

TABLE OF CONTENTS

SECTION ONE	ABSTRACT
SECTION TWO	THE FIRM
SECTION THREE	SCOPE OF SERVICES
SECTION FOUR	SCHEDULE AND BUDGET
SECTION FIVE	QUALIFICATIONS
APPENDIX A	BENTHIC LABORATORY PROCEDURES MANUAL
APPENDIX B	REPRESENTATIVE BENTHIC COMPUTER GRAPHICS

ABSTRACT

The following proposal responds to the RFP for the Biscayne Bay Restoration and Enhancement Program's Benthic Sampling Program. It includes sections on the Firm, Scope of Services, Schedule and Budget, Qualifications and Appendices. Background of the Metcalf & Eddy Coral Gables office, as well as the national and international levels of the firm is presented. The Scope of Services includes information on field and laboratory services, data analysis and report preparation for both Phases I and II of the program. The project schedule and budget are presented in six month increments, including a flow chart of the chronological phasing of the project. The qualifications of the project team and related work experience are included. Appendix A presents a benthic laboratory procedures quality control manual for a similar Metcalf & Eddy project in Florida. Samples of computer-generated graphics that will be used in this project are presented in Appendix B.

THE FIRM

Metcalf & Eddy's local presence in South Florida was achieved through the acquisition of Connell Associates, a firm that was established in Dade County in 1919. In 1980, Connell Metcalf & Eddy became a regional office of the Metcalf & Eddy system. All project team personnel listed in this proposal have worked for the local office and all listed related experience was performed by the staff of the Coral Gables office.

Metcalf & Eddy, Inc. is among the top Engineering firms in the nation, specializing in Sanitary Engineering. We are recognized world wide for our leadership across the broad spectrum of engineering and planning services. Our expertise covers every aspect of water supply treatment and distribution, wastewater collection and treatment, solid waste disposal and resource recovery, transportation, architectural and facilities engineering, community development and recreation planning, environmental assessment, flood control, drainage, and irrigation. Our history of continuing growth is evidence of client confidence in the firm's integrity, judgement, and professional competence.

SERVICES OFFERED

The professional training, experience, size, and diversity of the corporate staff enable Metcalf & Eddy to offer comprehensive services to government agencies, developers, and industry. These services are an integral part and extension of the firm's long-standing experience in solving complex problems. Some of the services Metcalf & Eddy provides its clients are:

- o Water Supply, Distribution, & Treatment Facilities
- o Wastewater Collection, Treatment, & Pumping Facilities
- o Chemical & Biological Laboratory Analysis
- o Water Quality Monitoring & Analysis
- o Plant Operations Services
- o Engineering & Economic Feasibility Studies
- o Construction Services & Administration
- o Water Management & Drainage Design
- o Site Evaluation & Selection
- o Traffic & Transportation Engineering
- o Computer Services & Computer-Aided Design
- o Master Planning Recreational Facilities & Marinas
- o Environmental Planning and Permitting
- o Environmental Studies, Analysis, & Monitoring
- o Architectural Design
- o Space Planning & Programming
- o Land Planning & Development
- o Site Planning & Development

SUPPORT SERVICES

There are experienced personnel in all of our support services including Cost Estimating, Specifications, and Construction Services. Our support services also include one of the largest professionally-staffed, in-house laboratories in the state, and a fully-equipped Computer Services Department.

STAFF

The staff resources available in the United States number nearly 1000 employees whose disciplines include:

Civil and Sanitary Engineers; Hydrogeologists, Soils Engineers, and Geologists; Architects (including Landscape Architects); Ecologists, Biologists, and Chemists; Land Use and Social Planners; Community and Regional Planners; Economists; Air and Noise Specialists; Civil and Sanitary Engineers; Transportation Engineers; Structural Mechanical, and Electrical Engineers; and Cost Estimators.

OFFICES

The firm's corporate and international headquarters are in Boston, Massachusetts. Regional offices are maintained throughout the United States and international offices in seven foreign countries.

In addition to the Southeast Regional office in Coral Gables, and its satellite offices in Atlanta, Georgia, Orlando and Cape Coral, Florida, there are regional offices in Honolulu, Hawaii.

M&E International offices are located in seven host countries. In addition, Metcalf & Eddy, as a subsidiary of Research-Cottrell, is affiliated with other firms throughout the United States.

ORGANIZATION

Metcalf & Eddy is organized into four major divisions: Civil Engineering, Environmental Sciences, Environmental Facilities, and Architecture. The organization of the firm into major divisions results in increased expertise through specialization in various environmental and engineering fields. Assisting these divisions is the Metcalf & Eddy Technical Support Group. The support departments include: Geotechnical, Structural, Electrical, Mechanical, Instrumentation, Specifications, and Construction Services.

FACILITIES

Complementing Metcalf & Eddy's staff capabilities are its physical facilities. These include a computer applications center, soil and biochemical laboratories, chemical and biological laboratory facilities, a large and current library, and a computerized word processing center.

SCOPE OF SERVICES

The following Scope of Services addresses the requirements detailed in the Biscayne Bay Benthic Sampling Program RFP. The final product will be a baseline qualitative/quantitative analysis of the major benthic communities of Biscayne Bay with emphasis on faunal distribution among major habitat types, and on seasonal trends in community parameters.

PHASE I

A work program with four major elements has been developed for this project. These elements are:

- Task 10 - Field Survey
- Task 20 - Laboratory Analysis
- Task 30 - Data Analysis
- Task 40 - Evaluation and Preparation of Reports

TASK 10 - FIELD SURVEY

The field survey for Phase I will be performed twice; once during the wet season and once during the dry season. All parameters listed below will be sampled during these surveys except sediments which will be collected and analyzed once during the initial survey.

Station Selection

Sixty permanently marked sampling stations will be selected throughout Biscayne Bay using a stratified sampling technique. Biscayne Bay will be divided into ten regions from north to south. All major habitats (i.e. seagrass beds, mud bottom, sand bottom, hard bottom, algal areas, and peat areas) represented in each region will be sampled. Sampling stations will coincide with existing DERM water quality monitoring stations when possible.

Macrophyte Analysis

Seagrass and macroalgae, within a five meter radius of each station, will be identified to species. A permanent 0.25 m² quadrat will be set up at all seagrass stations. All seagrasses within this quadrat will be identified and blade counts of each species will be recorded. All quadrats will be photographed each time blade counts are made.

Physical Parameters

Dissolved oxygen, temperature, salinity, turbidity, tide direction and water depth will be recorded at each station prior to sampling. Bottom characteristics and sources of freshwater and/or pollutants will also be noted. Circulation information pertinent to each station will be obtained from the circulation studies project.

Sediments

Two sediment samples will be collected at each station, using a 10 cm (diameter) x 10 cm (deep) aluminum core sampling device. Samples will be placed in labeled containers and stored on ice during transportation to the laboratory where they will be frozen until analysis. Sediment depth to bedrock or 50 cm will be recorded at each sampling station.

Benthic Cores

One benthic core sample will be collected by divers at each station using a 15 cm (diameter) x 15 cm (deep) aluminum core sampling device. The sampler is equipped with a top vent which is opened as the sampler is pushed into the substrate and closed as the sampler is retrieved. The resulting suction helps retain the sample and minimize loss. A cap will then be secured over the open end of the coring device to prevent sample loss. All samples will be sieved through a 0.6 mm sieve in the field, placed into a labeled container, preserved in 10% buffered formalin, and transported to the laboratory for analysis.

TASK 20 - LABORATORY ANALYSIS

Because of the importance of laboratory analysis and the data which they produce, Metcalf & Eddy has an ongoing quality assurance program. All aspects of sample collection, preservation, storage, and analyses are controlled to ensure the reliability of our laboratory data. Each sample collected is recorded in a field log and identified with a label. Detailed information recorded in the field log includes the collector's name, the exact time and location of sampling, and local conditions such as weather. A copy of our procedures manual for a previous Florida Power Corporation Benthic Community Structure Study is presented in Appendix A.

All field and laboratory data will be recorded on standard reporting forms prepared especially for this study. These data sheets will be maintained in a neat and orderly fashion to facilitate any review by DERM or other designated agencies. Each team leader will keep a daily field diary which will become part of the permanent records.

Taxonomic Quality Control

A quality control team will be assembled for this project to assure the accuracy of taxonomic identifications. Members of this team are among the leading experts in their respective fields in the South Florida area. Their names, affiliations, and areas of participation are listed below.

Dr. Jeffrey S. Prince
University of Miami

Macroalgae

Mr. Mark P. McMahon
Metcalf & Eddy

Aquatic Vascular Plants

Dr. Lowell P. Thomas
University of Miami

Annelids, Echinoderms
and other Phyla

Mr. Julio Garcia-Gomez
Miami-Dade Community College

Crustaceans and Mollusks,

During the initial phases of this project, the quality control team will work closely with the project personnel to assure the accuracy of identifications and set up a voucher collection. Throughout the course of the study each member of the quality control team will confirm both species identifications and numbers of individuals from representative samples, and check the identification of any new species added to the voucher collection.

Voucher Collection

A voucher collection containing every species or taxon collected will be established and maintained. Every specimen in the voucher collection will be verified by the appropriate member of our quality control team, and a list of all keys and other references used in taxonomic identification will be kept on file.

Sediment Samples

Samples will be analyzed by a combination of sieve analysis and the pipette method as described by Royse (1970). Size classes from -1 phi to 4 phi (sand fraction) will be separated in a single phi-unit series of nested sieves. Pipette analysis will separate the 4 phi to 8 phi classes (silt fraction). Material remaining on the largest mesh sieve, consisting mostly of shell fragments, will be classified as "gravel", while material remaining after the last pipette fraction will be classified as "clay".

Prior to particle-size analysis, all sediment samples will be rinsed with deionized water to eliminate dissolved salts, treated with hydrogen peroxide to remove organic matter, and dispersed in a 5.5 g/l solution of sodium hexametaphosphate.

The percentage of organic matter in sediments will be determined by ashing approximately 1 gram of sediment (dry weight) in a ceramic crucible at 600°C overnight. Material lost on ignition will be classified as organic matter. Carbonate content will be obtained by an acid-insoluble residue method (Maxwell, 1968). Samples will be split to 10 gram portions, passed through a 250 micron sieve (to decrease the masking effect to shell material), and dried at 70°C for 6-10 hours. Samples will then be weighted to 5 grams, placed in a suitable reaction flask, and 50 ml of 3N HCL will be added. The samples will be filtered with a Buchner funnel apparatus through previously weighed filter paper and placed in a drying oven for 1-3 hours. The residue will be weighed and weight loss will be calculated to obtain carbonate percent by weight.

Phase II

TASK 10 - FIELD SURVEY

Station Selection

The number and location of sampling stations for Phase II will be determined from analysis of Phase I data. However, each habitat in the Bay will have at least one station. Stations will be permanently marked.

Macrophyte Analysis

Macrophyte quadrats at each of the established stations will be set up and recorded as in Phase I Macrophyte Analysis.

Physical Parameters

Dissolved oxygen, temperature, salinity, turbidity, and water depth will be recorded at each station.

Benthic Cores

Five replicate benthic core samples will be collected by divers at each station using a 10 cm (diameter) x 15 cm deep aluminum core sampling device. The use of this sampler and the sieving procedure are the same as those described in Phase I Benthic Cores.

TASK 20 - LABORATORY ANALYSIS

Laboratory procedures for Phase II Bottom Core Samples will be the same as those for Phase I. All new species or taxa will be verified by the appropriate quality control member and added to the voucher collection.

TASK 30 - DATA ANALYSIS

The analysis used in Phase I will be duplicated with the Phase II data. In addition, between station and seasonal effects will be addressed using multiway analysis of variance (ANOVA) techniques. As the ANOVA requires some replication to assess factor interaction, sample replicates will not be pooled for these analyses. These data will also be presented graphically.

Task 40 - EVALUATION AND PREPARATION OF REPORTS

Progress reports containing raw data from the previous field trip and new species collected will be submitted on a quarterly basis. An interim annual report with preliminary results and discussions but no conclusions will be submitted after the completion of the first twelve months of work in Phase II. The final report will contain all the analysis detailed in Task 30 for the entire two years' data collected during Phase II.

SCHEDULE AND BUDGET

Metcalf & Eddy is aware that the Biscayne Bay Benthic Sampling Program is at least a three year study, consisting of two Phases. Phase I is designed to correlate benthic species abundance, diversity and distribution with seasonality (wet vs. dry season), as well as biotic (primarily macrophytes) and abiotic (sediments, circulation, disturbance, etc.) parameters throughout the Bay. A flow chart indicating the timing of the various tasks and phases is presented in Figure 1.

Phase I (first twelve months)

Phase I consists of the selection of up to 60 sampling sites, the collection and analysis of benthic and sediment samples, and the field monitoring of macrophytes as outlined in the Scope of Services section.

As per the RFP we are providing you with our budgeting estimates on a six-month basis.

Phase I-A (August 1, 1981 - January 31, 1982)

During this period we will conduct initial station selection, collect the wet season benthic cores, perform the wet season macrophyte analysis, collect and analyze the sediment samples and analyze the wet season benthic samples. In addition, we will attend six monthly Working Team Meetings. Quarterly progress reports will be submitted to DERM.

Budget

SALARIES

Field	\$ 3,518
Laboratory	\$18,942
Office	\$ 3,300
Total	\$25,760

EXPENSES

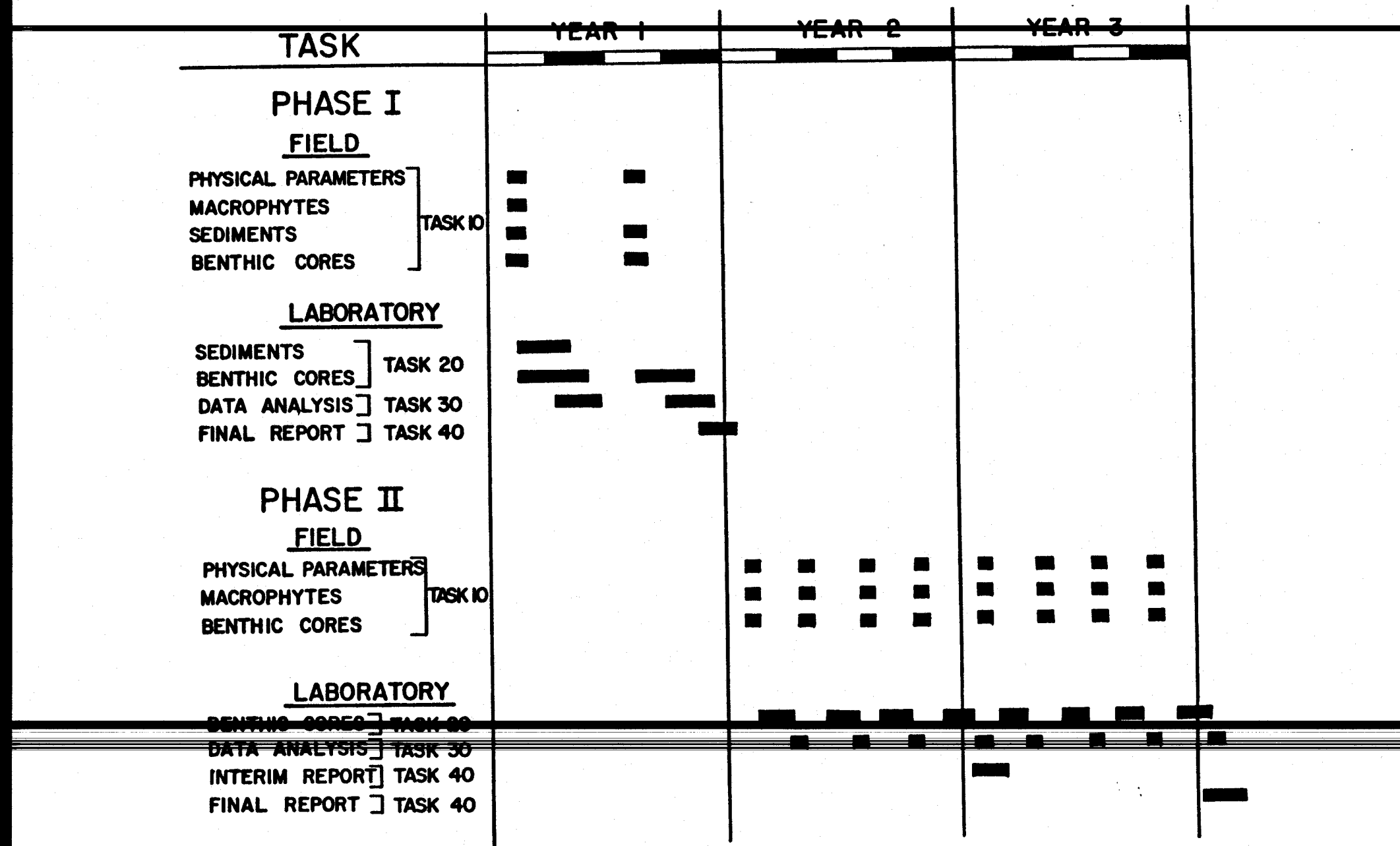
Field	\$ 1,240
Laboratory	\$ 863
Office	\$ 0
Total	\$ 2,103

ESTIMATED MAN-HOURS

Field	135
Laboratory	1080
Office	75
Total	1290

Phase I-B (February 1, 1982 - July 30, 1982)

During this period we will collect the dry season benthic samples, perform the dry season macrophyte analysis, and analyze the dry season benthic samples. In addition we will attend six monthly Working Team Meetings. We will also produce the Phase I Final Report. Quarterly progress reports will be submitted to DERM.



Budget

SALARIES

Field	\$ 1,627
Laboratory	\$ 6,681
Office	<u>\$10,869</u>
Total	<u>\$19,177</u>

EXPENSES

Field	\$ 1,240
Laboratory	\$ 862
Office	<u>\$ 800</u>
Total	<u>\$ 2,902</u>

ESTIMATED MAN-HOURS

Field	69
Laboratory	360
Office	<u>363</u>
Total	<u>792</u>

In summary, Metcalf & Eddy will provide you with the Phase I study for a lump sum fee of Forty Nine Thousand Nine Hundred Forty-Two Dollars (\$49,942).

Phase II (next 24 months)

Phase II is designed to be a more intensive sampling program of benthos and macrophytes at selected stations determined by the Phase I analysis. For the purposes of this budget proposal, we are assuming that twenty (20) stations will be analyzed during the course of Phase II work. In Phase II, benthic sample collection and in situ macrophyte analysis will be performed quarterly. Five replicate cores will be collected each quarter at each station as is outlined in the Scope of Services section.

Phase IIA (August 1, 1982 - January 31, 1983)

During this period we will collect the fall and winter benthic samples, perform the fall and winter macrophyte analysis and perform the lab analysis on the fall and winter benthic samples. In addition, we will attend six monthly Working Team meetings. Quarterly progress reports will be submitted to DERM.

Budget

SALARIES

Field	\$ 1,698
Laboratory	\$14,541
Office	<u>\$ 3,615</u>
Total	<u>\$19,854</u>

EXPENSES

Field	\$ 390
Laboratory	\$ 690
Office	<u>\$ 0</u>
Total	<u>\$ 1,080</u>

ESTIMATED MAN-HOURS

Field	72
Laboratory	800
Office	<u>81</u>
	953

Phase IIB (February 1, 1983 - July 30, 1983)

During this period, we will collect the spring and summer benthic samples, perform the spring and summer macrophyte analysis and the lab analysis on the spring and summer benthic collections. In addition, we will attend six monthly Working Team Meetings and prepare first year' data for inclusion into the Phase II Final Report. Quarterly progress reports will be submitted to DERM.

Budget

SALARIES

Field	\$ 1,698
Laboratory	\$14,541
Office	<u>\$10,919</u>
Total	\$27,158

EXPENSES

Field	\$ 390
Laboratory	\$ 690
Office	<u>\$ 800</u>
Total	\$ 1,880

ESTIMATED MAN-HOURS

Field	72
Laboratory	800
Office	<u>328</u>
Total	1200

Phase IIC (August 1, 1983 - January 31, 1984) and Phase IID (February 1, 1984 - July 30, 1984) have budgets identical to Phase IIA and Phase IIB.

In summary Metcalf & Eddy will provide you with the Phase II study for an annual lump sum fee of Forty-Nine Thousand Nine Hundred Seventy Two Dollars (\$49,972.00) or Ninety-Nine Thousand Nine Hundred Forty-Four Dollars (\$99,944.00) over the two planned years of Phase II.

QUALIFICATIONS

Metcalf & Eddy is extremely qualified to provide Dade County Department of Environmental Resources Management the services required to perform the Biscayne Bay Benthic Sampling Program. This section of the proposal presents the personnel who will comprise the Project Team, and representative experience that the firm has acquired through numerous benthic projects conducted in and around Biscayne Bay as well as similar projects conducted in other parts of Florida.

Key personnel on this project will be Mr. Guido Van Meek, P.E., the Project Principal; Dr. Ronald Gaby, Director of Metcalf & Eddy's Environmental Sciences Division and a member of the Biscayne Bay Scientific/Technical Advisory Committee, will be the Principal Investigator. Mr. Mark McMahon, Metcalf & Eddy's Senior Ecologist will be the Project Manager. Mr. Jon Gleman, a Senior Project Biologist for Metcalf & Eddy will be the Field and Laboratory Supervisor for this project. In addition, to the eight Project Biologists assigned to this project, Metcalf & Eddy has assembled a Quality Control Team of outside consultants and in-house experts, whose duties will be to confirm all taxonomic identifications. These individuals are Dr. Lowell Thomas of the Rosensteel School of Marine and Atmospheric Sciences (RSMAS) a leading invertebrate taxonomist, Mr. Julio Garcia-Gomez, formerly of RSMAS, and now with Miami-Dade Community College, another leading invertebrate taxonomist; Dr. Jeff Prince of the University of Miami, a leading phycologist, and Mr. Mark McMahon of Metcalf & Eddy who will confirm seagrass identifications. The Metcalf & Eddy team members have a combined experience of 33 years of benthic work. The resumes of all Team members are presented on the following pages.

Following the resumes of the project team is the section on Metcalf & Eddy's related experience. Of primary importance to this project is Metcalf & Eddy's recently completed four year benthic community structure study conducted for Florida Power Corporation's Crystal River Nuclear Power Plant. This study consisted of quarterly sampling of benthic core samples, venturi samples, seagrass and macroalgae quadrats, and sediment samples, as well as seagrass transects, zooplankton and oyster reef samples. The Quality Control Team mentioned above performed Quality Control services for four years for this project. We have included a copy of our laboratory and data transfer procedures manual for this study as an example of how project quality control was monitored during the course of the study.

In addition, we have included a set of our computer-generated graphics that illustrate how benthic data similar to that required for this study are presented, as well as how weather data and physical parameters are treated. Metcalf & Eddy has conducted numerous other benthic studies in Biscayne Bay and other shallow water sites in central and southern Florida. Brief descriptions of these projects follow.

PROJECT TEAM MEMBERS

KEY PERSONNEL

Guido Van Meek, P.E. Vice President
Environmental Engineering

Ronald Gaby, Ph.D. Principal Investigator
Director Environmental Sciences Division

Mark McMahon Project Manager
Quality Control-Seagrasses

Jon F. Gleman Field/Laboratory Supervisor
Mollusk and Macroalgae Taxonomy

Benthic Team

Margaret Ahearn Project Biologist
Field Sampling and Laboratory Analysis

Barbara Bohnsack Project Biologist
Field Sampling and Laboratory Analysis

Elizabeth M. Frank Project Biologist
Field Sampling and Laboratory Analysis, Sediment Analysis

W. Neil Gillies Project Biologist
Computer Programming and Graphics, Crustacean Taxonomy

William A. Hieber Project Biologist
Field Sampling and Laboratory Analysis

Pamela Krauss Project Biologist
Field Sampling and Laboratory Analysis

Stephen P. Langley, M.S. Project Biologist
Field Sampling and Laboratory Analysis, Sediment Analysis

Steve Trine Project Biologist
Annelid Taxonomy

QUALITY CONTROL TEAM

Julio Garcia-Gomez, M.S.
Quality Control - Mollusks and Crustaceans

Mark McMahon
Quality Control-Seagrasses

Jeffrey F. Prince, Ph.D.
Quality Control - Macroalgae

Lowell P. Thomas, Ph.D.
Quality Control - Annelids, Echinoderms and other Phyla

EDUCATION

B.S., Civil Engineering, Universidad Nacional de Colombia, 1962
Graduate Studies, University of Maryland, 1963-1964

EXPERIENCE

Mr. Van Meek is presently Vice President in charge of the Civil/Environmental Departments. His diversified experience as a civil engineer includes the planning, design, and project supervision of multi-disciplined municipal, housing and recreational projects and the management of a private water and sewer utility company.

As former head of the Land Development and Environmental Facilities Department of Metcalf & Eddy, Mr. Van Meek was responsible for the master planning and design of site development, water management, water distribution and sewage collection systems, and road design for various projects throughout the Southeast.

In the Environmental Facilities, his recent responsibilities include the project management of the Kings Bay Naval Facilities at Kings Bay, Georgia which encompasses more than 50 miles of water distribution, more than 35 miles of sewage collection and the design of a 5.6 MGD water treatment and 1.2 MGD sewage treatment facilities along with well field and pumping station.

Mr. Van Meek has been responsible for the design and construction of more than 500 miles of water distribution and sewage collection systems, water treatment plants, sewage treatment plants, lift stations, and booster stations for private development companies, municipalities, and utility companies, as well as the operation of water and sewer facilities.

Before joining Metcalf & Eddy, he was District Engineer in charge of operations for the South Florida District of a major, private water and sewer utility company. Prior to that, as Principal of his own consulting engineering firm, he was involved in the design and construction of numerous land development projects ranging from the Ft. Myers area to Orlando. Among his clients were some of the largest land development companies in Florida.

PROFESSIONAL REGISTRATION

Professional Engineering - Florida
Professional Engineer and Land Surveyor - Colombia, South America

PROFESSIONAL AFFILIATIONS

American Society of Civil Engineers
National Society of Professional Engineers
Florida Engineering Society
Water Pollution Control Federation
American Water Works Association
Urban Land Institute

EDUCATION

B.S., Chemistry and Zoology, University of Miami, 1965
Ph.D., Biology, New Mexico State University, 1972

EXPERIENCE

Dr. Gaby's experience in environmental investigations involving terrestrial, aquatic, and coastal ecology includes the preparation of Environmental Impact Statements and Development of Regional Impact Reports, ecological surveys, environmental feasibility studies, water quality monitoring programs for both surface and groundwater, Complex Air Source Studies and air quality monitoring programs. He has also been responsible for the preparation of statistical analyses and computer programming relative to these investigations.

As the Director of Environmental Studies for Metcalf & Eddy, Dr. Gaby is responsible for directing the efforts of the environmental department's biologists, chemists, and environmental engineers and for the overall coordination of quality control procedures within the department. He is the principal investigator on the firm's environmental projects.

Dr. Gaby is Project Director for the American Crocodile Study being conducted in south Dade County; a benthic and planktonic community structure study for Florida Power Corporation's Crystal River Unit #3; and of a number of Environmental Impact Statements in compliance with 24CFR Part 58. He has also been involved in an Environmental Impact Study for the South Shore redevelopment on Miami Beach, Florida; a Development of Regional Impact Statement for a large residential community being developed by GAC Properties, Inc. in Cape Coral, Florida; and a DRI report for a 230 kV Florida Power Corporation transmission corridor.

Prior to joining Metcalf & Eddy, Dr. Gaby had his own environmental consulting firm, and has served as an environmental consultant with other firms. He has testified as an expert witness on environmental matters at public hearings on the local, regional, and state level.

Dr. Gaby was selected to be a technical reviewer for the proposed East Everglades Management Plan, funded under the 208 program. He is a visiting lecturer in Engineering Technology at Florida International University. He has served on the Biscayne Bay Scientific Technical Advisory Committee.

PROFESSIONAL AFFILIATIONS

American Society of Mammalogists
National Audubon Society
Florida Audubon Society
Sigma Xi
Phi Kappa Phi

EDUCATION

B.S. Biology-Ecology, University of Miami, 1971
Post Graduate Studies in Botany, University of Miami (1971-1974) and
Florida Atlantic University (1979)

EXPERIENCE

Mr. McMahon's experience in environmental investigations includes biological and ecological field investigations, laboratory analysis, and report writing. His specific areas of expertise include vegetation mapping, community analysis, photo interpretation and quantitative analysis, rare and endangered plant species, zoological investigations, the planning and coordination of field studies related to DRIs and EISs, and final report writing for ecological portions of DRI's, EIS's and environmental assessments.

Currently a Project Manager for Metcalf & Eddy, Mr. McMahon recently coordinated the EIA's for federal airport projects at Key West International and Marathon Airports in the Florida Keys; a regional coal-fired power plant site selection study in central and southern Florida, and the Development of Regional Impact for a 230 kV transmission corridor in central Florida. He was Field Supervisor for the environmental studies associated with the master plan, system plan, and DRI's for Dade County marinas. He coordinated the Benthic and Planktonic Community Structures Study for Florida Power Corporation, including writing of the annual reports, and is a member of the Quality Control Review committee for this project, his specific area of concern being seagrasses. He has also been involved in the DRI Study for a residential area and environmental assessments for two marina sites for a large residential development in Cape Coral, Florida. Mr. McMahon has recently been Project Manager for three turbidity monitoring programs associated with the port of Miami expansion, Biscayne Bay, Florida.

Mr. McMahon is responsible for the vegetation portion of a Rare & Endangered Species Study in Dade County in which he has been involved in field work, a literature review, and herbaria work. He has also been responsible for the coordination of an EIS for the National Weather Service Facility at Key West International Airport; and participated in botanical studies for Pumpkin Key, a low-density residential development in the Florida Keys. He was responsible for field coordination of the American Crocodile Study in South Florida, and had been responsible for coordinating regional treatment of rare and endangered species in DRIs and EISs as well as treatment of these species for power plant site selection.

His past experience in Florida includes two transmission corridor studies; two plant expansion studies for a major southern utility company; several Environmental Impact Studies; and more than eighteen DRIs for major housing developments throughout the state. Many of these projects were located in areas of wetland vegetation communities. Mr. McMahon assisted the Dade County Planning Department in their compilation of rare and endangered species for the Biscayne Bay Management Program.

PROFESSIONAL AFFILIATIONS

Florida Academy of Sciences

JON F. GLEMAN

EDUCATION

B.S., Biology, University of Miami, 1974.

EXPERIENCE

Mr. Gleman's work in conducting ecological studies has concentrated on environmentally sensitive terrestrial, marine and estuarine ecosystems in Florida.

As a Senior Project Biologist with Metcalf and Eddy, his experience included laboratory supervision of a major benthic community structure study and mammal trapping and tagging, and general taxonomy. He has prepared environmental impact statements, development feasibility studies, and scientific reports. He has also been extensively involved in benthic surveys in central and southern Florida. His experience includes benthic taxonomy, and marine inventories as well as vegetation characterization, community analysis, photo-interpretation, and vegetation mapping. His work has been the basis for numerous DRI's, including Florida Power and Light's Keentown-Whidden transmission corridor in central Florida, Florida Power Corporation's Piedmont-Sorrento transmission corridor near Orlando and Cape Coral Unit 86 in Ft. Myers. Mr. Gleman was also involved in a power plant site selection study in Martin County for Florida Power and Light Company.

Mr. Gleman has conducted several benthic studies as well as animal population studies, aquatic biology and endangered species surveys for an environmental assessment study of terrestrial and aquatic ecosystems at a proposed nuclear power plant site for Florida Power & Light Company in south Dade County, Florida; this study included benthic sampling and taxonomy for southern Biscayne Bay. As a certified diver, he participated in the benthic and planktonic community structures study for Florida Power Corporation's Nuclear power plant facility at Crystal River, Florida. His duties included mollusk and macroalgae taxonomic identifications as well as field supervision. Other benthic surveys and inventories he has been involved in include three Dade County Marinas, Turchin Marina, and Brickell Place, all on Biscayne Bay, and South Shore on Miami Beach.

Recently, Mr. Gleman has participated in a study of the American Crocodile, capturing, tagging, and radio tracking individual animals in an effort to determine the behavior and range of this endangered species. He has also taken part in several seagrass inventory studies Metcalf & Eddy has performed in the past year.

Mr. Gleman supervises the biological operations of Metcalf & Eddy's in-house Environmental Laboratory and has also prepared a number of environmental reports.

PROFESSIONAL REGISTRATION

Certified Scuba Diver

PROFESSIONAL AFFILIATIONS

Ecological Society of America
Florida Academy of Sciences
National Auduborn Society

MARGARET M. AHEARN

EDUCATION

B.S., Biology, Old Dominion University, Norfolk, Virginia, 1977
Environmental Engineering, Post Graduate Studies, University of Miami,
Florida International University, 1979 - current.

EXPERIENCE

Margaret Ahearn has more than three years of experience in biological research in marine science including field and laboratory biology and chemical oceanography.

As a Project Biologist for Metcalf & Eddy, she has participated in a variety of environmental studies. She was involved in seagrass surveys for proposed marina facilities & construction, which included identification of seagrasses, determination of cover density, field surveys and data analysis. She has performed field collections and identification of samples in the benthic and planktonic community structure study Metcalf & Eddy has conducted for Florida Power Corporation. Ms. Ahearn has field and laboratory experience in water quality and turbidity monitoring in Biscayne Bay.

Ms. Ahearn has also been involved in a study of the population biology and behavior of the American Crocodile at the Florida Power & Light Turkey Point plant in South Dade County. She has assisted in field investigations of this federally endangered species, including trapping and radio telemetry.

Before joining Metcalf & Eddy, Ms. Ahearn was a research assistant with the Rosenstiel School of Marine and Atmospheric Sciences of the University of Miami, where her duties included growing and maintaining cultures in various seawater media; isolation of certain types of algae; water quality analysis; analysis of herbicide and pesticides; measuring density, sound velocity and temperature effects on major sea salt components; gravimetric analysis and compilation of data for computer input.

At the Virginia Institute of Marine Sciences of the College of William and Mary, Ms. Ahearn participated in a benthic baseline study of the mid-Atlantic Continental Shelf, where her duties included the identification of benthic organisms; field collecting and sorting of samples; data compilation and sediment analysis.

PROFESSIONAL REGISTRATION

N.A.U.I Basic and Sport Diving Certificates
National Audubon Society
Florida Audubn Society

BARBARA BOHNSACK

EDUCATION

B.S., Biology (Chemistry and Geology Minors), University of Miami, 1976
Post Graduate Study, University of Miami, 1981

EXPERIENCE

Ms. Bohnsack is experienced in biology and environmental planning. Her experience includes field investigations involving taxonomy, photography, collection of marine and terrestrial fauna, as well as the preparation of environmental impact studies and assessments.

Ms. Bohnsack has been responsible for field investigations and taxonomic laboratory analysis for a benthic and planktonic community structures study for Florida Power Corporation at the Crystal River power plant facility, and has recently participated in a number of seagrass inventory studies. She has field experience in water quality and turbidity monitoring in Biscayne Bay.

As a Project Biologist with Metcalf & Eddy, Ms. Bohnsack is currently involved as principal investigator in a study of the population biology and behavior of the American Crocodile at the Florida Power & Light Turkey Point power plant in south Dade County. The study of this federally endangered species has involved trapping, tagging and radio telemetry as well as the preparation of proposals and technical reports.

She has also been extensively involved in a variety of environmental investigations. She has participated in vegetation characterization and mapping for both a transmission corridor study and a site selection study for Florida Power & Light Company. In addition, Ms. Bohnsack was involved in field investigations, aerial photographic interpretation, and vegetation mapping for the Florida Power Corporation Piedmont-Sorrento transmission corridor DRI, and the Marathon and Key West International Airports EIA's in Monroe County, Florida. Other recent work includes the preparation of a federal EIS for the South Shore Redevelopment on Miami Beach, Florida and a DRI for a 692-acre residential subdivision in Cape Coral, Florida.

Prior to joining Metcalf & Eddy, Ms. Bohnsack was a Research Assistant at the University of Miami School of Medicine, where she was involved in clinical drug research investigating the relationships between various mental states and drugs. She has also served as Research Assistant in research of the community structure of coral reef fishes in the Florida Keys, and research in pollination biology in Costa Rica. She participated in a study that developed quantitative photographic sampling techniques of marine benthic communities.

PROFESSIONAL REGISTRATION

Scuba Certification - P.A.D.I.

PROFESSIONAL AFFILIATIONS

Florida Field Biologists
National Audubon Society
International Oceanographic Foundation

ELIZABETH M. FRANK

EDUCATION

B.S., Biology, University of Miami, 1980

EXPERIENCE

As Project Biologist for Metcalf and Eddy, Ms. Frank has participated in field collection, sorting, identification and biomass determination of organisms, and sediment analysis as part of a benthic and planktonic community structures study for Florida Power Corporation; graphics preparation for vegetation analysis in a site selection study for a major utility company's proposed power corridor; and in trapping, tagging and radio tracking American crocodiles for our study of this endangered species at Florida Power and Light's Turkey Point plant in South Dade County. She has also assisted in preparation of development of regional impact studies and the master plans for three Dade County marinas. This included editing, and graphics preparation and analysis.

While working on water quality analysis projects in Metcalf & Eddy's laboratory, Ms. Frank has become skilled in the use of selective ion electrodes, the oxygen meter, and the turbidimeter. She has worked with various analytical standards and performed such tests as K₂Cr₂O₇, ammonias, orthophosphates, bromides, coliforms, oils and greases. She has also performed in situ water quality monitoring. She has field and laboratory experience in water quality and turbidity monitoring in Biscayne Bay.

Her field studies at the University of Miami include sampling and identification in marine and terrestrial ecosystems in South Florida. She became experienced in the use of various core samplers, dredges and otter trawls, and water samplers to test various water parameters. She was engaged in a special problems field study in Bermuda, concentrating on mollusk habitat, biology and identification.

PROFESSIONAL REGISTRATION

N.A.U.I. Basic Scuba Diving Certificate

W. NEIL GILLIES

EDUCATION

B.S., Biology, University of Miami, 1973.
Currently enrolled in M.S., Environmental Systems, Florida International University.

EXPERIENCE

Mr. Gillies' experience is in biological research, computer programming, laboratory analysis, and instruction. He has worked on a number of environmental assessment studies in south and central Florida; served as a research associate studying crustacean systematics; and was a project biologist involved in design and implementation of improved sorting techniques for bulky trawl and grab samples.

As a Project Biologist for Metcalf & Eddy, Mr. Gillies specializes in crustacean and zooplankton identification, sorting and field collection. He has been responsible for invertebrate taxonomy for the Florida Power Corporation Benthic and Planktonic Community Structures Study; has participated in a variety of field investigations; and has been involved in routine monitoring of water quality in Biscayne Bay. He has been instrumental in the experiment design phase of new projects, and in the statistical analysis of environmental data.

As a Director of Computer Operations, Mr. Gillies' responsibilities include management of all computer functions in-house, and development and maintenance of computer programs. He has developed many statistical, graphics and report programs for the firm.

Mr. Gillies has worked as a consulting crustacean taxonomist on several studies in the south Florida region. He identified gammaridean amphipods from Florida Bay, decapods and amphipods from a pass on the southwest coast. Prior to joining Metcalf & Eddy, as a Research Associate at a large university in Miami, he participated in a National Science Foundation Grant for the systematics study of the genus Pyloporus, and helped implement a study of benthic communities in a restored seagrass bed in Biscayne Bay. He has also served as a Research Associate for an environmental consulting firm, as an instructor in marine biology, and as a technician for a large university. He has considerable experience in the identification of gammaridean amphipods, and a working relationship with several international experts in amphipod taxonomy.

His work includes the Florida Power Corporation Crystal River Power Plant Environmental Study; the Florida Power Corporation Anclote Anchorage Power Plant Environmental Study of the Impact of Heated Effluent Discharge on Marine Communities; and the Peace River Environmental Study in Punta Gorda, Florida. He is a certified diver.

PROFESSIONAL AFFILIATIONS

Biometric Society
Crustacean Society

EDUCATION

B.S., Zoology, Arkansas State University, 1976

EXPERIENCE

Mr. Hieber's expertise in zoology has been utilized in environmental studies and research. His responsibilities with Metcalf & Eddy include field monitoring and laboratory analysis of chemical and biological parameters for water quality monitoring programs. Also, Mr. Hieber is responsible for the scheduling of personnel for both the chemical and biological laboratory operations.

He has been involved in a benthic and planktonic community structures study for Florida Power Corporation, and has participated in a number of seagrass inventory studies for Metcalf and Eddy. He has field experience and laboratory experience in water quality and turbidity monitoring in Biscayne Bay. He has assisted in the preparation of Development of Regional Impact Studies for three Dade County Marinas, and in population monitoring of the American crocodile, including trapping, tagging and radio telemetry, as part of an endangered species study for Florida Power and Light Company.

Prior to joining Metcalf & Eddy, as a laboratory technician with the Everglades National Park in Homestead, Florida, Mr. Hieber was involved in the collection and analysis of field data for the design and development of a marine water quality monitoring system for the park; maintenance of laboratory and field equipment; and use of computer technology for research and storage of historical data.

At the Rosenstiel School of Marine and Atmospheric Science's Division of Biology and Living Resources he worked with radioactive materials to trace calcium and carbon uptake in corals, developing expertise in the use of such instruments as the scintillation counter, oxygen electrodes, and spectrophotometers.

Mr. Hieber also photographed, collected and prepared coral samples from different areas of the Bahamas, Jamaica and Venezuela, and gained a working knowledge of University vessels used in sample acquisition in the Caribbean Sea. He worked with the E.P.A. on sewage outfall off the coast of Miami Beach and Hollywood, Florida and assisted in editing the Proceedings of the Third International Symposium on Coral Reefs in 1977. Also, Mr. Hieber has had extensive field work in the state of Arkansas, mainly water quality and wildlife management.

PROFESSIONAL REGISTRATION

Certified Scuba Diver, Arkansas State University, 1973.
Research Diver, University of Miami, 1977.

PROFESSIONAL AFFILIATIONS

International Oceanographic Foundation

PAMELA KRAUSS

EDUCATION

B.S., Biology (Chemistry Minor), University of Miami, 1974
Post Graduate Studies, Botany, Florida International University
M.S., Biological Science, Fla. Atlantic University (Scheduled for 1981)

EXPERIENCE

Ms. Krauss has experience in a variety of botanical and ecological investigations and research, including water quality and aquatic plant respiration studies; a benthic and planktonic community structures study; rare and endangered species studies and vegetation analysis by ground and aerial reconnaissance and aerial photography. Her research experience includes botanical field trips in the Caribbean.

As a member of the Metcalf & Eddy Environmental Staff, Ms. Krauss has participated in a number of environmental studies. Her experience includes laboratory and field work for a benthic and planktonic community structures study for Florida Power Corporation at the Crystal River plant site. She has field and laboratory experience in water quality and turbidity monitoring in Biscayne Bay. She has recently has involved in a Rare and Endangered Species Study for Florida Power & Light Company, entailing an exhaustive field, literature and herbaria review of plant species in South Florida, and was one of the authors of the plant chapter for this study. She was also involved in a site selection study for a major southern electric utility company which involved the regional treatment of rare and endangered plants.

Ms. Krauss has been responsible for vegetation identification mapping and characterization for several DRI's including the environmental studies related to the Master Plan for Dade County marinas, plant identification for the South Shore Redevelopment project on Miami Beach, the DRI for the Florida Power Corporation Piedmont-Sorrento transmission corridor in central Florida, and the vegetation mapping and characterization for the American Bankers Insurance Group DRI. She was also responsible for plant identification for the EIA's for the Key West International and Marathon Airports in Monroe County, Florida and the "Hole-in-the-Donut" Study for G.A.C. Properties in Collier County, Florida.

While associated with Metcalf & Eddy, Ms. Krauss has researched an old field succession project for the National Park Service in the Everglades National Park and has participated in other park services projects including rare plant species study. She has also been a research assistant for Fairchild Tropical Garden and assisted in teaching field botany for a university and museum in Dade County, Florida.

Ms. Krauss had a graduate assistantship under Dr. Daniel Austin on a Department of the Interior grant to study endangered plant species in South Florida.

PROFESSIONAL AFFILIATION

Ecological Society of America
Florida Academy of Science
Florida Field Biologists
Fairchild Tropical Garden

STEPHEN P. LANGLEY

EDUCATION

B.S., Biology, Manhattan College, 1968
M.S., Biological Oceanography, University of Miami, 1974

EXPERIENCE

Mr. Langley has experience in biological oceanography, marine ecology, environmental impact assessment and toxicology. As a Project Biologist with Metcalf & Eddy, he has conducted a number of environmental studies throughout Florida.

His recent studies include several field surveys in Biscayne Bay to provide biological data for the preparation of Regional Impact Statements for Dade County marinas at Black Point, Homestead Bayfront Park, and Chapman Field; the development of Claughton Island; and the South Shore Redevelopment project on Miami Beach. He has been responsible for aquatic vegetation characterization at a number of sites in Biscayne Bay and the Florida Keys in support of marina construction permit applications. He recently completed an analysis of the phytoplankton communities of Florida Bay for the Everglades Protection Association and he was involved in vegetative community analysis for the Orange-Levee transmission corridor. He also participated in the benthic and planktonic community structures study for Florida Power Corporation at the site of a nuclear power plant at Crystal River, Florida in which his primary responsibilities were zooplankton identification and sediment analysis. He has extensive field and laboratory experience in water quality and turbidity monitoring in Biscayne Bay.

Mr. Langley was involved in the Crocodile Study in south Dade County involving radio-tracking and trapping of crocodiles at Florida Power and Light's Turkey Point site and recently conducted a literature survey on water quality in the Key Largo Coral Reef Marine Sanctuary for NOAA. He has been involved in the preparation of Development of Regional Impact Reports for Unit 86 of the G.A.C. Properties residential development in Cape Coral, Florida and the water quality monitoring program for the Cocoplum Development in Coral Gables, Florida.

Prior to joining Metcalf & Eddy, Mr. Langley was a research associate with a private research laboratory in southern Chile where he conducted studies on the benthic ecology and marsh vegetation of an estuary contaminated by the Metula oil spill and intertidal mussel populations in the eastern sector of the Straits of Magellan.

Mr. Langley's experience also includes marine photography and a position as Project Manager with the Ministry of Fisheries of Mauritius where he organized a mongoose bioassay of ciguatera fish poisoning in the commercial fisheries; and as a Medical Laboratory technician in the U.S. Army Medical Corps where he was responsible for the operation of a brigade dispensary laboratory and field unit and the chemistry and histology sections of a 250-bed hospital.

He received a NDEA Graduate Fellowship and has a number of publications on biological subjects.

PROFESSIONAL REGISTRATIONS

N.A.S.D.S. Diver Certification

STEVEN E. TRINE

EDUCATION

B.S. Biology, University of Miami, 1976.
Currently working towards M.S. Degree, Invertebrate Zoology, University of Miami

EXPERIENCE

Mr. Trine is experienced in biological field and laboratory work as a research technician involved in the collection of algal, water and invertebrate samples and environmental studies in Central and South Florida.

As a member of Metcalf & Eddy's Environmental staff, Mr. Trine has participated in a number of environmental studies. He has been involved in a study for Florida Power Corporation to determine the effect of thermal effluent from a nuclear power plant on benthic and planktonic organisms, including identification of polychaetes and minor invertebrate groups; interpretation of data; and general sorting of samples. He has performed literature search and analysis, map preparation and coding, as part of a site selection study for a major southern utility company. As a field biologist, Mr. Trine has participated in field observation and trapping in a habitat study of the American crocodile. He has field and laboratory experience in water quality and turbidity monitoring in Biscayne Bay.

Prior to joining Metcalf & Eddy, as research technician for Rio Palenque Research Corporation, Mr. Trine was responsible for collection of water and benthic samples, and processing of benthic samples for a major South Florida development. He has worked at the Rosenstiel School of Marine and Atmospheric Sciences, where he was responsible processing and care of algal cultures; collection and preparation of samples on cruises and monthly collecting trips; laboratory cleanliness and purchasing of supplies.

As part of his M.S. Degree, Mr. Trine is conducting an ecological field study to identify grazing in South Florida on the alga Batophora oerstedii.

PROFESSIONAL REGISTRATION

YMCA Basic Scuba Diving Certificate

EXPERIENCE

B.S., Colegio Champagnat, Havana, Cuba, 1952
Doctor of Natural Science (Biological and Geological), University of
Havana, Havana, Cuba, 1955
M.S., University of Miami

EXPERIENCE

As a Consultant for Metcalf & Eddy, Mr. Garcia-Gomez has been a member of the Florida Power Corporation Crystal River Community Structure Study Quality Control Team, responsible for taxonomic verification of mollusks and crustaceans.

Mr. Garcia-Gomez has been responsible for the laboratory processing of biological samples to determine species composition, abundance index, biomass, and caloric and nitrogen content, and to determine the stomach contents of fishes and macro-invertebrates.

He has also assisted in the field collection of biological samples by use of nets, dredges, grabs, etc., and has provided assistance in identification. He is skilled in the use of collecting gear and has extensive knowledge of field sorting techniques.

He has extensive knowledge of identification of the marine organisms in the bay and inshore regions of South Florida and a broad familiarity with the literature pertaining to the identification and systematics of marine invertebrates and flora. He is also skilled in laboratory techniques and in the use of light microscopes and the bomb calorimeter.

His professional positions have included Research Assistant with the University of Miami Rosenstiel School of Marine and Atmospheric Sciences; Food Technologist for the Atlanta Corporation; and Research Scientist with the Institute of Oceanography of the Academy of Science in Havana, Cuba.

He has participated in a number of projects, grants, and projects which include "Studies of the Effects of Thermal Pollution in Biscayne Bay and Card Sound, Florida", "Ecological Studies of Rookery Bay and Fakahatchee Bay, Florida", "Ecological Studies off the Coast of Marco Island, Florida" and "Determination of the Primary Food Sources Utilized by Benthic, Epibenthic, and Cryptic Fauna in a Coastal Lagoon in Southeast Florida".

He has published a number of articles and technical papers.

PROFESSIONAL AFFILIATIONS

College of Sugar Chemists (Cuba)
College of Doctors of Science & Philosophy and Letters (Cuba)
Cuban Association of Doctors of Science in Exile

EDUCATION

B.A., University of Massachusetts, 1965
Ph.D., Cornell University 1971

EXPERIENCE

Dr. Prince is Assistant Professor of Biology at the University of Miami, in a joint appointment in the Department of Biology, Coral Gables and Department of Biology and Living Resources, Rosenstiel School of Marine and Atmospheric Science. He is coordinator for the introductory course for biology majors, lecturer in botany, and director of the laboratories. This course involves over 500 students, 7 biology professors, and 6 graduate teaching assistants. Additionally he is responsible for lectures and laboratories for a senior/graduate level course in phycology and is participating lecturer in plant physiology and developmental biology.

Dr. Prince served as member of the Quality Control Review Committee for Metcalf & Eddy's benthic community structure study at Florida Power Corporation's Crystal River Plant. He was responsible for verifying taxonomic identification of marine algae by staff biologists and for identification of new algal specimens.

His previous experience includes work at Cornell University Marine Shoals Laboratory, where he was at various times, a member of the core faculty instructing 60 students in all aspects of the marine environment, and lecturer and coordinator of Advanced Field Phycology.

As Assistant Professor of Biology at the George Mason University, Fairfax, Virginia, Dr. Prince was responsible for lectures and laboratories in both a senior level course in plant physiology and a sophomore/junior level course in algae/fungi. In addition he was a laboratory instructor in the introductory course for biology majors.

Dr. Prince was formerly a Post-doctoral Investigator for two years under Dr. John H. Ryther at Woods Hole Oceanographic Institution, Woods Hole, Massachusetts, prior to which he was a marine consultant for a well-known research laboratory in Newport, Rhode Island from 1969-1971.

Dr. Prince has numerous publications. The most recent is:

Prince, J.S. 1977. The ecology of Sargassum pteropleuron in the waters off South Florida: Preliminary results, Journal of Phycology 13 (Supplement): 56.

EDUCATION

B.S., University of Miami, 1955
 M.S., University of Miami, 1959
 Ph.D., University of Miami, 1965

EXPERIENCE

As a Consultant for Metcalf & Eddy, Dr. Thomas has been a member of the Florida Power Corporation Crystal River Community Structure Study Quality Control Team, responsible for taxonomic verification of annelids, echinoderms and other phyla. Dr. Thomas also wrote the section on endangered and threatened marine invertebrates for a regional endangered species study conducted by Metcalf & Eddy.

Dr. Thomas has more than 20 years of experience in Zoology and Marine Sciences which includes academic and research positions. His special research interests are the systematics of the Ophiuroidea and the systematics and ecology of marine invertebrates. He is currently a Professor in the Rosensteil School of Marine and Atmosphere Sciences at the University of Miami.

Early in his career, Dr. Thomas was both a Graduate Assistant and a Research Aide at the University of Miami. He was a Graduate Assistant in the Department of Zoology and a Research Aide in the Marine Laboratory. He later served as Assistant Curator of Marine Invertebrates at the Institute of Marine Sciences.

His positions have also included Visiting Curator at the Museum of Comparative Zoology of Harvard and the Peabody Museum of Yale; Visiting Lecturer at Florida State University; Visiting Scientist for the Organization for Tropical Studies in San Jose, Costa Rica; and Visiting Lecturer for the Sediment-Organism interrelationship Course at the Bermuda Biological Laboratory.

Dr. Thomas has numerous publications, the most recent ones include:

"The Ophiacanthid genus Amphilimna (Ophimoidea, Echinodermata)." *Proc.Biol.Soc.Wash.*, 88 (14): 127-140, 1975.

"The Systematic Relationships of Ophioplocus, Ophioceras, and Ophioceres (Echinodermata, Ophimoidea)" *Bull.Mar.Sci.*, 5 (2), 1975.

"Coral Reefs, Mangroves and Dutch Gin.", *Sea Frontiers*, 20(5): 284-293, 1974.

"Biological Results of the University of Miami Deep-Sea Expeditions" *Bull.Mar.Sci.*, 23(3): 585-599, 1974.

PROFESSIONAL AFFILIATIONS

American Society of Limnology and Oceanography
 Marine Biological Association of the United Kingdom
 International Oceanographic Foundation
 South-East Estuarine Research Society

ENVIRONMENTAL AND
ECOLOGICAL
STUDIES

REPRESENTATIVE EXPERIENCE IN
BENTHIC STUDIES AND PROJECTS ASSOCIATED WITH BISCAYNE BAY

KEY WEST INTERNATIONAL AIRPORT ENVIRONMENTAL IMPACT ASSESSMENT REPORT,
KEY WEST, FLORIDA

Metcalf & Eddy is providing the services required by Monroe County for Environmental Impact Assessment Reports for proposed airport improvements at Key West International Airport. The professional services include inventories of vegetation, wildlife, rare and endangered species, analysis of air quality, noise, socioeconomic impacts, water quality and the feasibility of alternatives. Benthic and seagrass surveys were conducted in on-site salt ponds. Laboratory services included taxonomic identification of benthos.

MARATHON AIRPORT ENVIRONMENTAL IMPACT ASSESSMENT REPORT, MARATHON, FLORIDA

Metcalf & Eddy is providing services to Monroe County for Environmental Impact Assessment Reports for proposed improvements at Marathon Airport. The services include inventories of vegetation, wildlife, rare and endangered species, analysis of air quality, noise, socioeconomic impacts, water quality and the feasibility of alternatives. Benthic and seagrass surveys were conducted in on-site tidal lagoons. Laboratory services included taxonomic identification of benthos.

NATIONAL WEATHER SERVICE BUILDING, KEY WEST, FLORIDA

Metcalf & Eddy prepared an environmental assessment report for the proposed facility. Professional services included inventories of vegetation, wildlife, rare and endangered species, as well as water quality analyses. Benthic and seagrass surveys were conducted in on-site salt ponds. Laboratory services included taxonomic identification of benthos.

ENVIRONMENTAL ASSESSMENT FOR COCOPLUM DEVELOPMENT, CORAL GABLES, FLORIDA

An environmental assessment was made of the Cocoplum residential development in Coral Gables, Florida. This site was among the last large undeveloped tracts of land fronting on Biscayne Bay in Dade County. Many types of problems were encountered and effectively solved during this project; most related to waterways, preservation of the remaining red mangrove tree growth along the bayfront, and disposal of stormwater runoff without discharge into adjacent waterways.

COMPREHENSIVE BASELINE FIELD INVESTIGATION OF PROPOSED FLORIDA POWER & LIGHT
NUCLEAR POWER PLANT SITE, DADE COUNTY, FLORIDA

Metcalf & Eddy has completed a comprehensive baseline field investigation to assess the impact on terrestrial and aquatic ecosystems resulting from the construction of a proposed nuclear power plant. All aspects of terrestrial and aquatic biology were inventoried. Impact assessments of construction and operation, including anticipated impact from mechanical draft cooling towers, were performed.

Initial work involved preparation of a detailed work program report and execution of a monthly monitoring program for the 2500-acre study area. The information obtained from over twelve months of field and laboratory investigations was used to prepare an environmental report to the Nuclear Regulatory Commission.

Scope of services included bimonthly Ponar dredge samples, fish samples and macrophyte inventories in southern Biscayne Bay. Taxonomic identification and analysis were performed in the laboratory. Mollusks and crustaceans were identified to species.

PLANNING AND ENVIRONMENTAL STUDIES FOR DADE COUNTY MARINAS & RELATED
FACILITIES, DADE COUNTY, FLORIDA

The firm has recently completed a system and hurricane plan study for all recreational boating facilities in Dade County. This project included forecasting demand, identifying alternatives of development, analyzing these alternatives, recommending a development plan and projected facility requirements. In addition, detailed site master planning has taken place for Homestead Bayfront Park, Black Point Park and Chapman Field. This master planning calls for the dredging of three major marinas, with new roads, parking, recreation and eating facilities. Development of Regional Impact studies are being prepared by Metcalf & Eddy with emphasis on sensitive environmental considerations. Terrestrial and marine benthic habitats, have been studied. Biological communities were sampled for community composition and abundance.

Of prime importance are the sensitive ecological aspects of the proposed sites. Thus, the integration of natural and man-made facilities in a compatible manner is the number one consideration in the master planning process. Also included are boundary surveys, topographical surveys, soundings adjacent to the three marina sites and preparing Dredge and Fill Permit applications.

DEVELOPMENT OF REGIONAL IMPACT, SOUTH SHORE REDEVELOPMENT PROJECT,
MIAMI BEACH, FLORIDA

Metcalf & Eddy was the prime contractor to the Miami Beach Redevelopment Agency for the preparation of a Development of Regional Impact Report on the proposed 225-acre South Shore Redevelopment Project, which included inventories of vegetation and wildlife in the project area. The firm also provided testimony at all public hearings before the South Florida Regional Planning Council, City of Miami Beach, and Dade County. Metcalf & Eddy also prepared the federal Environmental Impact Statement for this project.

A unique feature of this project is an extensive waterway system which will be dredged from the presently urbanized area. This canal system was designed and is being guided through the permitting process by Metcalf & Eddy. The firm performed a hydrographic study for the canal system, and provided compliance monitoring for the marina during construction.

Metcalf & Eddy also conducted a Complex Air Source Study for this project. Services included field monitoring of ambient air quality, mathematical modeling to predict future air quality resulting from construction of the South Shore Project, and preparation of the permit application and exhibits. Additional services involved attendance at public hearings.

DEVELOPMENT OF REGIONAL IMPACT FOR CLAUGHTON ISLAND, DADE COUNTY, FLORIDA

Metcalf & Eddy was part of a team selected to prepare a Development of Regional Impact Study for the development of Claughton Island located in Biscayne Bay near the mouth of the Miami River. This 44-acre island is connected to the mainland via a four-lane divided bridge. Metcalf & Eddy responsibilities included the overall coordination of the project, presentations at public hearings, and the preparation of those sections of the DRI related to impacts on the environmental and public facilities of the region.

Additional work has included master planning, permitting, design and construction of a marina to serve approximately 90 boats, and a complex air source monitoring and assessment study.

DEVELOPMENT OF REGIONAL IMPACT FOR FISHER ISLAND, DADE COUNTY, FLORIDA

The firm was engaged to prepare a Development of Regional Impact Report to the South Florida Regional Planning Council and to prepare initial site feasibility studies to develop Fisher Island, a 225-acre island in Biscayne Bay. A particular problem encountered in the planning involved the selection of feasible modes of accessibility connecting the island with the mainland. It was determined that the most economically feasible and least environmentally disruptive solution to this problem was the use of hovermarine watercraft.

FLORIDA POWER CORPORATION ENVIRONMENTAL TECHNICAL SPECIFICATION STUDIES,
CITRUS COUNTY, FLORIDA

Metcalf & Eddy conducted a four year benthic and planktonic community structure study as a part of the environmental technical specification studies at FPC's Crystal River Nuclear Power Plant. Five types of benthic samples from an area impacted by the thermal effluent were compared with control samples out of range of the thermal plume.

These included benthic core samples, venturi suction samples, seagrass monitoring, algal and seagrass harvesting, and oyster reef samples. Species identifications are carried out along with biomass and diversities calculated for all crustaceans, mollusks, polychaetes, echinoderms, algae and vascular plants. Plume and control samples of zooplankton were also taken on a seasonal (quarterly) basis. Taxonomic composition, abundance and total biomass were determined on a semiannual basis. The information obtained was compared with data from a two and one-half year baseline study to assess the impact on the environment by the 800 MW nuclear power generating unit.

COMPREHENSIVE CANAL SYSTEM ANALYSIS, PUNTA GORDA ISLES, FLORIDA

Metcalf & Eddy conducted a comprehensive water quality survey to assess the physical, chemical and biological aspects of the Punta Gorda Isles canal system, its environs, and Charlotte Harbor. This work involved a combination of field measurements and mathematical computer modeling. A wide variety of chemical and biological parameters were measured and analysed for canal and harbor waters. The dynamic behavior of the canals was simulated through application of hydraulic and hydrodynamic models. The coefficient rates for the models were determined in the field through dye studies and other established methods. With the measured data, the models were verified and subsequently used to ascertain the effects of pollutants on the canal and harbor water quality.

WATER QUALITY ANALYSIS, FLORIDA BAY

In October 1980, Metcalf & Eddy conducted a survey of water chemistry and planktonic community structure in Florida Bay for the Everglades Protection Association. The results revealed that several areas of the Bay where fishing has noticeably deteriorated during the past several years exhibit unique assemblages of planktonic organisms, low abundance, and elevated salinity.

Other chemical parameters showed no significant differences. The results support the hypothesis that restricted circulation in central Florida Bay may be contributing to the decline in the local sport fishery.

BIOLOGICAL AND CHEMICAL STUDIES, TAMPA, FLORIDA

Metcalf & Eddy recently designed a series of experiments for a 20 Study of the effects of stormwater runoff on the biota of the Hillsborough River and Tampa Reservoir. The experimental design consists of three components: a laboratory bioassay, a field bioassay and a benthic survey. Careful selection of stations will allow statistical control of receiving water salinity, adjacent land use and discharge rates. The field studies will reveal effects of proximity to outfalls and ambient pollution levels in the receiving waters, while laboratory bioassays will focus on effects due to the chemical composition of the runoff itself.

HYDROGRAPHIC AND BIOLOGICAL STUDY, MIAMI BEACH, FLORIDA

Metcalf & Eddy conducted an evaluation of an existing deteriorated marina for the Miami Beach Yacht Corporation. The initial work involved a biological and hydrographic survey to assess existing conditions. Additional work involved the preparation of coastal construction permits from the City of Miami Beach, the Florida Department of Environmental Regulation and the U.S. Army Corps of Engineers. Metcalf & Eddy also provided assistance with public hearings before these agencies.

BRICKELL KEY ON CLAUGHTON ISLAND, DADE COUNTY, FLORIDA

Metcalf & Eddy prepared the conceptual master plan, prepared the applications for coastal construction permits, and prepared the applications required to obtain agency approval for the Brickell Key Marina. When completed it will have 95 boat slips. Additional services included a complex air source monitoring and assessment study, attendance at public hearings and the preparation of construction documents for the approved facility following the issuance of the coastal construction permits. Seagrass surveys and benthic analysis were performed on this site.

BRICKELL PLACE MARINA, DADE COUNTY, FLORIDA

Metcalf & Eddy prepared the conceptual master plan, obtained coastal construction permits, and prepared the construction documents for the Phase II expansion of the Brickell Place Marina by the American Design and Development Corporation. This marina is located on Biscayne Bay in Miami at Brickell Place and will have a total of 99 boat slips when completed. The permitting services included the preparation of applications to the City of Miami, Dade County, the Florida Department of Environmental Regulation and the U.S. Army Corps of Engineers. Additional services included agency coordination during review, attendance at public hearings, and benthic and seagrass surveys and taxonomic identification.

FPC COMMUNITY STRUCTURE STUDY

Laboratory and Data Transfer Procedures Manual

MEMORANDUM

TO: All FPC Personnel
FROM: Jon Gleman
PROJ: FPC Benthic Study NO. 9425
SUBJ: Review of FPC Procedures Manual

Please review the following procedures manual and indicate that you understand the information contained within by initialing and dating this sheet next to your name.

Thanks.

Margaret Ahearn *MAA 8/21/80*
Barbara Bohnsack *BAR 8/22/80*
Beth Botzum
Elizabeth Frank *EMF 21 AUGUST*
Ron Gaby *R 22 AUG 80*
Neil Gillies *W.N.G. 22 AUG 80*
Jon Gleman *J.G. 22 AUGUST 80*
Bill Hieber *B.H. 8/22/80*
Steve Langley *SL 8/22/80*
Mark McMahon *MM 8/21/80*
Beth Smillie *EMS 8/22/80*
Steve Trine *ST 8/22/80*
Nancy Urban *NU 8/21/80*
Andrew Wohl *A.W. 8/21/80*
Pam Krauss *P.K.*

TABLE OF CONTENTS

	<u>Page No.</u>
<u>Laboratory Procedures</u>	1
General Procedures	1
Bottom Cores	2
Venturi Samples	3
Oyster Reefs	4
Benthic Macrophyte Samples	6
Biomass Determinations for Bottom Core, Venturi, Oyster Reef & Benthic Macrophyte Samples	8
A. <u>Wet weights:</u> <u>C. virginica</u> adults and spats; benthic macrophytes	9
B. <u>Wet weights:</u> all other groups	10
C. <u>Dry Weights</u>	11
Zooplankton Samples	12
Biomass Determination for Zooplankton Samples	13
A. Wet Weights	13
B. Dry Weights	14
<u>Data Transfer Procedures</u>	15
Venturis and Bottom Cores	16
Oyster Reefs	17
Seagrass	18
Macroalgae	19
Seagrass Radials	20
Zooplankton	21
Appendix 1. Species Code for Computer Program	
Appendix 2. Sample Data Sheets for each sample type	
Appendix 3. Aliquot Correction Factors	
Appendix 4. Quality Assurance/Quality Control Memorandum	
Appendix 5. Lab work memorandum	

LABORATORY PROCEDURES

The following is a summary of laboratory procedures for each type of sample taken for the Florida Power Corporation Benthic Community Structure Study at Crystal River, Florida. Instructions for sample preparation, sorting, identification and biomass determinations are given for Bottom Cores, Venturids, Oyster Reefs, Benthic Macrophytes and Zooplankton.

General Procedures

1. When samples arrive in the lab, a checklist of all sample types and sample numbers is prepared. These samples are checked and the list signed when sorted and ready for taxonomic identification.
2. All new taxa are put aside and recorded on the voucher species list so that appropriate members of the Quality Control Review Committee (QCRC) can verify the identifications. One station from bottom cores, venturids, macroalgae and seagrasses is also put aside. All organisms in the sample are to be verified by the appropriate QCRC member. QCRC members acknowledge these verifications by signing the Quality Assurance/Quality Control (QA/QC) log.
3. A lab log is kept, recording what activities are being performed on a daily basis.

Bottom Core Samples

There are five replicate samples taken at each benthic sampling station in the field. Replicate samples are analyzed separately in the lab.

1. Wash each bottom core sample thoroughly in tap water through 2mm and 0.5mm sieves coupled together (2mm sieve on top) until most of the less than 0.5mm silt has been washed out. Washing results in "coarse" and "fine" fractions.
2. Sort each fraction under a dissecting microscope into six major categories: worms (including annelids, nemerteans, sipunculids and nematodes), gastropods, bivalves, amphineurids, crustaceans, and others. Place each of these groups from both fractions in separate labeled jars containing 40% isopropyl alcohol.
3. Count and identify polychaetes, mollusks and crustaceans to species, if possible; otherwise, identify to family or other major classification (see Table 1). Identify chordates and worms other than polychaetes to class if possible; identify all other groups to phylum. ID's should be documented on blue Bottom Core raw data sheets; include sample number,

Table 1. Level of Taxonomic Identification and Biomass Determination.

<u>TAXON</u>	<u>PHYLUM</u>	<u>CLASS</u>	<u>ORDER</u>	<u>FAMILY</u>	<u>GENUS</u>	<u>SPECIES</u>
				X	X	X
Polychaeta	O	X				
Oligochaeta	O	X				
Archannelida	O	O		X	X	X
Bivalve		O		X	X	X
Gastropoda			OX			
Nudibranchia		O		X	X	X
Amphineura		O	X	X		
Cumacea		O	X	X	X	X
Tanaidacea		O		X	X	
Cirripedia		O		X		
Isopoda		OX				
Ostracoda		O		X		
Amphipoda		O	X			
Sysidacea		O		X		X
Decapoda		OX				
Cephalcarida		OX				
Insecta		OX				
Pycnogonida						
Porifera	OX	X				
Coelenterata	O					
Platyhelminthes	OX					
Aschelminthes	OX					
Nemertinea	OX					
Sipuncula	OX					
Chaetognatha	O					
Echinodermata	OX					
Ascidacea		OX				
Osteichthyes						

NOTE: Zooplankton biomass is the combined weight of plankton in sample. Identifications are variable insofar as grouping are concerned - see zooplankton data sheet.

X = taxonomic identification
O = biomass determination

Seagrass and Algae

	<u>DIVISION</u>	<u>CLASS</u>	<u>ORDER</u>	<u>FAMILY</u>	<u>GENUS</u>	<u>SPECIES</u>
Rhodophyta	0				X	
Chlorophyta	0				X	
Phaeophyta	0				X	
Spermatophyta						OX

date of collection and analysis, and signature of analyst. Note major classification, specific classification, and number of individuals. Place identified nemerteans, nematodes, and annelids (if any) in separate labeled jars. All crustaceans are placed in one labeled jar. For other groups: place by phylum into separate jars except for chordates and mollusks, which are separated by class. All jars should contain 40% isopropyl alcohol.

Venturi Samples

One Venturi sample is taken at each benthic sampling station in the field.

1. Wash each Venturi sample thoroughly in tap water through a 3.2mm sieve until most of the finer material has been washed out.
2. Place each washed sample in a large glass tray and sort into six major categories: worms (including annelids, nemerteans, nematodes), gastropods, bivalves, amphineurids, crustaceans, and others. Any organism that would obviously go through a 3.2mm sieve is not included in the analysis. Place each sorted group in labeled jars containing 40% isopropyl alcohol.

3. Count and identify polychaetes, mollusks, and crustaceans to species, if possible; otherwise, identify to family or other major classification. Identify all other groups to class or phylum. ID's should be documented on blue Venturi raw data sheets; include sample number, date of collection and analysis, and signature of analyst. Note major classification, specific classification, and number of individuals. Place identified nemerteans, nematodes, oligochaetes and polychaetes (if any) in separate labeled jars. All crustaceans are included in one labeled jar. For other groups: place by phylum into separate labeled jars except for chordates and mollusks, which are separated by class. All jars should contain 40% isopropyl alcohol.

Oyster Reefs

There are two samples taken at each Oyster Reef station in the field. These are analyzed separately.

1. Wash each Oyster Reef sample thoroughly in tap water through a 2mm sieve until most of the finer material has been washed out.

2. Place each washed sample in a large glass tray. Open and remove meat from each adult Crassostrea virginica ("adults" are distinguished from "spats" by shell lengths greater than 2 cm). Place meat from adult C. virginica in one labeled jar and measure right valve (top shell) to the nearest millimeter. Record on the back of blue Oyster Reef raw data sheets. Include also the sample number, date of collection and analysis, signature of analyst, major and specific classification of all oysters found and number of individuals. Place meat and right valve of C. virginica spats in one labeled jar. Include right valve and meat from O. equestris in a labeled jar with all bivalves other than C. virginica. No shell length measurements are taken of oyster spats, but note numbers of individuals on blue raw data sheet. Sort other organisms found into four major categories: amphineurids, bivalves other than C. virginica, gastropods and crustaceans. Barnacles and Hyale (Amphipoda) are counted during sorting. Presence and relative abundance of insects are recorded. Place all sorted groups in jars containing 40% isopropyl alcohol.
3. Count and identify amphineurids, bivalves, gastropods, and crustaceans to species, if possible; otherwise, identify to family or other major classification. Document ID's on the oyster reef raw data sheets;

include signatures of all analysts involved. Place identified amphineurids, bivalves, gastropods and crustaceans in separate jars. All jars should contain 40% isopropyl alcohol.

Benthic Macrophyte Samples

Three replicate samples are taken at each Benthic Plants sampling station in the field. Replicate samples are analyzed separately in the lab.

1. Wash each Benthic Macrophyte sample thoroughly in tap water through a 2mm sieve until most of the finer material has been washed out. Save the formalin solution.
2. Sort each sample in a large glass tray into seagrass and macroalgae fractions. Sort and separate macroalgae by division (Chlorophyta, Rhodophyta, Phaeophyta).
3. Identify seagrasses to species. In each sample, 50 leaves (if available) of each seagrass species are measured to the nearest millimeter from the stipe to the end of the blade. Document ID's and blade measurements on blue Seagrass raw data sheets; include sample number, date of collection and analysis, and signature of analyst. If no seagrasses are found,

indicate on a Seagrass raw data sheet the sample number and "No Seagrass Present." Place identified grasses in separate labelled jars by species. Jars should contain the original formalin solution.

4. Identify macroalgae to genus. Document ID's on blue Macroalgae raw data sheets; include sample number, date of collection and analysis, and signature of analyst. If no macroalgae is found, indicate on a Macroalgae raw data sheet the sample number and "No Macroalgae present." Place identified macroalgae in separate labelled jars by divisions (Rhodophyta, Chlorophyta, Phaeophyta). Jars should contain the original formalin solution.

Biomass Determinations For Bottom Core, Venturi, Oyster Reef
And Benthic Macrophyte Samples

Wet weights and dry weights are recorded for Bottom Core, Venturi, Oyster Reef, Seagrass and Macroalgae samples. After identification, organisms are divided for weighing as follows:

Venturis and Bottom Cores

Worms: polychaetes, oligochaetes, nemertean,
nematodes and sipunculids
Mollusks: bivalves, gastropods and amphineurids
Crustaceans: all weighed together
Other groups: divided by phylum except for chordates,
which are divided by class

Benthic Macrophytes

Seagrass: divided by species
Macroalgae: Rhodophyta, Chlorophyta, Phaeophyta

Oyster Reefs

Mollusks: bivalves (other than Crassostrea virginica),
gastropods, amphineurids, adult Crassostrea
virginica meat, and Crassostrea virginica
spats (meat plus top shell)
Crustaceans and insects are not weighed.

Wet weights for oysters and spats are usually done on the triple beam balance since the biomass is generally large. Dry weights are done on the Mettler. The Mettler is used for wet and dry weight biomass determinations for all other oyster reef groups.

A. Wet Weights: C. virginica adults and spats; Benthic Macrophytes

Materials needed include triple beam balance, sheets of newspaper, forceps, porcelain evaporating dishes and blue raw data sheets. Pour out excess preservative from a sample jar, then pour remaining preservative and plants or oyster meat out onto sheets of newspaper; pat dry. Obtain a tare weight of a porcelain evaporating dish. Transfer sample from newspaper sheets to dish and obtain sample plus container weight. Write these values on the back of the appropriate blue raw data sheet and calculate wet weight to two decimal places. This number then is transferred to the front of the data sheet. Label accordingly (e.g: 2CB Oysters; 1DA Phaeophyta) and set aside. Adult oyster meat samples are then oven-dried at 90°C for 48 hours. Spats and Benthic Macrophytes are oven-dried at 70°C for 24 hours. Collect all blue raw data sheets for samples placed in the oven and note on an attached paper tag the date and time samples went in the oven and the date and time they are to be removed. Place these data sheets in the file drawer labeled "In Oven."

B. Wet Weights: All other groups

The Mettler H10 balance is used for all wet and dry weight biomass determinations for Bottom Core, Venturi, and Oyster Reef Samples other than C. virginica adults and spats, and large amounts of Benthic Plants. Just prior to using the balance, make sure it is zeroed. Materials needed include paper towels, forceps, a strainer, aluminum weigh-boats, and blue raw data sheets. Write the sample type and number (e.g: 4C Venturi Mollusks; 2DA Core Crustaceans) on a paper label. Obtain a tare weight. Pour the sample and alcohol into the strainer; empty the sample from the screen onto paper towels. Spread sample out and pat dry. Place sample on aluminum weigh-boat and obtain sample plus container weight. This must be done as quickly as possible after patting dry to remove excess alcohol, as the sample continues to lose weight rapidly. Write these values on the back of the appropriate blue raw data sheet and calculate wet weight to three decimal places. Transfer this value to front of data sheet. Indicate $< 1 \times 10^{-3}$ g when applicable. When a group of samples has been wet-weighed, they are placed in the oven and dried at 70°C for 24 hours. Collect all blue raw data sheets from samples placed in the oven and note on an attached paper tag the date and time samples went in the oven and the date and time they are to be removed. Place these data sheets in the file drawer folder labeled "In Oven."

C. Dry Weights

After a group of samples has been oven-dried for 24 hours, remove and transfer rapidly to the dessicator located adjacent to the Mettler balance. It is important that the dried samples absorb as little moisture as possible prior to weighing. Accordingly, keep the door of the dessicator closed except when removing a sample and make sure the dessicant in the bottom tray is still active (bright blue in color). Place a small beaker of indicator dessicant inside the Mettler balance at least 15 minutes before weighing begins and keep the doors closed between weighings. Return the beaker of dessicant to the 100° oven when the Mettler is not in use. No dry weighing is to be done if the air conditioner has not been operating on a continuous basis.

Obtain a container plus sample weight and indicate this value on the back of the appropriate blue raw data sheet. Calculate dry weight to four decimal places; indicate $< 1 \times 10^{-4}$ g if necessary. Transfer this value to front of data sheet. Dispose of all dry-weighed samples and their oven-dried containers.

Zooplankton Samples

Two replicate plankton tows are taken at the surface and at mid-depth at each station per day. Samples are taken day and night for two consecutive days for a total of 16 samples at each station. Replicates are analyzed separately.

1. Prepare aliquots of zooplankton samples using the Langford Plankton Sub-sampler. Aliquot size ranges from $1/2$ to $1/512$. First, a $1/2$ aliquot is taken and saved for biomass determination. Second, the other $1/2$ aliquot is subsampled further as necessary, depending upon on the amount of phytoplankton and relative density of zooplankton organisms. Mix the sample thoroughly. Pour sample into Plankton Sub-sampler (make sure plug is inserted in bottom). Insert center core of subsampler part way. Swirl sample again. While contents are swirling, push center core to bottom of sub-sampler with the desired segment positioned over the drain hole. Position sub-sampler over a collecting dish and remove drain plug; allow subsample to drain out. Rinse down emptied segment. Reinsert plug. Pour balance of sample from sub-sampler back into original jar and save. Repeat procedure with sub-sample as many times as necessary in order to achieve desired aliquot size.

2. Count and identify zooplankton under a dissecting microscope. Record IDs on blue Zooplankton raw data sheets; include sample number, date of collection and analysis, and signature of analyst. Note major classification, specific classification, and number of individuals. Pour identified sub-sample back into jar containing the remainder of the original 1/2 aliquot from which the ID subsample was taken.

Biomass Determination for Zooplankton Samples

A. Wet Weights

Use 1/2 aliquot of sample previously set aside for biomass determination. If necessary, this may be subdivided again before filtration and weighing procedures. Cover the Mettler tray with aluminum foil. Tare a standard size millipore filter (47mm dia. Metrical GA-1, pore size 5u), which has been in the dessicator overnight, on the Mettler H10 balance. Record this tare weight on back of blue data sheet. Place filter in the Buchner funnel, add 50ml of distilled water and follow with full suction until excess water is removed. Wait 5 seconds, bleed system, then remove filter. Tare wet filter, record weight on back of blue data sheet, and replace in funnel. Filter aliquot of sample. Shut down suction after excess water is removed, bleed system, flood with 50ml distilled water, follow with full suction until excess water is removed, and bleed system.

Flood with 50ml distilled water and apply suction until excess water is removed again. Wait five seconds, bleed system, remove filter, and immediately obtain wet weight of sample plus filter on the Mettler. Calculate wet weight and record on front of appropriate blue raw data sheet. Place each filter in the oven on a larger labeled filter paper; zooplankton samples are then oven-dried at 60°C for 24 hours.

B. Dry Weights

After a group of samples has been oven-dried for 24 hours, remove and transfer rapidly to the dessicator. It is important that the dried samples absorb as little moisture as possible prior to weighing. Accordingly, keep the door of the dessicator closed except when removing a sample and make sure the dessicant in the bottom tray is still active (bright blue in color). Place a small beaker of indicator dessicant inside the Mettler balance at least 15 minutes before weighing begins and keep the door closed between weighings. Return the beaker of dessicant to the 100° oven when the Mettler is not in use. No dry weighing is to be done if the air conditioner has not been operating on a continuous basis.

Remove oven-dried sample and filter paper from dessicator; obtain sample weight. Calculate dry weight to four decimal places and record on front of appropriate blue raw data sheet. Dispose of all oven-dried samples.

DATA TRANSFER PROCEDURES

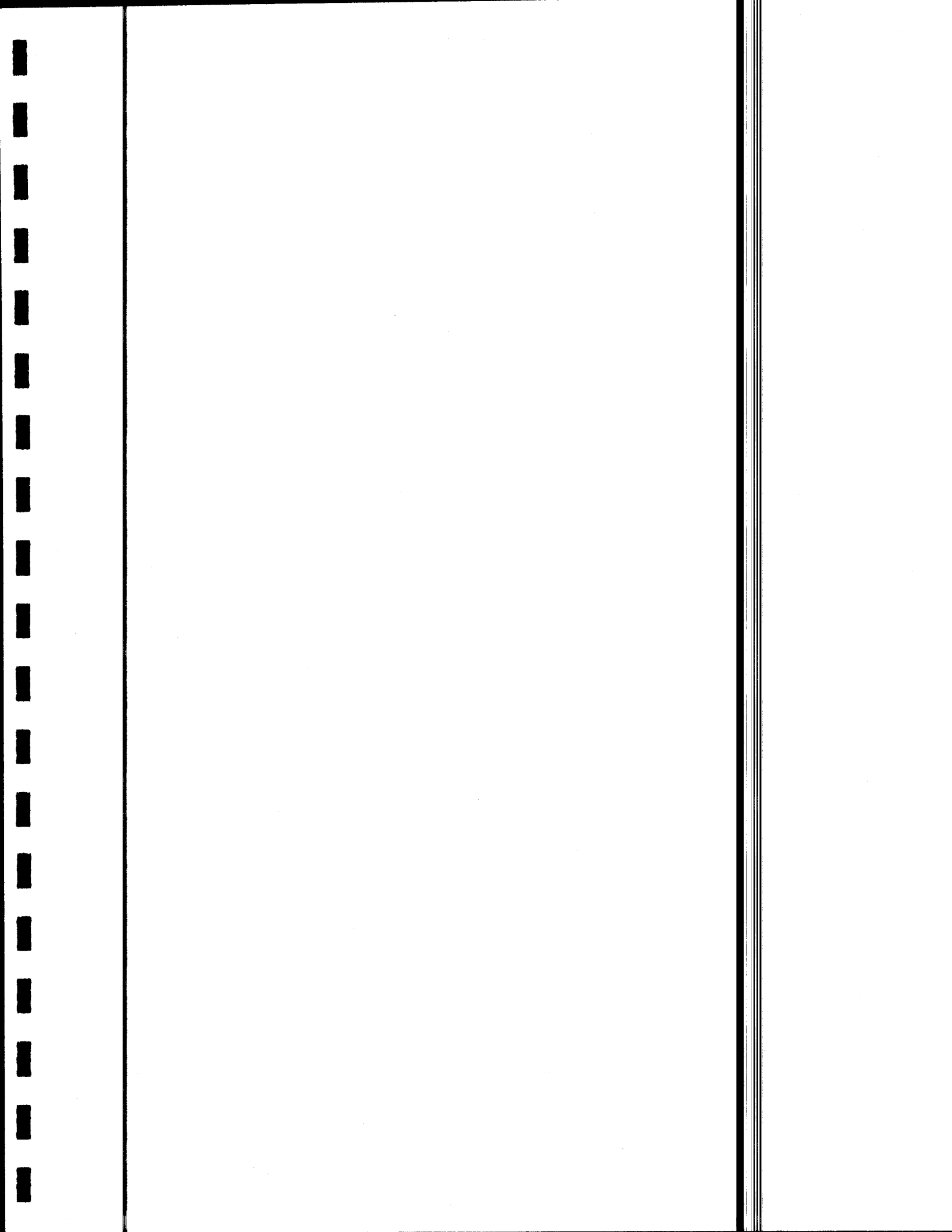
The following is a summary of data transfer procedures for each type of sample analyzed in the laboratory for the Florida Power Corporation Benthic Community Structure Study at Crystal River, Florida. Sample data sheets and instructions for calculations and data transfer are included for Venturis, Bottom Cores, Oyster Reefs, Seagrasses, Macroalgae, Radials, and Zooplankton. All blue data sheets should be checked for completeness and correct calculations. The checker should then initial the sheet in the lower lefthand corner. Laboratory sample data are transferred from blue raw data sheets to white final data sheets, with the exception of Radials (data transferred directly from field notebook). This must be done thoroughly and accurately. All new species, once verified by the Quality Control Review Committee, are written in with the correct species code (see Appendix 1) on the appropriate final data sheet. A list is maintained of all new species and their computer codes.

Data transfer is not complete until all analysts' signatures are obtained and a final data check completed by someone other than the person who transferred the data. Final data sheets are then assumed to be complete if the checker's initials are included in the lower left corner of every sheet.

Three photocopies are made of every data sheet. One complete copy of final data sheets is sent to Florida Power Corporation. A second copy of the final data sheets is placed in the Technical Manager's file and the third is maintained in the Connell Laboratory. The raw data sheets and original final data sheets are filed in the project file. All field log entries should be reviewed immediately following each quarterly field trip and checked for completeness and correct calculations. The checker should then initial the page in the lower lefthand corner.

Venturis and Bottom Cores

1. From the field book, transfer the date and time of sample collection, D.O., temperature, salinity and cloud cover to page 1 of the appropriate final data sheets. Fill in the quarter, station number and collector (see sample data sheets, Appendix 2). Use carets in place of decimal points.
2. From the blue raw data sheet, transfer the number of individuals of each species found to the spaces provided on the final data sheet. Transfer wet weights (to three places) and dry weights (to four places) for each group present.
3. Write analysts' initials on lines provided for each group. The analyst(s) must then sign his or her full name. For final data check, make sure data was



4. Write analysts' initials on the lines provided. The analyst(s) must then sign his or her full name. For final data check, make sure data was transferred correctly from blue raw data sheets to final sheets. This must be done by someone other than the person who transferred the data. Following final data check, the lower left corner of every data sheet must be initialed by the checker.

Seagrass

1. From the field book, transfer the date of sample collection to final Seagrass data sheets. Fill in the quarter, station number, and collector (see sample data sheet, Appendix 2).
2. From the blue raw data sheet, transfer wet weights (to three places) and dry weights (to four places) for all species. Indicate the number of seagrass blades measured for each species.
3. Calculate mean blade length standard deviation, and standard error for each species. Use a calculator with print-out capacity. Save all tapes. Record mean length and standard error in the spaces provided on the final Seagrass data sheets; record standard deviation under "Remarks" on the blue raw data sheets.

4. Write analyst's initials on the line provided. The analyst(s) must then sign his or her full name. For final data check, make sure data was transferred correctly from blue raw data sheets to final sheets. This must be done by someone other than the person who transferred the data. Following final data check, the lower left corner of every data sheet must be initialed by the checker.

Macroalgae

1. From the field book, transfer the date of sample collection to final Macroalgae data sheets. Fill in the quarter, station number and collector (see sample data sheet Appendix 2).
2. Indicate algae present on final data sheet with an "X" in the appropriate spaces. Transfer wet weights (to three places if weighed on Mettler, to two places if weighed on triple beam balance) and dry weights (to four places) from blue raw data sheets for each division.
3. Write analyst's initials on the line provided. The analyst(s) must then sign his or her full name. For final data check, make sure data was transferred

correctly from the blue raw data sheets to final sheets. This must be done by someone other than the person who transferred the data. Following final data check, the lower left corner of every data sheet must be initialed by the checker.

Seagrass Radials

1. From the field book, transfer the date the radials were done to Radial final data sheets. Fill in the quarter, station number, and collector (see sample data sheet, Appendix 2).
2. All Radial data are transferred from the field book directly to Radial final data sheets. All five replicates for each station are included on one sheet. Indicate for each replicate the percent cover and condition (good or poor) of each seagrass species found. For example, eighty percent Halodule, good growth, is entered as "080G" on the line corresponding to Halodule for the appropriate replicate. Indicate bottom type and the presence of any macroalgae by genus under "Remarks"; specifying replicate is not necessary.

3. No analyst signature is required. Data are checked against field logs for completeness; data sheets are then initialed by the checker in the lower left corner.

Zooplankton

1. Transfer from the field book the date and time the plankton tow was taken, D.O., temperature, salinity, cloud cover and the flowmeter readings ("net" = inside net; "control" = outside net) to zooplankton final data sheets (see sample data sheets). Use carets instead of decimal points. From the blue zooplankton raw data sheet, transfer the aliquot size and the number of individuals per aliquot of each taxa (see sample sheets, Appendix 2). Fill in the quarter, station number and collector.
2. Calculate the factor to convert number of organisms per aliquot to number of organisms per M³ by the following formula:

$$\text{conversion factor} = \frac{(\text{inverse of aliquot})(\text{aliquot correction factor})}{(0.00527)(\text{flowmeter reading})}$$

where: (1) the aliquot correction factors (listed in Appendix 3) are derived from calibration of the Langford Plankton Sub-sampler used exclusively in this project

(2) 0.00527 is a constant used to determine volume filtered in cubic meters when the flowmeter (General Oceanics Digital Flowmeter Model 2030) is positioned in the mouth of a half-meter-diameter plankton net;

and (3) the flowmeter reading is the difference in flowmeter counts from the beginning to the end of a plankton tow taken from the flowmeter positioned inside the net mouth

EXAMPLE

flowmeter reading (inside net) = 1761

aliquot = 1/128

No. of Acartia tonsa per aliquot = 110

conversion factor: $\frac{(128)(1.184)}{(.00527)(1761)} = 16.3302$

number per m³ = (number per aliquot) (conversion factor)
= 1796

3. Calculate relative % clogging

Relative % clogging = $\frac{(\text{difference in flowmeter readings})}{\text{outside net flowmeter reading}}$ (10)

where: the difference in flowmeter readings is the difference in total counts between the

inside flowmeter (flowmeter positioned in mouth of plankton net) and the outside flowmeter (flowmeter attached to ring without net); these two flowmeters are streamed simultaneously (Note: if outside net flowmeter reading inside net flowmeter reading, assume difference = 0)

4. Calculate total plankton wet and dry weights:

$$\text{total weight} = (\text{weight of aliquot}) (\text{inverse of aliquot}) (\text{aliquot correction factor})$$

EXAMPLE

$$\text{net weight of aliquot} = 2.461 \quad \text{aliquot} = 1/4$$

$$\text{total weight} = (2.461) (4) (1.075) = 11.356$$

5. Calculate dry weight per M^3 :

$$\text{dry weight per } M^3 = \frac{\text{total dry weight}}{(0.00527) (\text{flowmeter reading})}$$

EXAMPLE

$$\text{total dry weight} = 0.8954$$

$$\text{flowmeter reading (inside net)} = 1761$$

$$\text{dry weight per } M^3 = \frac{0.8954}{(0.00527) (1761)} = 0.0892$$

6. Record flowmeter readings (check arithmetic in field log), conversion factor, aliquot size, total wet and dry weights, dry weight per M^3 , and % clogging in

the spaces provided on the final zooplankton data sheets. Calculate wet weight to three decimal places and dry weights and conversion factors to four decimal places. Record number per M^3 to the nearest whole number.

7. Write analyst's initials on the line provided. Analyst must then sign his or her full name. Following a thorough data check (check calculations and blue raw data sheets against final data sheets) by someone other than the person who transferred the data, the final data sheets are initialed by the checker in the lower left corner.

APPENDIX 1

FPC SPECIES CODE

STRUCTURE OF THE CODE

The FPC Species Code is a 12-digit numerical reference to an animal or plant. It allows organisms to be grouped by species, family, suborder, order, subclass, class, and/or Phylum. Examples of the code follow:

Code - 503440450100

50

3

4

4

0

45

010

0

Phylum - Arthropoda

Class - Crustacea

Subclass - Copepoda

Order - Harpacticoida

Suborder - not given

Family - Tachidiidae

Genus-species - Euterpina acutifrons

Special Groupings - not given

Code - 403000829990

40

3

0

0

0

82

999

0

Phylum - Annelida

Class - Polychaeta

Subclass - not given

Order - not given

Suborder - not given

Family - Serpulidae

Genus-Species - unid. sp.

Special groupings - not given

Code - 270000009990

27

Phylum - Ectoprocta

0

Class - not given

0

Subclass - not given

0

Order - not given

0

Suborder - not given

00

Family - not given

999

Genus-Species - unid. sp.

0

Special characters - none given

Code - 850020100900

85

Phylum Phaeophyta

0

Class - not given

0

Subclass - not given

2

Order - Dictyotales

0

Suborder - not given

10

Family - Dictyotaceae

090

Genus-Species - Dictyota sp.

0

Special characters - not given

Code - 452000501300

Crassostrea virginica

- 452000501304

Crassostrea virginica (spats)

- 452000501305

Crassostrea virginica (adults)

It is important to realize that lower taxon levels are referenced by higher taxon levels. In the code 452000501300, the third position of the code (2) references the class Bivalvia only when combined with the first two positions of the code (45 - Mollusca). Therefore, the complete code for Bivalvia would be 452, and could be read; class Bivalvia (2) of the Phylum Mollusca (45). Similarly, the complete code for the Family Ostreidae (50) would be 45200050; read family Ostreidae (50), of the class Bivalvia (2), of the Phylum Mollusca (45). The only exception to the rule of finishing off a code at the lowest needed taxon level is for the Genus-Species level, which must also include the special character digit.

CREATING NEW CODES

A more or less phylogenetic order is followed in determining the code number for phylum, class and subclass levels. Order, suborder, and family are arranged alphabetically in their next higher groupings. Genus-Species are arranged alphabetically within the first taxon level higher than family. Very important - when the Genus-Species category is named unid. sp., the Genus-Species code must be 999. Always have the most recent copy of the complete species code on hand when creating a new code.

EXAMPLES OF ADDING TO CODE

Extant section of code:

40	<u>Annelida</u>
403	<u>Polychaeta</u>
403000009990	Unid. sp.
40300001	<u>Ampharetidae</u>
403000010100	<u>Amphicteis gunneri</u>
40300007	<u>Arabellidae</u>
403000070300	<u>Arabella iricolor</u>
403000079990	unid. sp.

New species:

Melinna maculata, in the family Ampharetidae.

The first eight digits of the code are already made, 40300001. Look on a core or venturi final data sheet to find the alphabetized list of polychaete species. You will find that Melinna maculata falls between Mediomastus californiensis and Minspio cirrifera (400 and 420, respectively). Pick a number between these two, add on a zero for special character category, and the code is made:

4030001	<u>Ampharetidae</u>
40300010100	<u>Amphicteis gunneri</u>
40300014100	<u>Melinna maculata</u>

Another 'species':

Melinna sp.

The rule for adding a name that includes an unidentified species with an identified genus is to pick a number that will fall after the last identified species level name in the same genus. The number for this 'new' species would be:

40300046	<u>Melinna maculata</u>
40300014130	<u>Melinna</u> sp.

To further illustrate the latter rule, inspect the following sequence of codes:

40300046	<u>Nereidae</u>
403000461300	<u>Ceratonereis</u> sp.
403000463200	<u>Laeonereis culveri</u>
403000464500	<u>Nereis acuminata</u>
403000464600	<u>Nereis falsa</u>
403000464700	<u>Nereis succinea</u>
403000464800	<u>Nereis</u> sp.
403000465700	<u>Perinereis floridana</u>

Notice that Nereis sp. follows Nereis succinea in the code, and that it falls before the next genus name.

APPENDIX 2

BIOLOGICAL SAMPLE DATA									
PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	D.O.	TEMPERATURE	SALINITY	CLOUD COVER	
FPC	Venturi	06/26/78	2	1C	NA	30.9	20.9	050	
PROJECT NO.	COLLECTOR	TIME COLLECTED		ANALYSIS METHOD					SHEET
8016.00	Braddock	1715		Species counts, wet and dry weights by group					1 of 9

PHYLUM ANNELIDA, CLASS POLYCHAETA

SPECIES	SPECIES CODE	NO.	SPECIES	SPECIES CODE	NO.
<u>Amphiteis gunneri</u>	403000010100	2	<u>Loandalia fauveli</u>	403000643500	
<u>Apoprionospio pygmaea</u>	403000850200		<u>Lumbrineris sp.</u>	403000373600	1
<u>Arabella iricolor</u>	403000070300		<u>Lysilla alba</u>	403000913700	
<u>Arabella irudescens</u>	403000070400		<u>Magelona pettiboneae</u>	403000403800	
<u>Arenicola cristata</u>	403000040500		<u>Marphysa sanguinea</u>	403000223900	
<u>Aricidea fragilis</u>	403000550600		<u>Mediomastus californiensis</u>	403000104000	2
<u>Aricidea philbiniae</u>	403000550700		<u>Melinna maculata</u>	403000014100	
<u>Aricidea taylori</u>	403000550800		<u>Minuspio cirrifera</u>	403000854200	
<u>Aricidea sp.</u>	403000550900		<u>Minuspio cirrbranchiata</u>	403000854300	
<u>Axiothella mucosa</u>	403000431000		<u>Naineris sp.</u>	403000524400	
<u>Branchioasychis americana</u>	403000431100	14	<u>Nereis acuminata</u>	403000464500	
<u>Capitella capitata</u>	403000101200		<u>Nereis falsa</u>	403000464600	
<u>Ceratonereis sp.</u>	403000461300		<u>Nereis succinea</u>	403000464700	12
<u>Chone dumeri</u>	403000761400		<u>Nereis sp.</u>	403000464800	3
<u>Chone sp.</u>	403000761500		<u>Notomastus latericus</u>	403000104900	
<u>Clymenella torquata</u>	403000431600		<u>Onuphis nebulosa</u>	403000495000	6
<u>Diopatra cuprea</u>	403000491700		<u>Paramastis speciosa</u>	403000105100	
<u>Enoplobranchus sanguineus</u>	403000911800		<u>Paranaitis speciosa</u>	403000615200	
<u>Eteone heteropoda</u>	403000611900		<u>Paraonides sp.</u>	403000555300	
<u>Eumida sanguinea</u>	403000612000		<u>Paraonis sp.</u>	403000555400	
<u>Eunice pinnata</u>	403000222100		<u>Paraprionospio pinnata</u>	403000855500	
<u>Exogone dispar</u>	403000882200		<u>Pectinaria gouldii</u>	403000585600	
<u>Exogone sp.</u>	403000882300		<u>Perinereis floridana</u>	403000465700	
<u>Fabricia sp.</u>	403000762400		<u>Pilargia sp.</u>	403000645800	
<u>Glyocera americana</u>	403000282500	2	<u>Pionia eruda</u>	403000255900	
<u>Glycinde solitaria</u>	403000312600		<u>Pista cristata</u>	403000916000	
<u>Glycinde sp.</u>	403000312700		<u>Pista palmata</u>	403000916100	
<u>Gyptis brevipalpa</u>	403000342800		<u>Platynereis dumerilii</u>	403000466200	
<u>Haploscoloplos robustus</u>	403000522900	2	<u>Poecilochaetus johnsoni</u>	403000676300	
<u>Harmothoe aculeata</u>	403000703000		<u>Polydora websteri</u>	403000856400	
<u>Heteromastus filiformis</u>	403000103100		<u>Polydora lupina</u>	403000736500	
<u>Laeonereis culveri</u>	403000463200	6	<u>Prionospio heterobranchia</u>	403000856600	
<u>Lepidometria commensalis</u>	403000703300		<u>Sabella microphthalma</u>	403000766700	
<u>Lemdonotus sp.</u>	403000703400		<u>Sabellaria vulgaris</u>	403000796800	

PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	SHEET
FPC	Venturi	06/26/78	2	1C	2 of 9

PHYLUM ANNELIDA, CLASS POLYCHAETA (CONTINUED)

SPECIES	SPECIES CODE	NO.	SPECIES	SPECIES CODE	NO.
<u>Sabellaria</u> sp.	403000796900	_____	Hesionidae unid sp.	403000349990	_____
<u>Schistomeringus rudolphi</u>	403000077000	_____	Lumbrinereidae unid sp.	403000379990	_____
<u>Scolecopsis squamata</u>	403000857100	_____	Maldanidae unid sp.	403000439990	_____
<u>Scyphoproctus platyproctus</u>	403000107300	_____	Nereidae unid sp.	403000469990	_____
<u>Spiochaetopterus costarum</u>	403000137400	_____	Orbiniidae unid sp.	403000529990	_____
<u>Streblosoma hartmanae</u>	403000917500	_____	Paraonidae unid sp.	403000559990	_____
<u>Streblosoma benedicti</u>	403000857600	_____	Phyllodoctidae unid. sp.	403000619990	_____
<u>Syllides</u> sp.	403000887700	_____	Polynoidae unid sp.	403000709990	_____
<u>Syllis</u> sp.	403000887800	_____	Sabellidae unid sp.	403000769990	_____
<u>Tharyx</u> sp.	403000167900	_____	Serpulidae unid sp.	403000829990	_____
<u>Arabellidae</u> unid sp.	403000079990	_____	Spionidae unid sp.	403000859990	_____
<u>Capitellidae</u> unid sp.	403000109990	_____	Syllidae unid sp.	403000889990	_____
<u>Cirratulidae</u> unid sp.	403000169990	_____	Terebellidae unid sp.	403000919990	_____
<u>Dorvillidae</u> unid sp.	403000199990	_____			_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

PHYLUM ANNELIDA, CLASS OLIGOCHAETA

SPECIES	SPECIES CODE	NO.
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Oligochaeta unid sp.	402000009990	_____
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PHYLUM ANNELIDA, CLASS ARCHIANNELIDA

Archiannelida unid sp.	404000009990	_____
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TOTAL ANNELID WET WEIGHT 40 1.020 g

TOTAL ANNELID DRY WEIGHT 0.1617 g

ANNEID ANALYST

PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	SHEET
FPC	Venturi	06/26/78	2	1C	5 of 9

SPECIES	SPECIES CODE	NO.	SPECIES	SPECIES CODE	NO.
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PHYLUM ANTHROPODA, CLASS CRUSTACEA

Subclass Copepoda unid sp.	503400009990	_____
Order Calanoida unid sp.	503410009990	_____
Order Cyclopoida unid sp.	503420009990	_____
Order Harpacticoida unid sp.	503440009990	_____

Subclass Ostracoda unid sp.	503500009990	_____
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Subclass Cirripedia Balanus sp.	503600100100	_____
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Subclass Cephalocarida unid sp.	503100009990	_____
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Subclass Malacostraca

Diastylidae unid sp.	503820039990	_____
Cumacea unid sp.	503820009990	_____

Order Cumacea

Non Diastylidae unid sp.	503820049990	_____
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Order Tanaidacea

Kalliapseudidae sp.	503842400100	_____
Kalliapseudidae unid sp.	503842400100	_____
Dikonophora unid sp.	503841009990	_____

Monokonophora unid sp.	503842009990	_____
Tanaidacea unid sp.	503840009990	_____

Order Isopoda

Aegidae unid sp.	503850059990	_____
Anthuridae unid sp.	503850109990	_____
Cirolanidae unid sp.	503850159990	_____
Excorallanidae unid sp.	503850259990	_____

Idoteidae unid sp.	503850359990	4
Sphaeromatidae unid sp.	503850709990	3
Isopoda unid sp.	503850009990	_____

PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	SHEET
IPC	Venturi	06/26/78	2	1C	6 of 9

SPECIES	SPECIES CODE	NO.	SPECIES	SPECIES CODE	NO.
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Order Amphipoda

Ampeliscidae unid spp.	503860059990	7	Hyalidae unid sp.	503860509990	
Amphilocheidae unid sp.	503860109990		Leucothoidae unid sp.	503860539990	
Amphithoidae unid spp.	503860159990	2	Liljeborgiidae unid sp.	503860559990	
Aoridae unid spp.	503860209990	1	Lysianassidae unid sp.	503860609990	
Bateidae unid sp.	503860259990		Melitidae unid sp.	503860659990	1
Caprellidae unid sp.	503860309990		Phliantidae unid sp.	503860709990	
Colomastigidae unid sp.	503860359990		Phoxocephalidae unid sp.	503860759990	
Corophiidae unid sp.	503860409990		Pontogeneidae unid sp.	503860809990	
Gammaridae unid sp.	503860459990		Stenothoidae unid sp.	503860859990	

Order Decapoda

<u>Alpheus armillatus</u>	503880050100		<u>Ogyrides limicola</u>	503880354000	
<u>Alpheus heterochaelis</u>	503880050200	2	<u>Ogyrides sp.</u>	503880354200	
<u>Alpheus normanni</u>	503880050250		<u>Pagurus spp.</u>	503880405600	6
<u>Alpheus sp.</u>	503880050300		<u>Palaemon floridanus</u>	503880454400	
<u>Ambidexter symmetricus</u>	503880680600		<u>Palaemon sp.</u>	503880454600	
<u>Callinectes sapidus</u>	503880650800		<u>Palaemonetes intermedius</u>	503880454800	22
<u>Callinectes sp.</u>	503880651000		<u>Palaemonetes pugio</u>	503880455000	
<u>Eurypanopeus abbreviatus</u>	503880701200		<u>Palaemonetes sp.</u>	503880455200	
<u>Eurypanopeus depressus</u>	503880701400		<u>Panopeus herbstii</u>	503880706000	
<u>Eurypanopeus sp.</u>	503880701800		<u>Panopeus occidentalis</u>	503880706100	
<u>Hexapanopeus augustifrons</u>	503880702000		<u>Panopeus sp.</u>	503880706200	
<u>Hippolyte pleuracantha</u>	503880202200	12	<u>Pelidnota mutica</u>	503880256400	
<u>Hippolyte sp.</u>	503880202600		<u>Penaeus sp.</u>	503880506600	2
<u>Libinia dubia</u>	503880252800	1	<u>Penaeopsis sp.</u>	503880505800	
<u>Libinia sp.</u>	503880253000		<u>Periclimenes americanus</u>	503880456800	
<u>Metoporphaphis sp.</u>	503880253200		<u>Periclimenes longicaudatus</u>	503880457000	
<u>Neopanope packardii</u>	503880703400		<u>Periclimenes sp.</u>	503880457200	
<u>Neopanope texana</u>	503880703600	16	<u>Petrolisthes armatus</u>	503880607400	
<u>Neopanope sp.</u>	503880703800	31	<u>Petrolisthes sp.</u>	503880607450	

PROJECT	SAMPLE TOPE	DATE	QTR	STATION NO.	SHEET
FPC	Venturi	06/26/78	2	1C	7 of 9

SPECIES	SPECIES CODE	NO.	SPECIES	SPECIES CODE	NO.
<u>Pinnixa</u> sp.	503880557600	2	Majidae unid sp.	503880259990	
<u>Rithropanopeus harrisii</u>	503880707800		Paguridae unid sp.	503880409990	
<u>Thor floridanus</u>	503880208000		Palaemonidae unid sp.	503880459990	1
<u>Tozeuma carolinense</u>	503880208200		Penaeidae unid sp.	503880509990	
<u>Urogebia affinis</u>	503880108400		Pinnotheridae unid sp.	503880559990	
<u>Uca minax</u>	503880300900		Xanthidae unid sp.	503880709990	
<u>Uca</u> sp.	503880300920		Natantia unid sp.	503882009990	
Alpheidae unid sp.	503880059990		Reptantia unid sp.	503884009990	
Callinassidae unid sp.	503880109990				
Grapsidae unid sp.	503880159990				

PHYLUM ARTHROPODA, CLASS PYCNOGONIDA

Pycnogonida unid sp. 508000009990

TOTAL CRUSTACEAN & PYCNOGONID WET WEIGHT 503 15.760 g

TOTAL CRUSTACEAN & PYCNOGONID DRY WEIGHT 4.0175 g

Wendell H. Bell
CRUSTACEA ANALYST

PHYLUM ARTHROPODA, CLASS INSECTA

Chironomidae unid sp. 50503150100

TOTAL INSECTA WET WEIGHT 505 _____ g

TOTAL INSECTA DRY WEIGHT _____ g

PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	SHEET
FPC	Venturi	06/26/78	2	1C	8 of 9

PHYLUM PORIFERA unid sp. 050000009990

TOTAL WET WEIGHT 05 _____ g TOTAL DRY WEIGHT _____ g

PHYLUM COELENTERATA

Class Anthozoa unid sp. 101000009990

TOTAL WET WEIGHT 10 _____ g TOTAL DRY WEIGHT _____ g

PHYLUM PLATYHELMINTHES unid sp. 150000009990

TOTAL WET WEIGHT 15 _____ g TOTAL DRY WEIGHT _____ g

PHYLUM ASCHELMINTHES unid sp. 200000009990

TOTAL WET WEIGHT 10 _____ g TOTAL DRY WEIGHT _____ g

PHYLUM NEMERTINEA unid sp. 250000009990

TOTAL WET WEIGHT 25 0.081 g TOTAL DRY WEIGHT 0.0103 g

PHYLUM SIPUNCULA unid sp. 300000009990

TOTAL WET WEIGHT 30 _____ g TOTAL DRY WEIGHT _____ g

PHYLUM CHLADONOMA

Sagitta sp. unid sp. 350000000100

TOTAL WET WEIGHT 35 _____ g TOTAL DRY WEIGHT _____ g

PHYLUM ECHINODERMATA unid sp. 550000009990

TOTAL WET WEIGHT 55 11.219 g TOTAL DRY WEIGHT 4.0527 g

PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	SHEET
FPC	Venturi	06/26/78	2	1C	9 of 9

PHYLUM CHORDATA

Class Ascidiacea unid sp.

601000009990

TOTAL DRY WEIGHT 8

TOTAL WET WEIGHT 601 8

3

Class Osteichthyes unid sp.

608000009990

TOTAL DRY WEIGHT 0.2923 8

TOTAL WET WEIGHT 608 1.127 8

OTHER GROUPS AND REMARKS

Other groups analyst

BIOLOGICAL SAMPLE DATA								
PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	D.O.	TEMPERATURE	SALINITY	CLOUD COVER
FPC	Bottom Core	06/26/78	2	ICA	NA	30.9	20.9	045
PROJECT NO.	COLLECTOR	TIME COLLECTED		ANALYSIS METHOD				SHEET
8016.00	CARVILL	1715		Species counts, wet and dry weights by group				1 of 9

PHYLUM ANNELIDA, CLASS POLYCHAETA

SPECIES	SPECIES CODE	NO.	SPECIES	SPECIES CODE	NO.
<u>Amphiteis gunneri</u>	40300010100		<u>Loandalia farwelli</u>	403000643500	
<u>Apoprionospio pygmaea</u>	403000850200		<u>Lumbrineris</u> sp.	403000373600	
<u>Arabella iricolor</u>	403000070300	2	<u>Lysilla alba</u>	403000913700	
<u>Arabella irudescens</u>	403000070400		<u>Magelona pettiboneae</u>	403000403800	
<u>Arenicola cristata</u>	403000040500		<u>Marphysa sanguinea</u>	403000223900	
<u>Aricidea fragilis</u>	403000550600		<u>Mediomastus californiensis</u>	403000104000	
<u>Aricidea philbiniae</u>	403000550700	7	<u>Melinna maculata</u>	403000014100	
<u>Aricidea taylori</u>	403000550800		<u>Mimospio cirrifera</u>	403000854200	
<u>Aricidea sp.</u>	403000550900		<u>Mimospio cirrbranchiata</u>	403000854300	
<u>Axiothella mucosa</u>	403000431000		<u>Naineris</u> sp.	403000524400	
<u>Branchioasychis americana</u>	403000431100		<u>Nereis acuminata</u>	403000464500	
<u>Capitella capitata</u>	403000101200	1	<u>Nereis falsa</u>	403000464600	
<u>Ceratonereis</u> sp.	403000461300		<u>Nereis succinea</u>	403000464700	
<u>Chone dimeri</u>	403000761400	1	<u>Nereis</u> sp.	403000464800	
<u>Chone</u> sp.	403000761500		<u>Notomastus lateralis</u>	403000104900	
<u>Clymenella torquata</u>	403000431600		<u>Onuphis nebulosa</u>	403000495000	
<u>Dicopatra cuprea</u>	403000491700		<u>Paramastis speciosa</u>	403000105100	
<u>Enoplobranchus sanguineus</u>	403000911800		<u>Paranaitis speciosa</u>	403000615200	
<u>Eteone heteropoda</u>	403000611900		<u>Paraonides</u> sp.	403000555300	
<u>Eumida sanguinea</u>	403000612000		<u>Paraonis</u> sp.	403000555400	2
<u>Eunice pinnata</u>	403000222100		<u>Paraprionospio pinnata</u>	403000855500	
<u>Exogone dispar</u>	403000882200	1	<u>Pectinaria gouldii</u>	403000585600	
<u>Exogone</u> sp.	403000882300		<u>Perinereis floridana</u>	403000465700	
<u>Fabricia</u> sp.	403000762400		<u>Pilearia</u> sp.	403000645800	
<u>Glycera americana</u>	403000282500		<u>Pironia eruca</u>	403000299900	
<u>Glycinde solitaria</u>	403000312600		<u>Pista cristata</u>	403000916000	
<u>Glycinde</u> sp.	403000312700		<u>Pista palmata</u>	403000916100	
<u>Gyptis brevipalpa</u>	403000342800	1	<u>Platynereis dimerilii</u>	403000466200	1
<u>Haploscoloplos robustus</u>	403000522900	1	<u>Poecilochaetus johnsoni</u>	403000676300	
<u>Harmothoe aculeata</u>	403000703000		<u>Polydora websteri</u>	403000856400	
<u>Heteromastus filiformis</u>	403000103100		<u>Polydora lupina</u>	403000736500	
<u>Laeonereis culveri</u>	403000463200		<u>Prionospio heterobranchia</u>	403000856600	1
<u>Lepidametria commensalis</u>	403000703300		<u>Sabella microstoma</u>	403000766700	
<u>Lepidametria</u> sp.	403000703400		<u>Sabellaria vulgaris</u>	403000796800	

PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	SHEET
FPC	Bottom Core	06/26/98	2	1CH	2 of 9

PHYLUM ANNELIDA, CLASS POLYCHAETA (CONTINUED)

SPECIES	SPECIES CODE	NO.	SPECIES	SPECIES CODE	NO.
<u>Sabellaria</u> sp.	403000796900	_____	Hesionidae unid sp.	403000349990	_____
<u>Schistomeringus rudolphi</u>	403000077000	_____	Lumbrinereidae unid sp.	403000379990	_____
<u>Scolecopsis squamata</u>	403000857100	_____	Maldanidae unid sp.	403000439990	_____
<u>Scyphoproctus platyproctus</u>	403000107300	_____	Nereidae unid sp.	403000469990	_____
<u>Spiochaetopterus costarum</u>	403000137400	_____	Orbiniidae unid sp.	403000529990	_____
<u>Streblosoma hartmanae</u>	403000917500	_____	Paraonidae unid sp.	403000559990	_____
<u>Streblospio benedicti</u>	403000857600	_____	Phyllodoctidae unid. sp.	403000619990	_____
<u>Syllides</u> sp.	403000887700	_____	Polynoidae unid sp.	403000709990	_____
<u>Syllis</u> sp.	403000887800	_____	Sabellidae unid sp.	403000769990	_____
<u>Tharyx</u> sp.	403000167900	_____	Serpulidae unid sp.	403000829990	_____
Arabellidae unid sp.	403000079990	_____	Spionidae unid sp.	403000859990	_____
Capitellidae unid sp.	403000109990	_____	Syllidae unid sp.	403000889990	_____
Cirratulidae unid sp.	403000169990	_____	Terebellidae unid sp.	403000919990	_____
Dorvillidae unid sp.	403000199990	_____			
<u>Scoloplos rubra</u>	403000527200	_____			

PHYLUM ANNELIDA, CLASS OLIGOCHAETA

SPECIES	SPECIES CODE	NO.
Oligochaeta unid sp.	402000009990	_____

PHYLUM ANNELIDA, CLASS ARCHIANNELIDA

Archiannelida unid sp.	404000009990	_____
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TOTAL ANNELID WET WEIGHT NO 0.097g

TOTAL ANNELID DRY WEIGHT 0.0027g

Carry
ANNELID ANALYST

PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	SHEET
FPC	Bottom Core	06/20/75	2	1CA	3 of 9

PHYLUM MOLLUSCA, CLASS BIVALVIA

SPECIES	SPECIES CODE	NO.	SPECIES	SPECIES CODE	NO.
<u>Abra aequalis</u>	452000650100		<u>Lucina nassula</u>	452000302100	
<u>Amygdalum papyrium</u>	452000400200	1	<u>Lyonsia hyalina</u>	452000382150	
<u>Arcopsis adamsi</u>	452000050300		<u>Musculus lateralis</u>	452000402200	
<u>Argopecten irradians</u>	452000550400		<u>Myrella planulata</u>	452000352300	
<u>Brachidontes domingensis</u>	452000400500		<u>Myrella sp.</u>	452000352400	
<u>Carditamera floridana</u>	452000150600		<u>Nucula oremulata</u>	452000452500	
<u>Chione cancellata</u>	452000900700		<u>Ostrea equestris</u>	452000502600	
<u>Chione sp.</u>	452000900800		<u>Parastarte triquetra</u>	452000902700	
<u>Codakia sp.</u>	452000300900		<u>Periploma sp.</u>	452000602800	
<u>Corbula dietziana</u>	452000201000		<u>Pleuromeris tridentata</u>	452000152900	
<u>Corbula swiftiana</u>	452000201100		<u>Semele proficua</u>	452000653000	
<u>Corbula sp.</u>	452000201200		<u>Semele sp.</u>	452000653100	
<u>Crassostrea virginica</u>	452000501300		<u>Solemya sp.</u>	452000753200	
<u>Cumingia coarctata</u>	452000651400		<u>Tagelus divinus</u>	452000703300	
<u>Cumingia sp.</u>	452000651500		<u>Tellina texana</u>	452000853400	
<u>Ensis minor</u>	452000801600		<u>Tellina sp.</u>	452000853500	
<u>Ischadium recurvum</u>	452000401700		<u>Transenella conradina</u>	452000903600	
<u>Laevicardium mortoni</u>	452000101800		<u>Tellinidae unid sp.</u>	452000859990	
<u>Lima pellucida</u>	452000251900				
<u>Licberus castaneus</u>	452000402000				

TOTAL BIVALVE WET WEIGHT 452 0.016 g

TOTAL BIVALVE DRY WEIGHT 0.0020 g

PHYLUM MOLLUSCA, CLASS GASTROPODA

<u>Acteocina canaliculata</u>	454000040100		<u>Anachis semiplicata</u>	454000320300	
<u>Acteocina sp.</u>	454000040200		<u>Bulla striata</u>	454000120400	

PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	SHEET
FPC	Bottom Core	06/26/78	2	161	5 of 9

SPECIES SPECIES CODE NO. SPECIES SPECIES CODE NO.

PHYLUM ARTHROPODA, CLASS CRUSTACEA

Subclass Copepoda unid sp. 503400009990
Order Calanoida unid sp. 503410009990
Order Cyclopoida unid sp. 503420009990
Order Harpacticoida unid sp. 503440009990

Subclass Ostracoda unid sp. 503500009990

Subclass Cirripedia
Balanus sp. 503600100100

Subclass Cephalocarida unid sp. 503100009990

Subclass Malacostraca

Order Cumacea

Diastylidae unid sp. 503820039990
Cumacea unid sp. 503820009990

Non Diastylidae unid sp.

503820049990

Order Tanaidacea

~~Kalliopodidae unid sp.~~ 503842400100
~~Kalliopseudidae unid sp.~~ 503842400100
Dikonophora unid sp. 503841009990

Monokonophora unid sp.
Tanaidacea unid sp.

503842009990
503840009990

Order Isopoda

Aegidae unid sp. 503850059990
Anthuridae unid sp. 503850109990
Cirolanidae unid sp. 503850159990
Excorallanidae unid sp. 503850259990

Idoteidae unid sp.
Sphaeromatidae unid sp.
Isopoda unid sp.

503850359990
503850709990
503850009990

PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	SHEET
FPC	Bottom Core	06/26/78	2	1 CA	6 of 9

SPECIES	SPECIES CODE	NO.	SPECIES	SPECIES CODE	NO.
Order Amphipoda					
Ampeliscoidea unid spp.	503860059990	2	Hyalidae unid sp.	503860509990	
Amphilocheidae unid sp.	503860109990		Leucothoidae unid sp.	503860539990	
Ampithoidae unid spp.	503860159990	4	Liljeborgiidae unid sp.	503860559990	
Aoridae unid spp.	503860209990	3	Lysianassidae unid sp.	503860609990	
Bateidae unid sp.	503860259990		Melitidae unid sp.	503860659990	
Caprellidae unid sp.	503860309990		Phliantidae unid sp.	503860709990	
Colomastigidae unid sp.	503860359990		Phoxocephalidae unid sp.	503860759990	
Corophiidae unid sp.	503860409990		Pontogeneidae unid sp.	503860809990	
Gammaridae unid sp.	503860459990		Stenothoidae unid sp.	503860859990	

Order Decapoda					
Alpheus armillatus	503880050100		Ogyrides limicola	503880354000	
Alpheus heterochaelis	503880050200		Ogyrides sp.	503880354200	
Alpheus normanni	503880050250		Pagurus spp.	503880405600	
Alpheus sp.	503880050300		Palaemon floridanus	503880454400	
Ambidexter symmetricus	503880680600		Palaemon sp.	503880454600	
Callinectes sapidus	503880650800		Palaemonetes intermedius	503880454800	
Callinectes sp.	503880651000		Palaemonetes pugio	503880455000	
Eurypanopeus abbreviatus	503880701200		Palaemonetes sp.	503880455200	
Eurypanopeus depressus	503880701400		Panopeus herbstii	503880706000	
Eurypanopeus sp.	503880701600		Panopeus occidentalis	503880706100	
Hexapanopeus augustifrons	503880702000		Panopeus sp.	503880706200	
Hippolyte pleuracantha	503880202200		Pellicia mitica	503880256400	
Hippolyte sp.	503880202600		Penaeus sp.	503880506600	
Libinia dubia	503880252800		Penaeopsis sp.	503880505800	
Libinia sp.	503880253000		Periclimenes americanus	503880456800	
Metophorhaphis sp.	503880253200		Periclimenes longicaudatus	503880457000	
Neopanope packardii	503880703400		Periclimenes sp.	503880457200	
Neopanope texana	503880703600		Petrolisthes armatus	503880607400	
Neopanope sp.	503880703800		Petrolisthes sp.	503880607450	

PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	SHEET
FPC	Bottom Core	06/26/78	2	1CH	7 of 9

SPECIES	SPECIES CODE	NO.	SPECIES	SPECIES CODE	NO.
<u>Pinnixa</u> sp.	503880557600	_____	Majidae unid sp.	503880259990	_____
<u>Kithropanopeus harrisi</u>	503880707800	_____	Paguridae unid sp.	503880409990	_____
<u>Thor floridanus</u>	503880208000	_____	Palaeomonidae unid sp.	503880459990	_____
<u>Toxuma carolinense</u>	503880208200	_____	Penaeidae unid sp.	503880509990	_____
<u>Urogebia affinis</u>	503880108400	_____	Pinnotheridae unid sp.	503880559990	_____
<u>Uca minax</u>	503880300900	_____	Xanthidae unid sp.	503880709990	_____
<u>Uca</u> sp.	503880300920	_____	Natantia unid sp.	503882009990	_____
Alpheidae unid sp.	503880059990	_____	Reptantia unid sp.	503884009990	_____
Callinassidae unid sp.	503880109990	_____			
Grapsidae unid sp.	503880159990	_____			

PHYLUM ARTHROPODA, CLASS PYCNOGONIDA

Pycnogonida unid sp. 508000009990

TOTAL CRUSTACEAN & PYCNOGONID WET WEIGHT 503 0.005 g

TOTAL CRUSTACEAN & PYCNOGONID DRY WEIGHT 0.0007 g

W. N. S. S. S.
CRUSTACEA ANALYST

PHYLUM ARTHROPODA, CLASS INSECTA

Chironomidae unid sp. 50503150100

TOTAL INSECTA WET WEIGHT 505 0.001 g

TOTAL INSECTA DRY WEIGHT 0.0001 g

PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	SHEET
MC	Bottom Core	06/26/78	2	1CA	8 of 9

PHYLUM PORIFERA unid sp.

050000009990

TOTAL WET WEIGHT 05 _____ g TOTAL DRY WEIGHT _____ g

PHYLUM COELENTERATA

Class Anthozoa unid sp.

101000009990

TOTAL WET WEIGHT 10 _____ g TOTAL DRY WEIGHT _____ g

PHYLUM PLATYHELMINTHES unid sp. 150000009990

TOTAL WET WEIGHT 15 _____ g TOTAL DRY WEIGHT _____ g

PHYLUM ASCHELMINTHES unid sp. 200000009990

TOTAL WET WEIGHT 10 _____ g TOTAL DRY WEIGHT _____ g

PHYLUM NEMERTINEA unid sp. 250000009990

TOTAL WET WEIGHT 25 0.007 g TOTAL DRY WEIGHT 0.0013 g

PHYLUM SIPUNCULA unid sp. 300000009990

TOTAL WET WEIGHT 30 _____ g TOTAL DRY WEIGHT _____ g

PHYLUM CHAETOGNATHA

Sagitta sp. unid sp.

350000000100

TOTAL WET WEIGHT 35 _____ g TOTAL DRY WEIGHT _____ g

PHYLUM ECHINODERMATA unid sp. 550000009990

TOTAL WET WEIGHT 55 0.077 g TOTAL DRY WEIGHT 0.016 g

PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	SHEET
FPC	Bottom Core	06/26/73	2	101	9 of 9

PHYLUM CHORDATA

Class Ascidiacea unid sp.

601000009990 1

TOTAL DRY WEIGHT N/A g

TOTAL WET WEIGHT 601 0.002 g

Class Osteichthyes unid sp.

608000009990

TOTAL DRY WEIGHT 8

TOTAL WET WEIGHT 608 8

OTHER GROUPS AND REMAINS

W. J. H. S.
W. J. H. S.

Other groups analyst

BIOLOGICAL SAMPLE DATA

PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	COLLECTOR
FPC	Oyster Reef	06/29/78	2	ICB	Brodack
PROJECT NO.					SHEET
ANALYSIS METHOD					1 of 1
8016.00					Species counts, shell lengths for adult oysters, wet and dry weights by group

SPECIES	SPECIES CODE	WET WT. (g)	DRY WT (g)	NO.	MEAN SHELL LENGTH (cm)	STANDARD ERROR
<u>Crassostrea virginica</u> adults	452000501305	475.03	57.10	469	03.9	00.060
<u>Crassostrea virginica</u> spats(2cm)	452000501304	20.37	12.9205	59		
OTHER BIVALVIA	452	81.43	50.0357			
<u>Carditamera floridana</u>	452000150600			527		
<u>Ischadium recurvum</u>	452000401700					
<u>Ostrea equestris</u>	452000502600					
<u>Semele proficua</u>	452000653000					
GASTROPODA	454	5.85	3.4961	38		
<u>Crepidula plana</u>	454000201600					
AMPHINEURA	451					
<u>Acanthochitona pygmaea</u>	451000050100					
CRUSTACEA	503	58.57	26.1977	304		
<u>Balanus</u> sp.	503600100100			1		
<u>Hyalidae</u> unid sp.	503860509990			4		
<u>Petrolisthes armatus</u>	503880607400					
<u>Petrolisthes</u> sp.	503880607450			10		
<u>Eurypanopeus depressus</u>	503880701400			12		
<u>Panopeus herbstii</u>	503880706000					
<u>Rithropanopeus harrisi</u>	503880707800			13		
<u>Xanthidae</u> unid sp.	503880709990					
INSECTA	505					
<u>Anurida maritima</u>	505020600100					

ANALYST

Boony
Romero
OYSTERS

OTHER
MOLLUSKS

CRUSTACEA

INSECTA

PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	COLLECTOR
FPC	SEAGRASS	06/26/78	2	ICA	Brodack
PROJECT NO.	ANALYSIS METHOD				SHEET
8016.00	Blade lengths(maximum sample size=50 blades), wet and dry weights by species				1 of 1

TAXON & CODE	WET WT (g)	DRY WT (g)	BLADES COUNTED	MEAN LENGTH(cm)	STANDARD ERROR
<u>Diplanthera wrightii</u> 875000100900	<u>123.3</u>	<u>12.6</u>	<u>50</u>	<u>12.6</u>	<u>00.090</u>
<u>Syringodium filiformis</u> 875000102300	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u>Halophila engelmannii</u> 875000300900	<u>0.32</u>	<u>0.03</u>	<u>15</u>	<u>01.7</u>	<u>00.080</u>
<u>Ruppia maritima</u> 875000701800	<u>1.07</u>	<u>0.15</u>	<u>15</u>	<u>07.5</u>	<u>00.540</u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

[Signature]
ANALYST

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JECT	SAMPLE TYPE	DATE	QTR	STATION NO.	ANALYSIS METHOD	COLLECTOR
PC	Macroalgae	6/26/78	2	ICC	Check Presence/Absence, wet & dry weights by phylum	Brodack

JECT NO.	SHEET
3016.00	1 of 1

PHYLUM RHODOPHYTA

<u>Centroceras</u> sp.	800010200050	_____	<u>Herposiphonia</u> sp.	800010700700	_____
<u>Ceramium</u> sp.	800010200100	_____	<u>Hypnea</u> sp.	800020400800	_____
<u>Champia</u> sp.	800050200700	_____	<u>Laurencia</u> sp.	800010700900	_____
<u>Chondria</u> sp.	800010700400	X	<u>Polysiphonia</u> sp.	800010701900	_____
<u>Chrysemenia</u> sp.	800050700500	_____	<u>Spyridia</u> sp.	800010200900	X
<u>Gracilaria</u> sp.	800020300900	_____	unid sp.	800000009990	_____

TOTAL RHODOPHYTA WET WEIGHT 80 17.88 g

TOTAL RHODOPHYTA DRY WEIGHT 1.3859 g

PHYLUM CHLOROPHYTA

<u>Acetabularia</u> sp.	820030100500	_____	<u>Halimeda</u> sp.	820080200900	_____
<u>Caulerpa</u> sp.	820080100900	X	<u>Penicillus</u> sp.	820080203500	_____
<u>Cladophora</u> sp.	820090100300	_____	<u>Udotea</u> sp.	820080205300	_____

TOTAL CHLOROPHYTA WET WEIGHT 82 35.02 g

TOTAL CHLOROPHYTA DRY WEIGHT 3.5039 g

PHYLUM PHAEOPHYTA

<u>Diatyota</u> sp.	850020100900	_____	<u>Sargassum</u> sp.	850040201500	_____
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TOTAL PHAEOPHYTA WET WEIGHT 85 _____ g

TOTAL PHAEOPHYTA DRY WEIGHT _____ g

J. Glavin
ANALYST

PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	SHEET
FFC	Zooplankton	12/13/99	4	8C4SID1	2 of 5

NUMBER PER ALIQUOT

NUMBER PER M3

SPECIES CODE

SPECIES

PHYLUM ANNELIDA

Class Polychaeta, unid. larva

4030000000002

PHYLUM MOLLUSCA

Class Bivalvia, unid. veligers

4520000000100

454
5450000000100

Class Gastropoda, unid. veligers

PHYLUM ECHINODERMATA

unid. spp.
unid. Ophiopluteus larvae

5500000009990
550000000200

PHYLUM CHORDATA

Class Larvacea unid. spp.

6050000009990

Class Osteichthyes

unid. eggs
unid. larvae
unid. juvenile

6080000000001
6080000000002
6080000000003

2111

PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	SHEET
FPC	Zooplankton	12/15/98	4	OCAST01	3 of 5

SPECIES	SPECIES CODE	NUMBER PER M ³	NUMBER PER ALIQUOT
PHYLUM ARTHROPODA			
Class Crustacea unid. spp.	503000009990		
Subclass Copepoda			
unid. spp.	503400009990		
unid. Nauplii	503400000100	96	4
A. Order Calanoida			
<u>Acartia tonsa</u>	503410100100	5987	249
<u>Centropages hamatus</u>	503410200200	48	2
<u>Labidocera mirabilis</u>	503410580300		
<u>Labidocera scotti</u>	503410580400		
<u>Labidocera sp.</u>	503410580500		
<u>Paracalanus crassirostris</u>	503410500600	385	16
<u>Paracalanus parvus</u>	503410500650		
<u>Pseudodiaptomus coronatus</u>	503410300700	72	3
<u>Temora turbinata</u>	503410700800	24	1
<u>Tortanus setaceus</u>	503410790900		
unid. spp.	503410009990		
B. Order Cyclopoida			
<u>Oithona spp.</u>	503420500100	144	6
unid. spp.	503420009990		

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PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	SHEET
FPC	Zooplankton	12/15/79	4	20ASTD1	4 of 5

SPECIES

SPECIES CODE

NUMBER PER M3

NUMBER PER ALIQUOT

CLASS CRUSTACEA CONTINUED

C. Order Harpacticoida

Euterpina acutifrons
Microsetella sp.
Porcellidium sp.
Tegastidae unid. spp.
unid. spp.

503440450100
503440150200
503440350300
503440509990
503440009990

72

3

Longipodia sp.

503440200400

D. Order Monstrilloida unid. spp.

503470009990

Subclass Branchiopoda

Order Cladocera unid. sp.

503310009990

Subclass Cirripedia

unid. nauplii
unid. cypris larvae

503600000100
503600000200

72

3

Subclass Ostracoda unid. spp.

Subclass Malacostraca

A. Order Amphipoda unid. spp.

503860009990

B. Order Mysidacea unid. spp.

503830009990

C. Order Cumacea unid. spp.

503820009990

PROJECT	SAMPLE TYPE	DATE	QTR	STATION NO.	SHEET
FPC	Zooplankton	12/15/79	4	2(CAST 1)	5 of 5

SPECIES SPECIES CODE NUMBER PER M³ NUMBER PER ALIQUOT

CLASS CRUSTACEA CONTINUED

Order Isopoda unid. app.

503850009990

Order Decapoda unid. app.

503880009990

1. Suborder Natantia

unid. caridean zoea

503882000100

unid. mysis larvae

503882000200

unid. post larvae

503882000300

2. Suborder Reptantia

unid. porcellanid zoea

503884000100

unid. brachyuran zoea

503884000200

unid. megalopa

503884000300

CLASS PYCNOGONIDA unid. app.

508000009990

CLASS ARACHNIDA unid. app.

501020009990

OTHER GROUPS AND REMARKS

TOTAL PLANKTON WET WEIGHT:

2.9110

TOTAL PLANKTON DRY WEIGHT:

0.4853

FLOWMETER READINGS:

INSIDE NET 2701

OUTSIDE NET 3508

**RELATIVE % CLOGGING:

23%

*FACTOR FOR CONVERSION TO NUMBER PER M³:

24.0456

ALIQUOT SIZE:

1/256

*(inverse of aliquot)(aliquot correction factor)
(0.00527)(inside net flowmeter reading)

**(difference in flowmeter readings)(100)
outside net flowmeter reading

Stephen P. Langley

APPENDIX 3

ALIQOT CORRECTION FACTORS

Sequence	Aliquot	Factor	Inverse aliquot x Factor
	1/2	0.952	1.904
1/2	1/4	1.075	4.300
1/4	1/8	1.024	8.192
1/4 x 1/2	1/16	1.156	18.496
1/4 x 1/4	1/32	1.101	35.232
1/4 x 1/4 x 1/2	1/64	1.243	79.552
1/4 x 1/4 x 1/4	1/128	1.184	151.552
1/4 x 1/4 x 1/4 x 1/2	1/256	1.337	342.272
1/4 x 1/4 x 1/4 x 1/4	1/512	1.273	651.776
1/4 x 1/4 x 1/4 x 1/4 x 1/2			

APPENDIX 4

TO: All Project Personnel
FROM: Edward Zillioux
SUBJ: Quality Assurance &
Quality Control

DATE: April 26 1977
PROJECT: FPC Community
Structure Study
PROJECT NO. 7015.00
8016.00

In compliance with a letter from John F. Studt, Florida Power Corporation, of 29 March 1977, specific procedures relating to quality assurance and quality control are detailed in this memorandum for the following areas:

1. Instrument calibration
2. Sampling gear reliability
3. Data acquisition
4. Taxonomic identification
5. Voucher collection
6. Data handling and document control
7. Inspection of work performed
8. Environmental report preparation

The following procedures should not be changed during the conduct of the FPC Community Structure Study unless preceded by a memorandum authorizing the change. Should questions arise concerning these procedures, please consult Ed Zillioux or John Guttman.

INSTRUMENT CALIBRATION

APPLICATION

Current meter
Plankton net flowmeters
Temperature/dissolved oxygen meter
Salinity meter
Balance

GUIDELINES

Current meter (General Oceanics digital flowmeter model #2031 and flowmeter readout model #2035)

-1-

Revised _____

Authorization _____

In determining boat speed during plankton net hauls, the digital flowmeter is streamed from off the bow of the boat to avoid the increased velocities which occur adjacent to the hull aft of the bow. When connecting the flowmeter to the circuit, polarity of the flowmeter must be observed. The voltage supplied to the flowmeter by the system should not exceed 24 volts DC and the current must not be greater than 100 milliamps. An environmental operating temperature of not more than 50°C should be observed. Prior to each operation the TEST position of the readout meter should be used for checking the two 9 volt manganese/alkaline batteries. In test runs with a 1/2m 202um mesh plankton net streamed, the counts per unit of time corresponding to the 2 knots of speed required for the plankton sampling will be correlated with the boat engine RPM. During sampling runs this predetermined RPM will be attained before deployment of the plankton net so only minor adjustments need be made to bring the flowmeter readout to the correct value. Curves have been prepared from average values of tests with four current meter units with counts per second (one revolution = 10 counts) on the abscissa and water velocity (centimeters per second) on the ordinate. Two knots of speed (27.7 cm/sec) is achieved at a readout of 9 counts/sec.

Plankton net flowmeters (General Oceanics digital flowmeter model #2030 MKII)

For any given period and speed of towing of a plankton net, the amount of water filtered through the net will be determined by two factors, (1) the mesh size (mesh opening and % open area) and (2) the amount and nature of suspended material. The second factor is not predictable and may change drastically, due to patchiness, within only a few meters. Some species of the diatom Rhizosolenia, for example, can so completely clog a 202um mesh net under bloom conditions that effective filtering may be precluded after relatively few seconds at a tow speed of two knots. The same is true of the blue-green alga Oscillatoria, known to bloom in the study area. Under virtually any normal conditions, the magnitude of the compression wave in front of the net increases throughout the tow at an unpredictable rate unless a maximum is reached by complete clogging of the mesh opening of the plankton net.

-2-

Original 4/26/77
Revised _____

Authorization _____

To compensate for this variation between tows, a flow meter will be suspended just off center in the mouth of the net for each plankton tow. From the calibration curve supplied with each flowmeter, the amount of water filtered during the required haul of two knots for one minute duration will be estimated. From this information, zooplankton abundance and biomass will be related to water volume. The operation of all flowmeters will be checked during a test run at the onset of each sampling period to assure the continued validity of the respective calibration.

Temperature and Dissolved Oxygen Meter (YSI Model 54)

Although not specifically required, dissolved O_2 and temperature, as well as salinity and atmospheric conditions, are recorded routinely. For calibration (at the outset of each use period) the probe is placed in water-saturated air in a B.O.D. bottle at ambient temperature. The meter is set at the measured temperature (accuracy $\pm 0.7^\circ C$). After an equilibration period of at least 15 minutes, the meter is adjusted to an oxygen concentration value given by a table of O_2 solubility values for various temperatures and pressures.

Salinity meter (YSI Model 33 S-C-T)

To compensate for ambient temperature, the salinity meter is set at the temperature measured with the YSI Model 54. Before reading, the salinity meter is calibrated by adjusting first to 0 and then to "red line" for battery compensation, and this is repeated until no further adjustment is necessary. If unable to adjust to red line, the battery is replaced.

Above 40° the meter is accurate to ± 0.9 o/oo at 40 o/oo and ± 7 o/oo at 20 o/oo plus the conductivity probe. The probe has an accuracy of $\pm 2\%$ of reading for conductivity and salinity. Satisfactory operation is assured in the ambient range of -5 to $+45^\circ C$. A maximum error of $\pm 0.1\%$ of the reading per $^\circ C$ change in instrument temperature can occur. This error is negligible if the instrument is readjusted to red line for each reading.

A temperature-compensated American Optical Corporation salinity refractometer provides back-up salinity measurement capability.

-3-

Original 4/26/77
Revised _____

Authorization _____

Balance (Mettler Model H10)

The Mettler Model H10 generally will be used for all wet and dry weight biomass determinations. Calibration of the balance is maintained through a Mettler annual preventative maintenance contract. In addition, frequent periodic checks for accuracy are made with the use of analytical grade balance weights owned by the Connell laboratory.

For excessive wet weights, primarily oyster meat and benthic macrophytes, an Ohaus Harvard Trip Balance is used. Dry weights for these groups are then made on the Mettler H10.

SAMPLING GEAR RELIABILITY

APPLICATION

Venturi suction sampler
Core sampler
Plankton nets
Plankton subsampler

GUIDELINES

Venturi suction sampler

This unit was designed by Connell biologists and engineers for maximum reliability under adverse working conditions. Its sturdy construction, which protects the venturi jets by welding copper fittings into a brass cylinder of 1/4 inch wall thickness, can withstand any conceivable twisting stress which might be encountered in the normal three-man operation. All non-collapsible hoses were used to prevent kinking in black-water situations where confusion of long hoses is a factor.

Two pump units with identical 16 HP aluminum block Onin engines were purchased new for this application. The pump/engine units were selected not only to meet operational specifications but also because their reliability has been proven by years of service as irrigation pumps.

Core sampler

A 10 cm diameter by 15 cm penetration core sampler was fabricated from aluminum irrigation pipe. It is manually operated with no moving parts. Its simplicity assures reliability.

-4-

Original
Revised

4/26/77
10/4/78

Authorization



Plankton nets

202um mesh 1/2 meter standard conical plankton nets will be used for zooplankton studies. Dacron collars will be used at both mouth and cod end and along the seams to prevent rotting common in canvas reinforced nets. Before each use the nets will be carefully checked for rips or holes. The nets will be thoroughly cleaned after each use to prevent successive clogging with continued use. Two complete back-up units (including G.O. flowmeter) will be on hand in the event of loss or damage.

Plankton subsampler

In the Connell Laboratory the Cushing subsampler (Limnology and Oceanography, Vol. 6, No. 4, pp. 489-490, 1961) has been adopted in preference to the more common Folsom plankton splitter. The Cushing subsampler is inherently more accurate because uneven displacement of plankton organisms of different densities during mixing does not affect the accuracy of the aliquot. This is achieved because the sample is mixed in a cylindrical chamber which is divided during mixing into calibrated pie-shaped sections. Individual sections may then be drained and rinsed for microscopic examination.

DATA ACQUISITION

Essential links to meaningful laboratory data are the proper choice of the sampling location, strict adherence to proper sampling procedures, complete identification of the sample, and prompt transport of the sample to the laboratory. Coupled with these restrictions is the problem of getting a representative sample.

The greatest obstacle to collection of a representative sample is the general lack of homogeneity. This problem is most pronounced in sampling natural communities subject to unpredictable patchiness over both space and time. Even under the most favorable conditions, errors that relate to sampling are usually much greater than those in laboratory analyses. Unless samples are carefully selected and handled with care, taken at proper locations, promptly transported and laboratory processed, the results of these tests will be confusing, misleading, and detrimental to any monitoring program.

-5-

Original
Revised

4/26/77

Authorization _____

Considerable care is taken, therefore, to assure that the control samples yield data which can be compared with maximum confidence to the plume samples. The most important consideration here is timing, assuming all handling of plume and control samples to be equal. Daily vertical migration is a persistent character among plankton communities, and, to a lesser extent, among certain elements of benthic communities. Plume and control benthic samples will be collected on different days (on consecutive days if environmental conditions permit) due to the amount of time required to sample each side.

Zooplankton samples for control and plume will be collected on the same day (for each of the two days of plankton sampling) because of the minimal amount of time required to collect these samples. Daytime sampling will not begin until at least one hour after sunrise to ensure that daytime activity patterns have begun. Nighttime sampling will not begin until one hour after sundown. Cloud cover, angle of sun, and water turbidity will substantially affect the amount of light transmitted to the benthos, and will affect the daytime activities of benthic organisms. However, the realities of field sampling dictate that one cannot wait for ideal environmental conditions to take samples; therefore, samples will be taken whenever it is possible and safe to take them with the constraints listed above.

To facilitate comparison with previous sampling data, basic procedures of both benthos and plankton data acquisition will be conducted according to procedures and guidelines developed during two and one-half years of study at the Crystal River Power Plant by various groups of the University of Florida.

TAXONOMIC IDENTIFICATION

To facilitate sorting and identification of benthic samples, rose bengal stain is added to 10% buffered formalin at 100 mg/l during initial preservation of the field samples (W.T. Mason and P. P. Yevich, Trans. Amer. Microsc. Soc., Vol. 86, No. 2, 221-223, 1967). If the formalin-stain solution is added after transport to the laboratory, allow at least two days' exposure before processing. Just before sorting, excess stain is washed out in the operation of the bubble washer-separator. The washed samples are placed in 40% isopropyl alcohol for sorting and identification. Plankton samples will not be stained and will remain in 10% buffered formalin.

-6-

Original
Revised

4/26/77
5/22/80

Authorization

M. P. Miller

Upon arrival in the laboratory, each sample will be identified with the appropriate station number and sample type. A majority of all taxonomic identifications will be carried out by the same biologist who collected the samples in the field. We have found that this combined effort greatly facilitates individual sample identifications and reduces the possibility for error.

Initial taxonomic identifications will be carried out by our biologists according to their areas of expertise. During this identification process we will rely heavily on the quality control review committee which has been assembled for this project. Each team biologist will work with his respective review committee member to confirm the identity of each organism found to occur in the samples. All mollusks, crustaceans, and polychaetes will be identified to species if possible, with the remaining groups identified to phyla. Throughout the entire identification process, the individual members of the quality control review committee will conduct periodic checks of the work and assist in the review of the laboratory work sheets.

The individuals who comprise the quality control review committee and their areas of expertise are as follows:

Dr. Jeffrey S. Prince
University of Miami

Mr. Mark P. McMahon
Connell Metcalf & Eddy

Dr. Harding Michel
University of Miami

Dr. Lowell P. Thomas
University of Miami

Mr. Julio Garcia-Gomez
Connell Metcalf & Eddy
and University of Miami

Macroalgae

Aquatic Vascular
Plants

Zooplankton

Annelids

Crustaceans, Mollusks
and other phyla

-7-

Original
Revised

4/26/77
8/16/77

Revised

8/22/80

Authorization

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VOUCHER COLLECTION

Upon confirmation of the taxonomy, a collection of voucher specimens will be made and preserved for future reference. For the zooplankton samples, a complimentary album of photomicrographs, each with complete taxonomic information, will accompany the mixed samples in the voucher collection. Representative zooplankton samples added to the collection will remain in 10% buffered formalin, whereas all specimens sorted from the benthic samples will be maintained in 40% isopropyl alcohol.

Glass or plastic jars with plastic tops will be used for all stored samples, thus eliminating the destruction of samples which too frequently results from rusting of metal jar tops. All labels will include location and date of collection, and, except in the case of mixed zooplankton samples, the taxonomic identification. The labels will be placed inside the sample containers and will be printed in pencil on high quality 100% rag paper such as the L.L. Brown Resistal Linen Ledger Substance 44.

All voucher specimens and plankton samples will be preserved initially in 10% buffered formalin. Benthos specimens will be transferred after washing to 40% isopropyl alcohol according to standard museum procedure.

Photomicrographs of planktonic specimens will be taken with a polaroid land camera attachment coupled to a Unitron research inverted microscope model BR-BMIC. These will be kept as an integral part of the permanent voucher collection and identified to compare with the corresponding whole plankton sample also maintained in the voucher collection. Plankton samples will remain in 10% buffered formalin.

Following preparation, additions to the voucher collection will be reviewed for taxonomic accuracy by the review committee on a quarterly basis.

DATA HANDLING AND DOCUMENT CONTROL

Each sample collected in the field will be recorded and identified by a label within each sample container. Detailed information includes type of sample, sample number, date, and number of containers comprising the sample. In addition, each team leader will keep a daily field diary which will become part of the permanent field records, with weather conditions, and time of sampling.

Revised

8/22/50

Authorization

M. P. McIlhenny

-8-

Original
Revised

4/26/77
10/4/78

Authorization

B. Gilliam

Revised

3/5/79

Authorization

B. Gilliam

Upon arrival at each biological sampling station we will take in-situ measurements of dissolved oxygen, temperature and salinity. It is our standard operating procedure to record this information directly in the log book. Typical information will contain any unique visual observations made during the collection period.

All field and laboratory data will be recorded directly on the standard computer-coded reporting forms which we have prepared. These data sheets will be maintained in a neat and orderly fashion to facilitate any review by FPC or designated agencies.

Following completion of the laboratory investigations, all laboratory work sheets will be delivered to the project manager who will review them for completeness of information. At that time he will prepare two Xerox copies of each data sheet and place the originals in the project file. One copy of the data sheets will be sent to the laboratory for incorporation into their permanent records. The completed laboratory data forms will then be sent to our data processing center where the information will be placed on computer cards. Following completion of the key punching operation, each data set will be verified by means of a computer listing program.

All computer operations will be conducted on a Digital Equipment Corp. PDP/11 Network facility in our office. In addition to the laboratory work sheets, we will place all raw data on a magnetic tape which will be delivered to FPC at the completion of the project.

Using this data, the species diversity will be calculated two ways:

- a. Species richness (total number of taxa)
- b. Shannon-Weiner (H' and J')

Following completion of the individual data calculations, we will perform standard statistical operations similar to those in the preoperational programs. This analysis will include mean and standard deviation on the population parameters such as biomass, number of individuals, etc. The results of these statistics will then be compared with those from the preoperational program.

-9-

Original
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4/26/77

10/4/78

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Throughout the entire data handling effort, the field biologist and the members of the quality control review committee will maintain a continuous check of the data to insure that there are no additions or deletions during data processing.

INSPECTION OF WORK PERFORMED

The purpose of the review committee (identified under TAXONOMIC IDENTIFICATION above) will be to maintain continuous quality control throughout the taxonomic investigations associated with this project. They will oversee the initial identifications, conduct periodic routine checks of the work, and assist in the preparation of the standard voucher collection which will be used throughout this work. Inspection reports by the individual committee members will be incorporated into the quarterly reports forwarded to Florida Power Corporation.

ENVIRONMENTAL REPORT PREPARATION

All required work will be brought together in a final environmental report following the completion of the analysis of the fourth quarterly samples. The primary responsibility for the report will be shared by the project manager and technical manager. In-house reviews will be complemented by the independent reviews of consultants, L. Thomas for non-statistical portions and P. Healand for statistical analyses.

All quarterly reports will be in the form of final computer coded laboratory sheets. Both annual and final reports will be prepared in a standard comprehensive format which will facilitate statistical treatment and comparison with data presented in all previous and future reports associated with this project.

-10-

Original
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4/26/77

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8/23/80

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cc: J. Studt (FPC)
L. Thomas (UM)
J. Prince (UM)
H. Michel (UM)

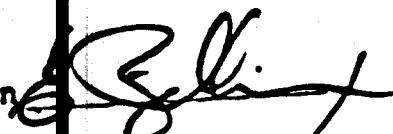
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J. Gleman
M. McMahon
J. Garcia-Gomez
P. Krauss
N. Gillies
B. Bohnsack
S. Langley
B. Hieber
M. Ahearn
R. Gaby
E. Frank
E. Smillie
N. Urban

-11-

Original
Revised

4/26/77
10/4/78

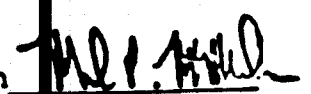
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APPENDIX 5

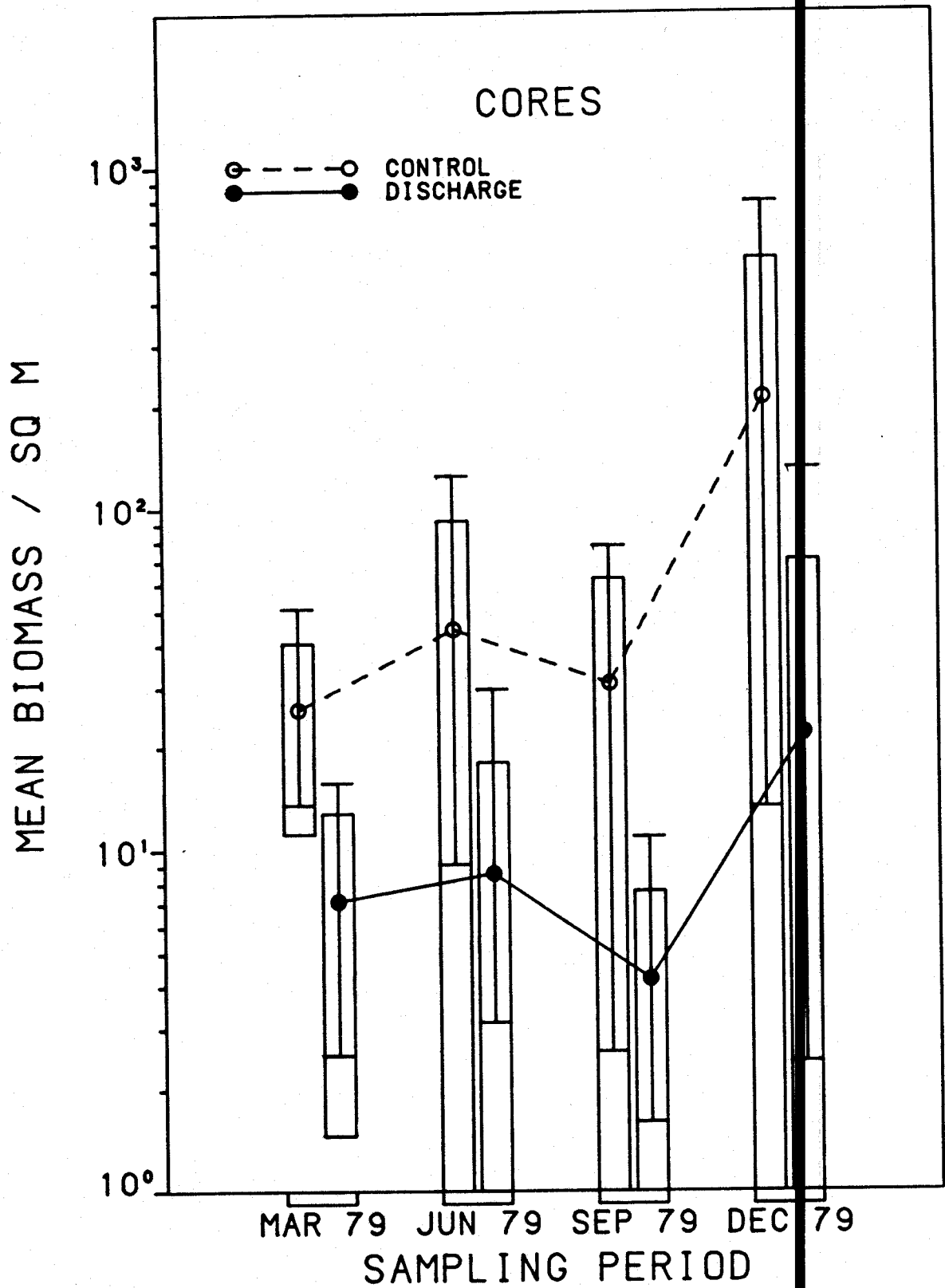


Fig. 14-1. Mean biomass per meter squared of animals collected in bottom core samples in the discharge and control basins. Given are means (connected circles), standard deviations (rectangles), and ranges (horizontal bars).

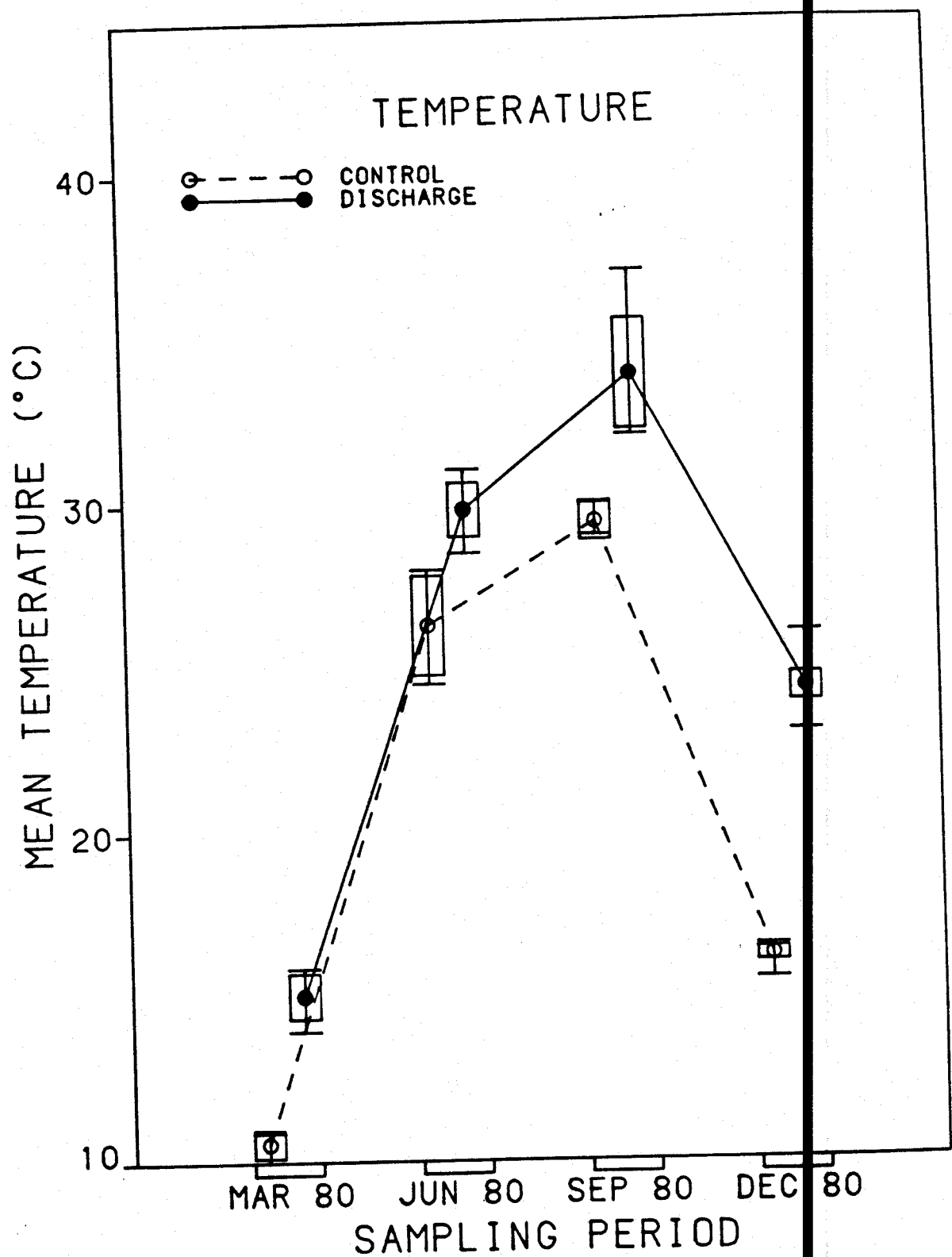


Fig. 4. Temperature at inside stations of control and discharge basins. Given are means (connected circles), standard deviations (rectangles) and ranges (horizontal bars). MAR- $P < .001$ (*); JUN- $P < .001$ (*); SEP- $P < .001$ (*); DEC- $P < .001$ (*). (*) indicates significant difference.

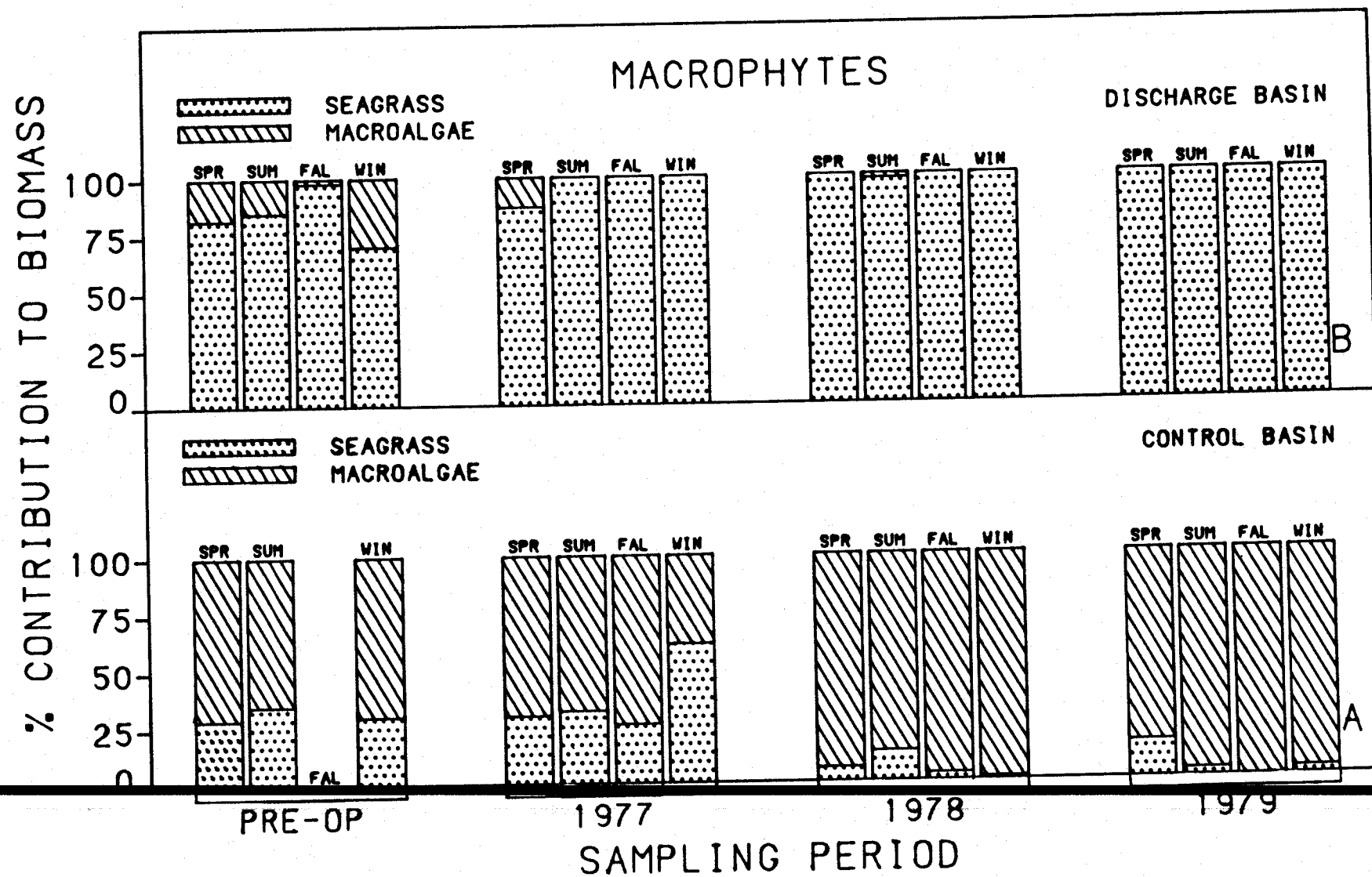
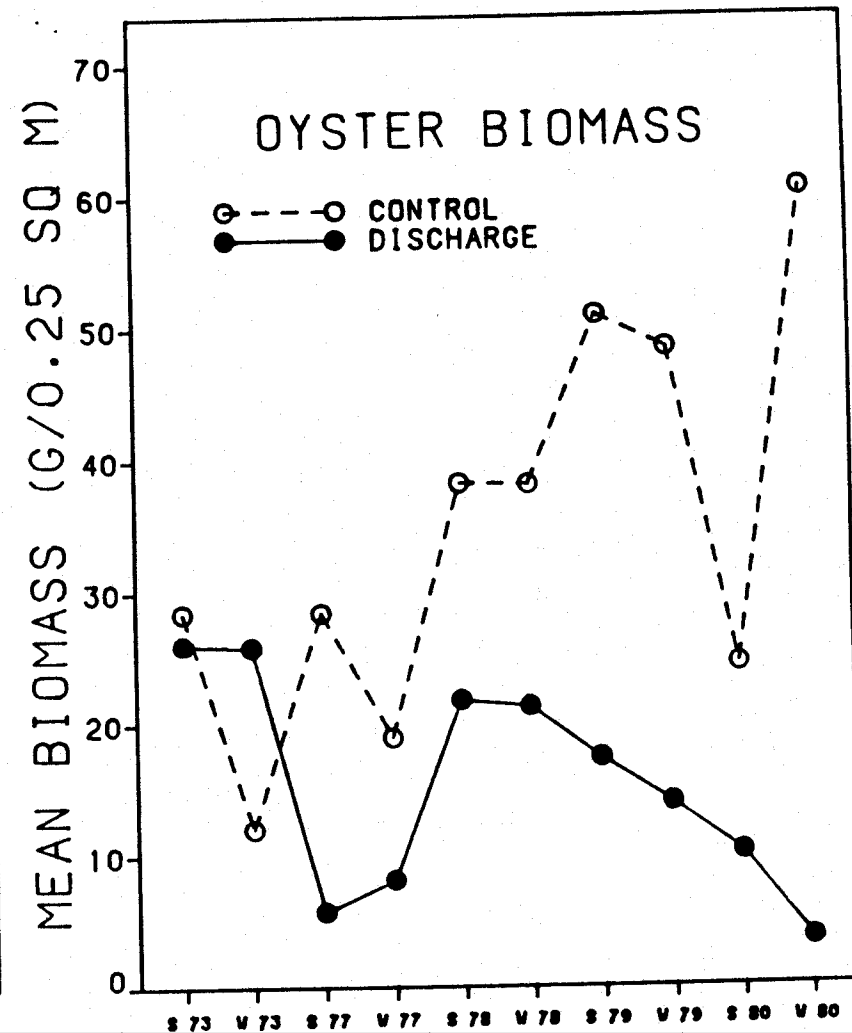
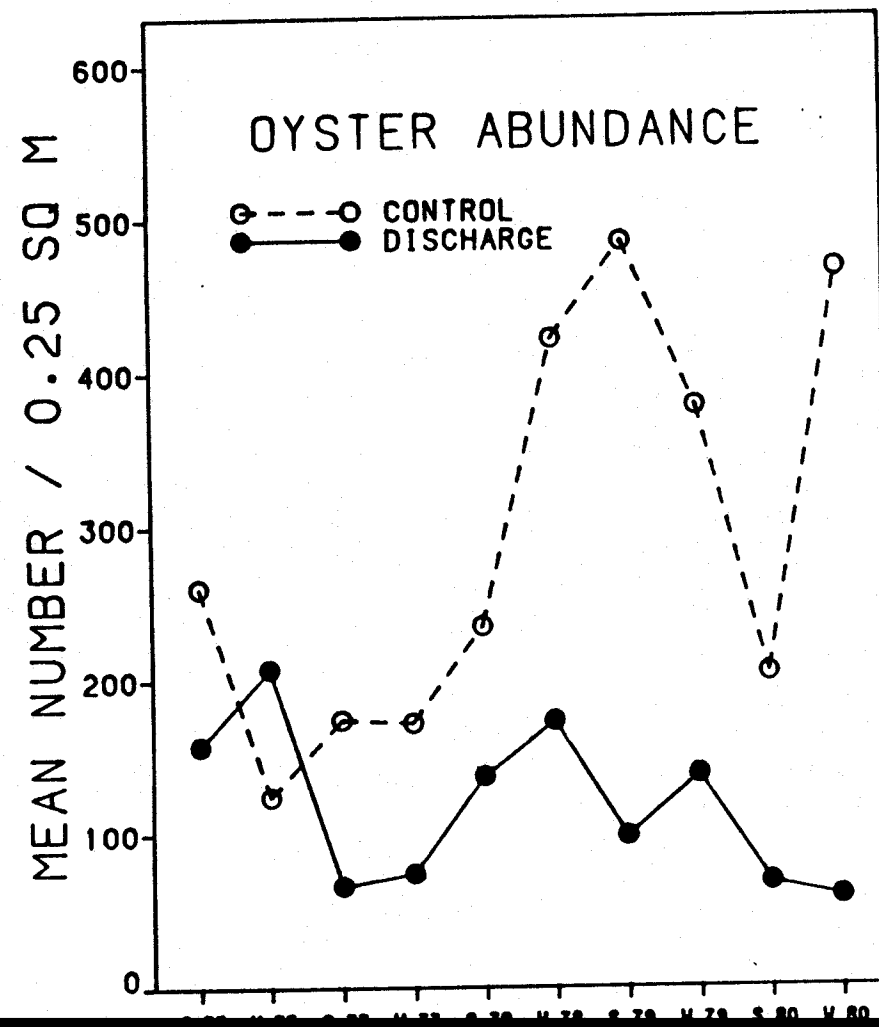


Fig.29. Percent contribution of seagrass and macroalgae to total macrophyte biomass in the control basin (A) and the discharge basin (B).



SAMPLING PERIOD

SAMPLING PERIOD

Fig.73. Comparative oyster reef data (adults) for pre-operational, 1977, 1978, 1979, and 1980 studies, for summer (S) and winter (W) sampling periods. Data presented are for 0.25 meter square quadrats.

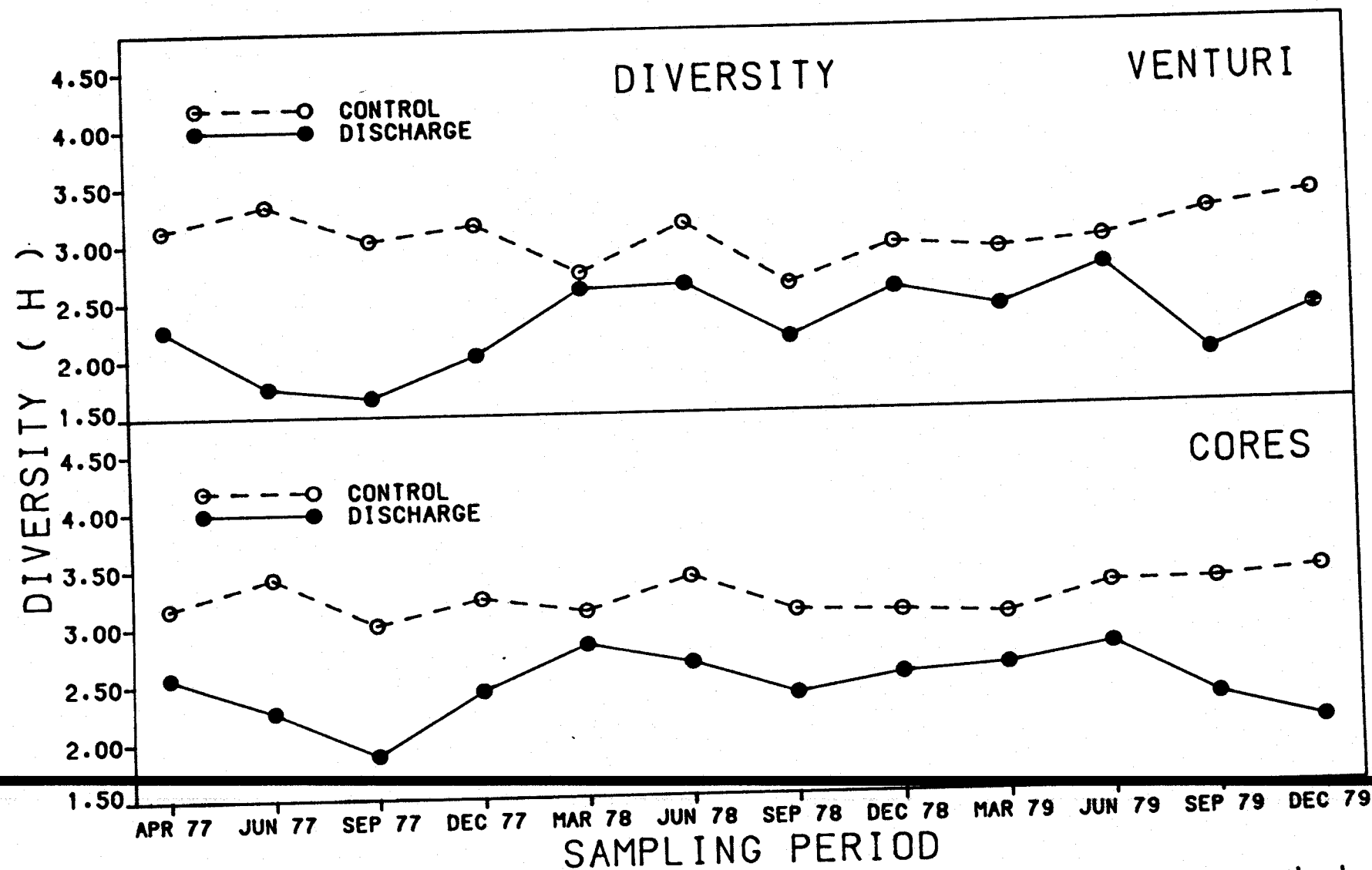


Fig.19-1. Mean benthic animal diversity (H) in venturi and bottom core samples for quarterly sampling periods of 1977, 1978 and 1979.

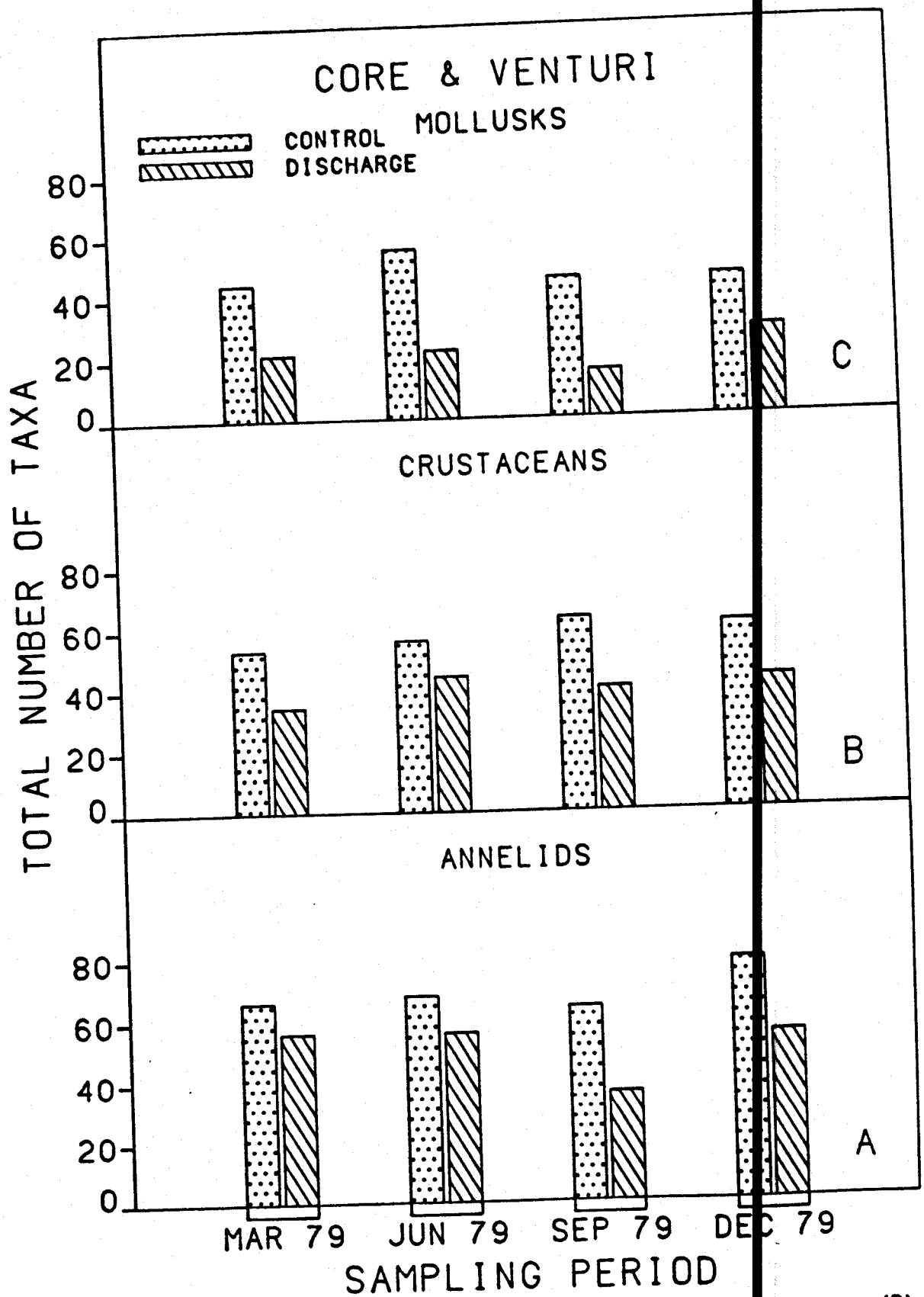
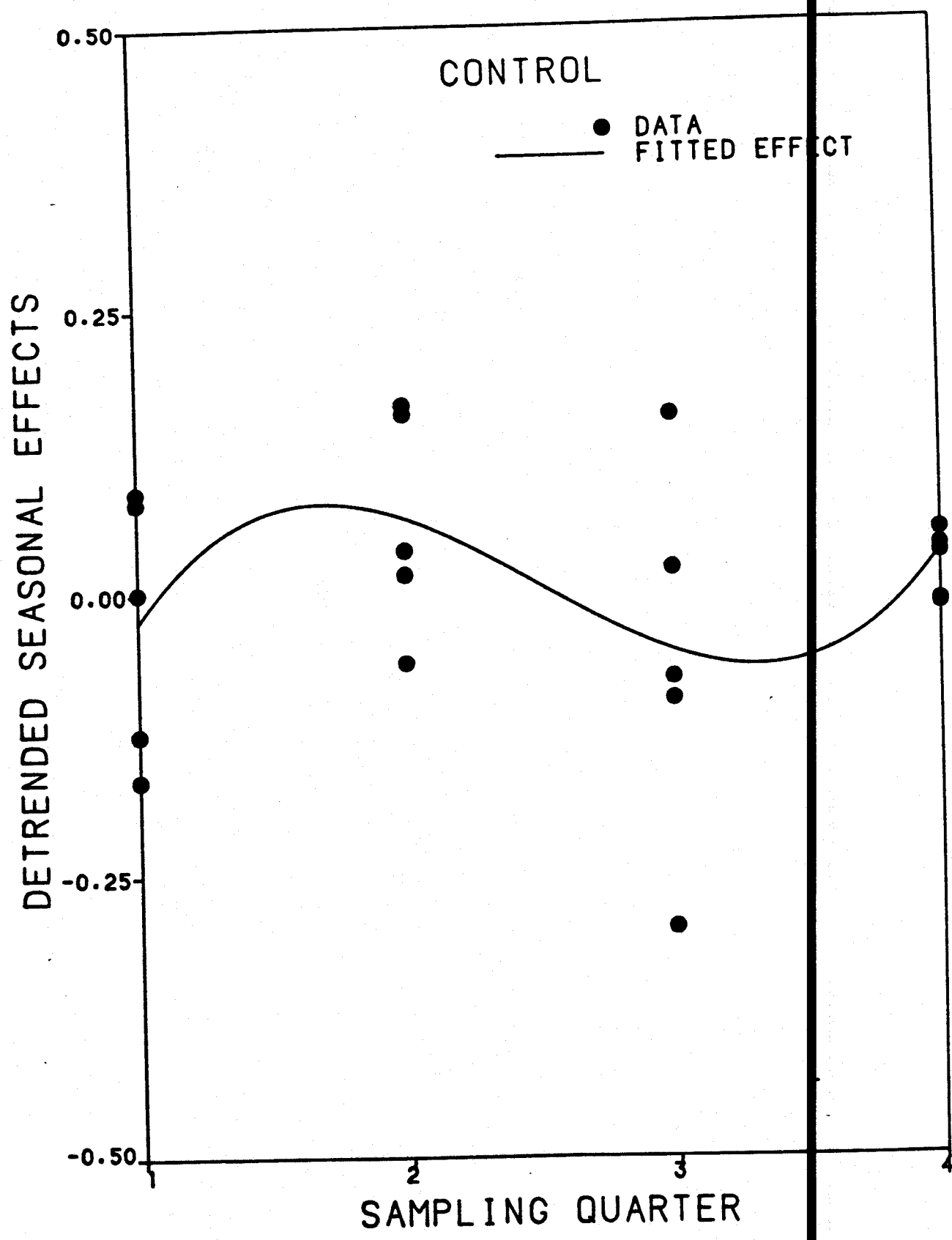
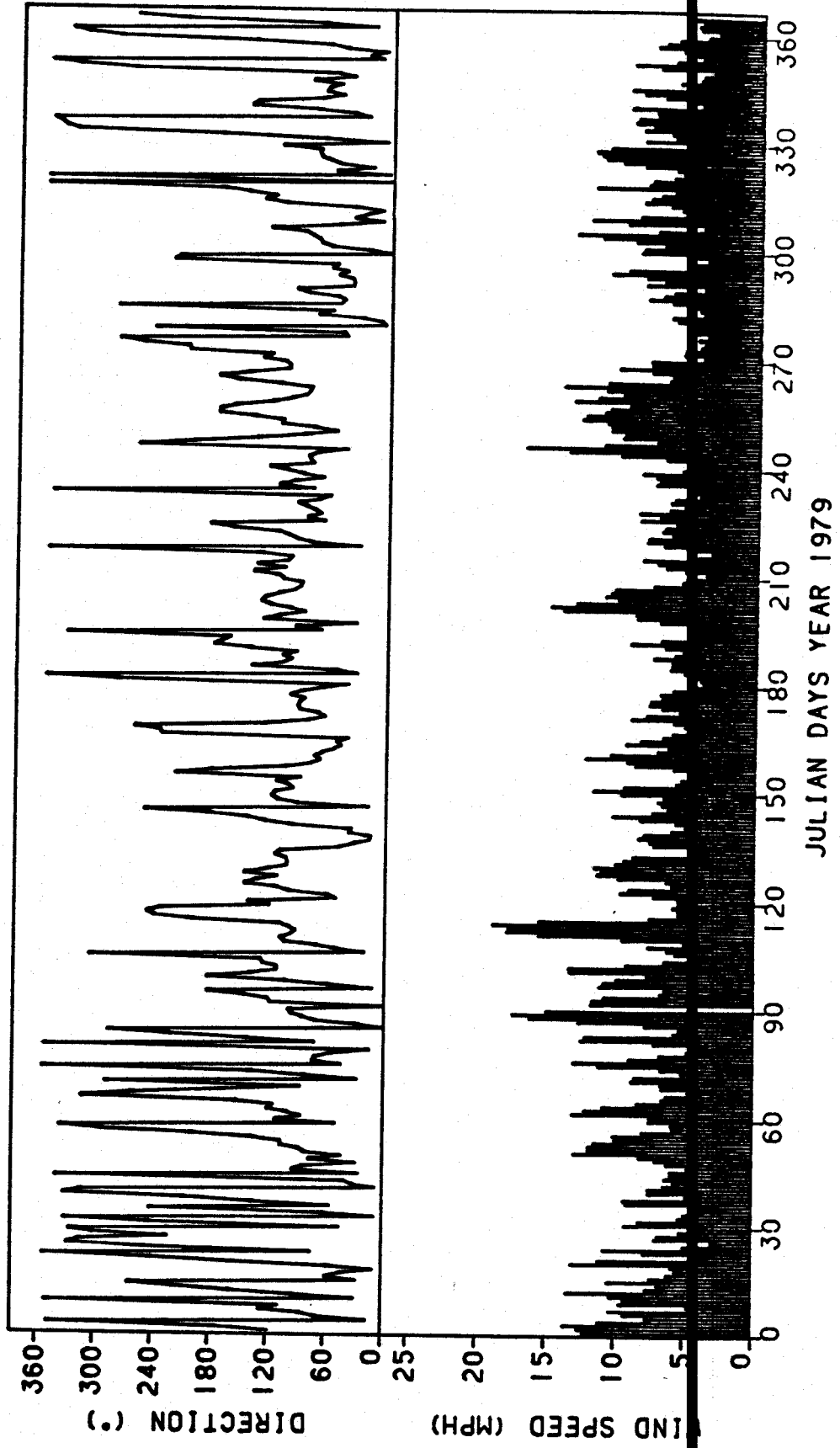


Fig. 7. Total number of taxa of annelids (A), crustaceans (B) and mollusks (C) at control and discharge stations.







CRYSTAL RIVER BENTHIC AND PLANKTONIC COMMUNITY STRUCTURE STUDY

CLIENT: Florida Power Company

COMPLETED: Ongoing

SERVICES: Field Sampling
Laboratory Analysis
Data Analyses
Report Preparation

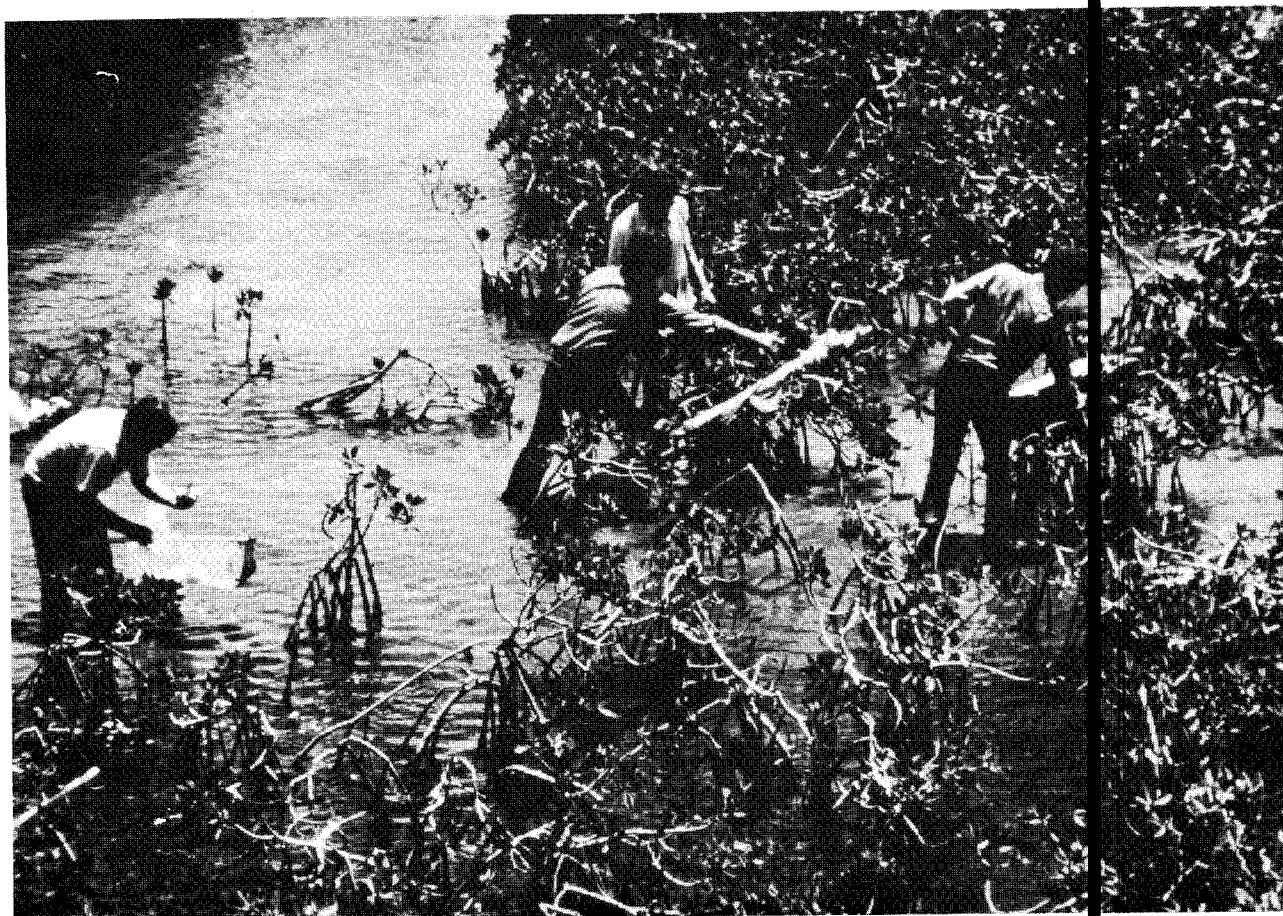
SPECIAL FEATURES:

- Analyses of five types of benthic samples impacted by thermal plume from nuclear power plant
- Seasonal zooplankton sampling and analyses
- Annual report to U.S. Nuclear Regulatory Commission

PROJECT DESCRIPTION:

A benthic and planktonic community structure study is part of Environmental Technical Specification studies at the Florida Power Company's Crystal River Nuclear Power Plant. Five types of benthic samples from an area impacted by the thermal plume are being compared with control samples out of range of the thermal plume. These include benthic core samples, venturi suction samples, seagrass monitoring, algal and seagrass harvesting, and oyster reef samples. Species identifications are carried out with biomass and diversities calculated for all crustaceans, mollusks, polychaetes, echinoderms, algae, and vascular plants.

Plume and control samples of zooplankton are taken on a seasonal basis. Taxonomic composition, abundance, and total biomass are being determined on a semidiurnal basis. The information is being compared with data from a two and one-half year baseline study to assess the effect on the environment of the 800 MW nuclear power unit. An annual report is submitted to the United States Nuclear Regulatory Commission.



CONSERVATION

Metcalf & Eddy's services relating to conservation range from environmental evaluation and natural resource planning to landscape design. The firm's experience includes projects such as preparation of townwide conservation/open space plans for Medfield and Saugus, Massachusetts; and a detailed natural resources inventory and environmental evaluation of a proposed flood control project in Union County, New Jersey. An ecological study was conducted to determine the requirement for restoring the Herring River to one of the foremost alewife spawning areas in New England. As a part of the Federal Endangered Species Program for the Fish and Wildlife Service, conservation work by the firm includes a study of the American Crocodile in Dade County, Florida.

SERVICES INCLUDE:

- Development of conservation goals and objectives
- Environmental assessments of conservation projects
- Natural resources inventories
- Rare and endangered species studies
- Open space planning
- Land/water use studies
- Soil and biochemical surveys
- Conservation mapping
- Quality of life analyses
- Cost-benefit analyses
- Capital improvements programs
- Conservation facilities and site design
- Government agency liaison services
- Preparation of resource protection bylaws



RARE AND ENDANGERED SPECIES STUDY

CLIENT: Florida Power & Light Company

COMPLETED: Ongoing

SERVICES: Environmental Studies

SPECIAL FEATURES:

- Environmental analyses of the status of rare and endangered species within areas to be affected by current or planned activities
- Study areas include the critical habitats of the Florida Keys, Florida Bay, and the Everglades

PROJECT DESCRIPTION:

This project encompasses coordinating a study in southeastern Florida to provide the basic data necessary to evaluate the status of rare and endangered species and their habitats which exist or might be expected to exist on Florida Power & Light Company's property. The study is based upon the recently completed Inventory of Rare and Endangered Biota of Florida prepared by the Florida Committee on Rare and Endangered Plants and Animals. The present study is designed to complement and to increase the value of the inventory with in-depth analyses of the status of rare and endangered species within the areas which soon may be affected by man's current or planned activities. In order to evaluate the subject species and habitats in the context of the surrounding natural and altered environments, the study area encompasses a 20-mile radius of the subject property. This study area is sufficient to provide data on most of the critical habitats of southeastern Florida including the upper Florida Keys, Florida Bay, and the Everglades.