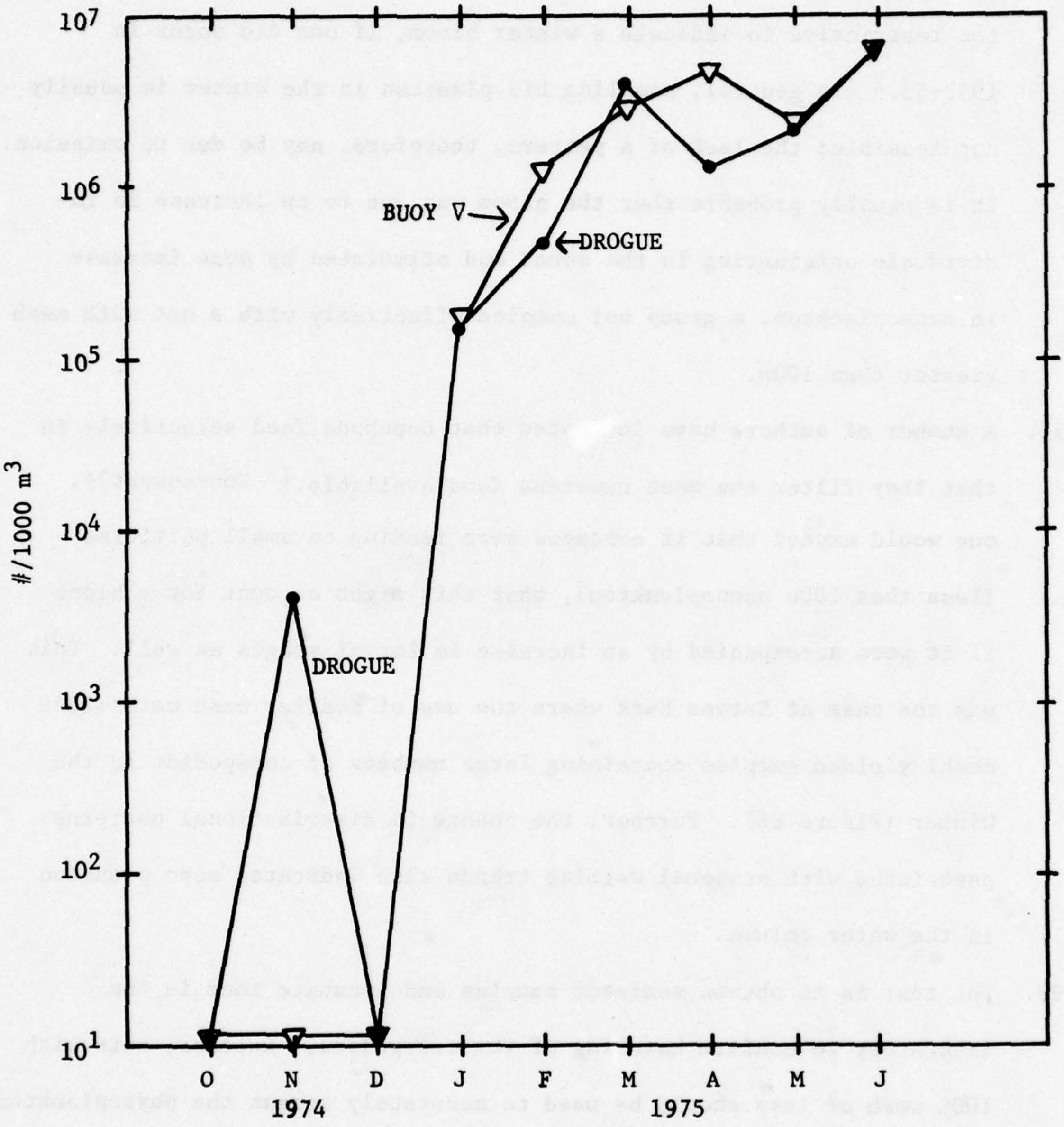


Figure E4. Quantities of *Acartia clausii* collected at station ENA, middepth buoy vs. drogue

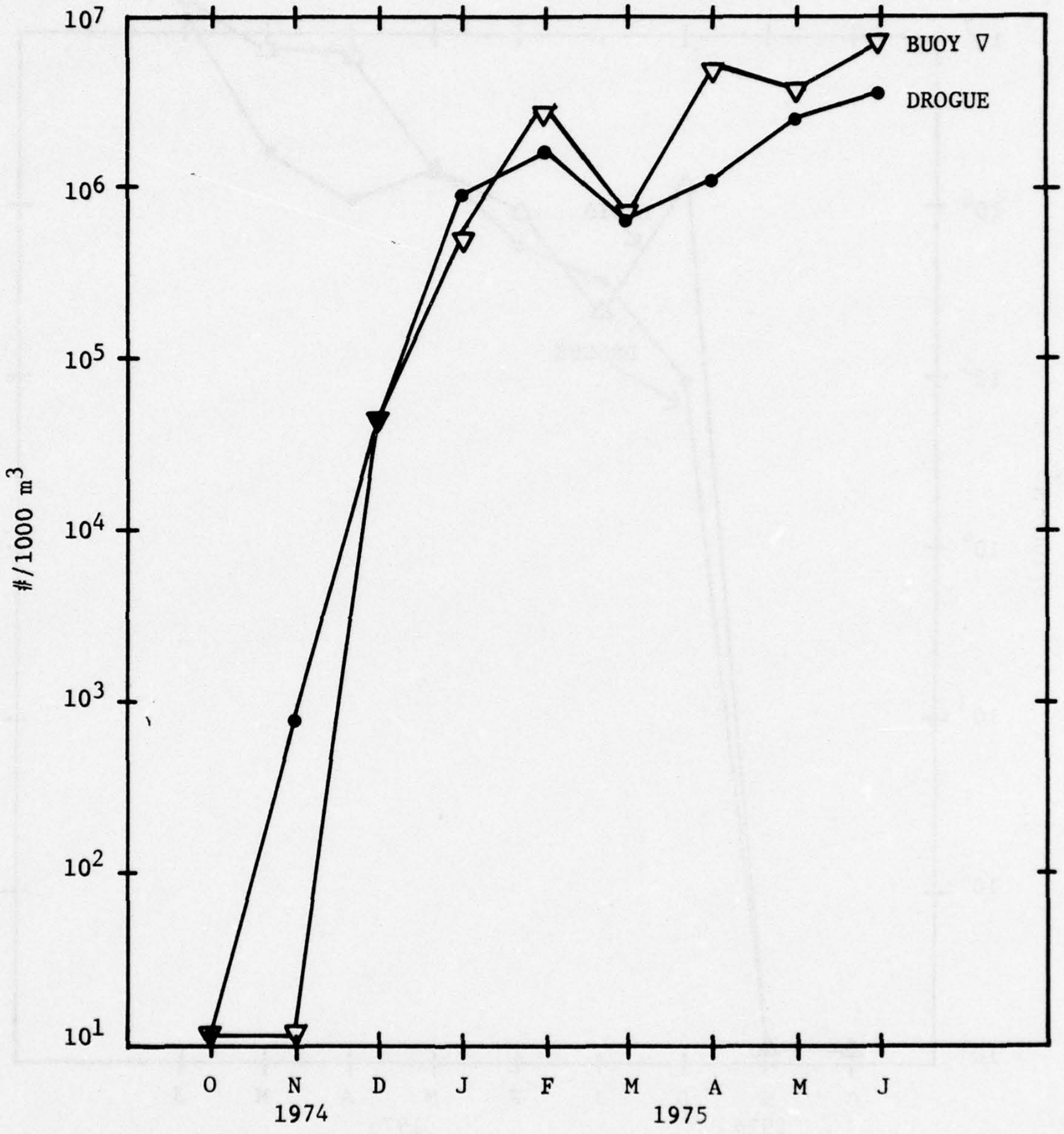


Figure E5. Quantities of *Temora longicornis* collected at station ENA, bottom buoy vs. drogue

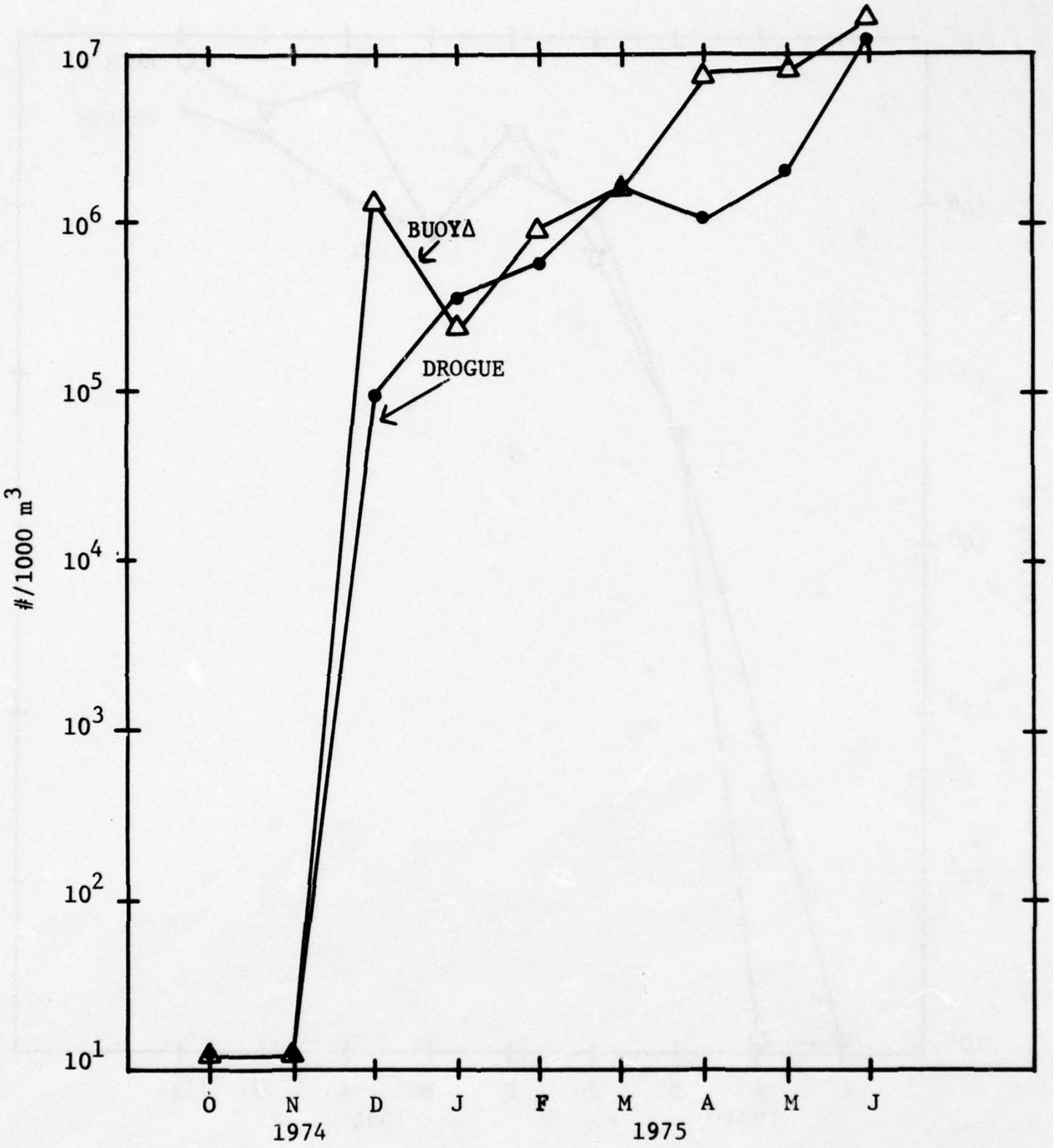


Figure E6. Quantities of *Acartia* spp. copepodid collected at station ENA, bottom buoy vs. drogue important source of planktonic food for fish and/or benthos requires that any change in sediment composition be viewed carefully in terms of the potential impact of disposal.

Other Crustacea.

99. The Crustacea holoplankton were represented by both Cladocera and Mysidacea. The former is a typical late spring-summer resident of LIS waters, whereas the latter is more common in the winter. Seasonal succession was noted for the two species of Cladocera (Figure E7, *Podon* sp. and *Evadne* sp., with the latter appearing first.[2,6] *Podon* sp. appeared from February through June 1975; whereas *Evadne* sp. was absent from the early May samples and appeared again the following month. Unlike the previously discussed group, Copepoda, this group appears to be an example of advected plankton. Temperature patterns also have been correlated to the distribution of Cladocera in terms of blooms and species succession.[6]

100. The Mysicadea are basically benthic crustaceans that are obtained in plankton tows during the night (surface samples) or throughout the day (bottom samples). They were common in the Shoreham/Jamesport study[6] and should be considered an important planktonic group to monitor during and following disposal operations. As Pericarideans, they bear their young in pouches alongside the female's carapace. The number of young/females can be used to characterize the reproductive success of the population and might be a valuable assay for determining the potential impact of disposal.

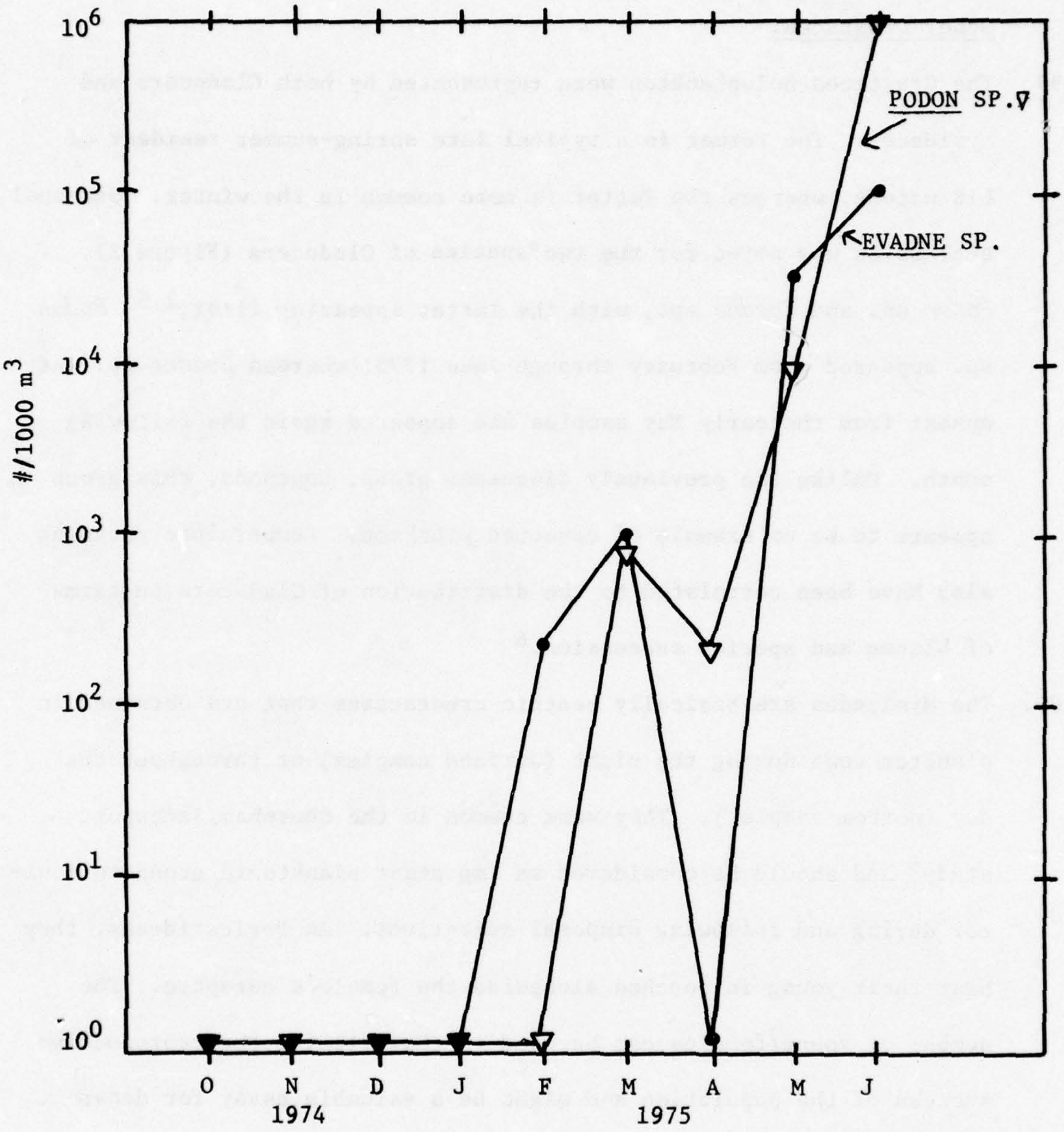


Figure E7. Quantities of *Podon* sp. and *Evadne* sp. at station ENA

Chaetognatha

101. Chaetognatha, or arrow worms, are an active plankter which migrate vertically during the night and are characteristic of both Atlantic Shelf water and Block Island Sound water. They were common in the winter at Eatons Neck and have been shown to be a dominant winter plankters in LIS.[2,7,8]

Ctenophora

102. The last invertebrate holoplankters to be discussed are the Ctenophora. This group is common in the Sound in late summer[2,7,8] and represents another group which probably does not originate in the Sound, but is advected by Block Island Sound water. Ctenophora could also be used to determine chemically the impact of disposal on planktonic communities. The effect of Ctenophora grazing on Copepoda and other invertebrate holoplankton has already been discussed.

Invertebrate Meroplankton

Crustacea

103. The Crustacea larvae of crabs (Brachyura) and shrimp (Caridea) are an important component of the zooplankton, primarily in the spring (February-March) and early summer (April-June)(Figure E8). Large numbers of crab larvae were reported by Caplan and Austin[6] at both Jamesport and Shoreham during the spring of 1973-74 (February-April). The Caplan and Austin[6] report and the present one for Eatons Neck represent a departure from the pattern reported for LIS waters by Deevey.[2] Larval forms of this group (Brachyura) are probably of LIS

origin and, in representing the recruits for subsequent benthic populations, should be monitored in terms of potential impact of disposal operations. This is also true of the larval shrimps (Caridea). Also of LIS origin, the larval shrimp are one of the major foods of many of the benthic fishes collected at Eatons Neck.[24]

Mollusca

104. The second most important component of the meroplankton are the molluscan larvae of snails (Gastropoda) and clams (Bivalvia)(Figures E9 and E10). They, like their crustacean counterparts, first appeared in the late spring (April) and were abundant throughout the remainder of the study. The maximum densities for the snail larvae (Gastropoda veligers) is in July,[6-8] a period which was not sampled in this study. However, Deevey[2] reported larval snails from plankton collected in the winter (November 1952-January 1953). The high variability associated with their distribution indicates that annual changes in population densities are very great. Therefore, there appears to be no safe time period during which larval snails will not potentially be influenced by disposal activities in LIS, based on the above annual distributional pattern.

105. Larval clams (Bivalvia) were present later than the larval gastropods at Eatons Neck (Figure E10). They did not appear until February 1975. This pattern of abundance was similar to that reported previously.[6] They are probably recruited from local benthic populations and, like the gastropod larvae, did not show any vertical migration patterns. As

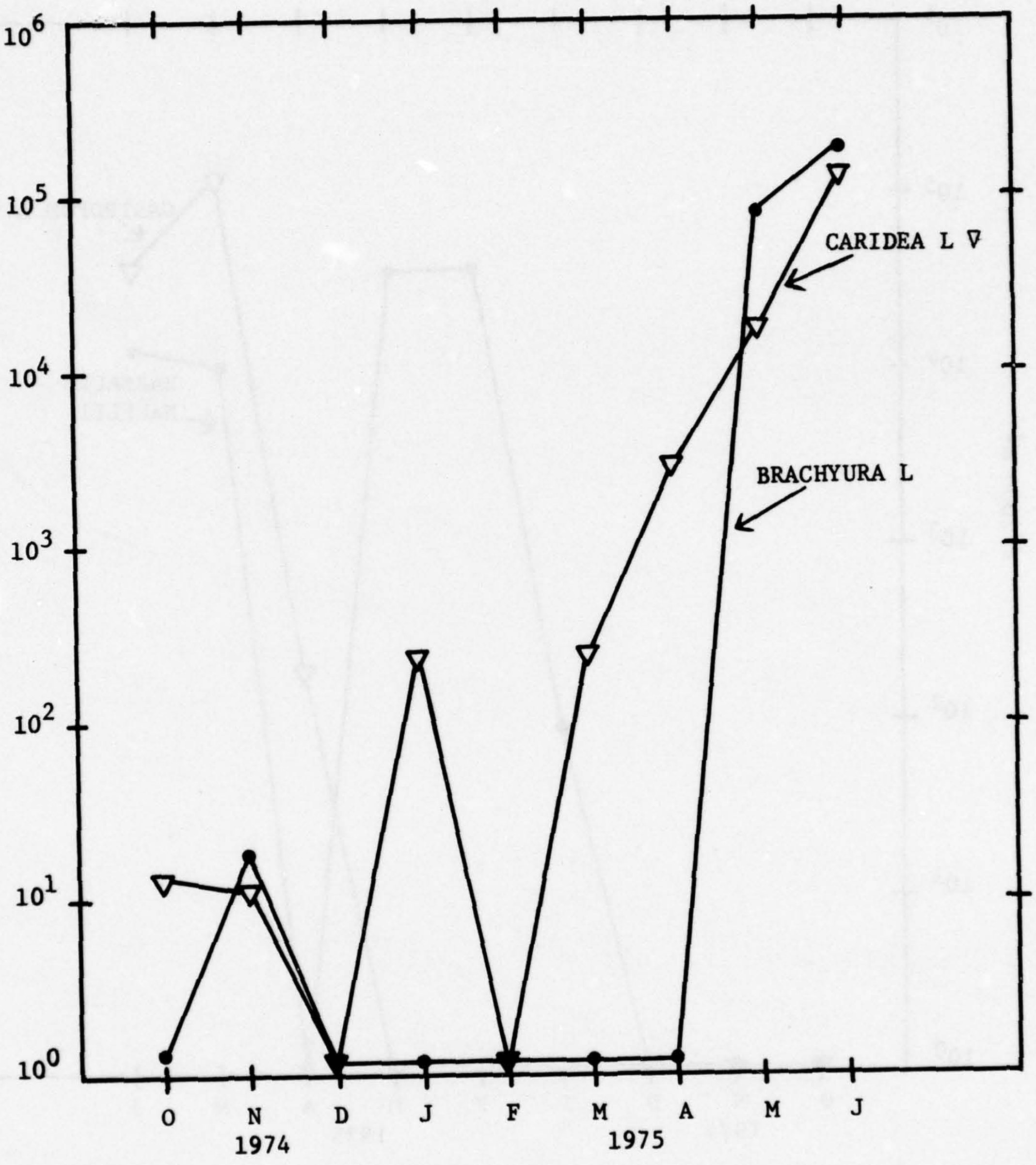


Figure E8. Quantities of crab and shrimp larvae collected at station ENA

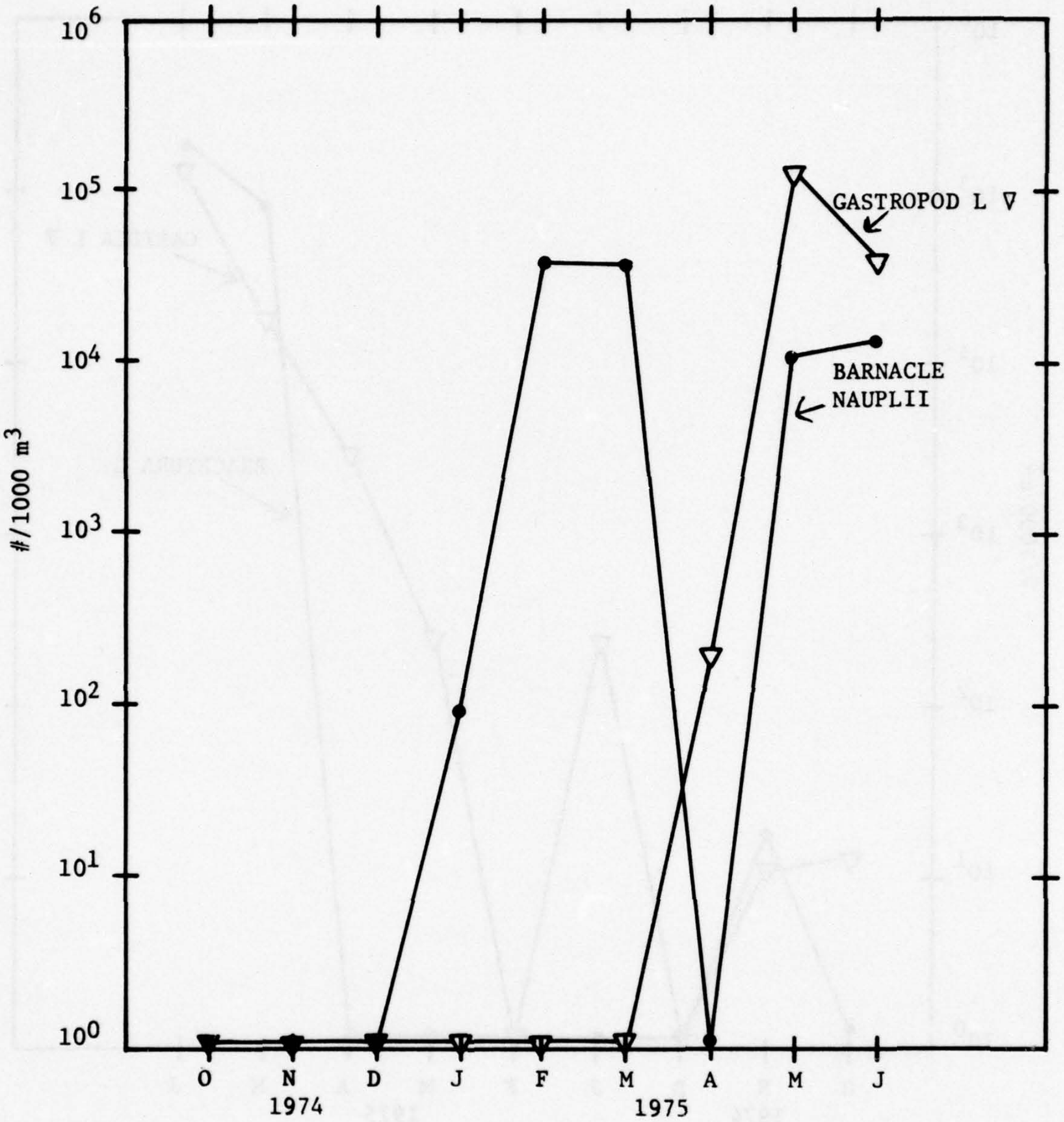


Figure E9. Quantities of barnacle nauplii/gastropod larvae at station ENA

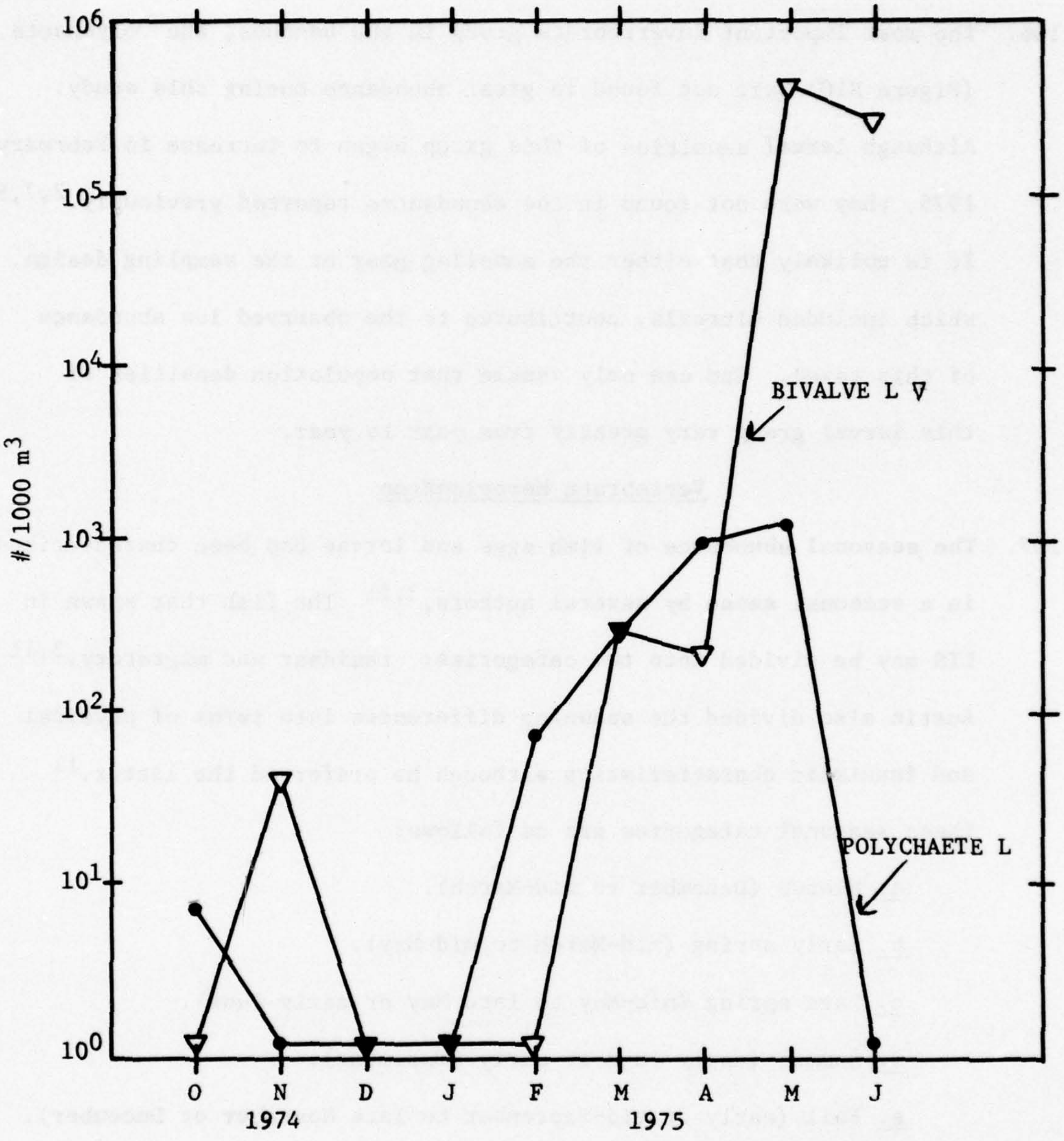


Figure E10. Quantities of Polychaeta larvae/Bivalvia larvae collected at station ENA inputs to the benthos upon settling, their populations should be monitored carefully along with the other invertebrate meroplankton.

Polychaeta

106. The most important invertebrate group in the benthos, the Polychaeta (Figure E10) were not found in great abundance during this study. Although larval densities of this group began to increase in February 1975, they were not found in the abundances reported previously.[2,7,8] It is unlikely that either the sampling gear or the sampling design, which included diurnals, contributed to the observed low abundance of this taxon. One can only assume that population densities of this larval group vary greatly from year to year.

Vertebrate Meroplankton

107. The seasonal abundance of fish eggs and larvae has been characterized in a seasonal sense by several authors.[3,11] The fish that spawn in LIS may be divided into two categories: resident and migratory.[3,11] Austin also divided the spawning differences into terms of physical and faunistic characteristics although he preferred the latter.[11] These seasonal categories are as follows:

- a. Winter (December to mid-March).
- b. Early spring (mid-March to mid-May).
- c. Late spring (mid-May to late May or early June).
- d. Summer (early June to early September).
- e. Fall (early or mid-September to late November or December).

108. Austin[11] further pointed out that

> ...yearly fluctuations in total egg production, larval survival, or spawning by individual species is often of such magnitude that no one year ever appears 'normal'. The seasons are based upon measurements and not the Gregorian Calendar.

109. Austin's scheme, Ichthyoplankton characteristics, and interpretation were used to evaluate the vertebrate meroplankton patterns for Eatons Neck.

Winter

110. Austin[11] has pointed out that during the winter seasonal, variation in temperature is slight (0.4°C/week) and ranges from 0.7° to 7°C. The number of eggs and larvae tend to be low (less than 50/1000 m^3). This is due to the absence of spawning populations of pelagic species in LIS as well as the fact that those species which do spawn produce demersal eggs, e.g., *Pseudopleuronectes americanus*. When eggs are present at this time they normally belong to the cod, *Gadus morhua*. However, at Eatons Neck the eggs of the fourbearded rockling, *Enchelyopus cimbrius*, were found at all stations and depths in both February and March 1975.

111. Austin[11] also reported that larvae of the sand lance, *Ammodytes hexapterus*, the sculpin, *Myoxocephalus* spp., and the winter flounder, *Pseudopleuronectes americanus*, were indicative of winter ichthyoplankton patterns. This same pattern was found in the present study at both the disposal site and control site. However, only the larvae

of the winter flounder was common at all stations and depths. It appears that ichthyoplankton distributions in the northern portion of the Sound contain fewer larvae than was reported by Austin[11] for the southern portion near Shoreham and Jamesport.

Early spring

112. The temperature regime in early spring is characterized by an isothermal water column and rapidly increasing temperatures of approximately 1.5°C per week.[11] Austin found that at Shoreham and Jamesport there was an abundance of the pelagic eggs of the fourbearded rockling, and the appearance of the mackerel, *Scomber scombrus*.[11] In the present study, eggs of these two species were found in April 1975, as well as those of the windowpane flounder, *Scophthalmus aquosus*. This latter species was found at the control site only. Although its eggs are demersal, Austin points out that "The occurrence of these demersal eggs in the plankton is not unusual in shallow water as winter turbulence is generally sufficient to lift them from the bottom."[11] At the control site they were found in samples from both surface and subsurface tows.

113. The larval pattern for this early spring period at Eatons Neck (control and disposal sites) indicated an abundance of fourbearded rocklings. Two other species were present, the sculpin and the winter flounder. Whereas the winter flounder larvae reached their peak abundance

during this period in 1973-74,[11] they were found in peak abundance during the next period at the Eatons Neck disposal site (control site).

Late spring

114. Although the hydrographic conditions during this period are similar to the previous one, the faunistic elements tend to be more diverse. Austin reported that the eggs of the weakfish, *Cynosian regalis*, the windowpane flounder, *Scophthalmus aquosus*, and the mackerel become numerous.[11] Further, one finds for the first time, the eggs of two other species, the menhaden, *Brevoortia tyrannus*, and the blackfish, *Tautoga onitis*. This pattern for the southern Sound differs from that observed for the northern sound with respect to the following:

a. Nine species of fish eggs were found in May 1975 including those mentioned above as well as those of the cunner, *Tautogolabrus adspersus*, the small mouth flounder, *Etropus microstomus*, and the scup, *Stenotomus chrysops*.

b. Larvae of the species mentioned by Austin were already abundant by this time period in the northern Sound.[11]

Summer

115. Although the present study included only one sampling period during this season, there were some significant differences between the pattern of egg and larval distributions at Eatons Neck disposal control sites and those reported previously.[11] In general, the northern Sound was about 6 weeks ahead of the reported patterns for 1973-74 in terms

of both eggs and larvae. Specifically, eggs of several species were still at peak abundance in June 1975, e.g., the menhaden, the mackerel, and the windowpane flounder. The eggs of the butterfish, *Peprilus triacanthus*, were noted for the Eatons Neck region, but not reported by Austin.[11] Finally, although anchovy larvae were present in June 1975 as previously reported by Austin,[11] the sea robin, *Prionotus* spp., was not found during this period.

Fall

116. Insufficient ichthyoplankton were collected during this period to allow discussion.

SUMMARY

a. *Acartia tonsa* was common throughout the first 6 months of the study with densities as high as 500,000 individuals/1000m^3 estimated in March 1975 (Figure E11).

b. A plankton bloom occurred in populations of several copepods (including copepodids) in December 1975, e.g., *Acartia clausii, Temora longicornis,* and *Acartia* spp. copepodids.

c. Meroplankton Crustacea, Caridea (shrimp), and Brachyura (crabs) became abundant (greater than 100,000 individuals/1000m^3) in March and April 1975, respectively.

d. Meroplanktonic Mullusca, Gastropoda, and Bivalvia became abundant (greater than 1000 individuals/1000m^3) in April and May 1975, respectively.

e. There were two blooms of Cladocera during 1975, one in February (1000 individuals/1000m^3) and one in June (1,000,000 individuals

/1000m^3). *Evadne* sp. dominated the first bloom and *Podon* sp., the second.

f. Polychaeta larvae were not common at any time during the present study.

g. The first significant numbers of fish eggs obtained in this study were collected in February 1975 at both control and disposal sites. They belonged to the fourbearded rockling. Larvae of the winter flounder and the sand lance were also collected with the former being present at the control site only.

h. The spring pattern of ichthyoplankton abundance included the eggs of *E. cimbrius, S. scombrus,* and *S. aquosus. Myoxocephalus* spp. and *P. americanus* larvae were also collected.

i. The summer ichthyoplankton included nine species of eggs and larvae; with the first appearance of the butterfish.

j. The winter patterns of copepod abundance indicated two important findings as follows:

1. There was a copepod bloom in December 1975, 6 weeks before the spring diatom bloom.
2. Copepod densities were maximum at depth during the November diurnal, indicating a reproductive strategy not previously reported.

k. Sexually mature copepods produce gametes in the winter, a common pattern for many temperate marine invertebrates.[1] This adaptative strategy permits the copepods to transform lipid material into gametes under conditions of low maintenance, i.e., little

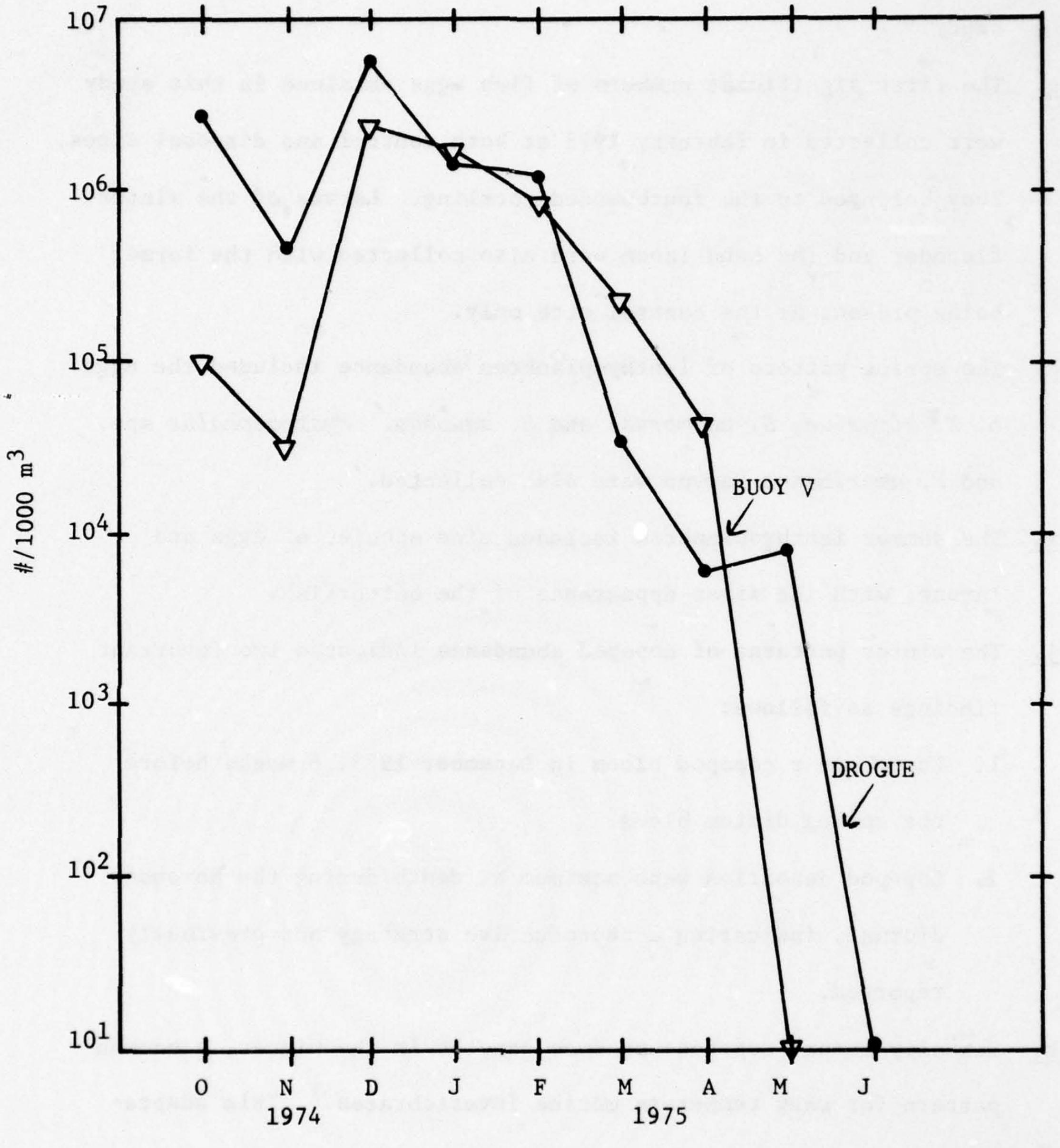


Figure E11. Quantities of *Acartia tonsa* collected at station ENA, surface buoy vs. drogue energy is expended for tissue growth (moulting) or searching for food or metabolism.

l. The near-bottom temperatures in LIS are higher than surface temperatures in winter. As poikilotherms, the assimilation efficiencies of these copepods will be greater at the intermediate temperatures (4-8°C) at depth than at the lower temperatures of surface waters (1-2°C).

m. The gametes, when released, sink to the bottom and remain there until the temperatures increase to a level which produces hatching in the sediments.[20] This procedure maintains the resident populations by keeping the fertilized "wintering" eggs in the same region as the adults, a reproductive strategy critical for planktonic populations spawning in highly advective environments like LIS. There is insufficient evidence at this time to determine the extent of this type of reproductive strategy.

n. Finally, there is no advantage to migrate to the surface at night in the winter as the food densities (phytoplankton) are extremely low. Also, predators (Ctenophora) are more common near the surface and any vertical migration would increase adult mortality due to predation.

REFERENCES

1. Caplan, R.I., "Vertical Distribution and Reproduction on Marine Zooplankton I: Winter Patterns in Long Island Sound", in preparation, 1976, 10 pp.
2. Deevey, G.G., "Oceanography of Long Island Sound, 1952-1954. Zooplankton", Bull. Bingham Oceanogr. Coll. Vol. 15: 1956, p 133-155.
3. Richards, S., "Oceanography of Long Island Sound, Part VI, Pelagic Fish Eggs and Larvae of Long Island Sound", Bull. Bingham Oceanogr. Coll. Vol. 17(1):1959, p 95-125.
4. Caplan, R.I., & B.G. Pastalove, "Zooplankton Diversity in Western Long Island Sound", American Fisheries Society, N.E. Section, May 15, 1972. Proceedings of American Fisheries Society Meeting (Abstract), 1972, p 2.
5. National Marine Fisheries Service, "Davids Island-Phase I: A Short Term Ecological Survey", 1971, pp 1-33.
6. Caplan, R.I., & H.M. Austin, "Baseline Aquatic Survey of Jamesport, Long Island for the LILCO proposed 1150 MW Electrical Generating Facility. Vol. III, Zooplankton", 1974, 133 pp.
7. Austin, H.M., & R.I. Caplan, "Preoperational Ecological Monitoring Program of the Marine Environs at the LILCO Nuclear Power Generating Facility, Shoreham, L.I., N.Y., Vol. II: Zooplankton", 1974a, pp 50.
8. Austin, H.M., & R.I. Caplan, "Baseline Aquatic Survey at Shoreham West for the LILCO proposed 1150 MW Electrical Generating Facility, Shoreham, L.I., N.Y., Vol. III: Zooplankton", 1974b, pp 145.
9. Austin, H.M., J. Dickinson, & C. Hickey, "An Ecological Study of the Ichthyofauna at the Northport Power Station, L.I., N.Y.", Final Report, pp 1-135.
10. Williams, G.C., "Studies on the Effects of a Steam Electric Generating Plant on the Marine Environment at Northport, N.Y.", M.S.R.C., State University of New York Tech. Pub. #9, 1971.
11. Austin, H.M., "Baseline Aquatic Survey at Shoreham West for the proposed LILCO 1150 MW Electrical Generating Facility at Shoreham, L.I., N.Y., Vol. IV, Ichthyoplankton", 1974a, p 1-92.
12. Austin, H.M., "Baseline Aquatic Survey at Jamesport for the Proposed LILCO 1150 MW Electrical Generating Facility at Jamesport, L.I., N.Y., Vol. IV, Ichthyoplankton", 1974b, pp 1-92.

13. Purdin, J., "Hart Island Zooplankton Population Density", Section HI - HXVII. Equitable Environmental Health, Inc., 1975.

14. Sosnow, A., "Hart Island Zooplankton Population Density", Section HI - HXVII. Equitable Environmental Health, Inc., 1975.

15. Marak, Robert R., & J. Jossi, "MARMAP Survey I Manual", MARMAP Program Office, N.M.F.S., NOAA, 1975, pp 1-23.

16. Miller, C.B., "Subsampling error of the Folsom Plankton Splitter", (Manuscript), 1970, pp 1-16.

17. Conover, R.J., "Oceanography of Long Island Sound, 1952-1954, VI. Biology of *Acartia clausii* and *Acartia tonsa*", Bull. Bingham. Oceanogr. Coll., Vol. 15: 1956, pp 156-233.

18. Pastalove, B.G., "An Analysis of the Copepod Population of the Western End of Long Island Sound", M.S. Thesis, State University of New York, 1973, pp 1-47.

19. Hollman, R., & G. Sandberg, "Residual Drift in Eastern Long Island Sound and Block Island Sound", N.Y.O.S.L. Technical Report #0015, 1972, pp 1-19.

20. Grice, G.D., & V.R. Gibson, "Occurrence, Viability and Significance of Resting Eggs of the Calanoid Copepod *Labidocera aestiva* Wheeler", W.H.O.I. pub. #2992, 1975, pp 1-7.

21. Jeffries, P.H., "Succession of two *Acartia* species in Estuaries", Limnol. & Oceanogr. Vol. 7: 1962, pp 354-364.

22. Zimmerman, S.T., "Seasonal Succession of Zooplankton Populations in Two Dissimilar Marine Embayments on the Oregon Coast", Ph.D. Thesis, Corvallis, Oregon State University, 1972, pp 193.

23. Johnson, K.J., & C.B. Miller, "Dynamics of Isolated Plankton Populations in Yaquina Bay, Oregon", Proc. 3rd Annual Tech. Conf. Estuaries of the Pacific Northwest, O.S.U. Engineering Expt. Station Circular #46, 1973, pp 27-35.

24. Valenti, R.J., & S.J. Peters, "Aquatic Disposal Field Investigations Eatons Neck Disposal Site, Long Island Sound APPENDIX D: Predisposal Baseline Conditions of Demersal Fish Assemblages", 1976, pp 89.

Table E1

Zooplankton and Ichthyoplankton Data Base, Long Island Sound

Site	Year	Group	Investigator (Reference)
Mid-Sound	1951-52	Zooplankton	Deevey, 1956 (2)
Mid-Sound	1951-52	Ichthyoplankton	Richards, 1956 (3)
West Sound	1971	Zooplankton	Caplan and Pastalove, 1972 (4)
West Sound (Davids Island)	1972	Zooplankton	National Marine Fisheries Service (5)
Mid-Sound (Northport)	1972	Ichthyoplankton	Austin, et al., 1974 (9)
Mid-Sound (Northport)	1971-72	Zooplankton	Williams, et al., 1973 (10)
Mid-Sound (Shoreham)	1973-74	Zooplankton	Austin and Caplan, 1974 (7, 8)
Mid-Sound (Shoreham)	1973-74	Ichthyoplankton	Austin, 1974 (11)
Mid-Sound (Jamesport)	1973-74	Zooplankton	Caplan and Austin, 1974 (6)
Mid-Sound (Jamesport)	1973-74	Ichthyoplankton	Austin, 1974 (12)
West Sound (Hart Island)	1975	Zooplankton	Purdin, 1976 (13)
West Sound (Hart Island)	1975	Ichthyoplankton	Sosnow, 1976 (14)

Table E2

Eatons Neck Sampling Program

Cruise	Station	Month	Net*	Depth**	Reference†	Date
EN1	EN1	Oct	II	1	C	31 Oct 74
	EN2		II	1	C	
EN2	EN1	Nov	II	3	C	19 Nov 74
	EN2		II	3	C	
	ENCONT		II	3	C	
EN3	ENCONT	Nov	II	3	C	20 Nov 74
	EN2		II	3	A	
	ENA		II	3	A	
EN4	END	Dec	III	2	B	13 Dec 74
	ENCONT		III	2	B	
	ENB		III	2	B	
EN5	ENB	Dec	I	3	A	18 Dec 74
	END		I	3	A	
EN6	END	Jan	I	4	A	23 Jan 75
	ENCONT		I	4	A	
	ENB		I	4	A	
EN7	END	Feb	I	4	A	18 Feb 75
	ENCONT		I	4	A	
	ENB		I	4	A	
EN8	END	Mar	I	4	A	1 Apr 75
	ENB		I	4	A	
	ENCONT		I	4	A	
EN9	ENB	Apr	I	4	A	28 Apr 75
	ENDSA		I	4	A	
	ENCONT		I	4	A	
EN10	ENA	May	I	4	A	29 May 75
	ENCONT		I	4	A	
EN11	ENDSA	May	I	4	A	29 May 75
	ENDSA		I	4	A	30 May 75
EN12	ENDSA	June	I	4	A	17 Jun 75
	ENA		I	4	A	
	ENCONT		I	4	A	

---

*Net, micron mesh: I = 363/202; II = 363; III = 202.

**Depth: 1 = surface, middepth, and bottom; 2 = surface; 3 = middepth and bottom; and 4 = surface and middepth.

†Reference: A = buoy/drogue; B = buoy; C = drogue.

Table E3

Sampling Station Locations for Eatons Neck Zooplankton

Station	Depth, m	Latitude	Longitude
Control EN3	25	41°00'00"	73°22'00"
EN1	23	41°00'26"	73°27'13"
EN2	31	40°59'59"	73°25'32"
ENB	23	41°01'09"	73°26'51"
END	33	49°59'17"	73°25'56"
ENA	26	41°00'12"	73°26'30"
ENDSA	25	41°00'37"	73°28'8"

Table E4

Copepod Standing Crop Densities During Monthly Sampling Periods

Station	*Acartia tonsa*	*Acartia clausii*	*Temora longicornis*	*Pseudodiaptomus coronatus*	*Labidocera aestiva*	*Centropages* sp.	*Pseudocalanus minutus*
	Sample						
				October			
EN1-363-IDA	3,898 93.1	144 3.4	0 0	0 0	0 0	0 0	29 0.7
EN1-363-IDB	117,278 99.3	0 0	0 0	660 0.6	132 0.1	0 0	0 0
EN1-363-IDC	152,554 47.0	0 0	139 0.04	16,241 5.0	1,666 0.5	0 0	0 0
EN1-363-2DA	200,264 99.7	0 0	0 0	620 0.3	0 0	0 0	0 0
EN1-363-2DB	2,662,322 99.9	0 0	0 0	0 0	1,629 0.1	0 0	0 0
EN1-363-2DC	441,205 81.3	0 0	0 0	75,876 14.0	25,292 4.7	0 0	0 0
EN2-363-1BA	4,127 100.0	0 0	0 0	0 0	0 0	0 0	0 0
EN2-363-1BC	584 87.5	0 0	0 0	50 7.5	17 2.5	0 0	0 2.5
EN2-363-2BA	1,426 100.0	0 0	0 0	0 0	0 0	0 0	0 0
EN2-363-2BB	13,714 96.2	183 1.3	0 0	366 2.6	0 0	0 0	0 0
EN2-363-2BC	154,331 89.8	0 0	0 0	11,337 6.6	6,217 3.6	0 0	0 0
				November			
EN1-363-1B	23,724 99.6	0 0	0 0	102 0.4	0 0	0 0	0 0
EN1-363-1C	1,575,443 98.2	5,667 0.4	1,889 0.1	17,001 1.1	3,778 0.2	0 0	0 0
EN2-363-1A	5,110,740 91.1	0 0	0 0	351,697 6.3	142,460 2.5	4,452 0.1	0 0
EN2-363-1B	552,010 97.8	3,450 0.6	690 0.1	8,280 1.5	0 0	0 0	0 0
EN2-363-1C	2,208,039 98.0	5,520 0.2	0 0	38,641 1.7	0 0	0 0	0 0
EN3-363-1B	62,798 98.0	0 0	0 0	866 1.4	433 0.7	0 0	0 0
EN3-363-1C	1,615,747 98.0	0 0	1,369 0.1	15,062 0.9	6,846 0.4	0 0	0 0

Station	*Acartia tonsa*	*Acartia* copepodite	*Temora longicornis*	*Temora* copepodite	*Centropages* sp.	*Centropages* copepodite	*Paracalanus* sp.	*Pseudodiaptomus coronatus*	*Oithona* sp.	*Harpaticoid*	*Labidocera aestiva*
						December					
ENB-202-1A	272,238 34.1	510,324 63.9	5,855 0.7	0 0	488 0.1	0 0	9,270 1.2	0 0	976 0.1	0 0	0 0
ENB-202-1B	2,407,615 65.1	1,107,562 29.9	56,267 1.5	2,964 0.8	0 0	0 0	85,876 2.3	8,884 0.2	2,961 0.1	0 0	0 0
ENB-202-2A	2,248,605 47.3	24,179,986 50.6	19,301 0.4	0 0	0 0	0 0	64,338 1.4	0 0	12,868 0.3	0 0	0 0
ENB-202-2B	3,754,260 77.8	86,512 17.9	28,565 0.6	57,130 1.2	0 0	4,081 0.1	77,534 1.6	32,646 0.7	0 0	4,081 0.1	0 0
ENB-363-1B	9,641,372 98.0	135,034 1.4	47,262 0.5	0 0	6,752 0.1	0 0	0 0	67,517 0.7	0 0	0 0	6,752 0
ENB-363-2B	5,740,832 98.5	0 0	39,647 0.7	0 0	0 0	0 0	0 0	47,576 0.8	0 0	0 0	0 0
END-202-1A	308,205 17.9	1,365,908 79.3	9,807 0.6	0 0	11,207 0.7	0 0	18,212 1.1	8,406 0.5	0 0	0 0	0 0
END-202-1B	4,326,335 64.9	1,615,732 24.2	90,353 1.4	85,039 1.3	0 0	5,315 0.1	255,116 3.8	287,005 4.3	0 0	0 0	0 0
END-202-2A	217,868 23.3	1,016,883 74.4	14,716 1.1	0 0	4,415 0.3	0 0	2,943 0.2	8,830 0.6	0 0	1,472 0.1	0 0
END-363-1B	3,688,455 97.6	0 0	30,163 0.8	0 0	4,309 0.1	0 0	0 0	56,016 1.8	0 0	0 0	0 0
ENCONT-202-1A	869,024 77.0	220,290 19.5	10,317 0.9	0 0	5,462 0.5	0 0	12,744 1.1	10,317 0.9	0 0	0 0	0 0
ENCONT-202-1B	91,907 19.4	1,161,130 74.9	5,817 1.2	0 0	4,654 1.0	0 0	6,980 1.5	9,307 2.0	607 0.1	0 0	0 0

(Continued)

NOTE: Upper number represents number of standing crop/10^6 liters, lower number represents percent standing crop.

Table E4 (Continued)

Station	*Acartia tonsa*	*Acartia* copepodite	*Acartia clausii*	*Temora longicornis*	*Temora* copepodite	*Paracalanus* sp.	*Centropages* sp.	*Pseudodiaptomus coronatus*	*Oithona* sp.
				January					
ENB-363-1A	Sample jar broken								
ENB-363-1B	1,814,311	0	112,653	495,082	0	0	5,929	0	0
	74.7	0	4.6	20.4	0	0	4.6	0	0
ENB-363-2A	390,165	0	587,367	1,348,613	0	0	8,482	6,361	0
	16.7	0	25.1	57.6	0	0	0.4	0.3	0
ENB-363-2B	1,504,507	0	137,762	746,815	0	0	7,251	9,063	0
	62.5	0	5.7	31.0	0	0	0.3	0.4	0
ENB-202-1A	1,441,233	261,756	63,074	1,132,372	0	47,305	18,922	3,154	6,307
	48.5	8.8	2.1	38.1	0	1.6	0.6	0.1	0.2
ENB-202-1B	4,285,195	210,939	23,438	1,484,388	74,219	160,158	3,906	19,531	19,531
	68.2	3.4	0.4	23.6	1.2	2.5	0.1	0.3	0.3
ENB-202-2A	2,304,668	489,612	0	243,424	94,425	24,481	10,492	6,994	0
	42.9	9.1	0	45.4	1.8	0.5	0.2	0.1	0
ENB-202-2B	3,023,223	324,661	29,785	1,638,200	71,485	74,464	5,058	20,850	178,713
	58.1	6.2	0.6	31.5	1.4	1.4	0.1	0.4	0.3
END-363-1A	709,702	0	285,923	1,797,232	0	0	0	2,553	0
	25.4	0	10.2	64.3	0	0	0	0.1	0
END-363-1B	1,340,391	0	28,900	3,506,977	0	0	0	12,388	0
	62.5	0	1.3	35.6	0	0	0	0.6	0
END-363-2A	2,938,170	0	56,685	524,336	0	0	0	54,323	0
	82.2	0	1.6	14.7	0	0	0	1.5	0
END-363-2B	1,275,983	0	13,070	692,723	0	0	3,268	9,803	0
	64.0	0	0.7	34.7	0	0	0.2	0.5	0
END-202-1A	2,471,894	1,756,476	118,414	4,080,352	192,423	34,537	4,934	9,868	4,934
	28.0	21.6	1.3	46.3	2.2	0.4	0.1	0.1	0.1
END-202-1B	2,425,512	511,207	0	1,405,818	81,576	73,418	4,719	19,034	10,877
	53.5	11.3	0	31.0	1.8	1.6	0.1	0.4	0.2
END-202-2A	1,238,656	1,503,047	3,622	3,393,627	159,359	7,244	0	7,244	10,865
	19.6	23.8	0.1	53.7	2.5	0.1	0	0.1	0.2
END-202-2B	3,019,639	607,166	64,764	1,748,638	121,433	105,242	8,096	52,621	20,239
	52.5	10.6	1.1	30.4	2.1	1.8	0.1	0.9	0.4
ENCONT-363-1A	2,867,121	0	229,209	1,713,034	0	0	16,085	28,148	0
	59.1	0	4.7	35.3	0	0	0.3	0.6	0
ENCONT-363-1B	548,568	0	85,333	1,867,568	0	0	0	2,438	0
	21.9	0	3.4	74.6	0	0	0	0.1	0
ENCONT-363-2A	2,392,561	0	0	308,055	0	0	2,567	56,477	0
	86.7	0	0	11.2	0	0	0.1	2.0	0
ENCONT-363-2B	3,092,944	0	73,577	25,881	0	0	10,900	59,951	0
	88.5	0	2.1	7.4	0	0	0.3	1.7	0
ENCONT-202-1A	3,417,176	972,720	43,393	437,543	47,009	54,241	7,232	94,018	21,696
	67.3	19.0	0.8	8.5	0.9	1.1	0.1	1.8	0.4
ENCONT-202-1B	4,247,061	1,025,860	0	943,791	198,333	170,977	6,839	136,781	0
	63.1	15.2	0	14.0	2.9	2.5	0.1	2.0	0
ENCONT-202-2A	6,380,011	1,719,436	103,425	749,829	71,104	116,353	6,464	161,601	51,712
	68.2	18.4	1.1	8.0	0.8	1.2	0.1	1.7	0.6
ENCONT-202-2B	4,483,317	789,365	34,172	556,998	85,429	136,687	6,834	78,595	30,754
	72.3	12.7	0.6	9.0	1.4	2.2	0.1	1.3	0.5

(Continued)

Table E4 (Continued)

Station	*Acartia tonsa*	*Acartia clausii*	*Acartia* copepodite	*Temora longicornis*	*Temora* copepodite	*Centropages* sp.	*Pseudodiaptomus coranatus*	*Paracalanus* sp.	*Oithona* sp.
February									
ENB-363-1A	582,436 49.9	351,045 30.1	0 0	228,751 19.6	0 0	2,639 0.2	2,639 0.2	0 0	0 0
ENB-363-1B	839,548 19.3	1,100,741 25.3	0 0	2,384,317 54.8	0 0	3,731 0.1	18,657 0.4	0 0	0 0
ENB-363-2A	2,047,701 63.6	156,927 4.9	0 0	1,006,627 31.3	0 0	0 0	7,655 0.2	0 0	0 0
ENB-363-2B	1,033,513 35.8	408,054 14.1	0 0	1,431,533 49.6	0 0	3,345 0.1	10,034 0.3	0 0	0 0
ENB-202-1A	795,127 59.2	198,402 14.8	213,605 15.9	126,947 9.5	2,280 0.2	760 0.1	760 0.1	3,041 0.2	1,520 0.1
ENB-202-1B	4,364,087 46.4	898,489 9.5	786,875 8.4	3,192,146 33.9	66,968 0.7	11,161 0.1	16,742 0.2	39,065 0.4	33,484 0.4
ENB-202-2A	2,010,309 47.6	812,112 19.2	219,669 5.2	1,164,914 27.6	13,313 0.3	0 0	0 0	0 0	0 0
ENB-202-2B	4,486,823 50.4	1,225,317 13.8	495,533 5.6	2,522,712 28.3	45,048 0.5	0 0	90,097 1.0	27,029 0.3	2,010 0.1
ENB-363-1A	95,565 67.1	22,785 16.0	0 0	23,277 16.3	0 0	820 0.6	0 0	0 0	0 0
END-363-1A	1,140,545 32.1	900,431 25.2	0 0	1,493,514 42.1	0 0	2,101 0.1	12,610 0.6	0 0	0 0
END-363-2A	1,811,186 64.9	218,742 7.8	0 0	754,661 27.0	0 0	6,562 0.2	0 0	0 0	0 0
END-202-1A	745,706 56.5	272,891 20.7	135,716 10.3	154,687 11.7	5,837 0.4	2,919 0.2	1,459 0.1	1,459 0.1	0 0
END-202-1B	3,059,272 42.6	867,161 12.1	792,329 11.0	2,130,486 29.7	184,877 2.6	17,607 0.2	33,212 0.5	66,027 0.9	26,411 0.4
END-202-2A	2,105,158 63.2	542,212 16.3	222,049 6.7	433,769 13.0	12,049 0.4	10,328 0.3	0 0	0 0	6,885 0.2
ENCONT-363-1A	33,115 50.1	12,846 19.4	0 0	19,840 30.0	0 0	285 0.4	0 0	0 0	0 0
ENCONT-363-1B	889,502 24.1	543,785 14.7	0 0	2,243,563 60.7	0 0	7,202 0.2	14,405 0.4	0 0	0 0
ENCONT-363-2A	2,099,517 13.8	1,193,410 7.8	0 0	11,889,898 78.1	0 0	22,100 0.1	22,100 0.1	0 0	0 0
ENCONT-363-2B	800,998 28.4	579,789 20.5	0 0	1,410,850 50.0	0 0	6,472 0.2	23,651 0.8	0 0	0 0
ENCONT-202-1A	1,114,636 42.4	604,061 23.0	462,035 17.6	420,685 16.0	7,191 0.3	8,989 0.3	1,798 0.1	3,596 0.1	3,596 0.1
ENCONT-202-1B	3,779,186 39.4	408,764 7.1	513,129 8.9	2,348,217 40.8	156,548 2.7	8,697 0.2	21,743 0.4	8,697 0.2	21,743 0.4

(Continued)

Table E4 (Continued)

Station	*Acartia tonsa*	*Acartia clausii*	*Acartia* copepodite	*Temora longicornis*	*Temora* copepodite	*Centropages* sp.	*Centropages* copepodite	*Pseudodiaptomus coraratus*	*Pseudodiaptomus* copepodite	*Paracalanus* sp.	*Oithona* sp.	*Pseudocalanus minutus*
						March						
ENB-363-1A	2,942	325,689	0	44,862	0	8,090	0	3,677	0	0	0	0
	0.5	90.4	0	7.2	0	1.3	0	0.6	0	0	0	0
ENB-363-1B	222,155	2,498,482	0	520,390	0	9,130	0	57,821	0	0	0	0
	6.7	75.5	0	15.2	0	0.3	0	1.7	0	0	0	0
ENB-363-2A	1,038	884,085	0	87,540	0	8,301	0	10,377	0	0	0	0
	0.1	88.3	0	9.7	0	0.8	0	1.0	0	0	0	0
ENB-363-2B	35,412	3,776,420	0	566,590	0	10,112	0	63,235	0	0	0	0
	0.8	84.8	0	12.7	0	0.2	0	1.4	0	0	0	0
ENB-202-1A	3,045	951,503	570,902	68,508	89,822	16,746	9,134	4,567	0	1,522	1,522	0
	0.2	55.4	33.2	4.0	5.2	1.0	0.5	0.3	0	0.1	0.1	0
ENB-202-1B	56,051	4,947,250	1,601,882	887,968	492,660	2,950	17,700	103,252	47,201	5,900	2,950	0
	0.7	60.6	19.6	10.9	6.0	0.04	0.2	1.3	0.6	0.1	0.04	0
ENB-202-2A	5,291	1,760,203	504,427	102,296	109,351	12,346	0	8,819	3,527	3,527	0	0
	0.2	70.1	20.1	4.1	4.4	0.5	0	0.4	0.1	0.1	0	0
ENB-202-2B	332,532	4,045,806	1,257,387	800,155	443,376	10,892	6,928	45,030	10,392	3,464	6,928	0
	4.8	58.1	18.1	11.5	6.4	0.1	0.1	0.6	0.1	0.04	0.1	0
END-363-1A	465,422	874,085	0	304,605	0	0	0	18,920	0	0	0	0
	28.0	52.6	0	18.3	0	0	0	1.1	0	0	0	0
END-363-1B	215,407	4,687,675	0	2,492,571	0	20,515	0	246,180	0	0	0	0
	2.8	61.2	0	32.5	0	0.3	0	3.2	0	0	0	0
END-363-2A	28,764	2,022,144	0	454,479	0	8,629	0	28,764	0	0	0	0
	1.1	79.5	0	17.9	0	0.3	0	1.1	0	0	0	0
END-363-2B	142,844	2,758,440	0	1,814,506	0	4,891	0	254,324	0	0	0	0
	2.1	55.9	0	36.8	0	0.1	0	5.2	0	0	0	0
END-202-1A	44,804	3,598,112	2,726,156	375,365	379,111	6,893	3,446	34,465	10,339	0	0	6,893
	0.6	50.1	37.9	5.2	5.3	0.1	0.04	0.5	0.1	0	0	0.1
END-202-1B	174,359	8,610,651	3,514,004	2,132,544	1,046,154	13,412	0	308,481	0	13,412	0	0
	1.1	54.5	22.2	13.5	6.6	0.1	0	2.0	0	0.1	0	0
END-202-2A	152,773	3,459,851	1,162,270	362,461	164,755	11,982	0	38,942	0	0	0	0
	2.9	64.6	21.7	6.8	3.1	0.2	0	0.7	0	0	0	0
END-202-2B	173,980	8,163,132	2,122,553	2,929,820	521,939	20,878	0	473,225	76,551	6,959	0	48,714
	1.2	56.2	14.6	20.2	3.6	0.1	0	3.3	0.5	0.04	0	0.3
ENCONT-363-1A	107,794	3,399,281	0	2.5	0	0.3	0	0.2	0	0	0	0
	3.0	94.0	0	2.5	0	0.3	0	0.2	0	0	0	0
ENCONT-363-1B	69,770	1,979,734	0	113,186	0	0	0	17,443	0	0	0	0
	2.2	61.9	0	35.4	0	0	0	0.5	0	0	0	0
ENCONT-363-2A	2,861	836,120	0	80,823	0	8,583	0	3,576	0	0	0	0
	0.3	89.7	0	8.7	0	0.9	0	0.4	0	0	0	0
ENCONT-363-2B	113,536	2,490,694	0	1,717,231	0	7,096	0	49,672	0	0	0	0
	2.6	56.9	0	39.2	0	0.2	0	1.1	0	0	0	0
ENCONT-202-1A	197,338	6,817,699	3,603,004	210,069	490,161	6,366	12,731	0	0	6,366	0	0
	1.7	60.1	31.8	1.9	4.3	0.1	0.1	0	0	0.1	0	0
ENCONT-202-1B	211,939	4,841,634	2,284,234	2,157,070	923,113	14,129	14,129	23,549	65,937	61,227	4,710	0
	2.0	45.7	21.5	20.3	8.7	0.1	0.1	0.2	0.6	0.6	0.04	0
ENCONT-202-2A	2,708	115,716	935,631	67,701	54,161	18,956	8,124	5,416	0	0	0	0
	0.1	50.5	42.4	3.1	2.5	0.9	0.4	0.2	0	0	0	0
ENCONT-202-2B	65,457	3,972,751	1,535,727	2,054,350	800,592	5,035	0	40,281	10,070	5,035	0	5,035
	0.8	46.8	18.1	24.2	9.4	0.1	0	0.5	0.1	0.1	0	0.1

(Continued)

Table E4 (Continued)

Station	*Acartia tonsa*	*Acartia clausii*	*Acartia* copepodid	*Temora longicornis*	*Temora* copepodid	*Centropages* sp.	*Centropages* copepodid	*Pseudodiaptomus coranatus*	*Pseudodiaptomus* copepodid	*Oithona* sp.	*Paracalanus parvus*	*Labidocera aestiva*
						April						
ENB-363-1A	0	4,394,587	0	252,877	0	17,086	0	37,590	0	0	0	0
	0	93.5	0	5.4	0	0.4	0	0.8	0	0	0	0
ENB-363-1B	40,732	4,219,825	0	3,910,262	0	24,439	0	627,271	0	0	0	0
	0.5	47.8	0	44.3	0	0.3	0	7.1	0	0	0	0
ENB-363-2A	6,133	3,038,974	0	585,715	0	107,330	0	33,732	0	0	0	0
	0.2	80.6	0	15.5	0	2.8	0	0.9	0	0	0	0
ENB-363-2B	6,160	1,075,900	0	907,534	0	8,213	0	108,822	0	0	0	0
	0.3	51.1	0	43.1	0	0.4	0	5.2	0	0	0	0
ENB-202-1A	11,195	3,716,851	738,892	207,114	0	16,793	5,598	33,586	5,598	0	0	5,598
	0.2	78.4	15.6	4.4	0	0.4	0.1	0.7	0.1	0	0	0.1
ENB-202-1B	49,181	8,557,558	6,164,065	7,393,599	11,196,747	49,181	163,938	1,442,653	639,358	0	0	0
	0.2	33.4	24.0	28.8	4.7	0.2	0.6	5.6	2.5	0	0	0
ENB-202-2A	0	3,362,448	681,302	423,696	44,064	105,076	0	23,727	0	0	0	0
	0	72.5	14.7	9.1	0.9	2.3	0	0.5	0	0	0	0
ENB-202-2B	7,009	1,422,741	879,577	1,005,731	220,770	3,504	3,504	182,223	70,086	7,009	3,504	0
	0.2	37.4	23.1	26.4	5.8	0.1	0.1	4.8	1.8	0.2	0.1	0
ENSA-363-1A	0	2,379,931	0	193,518	0	20,370	0	23,765	0	0	0	0
	0	90.9	0	7.4	0	0.8	0	0.9	0	0	0	0
ENSA-363-1B	8,332	1,222,084	0	1,247,082	0	5,555	0	305,521	0	0	0	0
	0.3	43.8	0	44.7	0	0.2	0	11.0	0	0	0	0
ENSA-363-2A	4,331	2,706,756	0	281,403	0	8,662	0	34,646	0	0	0	0
	0.1	89.2	0	9.3	0	0.3	0	1.1	0	0	0	0
ENSA-363-2B	51,507	2,262,034	0	2,480,940	0	8,585	0	382,013	0	0	0	0
	1.0	43.6	0	47.8	0	0.2	0	7.4	0	0	0	0
ENSA-202-1A	17,748	3,219,523	1,916,805	312,368	138,436	10,649	0	24,847	10,649	3,550	0	0
	0.3	56.9	33.9	5.5	2.4	0.2	0	0.4	0.2	0.1	0	0
ENSA-202-1B	14,965	4,556,896	3,352,199	3,307,303	927,841	0	0	950,289	493,851	0	0	0
	0.1	33.5	24.6	24.3	6.8	0	0	7.0	3.6	0	0	0
ENSA-202-2A	33,408	5,703,207	3,331,245	2,018,892	300,671	42,953	9,545	243,400	95,451	0	0	0
	0.3	48.4	28.3	17.1	2.6	0.4	0.1	2.1	0.8	0	0	0
ENSA-202-2B	52,174	4,591,304	4,617,391	4,878,261	560,870	13,043	52,174	769,565	234,783	0	13,043	0
	0.3	29.1	29.3	30.9	3.6	0.1	0.3	4.9	1.5	0	0.1	0
ENCONT-363-1A	8,499	1,592,081	0	1,728,059	0	19,830	0	5,666	0	0	0	0
	0.3	47.5	0	51.5	0	0.6	0	0.2	0	0	0	0
ENCONT-363-1B	11,267	3,498,324	0	5,199,602	0	16,900	0	315,469	0	0	0	0
	0.1	38.7	0	57.5	0	0.2	0	3.5	0	0	0	0
ENCONT-363-2A	12,113	2,041,080	0	5,081,501	0	24,226	0	121,132	0	0	0	0
	0.2	28.0	0	69.8	0	0.3	0	1.7	0	0	0	0
ENCONT-363-2B	2,511	2,975,685	0	5,141,532	0	18,833	0	420,614	0	0	0	0
	0.3	34.7	0	59.9	0	0.2	0	4.9	0	0	0	0
ENCONT-202-1A	40,603	4,913,000	4,852,095	4,303,950	351,895	47,371	6,767	261,551	162,413	6,767	0	0
	0.3	33.0	33.0	29.0	2.4	0.3	0.04	1.5	1.1	0.04	0	0
ENCONT-202-1B	14,261	6,588,763	6,931,036	7,558,538	869,945	42,784	0	641,763	57,046	0	0	0
	0.1	29.0	30.5	33.3	3.8	0.2	0	2.8	0.3	0	0	0
ENCONT-202-2A	35,585	9,014,827	9,418,122	8,919,934	1,055,684	47,446	0	450,741	213,509	0	0	0
	0.1	30.9	32.3	30.6	3.6	0.2	0	1.5	0.7	0	0	0
ENCONT-202-2B	20,420	1,127,741	8,698,921	10,210,000	1,357,930	20,420	20,420	1,235,416	398,190	0	0	0
	0.1	35.1	25.7	30.2	4.0	0.1	0.1	3.6	1.2	0	0	0

(Continued)

(Sheet 5 of 7)

Table E4 (Continued)

Station	*Acartia tonsa*	*Acartia clausii*	*Acartia* copepodid	*Temora longicornis*	*Temora* copepodid	*Pseudocalanus minutus*	*Pseudocalanus* copepodid	*Centropages hamatus*	*Centropages typicus*	*Oithona* sp.	*Paracalanus parvus*	*Harpacticoids*	*Pseudodiaptomus coronatus*
						May							
ENA-202-1A	378,769	5,811,114	737,603	59,806	119,611	0	0	0	0	0	19,935	19,935	0
	5.3	81.1	10.3	0.8	1.7	0	0	0	0	0	0.3	0.3	0
ENA-363-1A	0	2,836,879	0	0	61,982	0	0	4,768	4,768	0	0	0	0
	0	97.5	0	0	2.0	0	0	0.2	0.2	0	0	0	0
ENA-202-1B	0	10,423,964	6,665,575	5,473,890	1,728,597	1,257,162	0	0	0	0	0	0	29,465
	0	40.7	26.0	21.4	6.7	4.9	0	0	0	0	0	0	0.3
ENA-363-1B	0	1,951,775	0	3,207,417	0	45,541	0	13,012	6,502	0	0	0	0
	0	37.4	0	61.4	0	0.9	0	0.2	0.1	0	0	0	0
ENA-202-2A	0	9,390,666	880,375	440,187	701,039	0	0	0	0	0	0	211,942	0
	0	80.8	7.6	3.8	6.0	0	0	0	0	0	0	1.8	0
ENA-363-2A	0	2,756,315	0	81,724	0	0	0	52,006	0	0	0	0	0
	0	95.4	0	2.8	0	0	0	1.8	0	0	0	0	0
ENA-202-2B	0	14,942,926	1,715,669	3,449,787	2,066,182	1,272,916	0	0	0	18,448	55,344	18,448	147,584
	0	63.1	7.2	14.6	8.7	5.4	0	0	0	0.1	0.2	0.1	0.6
ENA-363-2B	8,705	3,464,824	0	2,124,163	0	78,350	0	0	0	0	0	0	0
	0.2	61.0	0	37.4	0	1.4	0	0	0	0	0	0	0
ENDSA-202-1-1A	0	7,802,341	2,205,462	0	395,319	0	0	0	0	0	0	20,806	0
	0	74.9	21.2	0	3.8	0	0	0	0	0	0	0.2	0
ENDSA-363-1-1A	0	1,964,135	0	14,442	0	0	0	0	0	0	0	0	0
	0	99.3	0	0.7	0	0	0	0	0	0	0	0	0
ENDSA-202-1-1B	0	13,823,814	2,652,469	4,820,910	2,749,274	696,999	329,138	77,444	0	0	0	0	96,805
	0	54.8	10.5	19.1	10.9	2.8	1.3	0.3	0	0	0	0	0.4
ENDSA-363-1-1B	0	22,332,168	0	2,540,736	0	37,921	0	0	0	0	0	0	0
	0	47.5	0	51.7	0	0.8	0	0	0	0	0	0	0
ENDSA-202-1-2A	0	7,687,448	4,295,927	0	385,702	0	0	0	0	0	0	13,300	0
	0	62.1	34.7	0	3.1	0	0	0	0	0	0	0.1	0
ENDSA-363-1-2A	156,687	3,368,774	0	22,384	0	0	0	5,596	0	0	0	0	0
	4.4	94.8	0	0.6	0	0	0	0.2	0	0	0	0	0
ENDSA-202-1-2B	206,452	17,909,677	9,135,484	5,109,677	3,337,634	1,273,118	447,312	0	0	68,817	34,409	0	172,043
	0.5	47.5	24.2	13.6	8.9	3.4	1.2	0	0	0.2	0.1	0	0.5
ENDSA-363-1-2B	0	2,838,365	0	3,067,648	0	55,344	0	0	0	0	0	0	0
	0	47.6	0	51.5	0	0.9	0	0	0	0	0	0	0
ENCONT-202-1A	1,133,361	7,671,979	3,367,389	0	87,182	0	0	0	0	0	54,488	0	0
	9.2	62.3	27.3	0	0.7	0	0	0	0	0	0.4	0	0
ENCONT-363-1A	743,959	2,481,673	0	38,012	0	0	0	10,861	0	0	0	0	0
	22.7	75.8	0	1.2	0	0	0	0.3	0	0	0	0	0
ENCONT-202-1B	21,993	8,511,340	4,354,639	3,452,921	2,023,368	549,828	0	0	0	0	65,979	0	43,986
	0.1	44.7	22.9	18.2	10.6	2.9	0	0	0	0	0.3	0	0.2
ENCONT-363-1B	0	860,093	0	2,472,768	0	16,976	0	16,976	0	0	0	0	0
	0	25.5	0	73.4	0	0.5	0	0.5	0	0	0	0	0
ENCONT-202-2A	0	11,184,644	9,419,854	229,193	2,108,580	68,758	0	68,758	0	114,597	0	22,919	0
	0	48.2	40.6	1.0	9.1	0.3	0	0.3	0	0.5	0	0.1	0
ENCONT-363-2A	0	2,525,140	0	135,021	0	0	0	5,587	0	0	0	0	0
	0	94.8	0	5.0	0	0	0	0.2	0	0	0	0	0
ENCONT-202-2B	0	9,273,650	7,856,022	3,086,294	1,860,638	132,903	103,369	0	0	0	0	0	0
	0	41.6	35.2	13.8	8.3	0.5	0.5	0	0	0	0	0	0
ENCONT-363-2B	3,644	1,071,282	0	1,034,844	0	0	0	7,288	0	0	0	0	0
	0.2	50.6	0	48.9	0	0	0	0.3	0	0	0	0	0

(Continued)

Table E4 (Concluded)

Station	*Acartia clausii*	*Acartia* copepodid	*Temora longicornis*	*Temora* copepodid	*Pseudocalanus minutus*	*Pseudocalanus* copepodid	*Centropages hamatus*	*Paracalanus parvus*	*Pseudodiaptomus coronatus*	Harpacticoida
					June					
ENA-363-1A	2,983,196 77.4	0 0	870,099 22.6	0 0	0 0	0 0	0 0	0 0	0 0	0 0
ENA-202-1A	27,959,483 71.6	8,988,520 23.0	1,166,779 3.0	648,210 1.6	129,642 0.3	0 0	0 0	43,214 0.1	129,642 0.3	0 0
ENA-363-1B	6,247,454 47.4	76,656 0.6	6,732,941 51.1	0 0	114,984 0.9	0 0	0 0	0 0	0 0	0 0
ENA-202-1B	46,506,960 67.5	13,112,094 19.0	7,375,553 10.7	1,160,968 1.7	341,461 0.5	0 0	0 0	0 0	341,461 0.5	68,292 0.1
ENA-363-2A	943,469 60.0	18,447 1.2	608,775 38.7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
ENA-202-2A	11,898,189 62.9	5,838,699 30.8	956,761 5.1	0 0	73,597 0.4	73,597 0.4	0 0	0 0	73,597 0.4	0 0
ENA-363-2B	2,435,271 44.6	0 0	2,987,600 54.7	0 0	33,474 1.7	0 0	0 0	0 0	0 0	0 0
ENA-202-2B	56,249,656 64.3	11,564,748 13.2	16,943,181 19.3	2,432,648 2.8	128,034 0.1	0 0	0 0	85,356 0.1	0 0	0 0
ENDSA-363-1A	295,023 96.3	0 0	11,175 3.7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
ENDSA-202-1A	1,883,057 97.0	0 0	27,159 1.4	12,070 0.6	0 0	0 0	18,106 0.9	0 0	0 0	0 0
ENDSA-363-1B	1,182,851 78.4	0 0	314,897 20.9	0 0	0 0	0 0	7,938 0.5	0 0	2,646 0.2	0 0
ENDSA-202-1B	22,546,265 63.9	11,201,783 31.9	749,164 2.1	606,465 1.7	107,023 0.3	0 0	0 0	71,349 0.2	0 0	0 0
ENDSA-363-2A	148,075 97.9	0 0	2,075 1.4	0 0	0 0	0 0	1,038 0.7	0 0	0 0	0 0
ENDSA-202-2A	1,937,017 79.5	160,427 6.6	338,681 13.9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
ENDSA-363-2B	1,427,191 97.9	0 0	29,289 2.1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
ENDSA-202-2B	23,775,552 82.4	3,428,732 11.9	383,476 1.3	879,740 3.0	0 0	0 0	0 0	135,344 0.5	248,132 0.8	0 0
ENCONT-363-1A	9,616,750 64.9	0 0	5,193,715 35.1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
ENCONT-202-1A	78,751,209 72.8	22,370,172 20.6	6,959,609 6.4	0 0	0 0	0 0	0 0	0 0	0 0	71,016 0.2
ENCONT-363-1B	3,513,240 13.9	0 0	21,697,770 86.1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
ENCONT-202-1B	35,795,098 51.9	16,836,700 24.4	13,551,490 11.7	1,300,396 1.9	1,095,069 1.6	0 0	0 0	0 0	342,209 0.5	0 0
ENCONT-363-2A	8,528,548 53.9	0 0	7,396,928 46.5	0 0	0 0	0 0	0 0	0 0	0 0	0 0
ENCONT-202-2A	56,228,569 55.5	24,000,000 22.7	18,971,427 18.7	0 0	30,857,141 3.0	0 0	0 0	0 0	0 0	0 0
ENCONT-363-2B	2,757,629 12.9	0 0	18,652,299 87.1	0 0	0 0	0 0	0 0	0 0	0 0	0 0
ENCONT-202-2B	42,095,599 55.2	6,363,288 8.3	25,453,153 33.4	1,305,289 1.7	244,741 0.3	0 0	0 0	0 0	734,225 0.9	0 0

(Sheet 7 of 7)

Table E5

Zooplankton Standing Crop Densities During Monthly Sampling Periods, #/1000 m^3

	Sample				
Station	Crab larvae	Shrimp larvae	Polychaete larvae	Veligers	Mysids
		October			
EN1-363-1DA	0 0	0 0	0 0	0 0	58 100.0
EN1-363-1DB	0 0	92 21.2	7 1.6	0 0	336 77.2
EN1-363-1DC	7 0.2	69 0.8	7 0.2	0 0	7,808 98.8
EN1-363-2DA	0 0	16 12.8	0 0	0 0	109 87.2
EN1-363-2DB	0 0	0 0	0 0	0 0	2,688 100.0
EN1-363-2DC	0 0	141 0.2	0 0	281 0.4	76,157 99.4
EN2-363-1BA	0 0	13 50.0	0 0	0 0	13 50.0
EN1-363-1BC	0 0	0 0	0 0	0 0	17 100.0
EN2-363-2BA	0 0	71 79.8	0 0	0 0	18 20.2
EN2-363-2BB	0 0	110 70.5	0 0	0 0	46 29.5
EN2-363-2BC	0 0	37 1.3	0 0	0 0	2,706 98.7

	Sample											
	Foraminifera	Hydromedusa	Polychaete Larvae	Crustacean Eggs	Mysids	Ostracoda	Veligers	Barnacle Nauplii	Shrimp Larvae	Trochophore Larvae	Turbellaria	Crab Larvae
						December						
ENB-202-1A	23 7.1	264 82.0	6 1.9	23 7.1	6 1.9	0 0	0 0	0 0	0 0	0 0	0 0	0 0
ENB-202-1B	0 0	0 0	0 0	0 0	1,481 100.0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
ENB-202-2A	0 0	2,915 73.6	67 1.7	402 10.2	268 6.8	34 0.9	134 3.4	134 3.4	0 0	0 0	0 0	0 0
ENB-202-2B	0 0	0 0	45 2.3	0 0	1,883 97.7	0 0	0 0	0 0	0 0	0 0	0 0	0 0
ENB-363-1B	0 0	0 0	0 0	0 0	3,591 100.0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
ENB-363-2B	0 0	0 0	0 0	0 0	5,688 100.0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
END-202-1A	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0	0 0
END-202-1B	0 0	0 0	0 0	0 0	744 82.4	0 0	0 0	0 0	159 7.6	0 0	0 0	0 0
END-202-2A	0 0	9,764 95.6	99 0.9	159 1.5	0 0	0 0	99 0.9	179	20	119 1.1	0 0	0 0
END-363-1B	0 0	0 0	0 0	0 0	488 80.0	0 0	0 0	0 0	41 6.7	0 0	0 0	81 13.3
ENCONT-202-1A	0 0	13,940 99.7	9 0.05	141	9 0.05	0 0	18 0.1	0 0	26 0.2	0 0	0 0	0 0
ENCONT-202-2A	0 0	0 0	0 0	62 0.6	8 0.1	0 0	31 0.3	0 0	16 0.2	0 0	10,276 98.0	81 0.8

	Sample						
	Crab Larvae	Shrimp Larvae	Veligers	Chaetognaths	Mysids	Cladocera	Euphausids
			November				
EN1-363-1B	16 4.4	87 23.9	29 8.0	0 0	232 63.7	0 0	0 0
EN1-363-1C	0 0	0 0	76 2.2	94 2.8	3,211 95.0	0 0	0 0
EN2-363-1A	0 0	223 0.8	10,462 40.9	0 0	14,914 58.3	0 0	0 0
EN2-363-1B	0 0	0 0	449 11.7	0 0	3,381 88.3	0 0	0 0
EN2-363-1C	0 0	0 0	276 2.9	0 0	9,384 97.1	0 0	0 0
EN3-363-1B	32 42.7	0 0	0 0	0 0	43 57.3	0 0	0 0
EN3-363-1C	0 0	68 0.4	3,218 18.3	68 0.4	14,172 80.5	0 0	68 0.4

(Continued)

NOTE: Upper number represents number of standing crop/10^6 liters, lower number represents percent standing crop.

Table E5 (Continued)

Station	Chaetog-naths	Mysids	Shrimp Larvae	Veligers	Barnacle Nauplii	Cladocera	Hydro-medusa Larvae	Turbel-laria	*Siphonophore*	Trochophore *Larvae*	Poly-chaete *Larvae*	Bivalve *Larvae*	*Acarina*
						January							
ENB-363-1B	113	38	0	0	0	0	0	0	0	0	0	0	0
	74.8	25.2	0	0	0	0	0	0	0	0	0	0	0
ENB-363-2A	45	45	0	0	0	0	0	0	0	0	0	0	0
	50.0	50.0	0	0	0	0	0	0	0	0	0	0	0
ENB-363-2B	359	20	20	0	0	0	0	0	0	0	0	0	0
	90.0	5.0	5.0	0	0	0	0	0	0	0	0	0	0
ENB-202-1A	188	0	47	0	0	0	0	0	0	0	0	0	0
	80.0	0	20.0	0	0	0	0	0	0	0	0	0	0
ENB-202-1B	573	36	0	0	0	0	0	0	0	0	0	0	0
	94.1	5.9	0	0	0	0	0	0	0	0	0	0	0
ENB-202-2A	130	0	0	0	0	0	0	0	0	0	0	0	0
	100.0	0	0	0	0	0	0	0	0	0	0	0	0
END-202-2B	707	0	74	0	1,675	112	0	0	0	0	0	0	0
	27.5	0	2.9	0	65.2	4.4	0	0	0	0	0	0	0
END-363-1A	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0
END-363-1B	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0
END-363-2A	0	0	48	0	24	0	72	337	0	0	0	0	0
	0	0	10.0	0	5.0	0	15.0	70.0	0	0	0	0	0
END-363-2B	72	24	120	0	0	0	0	144	601	168	0	0	0
	6.4	2.1						12.8	63.8	14.9	0	0	0
END-202-1A	0	0	0	0	0	0	0	0	0	0	0	0	0
	0	0	0	0	0	0	0	0	0	0	0	0	0
END-202-1B	80	40	200	0	80	0	0	0	0	0	0	0	0
	20.0	10.0	50.0	0	20.0	0	0	0	0	0	0	0	0
END-202-2A	0	0	46	139	4,922	46	464	13,280	0	0	0	0	0
	0	0	0.2	0.7	26.0	0.2	2.5	70.4	0	0	0	0	0
END-202-2B	94	0	0	0	0	0	0	0	0	0	47	0	0
	66.7	0	0	0	0	0	0	0	0	0	33.3	0	0
ENCONT-363-1A	165	0	153	0	0	0	1,597	0	0	0	0	0	0
	8.6	0	8.0	0	0	0	83.4	0	0	0	0	0	0
ENCONT-363-1B	66	155	177	22	0	22	1,130	133	0	0	44	0	0
	3.8	8.9	10.1	1.3	0	1.3	64.5	7.6	0	0	2.5	0	0
ENCONT-363-2A	183	0	26	0	26	0	288	367	0	0	0	0	0
	20.6	0	2.9	0	2.9	0	32.4	41.2	0	0	0	0	0
ENCONT-363-2B	173	0	130	0	43	0	865	87	0	0	0	0	0
	13.3	0	10.0	0	3.3	0	66.7	6.7	0	0	0	0	0
ENCONT-202-1A	106	0	106	53	1,010	0	6,115	744	0	798	53	0	0
	1.2	0	1.2	0.5	11.2	0	68.1	8.3	0	8.8	0.5	0	0
ENCONT-202-1B	513	0	256	0	2,223	85	1,966	2,394	0	0	256	85	85
	6.5	0	3.3	0	28.3	1.1	25.0	30.3	0	0	3.3	1.1	1.1
ENCONT-202-2A	199	0	0	199	1,889	99	696	29,237	0	0	0	0	0
	0.6	0	0	0.6	5.8	0.3	2.2	90.5	0	0	0	0	0
ENCONT-202-2B	230	38	269	38	1,305	38	1,843	3,379	0	269	384	0	77
	2.9	0.5	3.4	0.5	16.6	0.5	23.4	92.9	0	3.4	4.9	0	1.0

(Continued)

Table E5 (Continued)

	Sample														
Station	Tubellaria	Barnacle nauplii	Barnacle cyprids	Chaetognaths	Invertebrate eggs	Polychaete larvae	Veligers	Siphonophores	Cladocera	Shrimp larvae	Mysids	Foraminifera	Bivalve larvae	Ostracods	Trochophore larvae
							February								
ENB-363-1A	880	22	0	0	0	0	0	11	0	0	0	0	0	0	0
	96.4	2.4	0	0	0	0	0	1.2	0	0	0	0	0	0	0
ENB-363-1B	1,034	74	37	148	111	0	0	0	0	0	0	0	0	0	0
	73.7	5.3	2.6	10.5	7.9	0	0	0	0	0	0	0	0	0	0
ENB-363-2A	7,966	0	0	44	44	44	0	0	0	0	0	0	0	0	0
	98.5	0	0	0.5	0.5	0.5	0	0	0	0	0	0	0	0	0
ENB-363-2B	1,314	0	0	171	0	0	57	57	0	0	0	0	0	0	0
	82.1	0	0	10.7	0	0	3.6	3.6	0	0	0	0	0	0	0
ENB-202-1A	370	3,772	0	0	3,811	0	0	19	10	0	0	0	0	0	0
	4.6	47.3	0	0	47.8	0	0	0.2	0.1	0	0	0	0	0	0
ENB-202-1B	6,476	36,171	0	0	2,825	69	0	69	207	0	0	0	0	0	0
	14.0	78.9	0	0	6.2	0.2	0	0.2	0.5	0	0	0	0	0	0
ENB-202-2A	95,874	20,617	0	0	1,109	0	0	0	0	0	0	0	0	0	0
	81.5	17.6	0	0	0.9	0	0	0	0	0	0	0	0	0	0
ENB-202-2B	6,607	15,977	0	0	360	0	0	120	240	120	120	120	120	0	0
	27.8	68.2	0	0	1.5	0	0	0.5		0.5	0.5	0.5	0.5	0	0
END-363-1A	1,202	0	0	0	0	0	0	2	0	0	0	0	0	0	0
	99.8	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0
END-363-1B	0	0	0	167	0	0	0	1,629	0	84	42	0	0	0	63
	0	0	0	8.4	0	0	0	90.5	0	4.2	2.1	0	0	0	3.2
END-363-2A	18,842	199	0	0	0	0	0	0	0	0	0	0	0	0	0
	99.0	1.0	0	0	0	0	0	0	0	0	0	0	0	0	0
END-202-1A	40,692	28,326	0	0	1,459	19	0	0	19	0	0	0	0	0	0
	57.7	40.2	0	0	1.1	0.005	0	0	0.005	0	0	0	0	0	0
END-202-1B	4,925	45,762	0	349	2,353	849	0	1,787	0	131	0	0	44	0	0
	8.8	81.4	0	0.6	4.2	1.5	0	3.2	0	0.2	0	0	0.08	0	0
END-202-2A	67,675	17,530	0	0	2,673	0	0	45	0	0	0	0	0	0	0
	77.0	19.9	0	0	3.0	0	0	0.05	0	0	0	0	0	0	0
ENCONT-363-1A	2,584	0	0	0	0	0	0	31	0	0	0	0	0	0	21
	98.0	0	0	0	0	0	0	1.2	0	0	0	0	0	0	0.8
ENCONT-363-1B	0	0	0	0	0	0	48	48	0	0	0	0	0	0	0
	0	0	0	0	0	0	50.0	50.0	0	0	0	0	0	0	0
ENCONT-363-2A	1,598	0	0	0	0	0	0	1,331	0	0	0	0	0	0	0
	54.5	0	0	0	0	0	0	45.5	0	0	0	0	0	0	0
ENCONT-363-2B	2,359	60	0	0	242	0	60	0	0	0	0	121	0	60	0
	81.3	2.1	0	0	8.2	0	2.1	0	0	0	0	4.2	0	2.1	0
ENCONT-202-1A	72,589	40,842	0	0	0	0	0	63	42	0	0	0	0	0	63
	63.9	35.9	0	0	0	0	0	0.06	0.04	0	0	0	0	0	0.06
ENCONT-202-1B	44,772	49,920	0	89	2,574	133	89	0	399	0	44	0	0	0	0
	45.7	50.9	0	0.1		1.36	0.1	0	1.8	0	0.04	0	0	0	0

(Continued)

Table E5 (Continued)

Station	Sample														
	[illegible]bel-laria	Barnacle nauplii	Barnacl[illegible] cy[illegible]ds	Cladocera	Veligers	Shrimp larvae	Invertebrate eggs	Chaetognaths	Polychaete larvae	Siphonophora	*Littorina littorea* eggs	*Podon leucarti*	*Evadne* sp.	Bivalve larvae	Foraminifera
							March								
ENB-363-1A	39 0.6	5,523 82.6	430 6.4	31 0.5	0 0	0 0	657 9.8	0 0	8 0.1	0 0				0 0	0 0
ENB-363-1B	197 3.6	36,455 87.1	2,959 7.1	874 2.1	0 0	28 0.07	1,240 3.0	85 0.2	28 0.07	0 0				0 0	0 0
ENB-363-2A	138 1.6	5,673 66.0	1,626 18.9	86 1.0	9 0.1	0 0	968 11.3	86 1.0	9 0.1	0 0				0 0	0 0
ENB-363-2B	391 0.6	53,691 87.2	4,537 7.4	913 1.5	0 0	235 0.4	1,069 1.7	78 0.1	0 0	0 0	678* 1.1			0 0	0 0
ENB-202-1A	267 2.2	3,390 28.5	1,020 8.6	*	0 0	0 0	5,879* 49.4	0 0	16 0.1	0 0	1,036* 8.7	157* 1.3	126* 1.2	0 0	0 0
ENB-202-1B	112 0.2	36,625 66.9	2,079 3.8	*	253 0.5	197 0.4	11,572* 21.1	169 0.3	281 0.5	0 0	1,882* 3.4	646* 1.2	899* 1.7	0 0	0 0
ENB-202-2A	52 0.2	4,243 13.6	2,357 7.5	323 1.0	0 0	0 0	16,974* 54.3	17 0.05	35 0.1	17 0.05	7,264* 23.2			0 0	0 0
ENB-202-2B	569 1.0	36,293 69.3	3,774 6.7	2,533 4.5	362 0.6	0 0	11,943 21.2	258 0.5	672 1.2	0 0				0 0	0 0
END-363-1A	100 0.07	148,237 98.4	597 0.4	328 0.2	0 0	0 0	166 0.1	17 0.01	50 0.3	1,112 0.8				0 0	0 0
END-363-1B	2,029 0.4	489,204 94.5	13,865 2.7	4,734 0.9	0 0	1,691 0.3	4,396 0.8	676 0.1	1,353 0.3	0 0				0 0	0 0
END-363-2A	0 0	70,919 98.3	471 0.6	595 0.9	25 0.03	0 0	0 0	0 0	99 0.1	0 0				0 0	0 0
END-363-2B	148 0.1	97,224 87.3	7,163 6.4	*	99 0.09	494 0.4	247* 0.2	99 0.09	445 0.4	2,717 2.4	1,680 1.8	494* 0.4	494* 0.4	0 0	0 0
END-202-1A	18,701 6.1	276.802 90.0	1,289 0.4	*	180 0.05	0	0	390 0.1	2,787 0.9	0	3,416* 1.1	1,109* 0.3	2,967* 1.04	30 0.01	0
END-202-1B	4,057 1.0	333,185 87.7	8,791 2.3	5,297 1.4	2,141 0.6	1,578 0.4	16,343 4.3	1,916 0.5	6,424 1.8	0 0				0 0	0 0
END-202-2A	3,352 15.7	8,614 40.3	642 3.0	*	71 0.3	0 0	4,615 21.6	24 0.1	1,046 4.9	143 0.7	1,926* 9.0	499* 2.3	428* 2.0	0 0	24 0.1
END-202-2B	0 0	255,443 82.5	34,591 11.1	2,559 0.8	409 0.1	921	5,833* 1.9	102 0.03	2,968 1.0	716 0.6	6,038* 2.0			0 0	0 0
ENCONT-363-1A	0 0	81,806 94.7	2,401 2.8	528 0.6	26 0.03	0 0	1,504 1.7	53 0.06	106 0.1	0 0				0 0	0 0
ENCONT-363-1B	0 0	164,037 91.5	4,956 2.6	6,458 3.6	0 0	262 0.1	0 0	143 0.08	548 0.3	2,931 1.6				0 0	0 0
ENCONT-363-2A	186 3.0	3,469 56.7	417 6.8	22 0.3	0 0	0 0	60* 1.2	0 0	15 0.2	291 4.7	1,658* 27.1			0 0	0 0
ENCONT-363-2B	0 0	254,645 94.8	6,510 2.4	3,343 1.2	0 0	469 0.2	0 0	0 0	977 0.5	2,522 0.9				0 0	0 0
ENCONT-202-1A	12,434 9.5	100,930 77.1	2,856 2.2	1,368 1.0	297 0.2	59 0.05	10,887 8.3	773 0.6	1,309 1.05	0 0				0 0	0 0
ENCONT-202-1B	1,366 1.2	30,950 26.1	1,306 1.1	*	2,496 2.1	471 0.4	39,421 33.2	0 0	3,203 2.7	3,768 3.2	26,704* 22.5	4,804* 4.1	4,097* 3.6	0 0	0 0
ENCONT-202-2A	2,997 16.8	3,408 19.1	1,278 7.2	*	61 0.3	0 0	6,390 35.9	0 0	213 1.2	152 0.9	2,982* 16.8	46* 0.3	274* 1.5	0 0	0 0
ENCONT-202-2B	148 0.1	41,485 32.2	17,327 13.4	54,400 42.2	938 0.7	296 0.2	4,986* 3.9	395 0.3	2,518 2.0	889 0.6	5,628* 4.4			0 0	0 0

(Continued)

---

* *Podon leucarti* and *Evadne* sp. were later identified separately from the larger group Cladocera.

* *Littorina litterea* eggs were later identified from the larger group Invertegrate eggs.

Table E5 (Continued)

	Sample													
Station	Hydromedusae (Adult)	Chaetognatna	Turbellaria	*Evadne* sp. (Cladocera)	*Podon leucarti* (Cladocera)	Actinula (Hydromedusae)	Polychaeta (Larvae)	Gastropoda (Larvae)	Bivalvia (Larvae)	Cirripedia (Nauplii)	Cirripedia (Cyprid)	Brachyura (Zoea)	Caridea (Larvae)	*Littorina litterea* (eggs)
							April							
ENB-363-1A	363	30					60				60			367
	41.3	3.4					6.8				6.8			41.7
ENB-202-1A	758	291	991				58				292			16,793
	4.0	1.5	5.2				0.3				1.5			87.5
ENB-363-1B	15,105	509		170	85		85				2,461	85	2,367	4,837
	58.8	2.0		0.7	0.3		0.3				9.6	0.3	9.2	18.8
ENB-202-1B	255,105	845	507		169		845	169	169		5,070		2,197	6,760
	93.9	0.3	0.2		0.06		0.3	0.06	0.06		1.9		0.7	2.5
ENB-363-2A	1,652		405			779					1,528			3,460
	21.1		5.2			10.0					19.5			44.2
ENB-202-2A	1,067		188								879			23,037
	4.2		0.7								3.6			91.5
ENB-363-2B	47,337	243					75				616	19	448	1,194
	94.8	0.5					0.2				1.2	0.04	0.9	2.4
ENB-202-2B	40,737	621	694	34			73				2,081		219	4,818
	82.7	1.3	1.4	0.08			0.1				4.2		0.4	9.8
ENDSA-363-1A	4,600	110	493	54							602		54	1,917
	58.7	1.4	6.3	0.7							7.7		0.7	24.5
ENDSA-202-1A	2,274	55	1,885				55				610			4,881
	23.3	0.6	19.3				0.6				6.2			50.0
ENDSA-363-1B	67,461	399	36								3,138	18	1,028	1,641
	91.5	0.6	0.05								4.2	0.02	1.4	2.2
ENDSA-202-1B	225,432	1,592	1,114				796	318			1,114	796	3,184	70,209
	74.0	0.5	0.4				0.3	0.1			0.4	0.3	1.0	23.1
ENDSA-363-2A	8,837	117	761				59	2,575			1,580		59	2,575
	53.4	0.7	4.6				0.4	15.5			9.5		0.4	15.5
ENDSA-202-2A	12,992	5,966		928				199			2,585			15,909
	33.7	15.5		2.4				0.5			6.7			41.2
ENDSA-363-2B	248,789	1,226		82				164			21,993	327	4,742	30,086
	80.9	0.4		0.03				0.05			7.2	0.1	1.5	9.8
ENDSA-202 2B	2,829	3,010	1,003	334			1,672	502			88,462	167		28,261
	2.2	2.4	0.8	0.3			1.3	0.4			70.1	0.1		22.4
ENCONT-363-1A	708	32	290				32				2,543			1,674
	13.4	0.6	5.5				0.6				48.2			31.7
ENCONT-202-1A		128	3,703				255				3,447			9,704
		0.7	21.5				1.5				20.0			56.3
ENCONT-363-1B	1,100	150	100	1,750	450	200	400			150	18,852	250	1,050	1,450
	4.2	0.6	0.4	6.8	1.7	0.8	1.5			0.6	72.8	0.9	4.1	5.6
ENCONT-202-1B		160	320	2,083	481						15,543		1,282	4,166
		0.7	1.3	8.7	2.0						64.6		5.3	17.3
ENCONT-363-2A	987		856	66							3,160		66	19,552
	4.0		3.4	0.3							12.8		0.3	79.2
ENCONT-202-2A		1,186		132							3,031			17,002
		5.5		0.6							14.3			79.6
ENCONT-363-2B	3,889	234	141	375			141			141	5,716	94	1,218	2,369
	27.1	1.6	1.0	2.6			1.0			1.0	40.0	0.6	8.5	16.6
ENCONT-202-2B	7,054	1,392	928	5,569	464	835	1,485		278	371	14,572	93	1,578	2,785
	18.9	3.7	2.5	14.9	1.2	2.2	3.9		0.7	1.0	40.0	0.2	4.2	7.4

(Continued)

Table E5 (Continued)

	Sample									
Station	Chaetognatha	*Evadne* sp. (Cladocera)	*Podon leveartí* (Cladocera)	Polychaeta (Larvae)	Gastropoda (Larvae)	Bivalvia (Larvae)	Cirripedia (Nauplii)	Cirripedia (Cyprid)	Brachyura (Zoea)	Caridea (Larvae)
					May					
ENA-363-1A		858 4.1		858 4.1	2,575 12.4				16,497 79.4	
ENA-202-1A		5,382 5.8		23,523 25.5	27,047 29.4	23,523 25.5	3,588 3.9		8,971 9.7	
ENA-363-1B	65 0.07	9,230 10.4	5,655 6.4		9,945 11.2	65 0.07	5,655 6.4		44,655 50.5	13,065 14.8
ENA-202-1B	4,814 0.8	29,726 4.9	8,381 1.4	11,916 2.0	345,184 57.8	103,581 17.4	9,559 1.6		69,011 11.5	14,274 2.4
ENA-363-2A		5,423 18.3	669 2.2	669 2.2	1,337 4.5		2,006 6.7	669 2.2	18,201 61.4	669 2.2
ENA-202-2A		9,955 3.8		35,578 13.7	104,448 40.4	73,277 28.3	9,955 3.8	2,122 0.8	22,195 8.5	979 0.3
ENA-363-2B	609 0.5	20,806 17.2	12,884 10.6	174 0.1	6,877 5.7		2,960 2.4	435 0.4	60,330 49.8	15,844 13.1
ENA-202-2B	1,107 0.1	36,343 4.1	27,857 3.9	25,827 2.9	487,213 55.4	137,438 15.6	11,622 1.3	1,107 0.1	124,340 14.1	25,643 2.9
ENDSA-363-1A	48 0.3	2,648 19.4	337 2.4	385 2.8	385 2.8		626 4.6	1,974 14.5	6,932 50.8	289 2.1
ENDSA-202-1A		7,490 3.3		4,369 1.9	153,132 67.9	37,659 16.7	5,618 2.4		17,061 7.5	
ENDSA-363-1B	853 0.8	34,507 32.8	15,452 14.7		6,920 6.5		7,774 7.4		29,293 27.8	10,332 9.8
ENDSA-202-1B		42,207 2.8	5,227 0.3	22,846 1.5	1,101,641 75.4	179,476 12.3	8,712 0.5	1,742 0.1	25,588 1.7	73,765 5.1
ENDSA-363-2A		2,015 14.1						5,036 35.4	6,156 43.3	1,007 7.2
ENDSA-202-2A		2,394 0.5		26,600 6.2	237,006 55.1	125,818 29.2	4,788 1.1	9,576 2.2	23,940 5.5	
ENDSA-363-2B	711 0.9	6,483 8.9	4,348 6.0	711 0.9	17,235 23.7			3,558 4.9	30,201 41.6	9,329 12.8
ENDSA-202-2B		9,462 0.4	9,462 0.4	29,591 1.4	1,747,066 84.1	195,437 9.4	14,107 0.6		54,709 2.6	17,204 0.8
ENCONT-363-1A		47,574 44.7	9,557 8.9	109 0.1		2,064 1.9		5,321 5.0	41,597 39.1	
ENCONT-202-1A		124,886 25.8	15,257 3.1	6,321 1.3	250,208 51.7	34,000 7.0		17,218 3.5	35,744 7.3	
ENCONT-363-1B		20,823 20.3	5,093 4.9	283 0.2		1,358 1.3		4,018 3.9	55,736 54.6	14,769 14.4
ENCONT-202-1B	220 0.05	102,048 26.2	15,395 3.9	1,759 0.4	146,034 37.5				115,463 29.6	8,577 2.2
ENCONT-363-2A		140,109 53.5	20,223 7.7				7,039 2.6		93,406 35.6	1,005 0.3
ENCONT-202-2A		457,012 30.0	132,474 8.7	4,125 0.2	33,004 2.1	714,625 47.0	50,881 3.3		125,827 8.2	1,145 0.1
ENCONT-363-2B	1,968 0.7	38,408 15.4	17,200 6.9		3,280 1.3		8,600 3.4	1,312 0.5	137,160 55.0	41,104 16.5
ENCONT-202-2B	148 0.02	155,791 25.3	60,249 9.8	2,067 0.3	81,809 13.3	58,625 9.5		7,974 1.3	185,178 30.1	61,726 10.1

(Continued)

Table E5 (Concluded)

Station	Sample Chaetognatha	 *Evadne* sp. (Cladocera)	 *Podon leucarti* (Cladocera)	 Polychaeta (Larvae)	 Gastropoda (Larvae)	 Bivalvia (Larvae)	 Cirripedia (Nauplii)	 Cirripedia (Cyprid)	 Brachyura (Zoea)	 Brachyura (Megalopa)	 Caridea (Larvae)	 *Homarus americanus* (Larvae)
						June						
ENA-363-1A		128,547 32.1	167,132 41.8		7,509 1.8				41,433 10.3	43,298 10.8	7,509 1.8	4,195 1.0
ENA-202-1A		5,444,969 81.6	762,296 11.4	11,667 0.1	86,428 1.3	3,889 0.05	7,778 0.1	3,889 0.05	145,199 2.2	200,513 3.0		3,889 0.05
ENA-363-1B		118,433 14.8	389,028 48.6	13,925 1.7	69,629 8.7				109,106 13.6		99,908 12.4	
ENA-202-1B		93,218 6.9	769,652 57.4		198,388 14.8		12,292 9.1		161,169 12.0		105,511 7.8	
ENA-363-2A		95,823 25.6	153,327 41.0		4,322 1.1				81,433 21.8	33,996 9.0	796 1.3	
ENA-202-2A		753,634 54.0	439,129 31.4	8,831 0.6	11,039 0.8				100,337 7.1	55,688 3.9	22,079 1.5	4,416 0.3
ENA-363-2B		182,604 20.2	474,752 52.6		114,148 12.6				76,070 8.4		54,814 6.0	
ENA-202-2B		484,823 28.2	461,349 26.8		507,868 29.5				170,172 9.9		93,038 5.4	
ENDSA-363-1A		83,039 26.6	226,885 72.8			134 0.05	268 0.06		1,356 0.4			
ENDSA-202-1A		377,116 30.2	497,716 39.8	1,086 0.08	31,778 2.5		13,688 1.0		325,620 26.1	1,085 0.08		
ENDSA-363-1B	238 0.04	180,418 35.2	308,653 60.3		10,108 1.9				18,999 3.7		952 0.1	
ENDSA-202-1B		635,342 22.6	862,608 30.6		1,248,606 44.4	32,107 1.1			32,107 1.1			
ENDSA-363-2A		203,307 50.9	193,994 48.5	124 0.003	1,010 0.2				375 0.09	249 0.06	124 0.003	
ENDSA-202-2A		2,314,082 74.3	643,850 2.1		137,255 4.4	2,139 0.06	12,953 0.4		2,139 0.06			
ENDSA-363-2B		334,298 52.9	258,998 41.0		21,301 3.3				16,215 2.5		479 0.3	
ENDSA-202-2B		498,505 32.3	276,897 17.9		697,320 45.2	22,567 1.4	18,279 1.1		28,660 1.8			
ENCONT-363-1A		112,753 13.2	662,617 77.9		4,523 0.5				60,984 7.1		9,214 1.2	
ENCONT-202-1A		1,163,959 48.1	1,213,670 50.1	6,391 0.2	6,391 0.2				31,957 1.4			
ENCONT-363-1B	2,529 0.2	219,788 17.6	883,059 70.8		40,753 3.2				46,093 3.6		53,682 4.6	
ENCONT-202-1B		360,679 27.1	821,280 61.7						93,078 6.9	6,159 0.4	49,277 3.7	
ENCONT-363-2A	2,484 0.3	117,854 14.5	534,345 65.9						107,918 13.3		47,749 5.8	
ENCONT-202-2A		1,245,714 57.7	882,286 40.8						30,857 1.5			
ENCONT-363-2B		250,867 25.2	609,359 61.4	3,447 0.3	55,535 5.5				48,641 4.9		24,512 2.4	
ENCONT-202-2B		1,394,213 41.8	1,809,458 54.3		51,396 1.5				36,711 1.2		36,711 1.2	

(Sheet 7 of 7)

Table E6

Ichthyoplankton Standing Crop Densities

	Station ENB															
	ENB-202-1A		ENB-363-1A		ENB-202-1B		ENB-363-1B		ENB-202-2A		ENB-363-2A		ENB-202-2B		ENB-363-2B	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
EN-1*(31 Oct 74)																
Scophthalmus aquosus											16 100.0					
TOTAL											16 100.0					
EN-4,5 (13,18 Dec 74)																
Ammodytes hexapterus														44.8 100.0		
Scophthalmus aquosus									33.5 100.0							
TOTAL									33.5 100.0					44.8 100.0		
EN-6 (23 Jan 75)																
Pholis gunnelus												22.6 100.0				
Myoxocephalus										43.2 100.0						
TOTAL										43.2 100.0		22.6 100.0				
EN-7 (18 Feb 75)																
Enchelyopus cimbrius	360.6 100.0		162.9 100.0		68.8 100.0		110.8 100.0		369.8 100.0		5484.1 100.0		120.1 100.0		22.0 100.0	
Ammodytes hexapterus		68.2 87.5		119.5 100.0		68.8 100.0				184.9 100.0						
Myoxocephalus		9.7 12.5														
TOTAL	360.6 100.0	77.9 100.0	162.9 100.0	119.5 100.0	68.8 100.0	68.8 100.0	110.8 100.0	0 0	369.8 100.0	184.9 100.0	5484.1 100.0	0 0	120.1 100.0	0 0	22.0 100.0	0 0
EN-8 (1 Apr 75)																
Enchelyopus cimbrius	3,076 100.0		2,219 100.0		3,231 100.0		2,761 100.0		3,266 100.0		999 100.0		3,102 100.0		2,793 100.0	
Ammodytes hexapterus										35 25.0						
Myoxocephalus spp.										17 12.1		26 14.1				
Pseudopleuronectes americanus		63 100.0		86 100.0		759 100.0		394 100.0		88 62.9		156 85.9		931 100.0		626 100.0
TOTAL	3,076 100.0	63 100.0	2,219 100.0	86 100.0	3,231 100.0	759 100.0	2,761 100.0	394 100.0	3,266 100.0	140 100.0	999 100.0	182 100.0	3,102 100.0	931 100.0	2,793 100.0	626 100.0
EN-9 (28 Apr 75)																
Enchelypus cimbrius	1,749 96.8	58 100.0	2,117 92.1	91 100.0	1,521 100.0	169 100.0	1,782 95.4	339 80.0	2,887 85.2		3,035 89.0	94 100.0	365 100.0		616 86.9	19 100.0
Ammodytes hexapterus								85 20.0								
Scophthalmus aquosus	58 3.2		181 7.9				85 4.6		502 14.8		375 11.0				93 13.1	
TOTAL	1,807 100.0	58 100.0	2,298 100.0	91 100.0	1,521 100.0	169 100.0	1,867 100.0	424 100.0	3,389 100.0		3,410 100.0	94 100.0	365 100.0		709 100.0	19 100.0

	Station END															
	END-202-1A		END-363-1A		END-202-1B		END-363-1B		END-202-2A		END-363-2A		END-202-2B		END-363-2B	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
EN-6 (23 Jan 75)																
Ammodytes hexapterus		162.7 100.0		118.3 100.0						138.7 100.0		48.5 100.0				24.0 100.0
TOTAL		162.7 100.0		118.3 100.0						138.7 100.0		48.5 100.0				24.0 100.0
EN-7 (18 Feb 75)																
Enchelyopus cimbrius	205.8 100.0		25.0 100.0		130.7 100.0		83.5 100.0		277.1 100.0		424.6 100.0					
Ammodytes hexapterus		37.4 100.0		20.5 100.0		43.5 100.0		83.5 100.0		158.5 100.0		74.6 100.0				
TOTAL	205.8 100.0	37.4 100.0	25.0 100.0	20.5 100.0	130.7 100.0	43.5 100.0	83.5 100.0	83.5 100.0	277.1 100.0	158.5 100.0	424.6 100.0	74.6 100.0				

BEST AVAILABLE COPY

(Continued)

(Sheet 1 of 6)

---

*Station B was sampled at station EN-1.

NOTE: Upper number represents number of standing crop/10^6 liters, lower number represents percent standing crop.

Table E6 (Continued)

	Station END (Continued)															
	END-202-1A		ENB-363-1A		ENB-202-1B		ENB-363-1B		ENB-202-2A		ENB-363-2A		ENB-202-2B		ENB-363-2B	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
EN-8 (1 Apr 75)																
Enchelyopus cimbrius	3,956 100.0		3,535 100.0		3,042 100.0		3,382 100.0		2,877 100.0		2,827 100.0		2,005 100.0		1,828 100.0	
Myoxocephalus spp.		68 25.2		16 50.0				112 11.0				25 16.8				
Pseudopleuronectes americanus		202 74.8		17 50.0		451 100.0		902 89.0		119 100.0		124 83.2		53 100.0		99 100.0
TOTAL	3,956 100.0	270 100.0	3,535 100.0	33 100.0	3,042 100.0	451 100.0	3,382 100.0	1,014 100.0	2,877 100.0	119 100.0	2,827 100.0	149 100.0	2,005 100.0	53 100.0	1,828 100.0	99 100.0

	Control Station									
	ENCONT-202-1A		ENCONT-363-1A		ENCONT-202-1B		ENCONT-363-1B		ENCONT-202-2A	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
EN-7 (18 Jan 75)										
Enchelyopus	105.8 100.0		31.5 100.0		44.4 100.0		144.0 100.0		798.8 100.0	
Ammodytes hexapterus						44.4 100.0				
Myoxocephalus		21.2 100.0		2.1 100.0						49.9 100.0
TOTAL	105.8 100.0	21.2 100.0	31.5 100.0	2.1 100.0	44.4 100.0	44.4 100.0	144.0 100.0	0 0	798.8 100.0	49.9 100.0

	Control Station (Continued)															
	ENB-202-1A		ENB-363-1A		ENB-202-1B		ENB-363-1B		ENB-202-2A		ENB-363-2A		ENB-202-2B		ENB-363-2B	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
EN-8 (1 Apr 75)																
Enchelyopus cimbrius	3,034 100.0		2,005 100.0		2,637 100.0		2,431 100.0		2,130 100.0		2,756 100.0		2,764 100.0		2,755 100.0	
Myoxocephalus spp.		60 14.4		26 50.0						46 33.6						
Pseudopleuronectes americanus		356 85.6		27 50.0		188 100.0		24 100.0		91 66.4		176 100.0		247 100.0		176 100.0
TOTAL	3,034 100.0	416 100.0	2,005 100.0	53 100.0	2,637 100.0	188 100.0	2,431 100.0	24 100.0	2,130 100.0	137 100.0	2,756 100.0	176 100.0	2,764 100.0	247 100.0	2,756 100.0	176 100.0

(Continued)

Table E6 (Continued)

	Control Station (Continued)															
	ENCONT-202-1A		ENCONT-363-1A		ENCONT-202-1B		ENCONT-363-1B		ENCONT-202-2A		ENCONT-363-2A		ENCONT-202-2B		ENCONT-363-2B	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
EN-9 (28 Apr 75)																
Enchelyopus cimbrius	11,875 92.1		12,941 93.9		11,217 97.2	160 25.0	9,430 96.6	122 23.0	15,815 96.0	395 100.0	10,072 93.3	66 100.0	7,704 95.04	371 40.0	5,762 93.9	141 25.0
Scomber scombrus	255 2.0		193 1.4		160 1.4		122 1.3		264 1.6		263 2.4		278 3.4		234 3.8	
Myoxocephalus spp.			32 100.0				41 7.7							93 10.0		
Ammodytes hexapterus						160 25.0		286 53.9						93 10.0		
Scophthalmus aquosus	766 5.9		644 4.7		160 1.4		204 2.1		395 2.4		461 4.3		93 1.2		141 2.3	
Pseudopleuronectes americanus						320 50.0		82 15.4						371 40.0		422 75.0
TOTAL	12,896 100.0		13,778 100.0	32 100.0	11,537 100.0	640 100.0	9,756 100.0	531 100.0	16,474 100.0	395 100.0	10,796 100.0	66 100.0	8,075 99.64	928 100.0	6,137 100.0	563 100.0
EN-10 (29 May 75)																
Brevoortia tyrannus	79,726 20.0	2,655 3.0	45,876 12.8	1,056 1.1	1,789 4.5	6,255 9.0	16,343 7.0	3,044 6.7	74,581 11.6	6,351 3.10	36,849 7.2	3,278 1.0	36,631 10.9	24,741 12.1	19,264 7.9	6,062 4.9
Anchoa mitchilli					1,118 2.8		967 0.4									
Enchelyopus cimbrius	4,690 1.2		4,301 1.2	1,056 1.1			3,867 2.0		7,715 1.0		2,047 0.3		3,925 1.2		6,643 2.7	674 0.5
Cynoscion regalis					447 1.1				2,572 0.4				2,617 0.8			
Tautoga onitis	4,690 1.2		7,168 2.0		3,131 7.8	695 1.0	2,900 1.0	435 1.0	7,715 1.0	2,117 1.0	14,330 2.7	1,639 1.0	1,308 0.4	1,903 0.9	4,650 1.9	1,347 1.1
Tautogolabrus adspersus	9,380 2.4		2,867 0.8		4,249 10.6	1,390 2.0	2,900 1.0		10,287 2.0	4,234 2.0	4,093 0.8		2,617 0.8		1,993 0.8	
Scomber scombrus	298,583 74.9	85,833 97.0	296,757 82.8	101,391 97.9	25,492 63.7	60,463 87.0	210,741 86.0	41,315 89.0	527,209 82.10	190,537 93.0	450,382 87.6	173,738 97.2	285,201 85.1	176,992 86.9	209,242 85.8	111,132 90.6
Prionotus spp.											2,047 0.4					
Scophthalmus aquosus	1,563 0.4		1,434 0.4		3,801 9.4	695 1.0	3,867 2.0	870 3.0	10,287 2.0	2,117 1.0	4,094 0.8		2,617 0.8		1,993 0.8	3,368 2.7
TOTAL	398,632 100.0	88,488 100.0	358,433 100.0	103,503 100.0	40,027 100.0	69,498 100.0	241,676 100.0	45,664 100.0	640,366 100.0	205,356 100.0	513,842 100.0	178,655 100.0	334,916 100.0	203,636 100.0	243,785 100.0	122,583 100.0
EN-12 (17 Jun 75)																
Brevoortia tyrannus	1,420 0.9	2,180 11.5	401 0.4	8,873 42.3	1,420 3.3	7,919 42.8	2,992 3.6	24,285 52.6			1,035 1.2	1,966 12.5	14,952 14.4	60,112 73.6	10,516 15.2	4,124 25.6
Anchoa mitchelli	135,641 92.7		85,870 88.0	1,242 5.9	26,985 63.3	1,759 9.5	58,847 71.9	99. 2.1	90,285 84.0		75,617 88.6		67,286 64.9		39,338 57.0	3,299 20.5
Enchelyopus cimbrius																412 2.5
Stenotomus chrysops	710 0.4		401 0.4		2,130 5.0		2,659 3.2		4,571 4.2		2,417 2.8		4,272 4.1		2,726 3.9	
Cynocion regalis	710 0.4		1,203 1.2						3,428 3.1		1,035 1.2		5,340 5.1		3,115 4.5	
Tautoga onitis	1,420 0.9	2,840 15.3	2,406 2.4	3,727 17.7	3,550 8.3	3,519 19.0	1,994 5.6	2,478 5.3	3,428 3.1	1,142 33.3	1,035 1.2	2,528 16.0	5,340 5.1	2,146 2.6		2,474 15.3
Tautogolabrus adspersus	4,971 3.3	2,130 11.5	4,413 4.5	887 4.2	2,130 5.0	1,759 9.5	3,989 4.8	4,460 9.6	3,428 3.1		3,798 4.4	2,528 16.0	3,204 3.0	6,440 7.8		2,474 15.3
Menidia menidia																2,474 15.3
Scomber scombrus		11,362 61.5		5,856 27.9		2,639 14.2	332 0.4	10,408 22.5		1,142 33.3		8,427 53.5		6,440 7.8		
Peprilus triacanthus					2,130 5.0		1,662 2.0				345 0.4				1,557 2.2	
Prionotus spp.			802 0.8	5,856 27.9	2,130 5.0		1,662 2.0								1,557 2.2	
Scopthalmus aquosus	1,420 0.9		2,006 2.0	354 1.6	2,130 5.0	879 4.7	2,992 3.6	3,469 7.5	2,285 2.1	1,142 33.3		281 1.7	3,204 3.0	6,440 7.8	3,505 5.0	824 5.1
TOTAL	146,294 100.0	18,464 100.0	97,507 100.0	20,942 100.0	99,241 100.0	18,478 100.0	81,788 100.0	46,093 100.0	107,428 100.0	3,426 100.0	85,285 100.0	15,732 100.0	103,600 100.0	81,581 100.0	103,600 100.0	81,581 100.0

(Continued)

Table E6 (Continued)

	Station ENDSA															
	ENDSA-202-1A		ENDSA-363-1A		ENDSA-202-1B		ENDSA-363-1B		ENDSA-202-2A		ENDSA-363-2A		ENDSA-202-2B		ENDSA-363-2B	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
EN-9 (28 Apr 75)																
Enchelyopus cimbrius	3,272		3,505		2,388		559	36	4,640	66	3,863		2,174		1,472	
	92.2		92.7		88.2		96.9	100.0	97.2	100.0	98.5		100.0		100.0	
Scomber scombrus									66							
									1.4							
Myoxocephalus spp.																82
																33.3
Scophthalmus	277		274		318		18		66		59					
aquosus	7.8		7.3		11.8		3.1		1.4		1.5					
Pseudopleuronectes																164
americanus																66.7
TOTAL	3,549		3,779		2,706		577	36	4,772	66	3,922		2,174		1,472	246
	100.0		100.0		100.0		100.0	100.0	100.0	100.0	100.0		100.0		100.0	100.0
EN-10 (29 May 75)																
Brevoortia tyrannus	7,490		7,329	367	3,563	2,171	6,336	2,191	13,406	1,908	7,755	850	5,160	1,804	3,307	2,015
	3.7		4.5	3.9	2.7	11.2	6.5	87.3	3.6	8.6	2.4	4.9	4.2	6.1	4.7	15.6
Anchoa mitchilli	1,664		1,332		1,018				2,979		1,292					
	0.8		0.8		0.8				0.8		0.4					
Enchelyopus cimbrius	3,329		1,999	52		181	1,584		14,896		3,877		1,407	601	827	583
	1.7		1.2	0.6		0.9	1.6		4.0		1.2		1.2	2.0	1.2	3.1
Cynocion regalis	15,813		7,995		1,018		2,376		4,469		7,755		1,407		827	
	7.9		4.9		0.8		2.4		1.2		2.4		1.2		1.2	
Tautoga onitis	11,651		6,662	420	8,145	362	3,168	487	5,958		15,510		4,222	902	1,929	194
	5.8		4.1	4.5	6.2	1.9	3.2	1.9	1.6		4.8		3.5	3.0	2.8	1.0
Tautogolabrus	12,484		11,326	262	8,145		2,772		10,427	273	18,095		7,506	301	3,859	
adspersus	6.2		7.0	2.8	6.2		2.8		2.8	1.2	5.6		6.2	1.0	5.5	
Menidia menidia												170				
												1.0				
Scomber scombrus	143,145	10,819	118,589	8,181	106,903	16,646	80,788	22,394	305,368	19,897	263,668	16,327	100,863	25,854	57,878	14,771
	71.4	98.1	73.3	87.2	81.1	86.0	82.3	89.3	82.0	90.1	82.3	94.1	82.7	86.9	83.0	79.2
Scophthalmus	4,993	208	6,662	105	3,054		1,188		14,896		2,585		1,407	301	1,102	194
aquosus	2.5	1.9	4.1	1.1	2.3		1.2		4.0		0.8		1.2	1.0	1.6	1.0
TOTAL	200,569	11,027	161,894	9,387	131,847	19,361	98,213	25,071	372,400	22,078	320,537	17,347	121,974	29,763	69,729	18,658
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

	Diurnal Station (ENDSA, Continued)															
	1400		1400		1400		1400		2200		2200		2200		2200	
	ENDSA-202-1A		ENDSA-363-1A		ENDSA-202-1B		ENDSA-363-1B		ENDSA-202-1A		ENDSA-363-1A		ENDSA-202-1B		ENDAS-363-1B	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
EN-11 (29 May 75)																
Brevoortia tyrannus	7,490		7,329	367	3,563	2,171	6,336	2,191	1,520		836		5,240	7,565	2,010	4,836
	3.7		4.5	3.9	2.7	11.2	6.4	8.7	4.3		0.4		4.1	14.2	3.2	20.0
Anchoa mitchelli	1,664		1,332		1,018				844		836		524			
	0.8		0.8		0.8				2.4		0.4		0.4			
Enchelyopus cimbrius	3,329		1,999	52		181	1,584		844		7,524		4,192		1,005	
	1.6		1.2	0.5		0.9	1.6		2.4		3.6		3.3		1.6	
Stenotomus chrysops									168				1,048			
									0.4				0.8			
Cynocion regalis	15,813		7,995		1,018		2,376		506		2,508		4,716		1,508	
	7.9		4.9		0.8		2.4		1.4		1.2		3.7		2.4	
Tautogo onitis	11,651		6,662	420	8,145	362	3,168	487	4,899	284	2,508	2,842	2,096	945	1,256	483
	5.8		4.1	4.5	6.2	1.9	3.2	1.9	14.0	7.2	1.2	1.0	1.6	1.7	2.0	2.0
Tautogolabrus	12,484		11,326	262	8,145		2,772		7,602		6,688	2,842	5,240	1,418	2,010	
adspersus	6.2		7.0	2.8	6.2		2.8		21.7		3.2	1.0	4.1	2.6	3.2	
Scomber scombrus	143,145	10,819	118,589	8,181	106,903	16,646	80,788	22,394	17,907	3,703	179,740	272,924	99,048	43,028	52,533	18,618
	71.3	98.1	73.2	87.1	81.1	86.0	82.2	89.3	51.2	92.8	87.3	95.0	78.7	81.2	84.2	77.0
Scophthalamus	4,993	208	6,662	105	3,054		1,188		675		5,016	8,528	3,668		2,010	
aquosus	2.5	1.9	4.1	1.1	2.3		1.2		1.9		2.4	3.0	2.9		3.2	
Pseudopleuronectes sp.																241
																1.0
TOTAL	200,569	11,027	161,894	9,387	131,847	19,361	98,213	25,071	34,725	3,987	205,657	287,163	125,776	52,958	62,336	24,180
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(Continued)

Table E6 (Continued)

	Station ENDSA (Continued)															
	ENDSA-202-1A		ENDSA-363-1A		ENDSA-202-1B		ENDSA-363-1B		ENDSA-202-2A		ENDSA-363-2A		ENDSA-202-2B		ENDAS-363-2B	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
EN-12(17 Jun 75)																
Brevoortia tyrannus	838	102,510	1,516	949	4,715	20,558	351	2,984	2,812	3,507	1,587	886	4,394	4,308	2,283	7,588
	0.3	31.4	0.7	27.0	3.8	48.8	4.0	40.0	1.6	36.0	1.1	9.3	3.7	16.0	2.8	33.3
Anchoa mitchelli	141,665	12,060	129,639	351	90,539	12,726	6,117	2,313	118,825	259	93,686	653	77,784	13,733	54,157	8,048
	61.6	3.7	66.2	10.0	73.6	30.2	69.0	31.0	67.0	2.7	64.4	4.1	66.4	4.1	66.5	35.3
Stenotomus chrysops	1,676		2,274		2,357		105		2,812		2,117		1,318	269	1,631	
	0.7		1.1		1.9		1.2		1.6		1.4		1.1	1.0	2.0	
Cynocion regalis	3,353				471		105		1,406		529		1,318		652	
	1.4				0.3		1.2		0.8		0.4		1.1		0.8	
Tautoga onitis	31,015	18,090	20,469	316	7,544	2,937	668	597	9,843	1,169	14,820	279	10,547	2,692	7,177	1,149
	13.5	5.5	10.4	9.0	6.1	6.9	7.5	8.0	5.5	12.0	10.2	6.1	9.0	11.0	8.7	5.0
Tautogolabrus adspersus	49,457	48,240	40,938	421	14,618	3,916	1,195	597	39,374	649			19,336	1,885	15,660	3,219
	21.5	14.8	20.9	12.0	11.9	9.3	13.5	8.0	22.2	6.7			16.5	7.0	19.0	14.1
Menidia menidia											32,287	326				
											22.1	7.2				
Scomber scombrus		144,720		1,476	471	1,957		895		3,767		2,285		2,423		2,759
		44.0		42.0	0.3	4.6		12.0		38.6		50.5		9.0		12.1
Peprilus triacanthus					943		105						439			
					0.7		1.2						0.4			
Prionotus spp.			758		943											
			0.3		0.7											
Scophthalmus aquosus	1,676				471		210	74	2,109	389	529	93	1,757	1,346	652	
	0.7				0.3		2.4	1.0	1.2	4.0	0.4	2.1	1.5	5.0	0.8	
TOTAL	229,683	325,620	195,597	3,516	123,077	42,096	48,346	7,462	177,184	9,744	145,558	4,525	116,897	26,660	82,542	22,765
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(Continued)

Table E6 (Concluded)

	Station ENA															
	ENA-202-1A		ENA-363-1A		ENA-202-1B		ENA-363-1B		ENA-202-2A		ENA-363-2A		ENA-202-2B		ENA-363-2B	
	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae	Eggs	Larvae
EN-10(29 May 75)																
Brevoortia	20,851	1,089	5,968	535	6,211	5,469	2,672	3,455	11,576	335	5,738	306	8,427	11,609	1,961	5,726
tyrannus	14.8	9.3	4.3	4.1	5.9	11.8	2.4	11.3	5.6	2.5	3.3	2.1	5.1	13.9	2.0	11.6
Anchoa			1,085				1,136		724		1,435		3,241		1,177	
mitchilli			0.8				1.2		0.3		0.8		2.0		1.2	
Enchelyopus	1,955		2,170	134	1,242		445		1,447	167	2,152	306	1,296		1,177	521
cimbrius	1.4		1.6	1.0	1.2		0.4		0.7	1.3	1.2	2.1	0.8		1.2	1.1
Stentomus	652	1,960													392	
chrysops	0.5	16.7													0.4	
Cynocion			542		414				1,447		2,152		1,296		1,177	
regalis			0.4		0.4				0.7		1.2		0.8		1.2	
Tautoga	2,606		6,510		4,969	456	4,454	288	13,024		9,325	153	6,482	829	5,100	521
onitis	1.9		4.7		4.7	1.0	4.0	0.9	6.3		5.4	1.0	3.9	1.0	5.3	1.1
Tautogolabrus	3,258	436	7,052		5,797		5,345	288	11,577		12,194		7,779		5,100	
adspersus	2.3	3.7	5.1		5.5		4.9	0.9	5.6		7.1		4.7		5.2	
Scomber	108,814	8,277	109,585	12,300	84,056	39,650	93,975	24,759	165,693	12,716	137,006	13,938	135,476	69,656	78,846	41,640
scombrus	77.3	70.4	79.5	94.8	80.2	85.3	85.4	81.1	80.1	96.2	79.3	93.8	82.0	83.2	81.4	84.2
Poronotus															785	
triacanthus															0.8	
Prionotus spp.					414						717		648			
					0.4						0.4		0.4			
Scophthalmus	2,606		4,883		1,656	912	1,782	1,727	1,447		2,152	153	648	1,658	1,177	521
aquosus	1.9		3.5		1.6	2.0	1.6	5.7	0.7		1.2	1.0	0.4	2.0	1.2	1.1
Pseudo-																
pleuronectes																521
americanus																1.1
TOTAL	140,742	11,762	137,795	12,969	104,759	46,487	110,009	30,517	206,935	13,218	172,871	14,856	165,293	83,753	96,892	49,448
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
EN-12(17 Jun 75)																
Brevoortia	7,952	2,897	2,299	6,204	8,141	40,292	5,847	21,121	3,696	1,704	2,769	1,988	7,455	11,471	4,509	11,875
tyrannus	2.7	11.7	0.8	44.0	5.4	50.0	5.1	57.0	1.5	21.0	1.8	23.0	9.3	35.3	8.3	30.0
Anchoa	234,027		235,678	1,128	110,494	13,684	83,807	4,155	187,620		148,165	344	49,996	10,679	36,900	13,854
mitchelli	80.4		82.6	8.0	74.2	16.9	74.4	11.2	78.6		80.7	4.0	62.9	32.9	70.3	35.0
Enchelyopus		1,448										86				
cimbrius		5.8										1.0				
Stenotomus	24,993		13,795		5,233		5,847		12,939	1,917	5,538	172	3,069		2,255	
chrysops	8.5		4.8		3.5		5.1		5.4	23.6	3.0	2.0	3.8		4.2	
Cynocion	2,272				2,326		2,923		1,848		2.076		2,631		1,229	
regalis	0.7				1.5		2.5		0.7		1.1		3.3		2.3	
Tautoga onitis	9,088	3,622	4,598	987	5,233	2,280	974	1,038	12,939	1,065	9,000	860	4,824	4,746	1,639	4,354
	3.1	14.7	1.6	7.0	3.5	2.8	0.8	2.8	5.4	13.1	4.9	10.0	6.0	14.6	3.1	11.0
Tautogolabrus	6,816	4,346	17,244	1,551	4,652	10,643	4,385	4,501	11,090	1,278	9,000	1,037	2,192	3,559	1,844	3,958
adspersus	2.3	17.6	6.0	11.0	3.1	13.2	3.8	12.1	4.6	15.7	4.9	12.0	2.7	10.9	3.5	10.0
Menidia				423						213		86				
menidia				3.0						2.6		1.0				
Scomber	2,272	5,795	3,448	2,679	2,326	12,923		4,155		1,491		3,976		1,977	205	3,166
scombrus	0.7	23.5	1.2	19.0	1.5	16.0		11.2		18.4		46.0		6.0	0.3	8.0
Sygnathus								346								
fuscus								0.9								
Peprilus	3,408		3,448		1,163		3,410		924				2,631		1,639	
triacanthus	1.1		1.2		0.7		3.0		0.3				3.3		3.1	
Prionotus spp.	1,136				1,163		1,949		3,696		3,461		2,631		615	
	0.3				0.7		1.7		1.5		1.8		3.3		1.1	
Scophthalmus	1,136	2,173	4,598	987		760	3,410	1,038	3,696	426	3,461	86	3,947		1,639	2,374
aquosus	0.3	8.8	1.6	7.0		0.9	3.0	2.8	1.5	5.2	1.8	1.0	4.9		3.1	6.0
Pseudo-																
pleuronectes sp.		4,346														
		17.6														
Paralichthys								692								
oblongus								1.8								
TOTAL	290,830	24,632	14,139	296,610	148,876	80,584	112,556	37,050	238,448	8,096	183,476	8,644	79,381	32,435	52,471	39,583
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

(Sheet 6 of 6)

Table E7

Copepod Standing Crop Densities

During Diurnal Surveys*

Sample	1400		2100		0300		0900	
	Sampling Time, hr							
	#/1000 m^3	Percent	#/1000 m^3	Percent	#/1000 m3	Percent	#/1000 m^3	Percent
ENDSA-202-1A								
Acartia tonsa								
Acartia clausii	7,802,341	74.9	6,114,756	53.9	6,751,918	46.5	9,136,298	52.0
Acartia copepodid	2,205,462	21.2	2,465,896	21.7	1,341,290	9.2	5,647,059	32.1
Temora longicornis			1,816,099	16.0	3,842,001	26.4	1,055,954	6.0
Temora copepodid	395,319	3.8	883,057	7.8	250,071	1.7	1,538,020	8.7
Pseudocalanus minutus					1,909,633	13.1	206,600	1.2
Pseudocalanus copepodid								
Centropages hamatus								
Centropages typicus								
Oithona sp.					68,201	0.5		
Paracalanus parvus								
Harpacticoids	20,806	0.2	66,646	0.6	159,136	1.1		
Pseudodiaptomus coronatus					204,604	1.4		
ENDSA-363-1A								
Acartia tonsa								
Acartia clausii	1,964,135	99.3	899,595	36.6	1,126,963	38.4	1,636,812	97.0
Acartia copepodid								
Temora longicornis	14,442	0.7	1,527,313	62.1	1,745,594	59.5	31,845	1.9
Temora copepodid								
Pseudocalanus minutus			19,991	0.8	62,342	2.1	6,369	0.4
Pseudocalanus copepodid								
Centropages hamatus			3,998	0.2			12,738	0.8
Centropages typicus								
Oithona sp.								
Paracalanus parvus								
Harpacticoids			7,996	0.3				
Pseudodiaptomus coronatus								

* Station EN-11, 29-30 May 75.

BEST AVAILABLE COPY

Table E7 (concluded)

Copepod Standing Crop Densities

During Diurnal Surveys*

Sample	1400		2100		0300		0900	
	#/1000 m^3	Percent	#/1000 m^3	Percent	#/1000 m^3	Percent	#/1000 m^3	Percent
				ENDSA-202-1B				
Acartia tonsa			361,083	1.2				
Acartia clausii	13,823,814	54.8	10,250,752	33.3	8,311,268	41.0	7,435,739	31.0
Acartia copepodid	2,652,469	10.5	5,757,272	18.7	2,845,882	14.0	9,344,026	39.0
Temora longicornis	4,820,910	19.1	4,092,277	13.3	5,918,140	29.2	2,056,344	8.6
Temora copepodid	2,749,274	10.9	7,542,628	24.5	436,584	2.1	3,865,926	16.1
Pseudocalanus minutus	696,999	2.8	2,066,199	6.7	2,215,260	10.9	806,087	3.4
Pseudocalanus copepodid	329,138	1.3	160,481	0.5			279,663	1.2
Centropages hamatus	77,444	0.3						
Centropages typicus								
Oithona sp.			60,181	0.2				
Paracalanus parvus			60,181	0.2	113,188	0.6		
Harpacticoids			60,181	0.2			32,902	0.1
Pseudodiaptomus coronatus	96,805	0.4	320,963	1.0	436,584	2.2	148,057	0.6
Nauplii			20,060	0.1				
				ENDSA-363-1B				
Acartia tonsa								
Acartia clausii	2,332,168	47.5	1,252,669	29.1	1,725,687	27.6	703,402	34.8
Acartia copepodid								
Temora longicornis	2,540,736	51.7	2,714,116	63.0	4,278,267	68.3	1,266,860	62.7
Temora copepodid								
Pseudocalanus minutus	37,921	0.8	294,187	6.8	215,711	3.4	47,876	2.4
Pseudocalanus copepodid								
Centropages hamatus								
Centropages typicus					7,190	0.1	3,683	0.2
Oithona sp.								
Paracalanus parvus								
Harpacticoids								
Pseudodiaptomus coronatus			47,450	1.1	28,761	0.5		

Sampling Time, hr

* Station EN-11, 29-30 May 75.

AD-A045 310   NEW YORK OCEAN SCIENCE LAB MONTAUK   F/G 13/2
AQUATIC DISPOSAL FIELD INVESTIGATIONS, EATONS NECK DISPOSAL SIT--ETC(U)
SEP 77   R I CAPLAN   DACW51-75-C-0016
UNCLASSIFIED   WES-TR-D-77-6-APP-F   NL

2 OF 2
AD
A045310











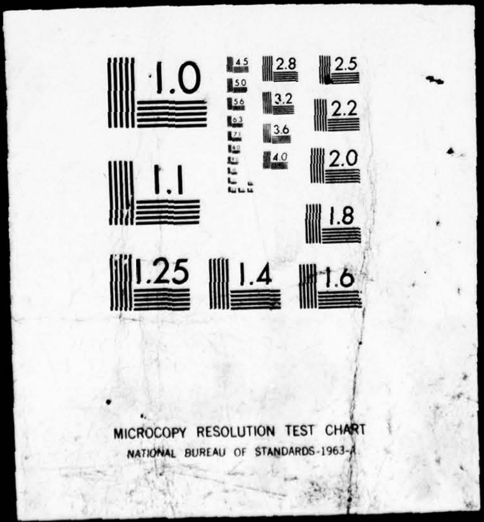




END
DATE
FILMED
11-77
DDC

2 OF 2

AD
A045310



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Table E8

Zooplankton Standing Crop Densities

During Diurnal Surveys*

Sample	1400 #/1000 m3	1400 Percent	2100 #/1000 m3	2100 Percent	0300 #/1000 m^3	0300 Percent	0900 #/1000 m^3	0900 Percent
ENDSA-202-1A								
Chaetognatha			1,495	0.05				
Evadne sp. (Cladocera)	7,490	3.3	8,972	0.55	28,871	0.7	16,528	5.4
Podon sp. (Cladocera)			1,495	0.05			35,351	11.5
Polychaeta (larvae)	4,369	1.9	21,101	0.8	16,368	0.4	4,132	1.3
Gastropoda (larvae)	153,132	67.9	2,199,128	84.8	3,231,827	84.8	27,087	8.8
Bivalvia (larvae)	37,659	16.7	339,674	13.1	506,280	13.3	95,954	31.1
Cirripedia (nauplii)	5,618	2.7						
Cirripedia (cyprid)								
Brachyura (zoea)	17,061	7.5	18,110	0.6	16,368	0.5	127,173	41.3
Brachyura (megalopa)								
Caridea (larvae)					6,138	0.2	2,066	9.6
Mysidacea			1,495	0.05	2,046	0.1		
ENDSA-363-1A								
Chaetognatha	48	0.3	2,159	0.4				
Evadne sp. (Cladocera)	2,648	19.4	5,117	0.9	10,454	16.9	30,379	31.0
Podon sp. (Cladocera)	337	2.4			2,589	4.2	7,738	7.8
Polychaeta (larvae)	385	2.8			863	1.4		
Gastropoda (larvae)	385	2.8	15,272	2.7	16,593	26.8	859	1.0
Bivalvia (larvae)								
Cirripedia (nauplii)	626	4.5	45,817	8.0	1,726	2.8		
Cirripedia (cyprid)	1,974	14.4	1,439	0.3	1,726	2.8		
Brachyura (zoea)	6,932	50.8	428,186	75.0	24,457	39.5	59,039	60.2
Brachyura (megalopa)								
Caridea (larvae)	289	2.6	33,423	5.8	2,589	4.2		
Mysidacea			39,260	6.9	863	1.4		

* Station EN-11, 29-30 May 75.

Table E8 (concluded)

Zooplankton Standing Crop Densities

During Diurnal Surveys*

Sample	1400 #/1000 m^3	1400 Percent	2100 #/1000 m^3	2100 Percent	0300 #/1000 m^3	0300 Percent	0900 #/1000 m^3	0900 Percent
ENDSA-202-1B								
Chaetognatha			2,006	0.3	1,779	0.06	494	0.04
Evadne sp. (Cladocera)	42,207	2.8	78,234	6.9	51,259	2.0	81,761	7.2
Podon sp. (Cladocera)	5,227	0.3	14,443	1.3	17,787	0.6	22,209	2.0
Polychaeta (larvae)	22,846	1.5	19,057	1.7	25,549	1.0	1,316	0.1
Gastropoda (larvae)	1,101,641	75.4	506,916	45.0	2,446,198	93.2	511,297	45.26
Bivalvia (larvae)	179,476	12.3	359,275	31.9			436,281	38.6
Cirripedia (nauplii)	8,712	0.6					5,100	0.5
Cirripedia (cyprid)	1,742	0.1						
Brachyura (zoea)	24,588	1.8	100,099	8.9	72,927	2.8	57,988	5.1
Brachyura (megalopa)								
Caridea (larvae)	73,765	5.2	21,865	1.9	6,306	0.3	13,654	1.2
Mysidacea			23,705	0.1	809	0.04		
ENDSA-363-1B								
Chaetognatha	853	0.9	2,315	2.7	647	0.5	516	0.7
Evadne sp. (Cladocera)	34,507	32.8	26,495	31.7	13,733	10.7	17,750	23.8
Podon sp. (Cladocera)	15,452	14.7	3,859	4.6	18,982	14.7	9,206	12.4
Polychaeta (larvae)								
Gastropoda (larvae)	6,920	6.6	4,716	5.6	31,997	24.8	3,535	4.9
Bivalvia (larvae)					647	0.5		
Cirripedia (nauplii)	7,774	7.3	2,315	2.7	3,236	2.5		
Cirripedia (cyprid)					647	0.5		
Brachyura (zoea)	29,293	27.9	35,841	42.9	49,685	38.6	32,627	43.8
Brachyura (megalopa)								
Caridea (larvae)	10,332	9.8	7,803	9.3	9,131	7.2	10,679	14.3
Mysidacea			257	0.5			221	0.3

Sampling Time, hr.

* Station EN-11, 29-30 May 75.

Table E9

October Dry Weight Levels

During Cruise EN1*

Station	Dry Weight mg/m^3
EN1-363-2A-1	ND**
EN1-363-2B-1	1.425
EN1-363-2C-1	0.142
EN1-363-2A-2	0.837
EN1-363-2B-2	23.860
EN1-363-2C-2	6.800
EN2-363-1A-1	0.129
EN2-363-1B-1	ND**
EN2-363-1C-1	0.016
EN2-363-1A-2	0.374
EN2-363-1B-2	0.201
EN2-363-1C-2	ND**

* 30 Oct 75.
** No data.

Table E10

November Spatial and Monthly Biomass Levels

During Cruise EN2*

Station	Displacement Volume ml/m^3	Dry Weight mg/m^3
EN1-B(363)	0.0309	3.02
EN1-C	-	12.76
EN3-B	-	0.28
EN3-C	-	22.30
EN2-B	0.0253	5.57
EN2-C	-	5.18

* 19 November 1974

Table E11

November Diurnal Biomass Levels

During Cruise EN3*

Station	Displacement Volume ml/m^3	Dry Weight mg/m^3
EN2-1B(363)	0.0253	5.57
EN2-1C	-	5.18
EN2-2B	-	0.63
EN2-2C	-	21.98
EN2-3B	-	3.23
EN2-3C	-	7.30
EN2-4B	-	6.85
EN2-4C	-	1.36
EN2-5B	NS**	NS**
EN2-5B	ND***	ND***
EN2-6A	0.0117	19.46
EN2-7A	0.0047	8.78
EN2-7B	0.0009	60.44
EN2-7C	-	37.09
EN2-7A(202)	0.0120	4.26
EN2-7B	0.0026	15.90
EN2-7C	-	33.39
ENA-8A	0.0028	1.15
ENA-8B	0.0316	31.37
ENA-8C	0.0135	17.02
ENA-8A(363)	0.0281	35.61
ENA-8B	0.0264	53.86
ENA-8C	0.0097	46.13

---

* 19 November 1974.

** Not sampled.

*** No data.

Table E12

December Monthly Biomass Levels

During Cruise EN4*

Station	Displacement Volume ml/m^3	Dry Weight mg/m^3
ENB-1A(202)	0.0207	3.06
ENB-2A	0.1592	16.68
END-1A	0.0359	6.06
END-2A	0.0310	5.81
ENCONT-1A	0.0143	2.65
ENCONT-2A	0.0279	4.95

* 13 December 1974

Table E12 (concluded)

December Monthly Biomass Levels

During Cruise EN5*

Station	Displacement Volume ml/m^3	Dry Weight mg/m^3
ENB-1B(363)	0.3182	36.46
ENB-2B	0.1775	55.42
ENB-1B(202)	0.1093	25.23
ENB-2B	0.0917	23.03
END-1B(363)	0.1772	65.37
END-1B(202)	0.1477	27.11

* 18 December 1974

Table E13

January Monthly Biomass Levels

During Cruise EN6*

Station	Dry Weight mg/m^3
ENB-1A(363)	NS**
ENB-1B	5.69
ENB-2A	ND***
ENB-2B	24.88
ENB-1A(202)	22.08
ENB-2A	34.07
ENB-1B	55.41
ENB-2B	47.41
END-1A(363)	66.41
END-2A	4.33
END-1B	19.02
END-2B	21.44
END-1A(202)	114.83
END-1B	31.49
END-2A	180.48
END-2B	35.54
ENCONT-1A(363)	47.93
ENCONT-1B	41.10
ENCONT-2A	54.35
ENCONT-2B	23.02
ENCONT-1A(202)	96.77
ENCONT-1B	39.89
ENCONT-2A	50.24
ENCONT-2B	58.95

---

* 23 January 1975

** Not samples.

*** No data.

Table E14

Monthly Dry Weight Levels

and Percent Ash Content

Sample	Dry Weight mg/m^3	Ash Percent
	February, EN7	
ENB-1A(363)	6.70	16.0
ENB-1B	80.00	9.8
ENB-2A	9.24	7.5
ENB-2B	80.00	8.4
ENB-1A(202)	28.04	7.4
ENB-1B	80.07	7.2
ENB-2A	36.30	9.3
ENB-2B	69.24	14.4
END-1A(363)	1.27	6.7
END-1B	33.92	6.7
END-2A	24.41	9.9
END-2B	NS*	NS*
END-1A(202)	33.07	7.4
END-1B	49.44	5.6
END-2A	5.29	9.0
END-2B	NS*	NS*
ENCONT-1A(363)	1.56	11.1
ENCONT-1B	50.57	14.2
ENCONT-2A	41.12	12.3
ENCONT-2B	28.16	7.6
ENCONT-1A(202)	9.32	13.2
ENCONT-1B	47.76	8.7
ENCONT-2A	NS*	NS*
ENCONT-2B	NS*	NS*

* Not sampled.

	March, EN8	
ENB-1A(363)	8.98	5.5
ENB-1B	30.64	5.6
ENB-2A	11.66	11.4
ENB-2B	35.36	5.8
ENB-1A(202)	9.80	14.2
ENB-1B	56.60	5.7
ENB-2A	15.50	5.7
ENB-2B	44.48	5.0

Table E14 (continued)

Sample	Dry Weight mg/m^3	Ash Percent
	March, EN8 (continued)	
END-1A(363)	25.44	5.8
END-1B	132.16	5.4
END-2A	71.04	6.4
END-2B	99.04	5.2
END-1A(202)	44.36	6.1
END-1B	120.16	5.4
END-2A	38.88	7.1
END-2B	126.08	7.2
ENCONT-1A(363)	23.12	5.8
ENCONT-1B	36.32	4.5
ENCONT-2A	10.56	5.8
ENCONT-2B	64.0	5.5
ENCONT-1A(202)	71.44	6.6
ENCONT-1B	67.36	5.4
ENCONT-2A	17.84	5.8
ENCONT-2B	86.24	5.5
	April, EN9	
ENB-1A(363)	32.17	8.88
ENB-1B	86.57	6.27
ENB-2A	17.47	10.48
ENB-2B	14.71	8.87
ENB-1A(202)	27.14	8.37
ENB-1B	65.20	7.39
ENB-2A	32.56	7.15
ENB-2B	21.09	9.92
ENSA-1A(363)	109.80	6.59
ENSA-1B	43.89	8.58
ENSA-2A	18.96	8.44
ENSA-2B	79.12	7.35
ENSA-1A(202)	92.85	9.30
ENSA-1B	82.39	6.40
ENSA-2A	50.67	7.19
ENSA-2B	101.84	7.14
ENCONT-1A(363)	37.66	6.92
ENCONT-1B	80.57	6.53
ENCONT-2A	46.80	6.79
ENCONT-2B	145.63	7.85
ENCONT-1A(202)	81.60	7.28
ENCONT-1B	102.41	8.83
ENCONT-2A	89.73	7.18
ENCONT-2B	146.40	6.64

Table E14 (continued)

Sample	Dry Weight mg/m^3	Ash Percent
	May, EN10, EN11	
ENA-1A(363)	31.06	11.87
ENA-2A	27.88	14.90
ENA-1B	60.02	8.15
ENA-2B	57.34	12.00
ENA-1A(202)	58.33	9.55
ENA-2A	57.91	13.50
ENA-1B	122.18	15.53
ENA-2B	86.73	8.04
ENCONT-1A(363)	46.83	14.58
ENCONT-2A	53.51	18.15
ENCONT-1B	52.32	15.68
ENCONT-2B	49.49	14.42
ENCONT-1A(202)	86.65	14.54
ENCONT-2A	111.43	15.87
ENCONT-1B	111.71	11.77
ENCONT-2B	100.50	17.77
ENDSA-1-1A(363)	26.58	12.87
ENDSA-1-1B	57.75	9.15
ENDSA-1-2A	31.38	12.78
ENDSA-1-2B	62.41	9.30
ENDSA-1-1A(202)	60.02	11.81
ENDSA-1-1B	140.15	7.86
ENDSA-1-2A	79.37	18.82
ENDSA-1-2B	158.13	7.78
ENDSA-2-1A(363)	55.87	23.97
ENDSA-2-1B	61.99	6.16
ENDSA-3-1A	43.29	25.52
ENDSA-3-1B	86.61	6.42
ENDSA-4-1A	32.64	13.44
ENDSA-4-1B	37.79	8.75
ENDSA-2-1A(202)	112.94	7.56
ENDSA-2-1B	165.88	9.77
ENDSA-3-1A	118.83	9.68
ENDSA-3-1B	135.37	6.39
ENDSA-4-1A	77.58	12.94
ENDSA-4-1B	86.78	6.27

Table E14 (concluded)

Sample	Dry Weight mg/m^3	Ash Percent
	June, EN12	
ENDSA-1A(202)	13.57	18.35
ENDSA-2A	25.10	22.16
ENDSA-1B	104.01	7.00
ENDSA-2B	96.58	4.35
ENDSA-1A(363)	4.46	19.44
ENDSA-2A	6.35	17.36
ENDSA-1B	12.60	15.31
ENDSA-2B	10.57	18.09
ENA-1A(202)	250.12	17.60
ENA-2A	145.41	17.42
ENA-1B	353.40	5.39
ENA-2B	193.78	7.81
ENA-1A(363)	44.62	16.55
ENA-2A	57.09	22.74
ENA-1B	109.07	11.50
ENA-2B	47.08	5.20
ENCONT-1A(202)	395.77	6.14
ENCONT-2A	440.63	5.47
ENCONT-1B	171.51	0.52
ENCONT-2B	344.83	4.57
ENCONT-1A(363)	153.33	8.49
ENCONT-2A	147.78	11.87
ENCONT-1B	190.24	13.33
ENCONT-2B	237.45	9.02

Table E15

Species Abundance of Phytoplankton*

	Bacillariophyta						Others					
	EN1 & EN2			EN3			EN1 & EN2			EN3		
	$\bar{X}$	SD	CV	$\bar{X}$	SD	CV	$\bar{X}$	SD	CV	$\bar{X}$	SD	CV
October	0.76	1.33	1.74	0.49	0.63	1.26	3.43	7.12	2.07	0.80	1.12	1.40
November	3.53	5.40	1.52	3.92	6.30	1.60	0.37	0.46	1.23	0.35	0.31	0.86
December	9.61	19.04	1.98	11.17	21.60	1.93	0.36	0.51	1.40	0.31	0.42	1.35
January	8.08	13.28	1.64	8.32	12.89	1.54	0.21	0.13	0.61	0.20	0.12	0.61

* In cells/litre.

Table E16

Total Phytoplankton Abundance

Date	Volume cells/ℓ
29 October 1974	11.3*
19 November 1974	26.8
20 December 1974	78.7
3 January 1975	60.9
21 January 1975	84.1
20 February 1975	80.4
29 March 1975	2355.7
1 April 1975	1005.5
9 April 1975	622.0
22 April 1975	716.8
6 May 1975	113.0
10 June 1975	1157.0

* Average of all stations/depths.

In accordance with letter from DAEN-RDC, DAEN-ASI dated 22 July 1977, Subject: Facsimile Catalog Cards for Laboratory Technical Publications, a facsimile catalog card in Library of Congress MARC format is reproduced below.

Caplan, Ronald I
Aquatic disposal field investigations, Eatons Neck disposal site, Long Island Sound; Appendix E: Predisposal baseline conditions of zooplankton assemblages / by Ronald I. Caplan, New York Ocean Science Laboratory, Montauk, New York. Vicksburg, Miss. : U. S. Waterways Experiment Station, 1977.
68, ₍36₎ p. : ill. ; 27 cm. (Technical report - U. S. Army Engineer Waterways Experiment Station ; D-77-6, Appendix E)
Prepared for Office, Chief of Engineers, U. S. Army, Washington, D. C., under Contract No. DACW51-75-C-0016 (DMRP Work Unit 1A06C)
References: p.64-65.

1. Aquatic microorganisms. 2. Disposal areas. 3. Dredged material disposal. 4. Eatons Neck disposal site. 5. Field investigations. 6. Fisheries. 7. Fishes. 8. Sampling. 9. Zooplankton. I. New York Ocean Science Laboratory. II. United States. Army. Corps of Engineers. III. Series: United States. Waterways Experiment Station, Vicksburg, Miss. Technical report ; D-77-6, Appendix E.
TA7.W34 no.D-77-6 Appendix E