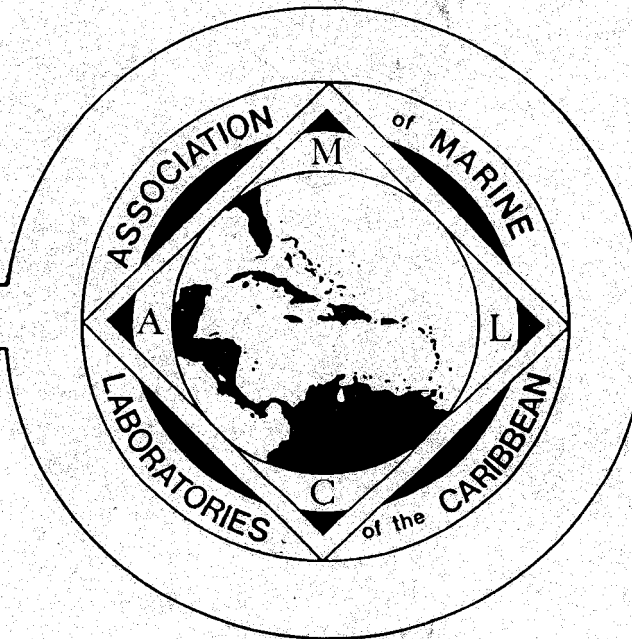


**Association
of
Marine Laboratories
of the
Caribbean**



**TWENTY-SECOND
MEETING**

May 8-11, 1989

**Program
and
Proceedings**

22nd AMLC MEETING
Hosted by the University of
Puerto Rico Sea Grant College
Program and the Department of
Marine Sciences of the
University of Puerto Rico

PUBLICATION NUMBER UPRSGCP-W-41



May 8, 1989

Dear AMLC Members:

Welcome! Welcome once more to Puerto Rico. It is a pleasure to host the 22nd meeting of the Association. Let it be known--those of you who are recent members--that the AMLC was born in Puerto Rico on April 1957 during an "organizing meeting" held at the Normandie Hotel in San Juan and at the Villa Parquera Hotel, right here where this meeting is being held! Later, we had the honor of hosting the 10th meeting at the Mayaguez Hilton Hotel during September 1973. Since the AMLC was established, we have roamed the Caribbean, the Atlantic and Gulf of Mexico: Bermuda (1958, 1981), Jamaica (1960, 1980), Curaçao (1962, 1976), Bimini, Bahamas (1963), Venezuela (1965, 1971), St. Croix (1975, 1986), Colombia (1977, 1987), Dominican Republic (1978), Miami (1983), Trinidad-Tobago (1984) and Sarasota, Florida (1988). Now we are back to the place of origin! The AMLC is still going strong; we are accomplishing what we set-out to do: to periodically meet and share the on-going research projects results being conducted at the affiliated laboratories or by individual members.

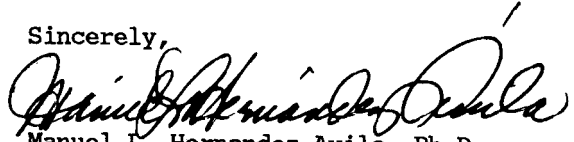
We wish to take this opportunity to acknowledge those usually unsung heroes, who with great determination, perseverance, devotion and interest have kept us together and vital, making our Association a viable and a significant one in the Caribbean Basin region. Of course, they cannot all be mentioned here. But there are those who deserve special recognition because they have been an integral part of our history and success. Would the AMLC been able to survive in the early stages without the dedication, persistence and commitment of our first Secretary-Treasurer, Charles Cutress (Puerto Rico)? Or the organizational guidance of Ivan Goodbody (Jamaica), Thomas Goreau (Jamaica) and James Lewis of Barbados? Later came Meredith Jones, Charlene Long, and Lucy Williams, who we all know have immensely contributed to maintain our continuity and our momentum as an organization. And most of all, Bert Williams who, as Kumar Mahadevan, our past president mentioned in his welcoming 21st meeting letter, "is always there." Yes, we owe Bert quite a lot, for which we should be specially grateful. The existence of our organization has many times hinged upon the selfless commitments of these individuals. We fully recognize their "advocacy."

The proceedings of this 22nd meeting of the Association indicate that the interest and continuing efforts of our members and affiliated laboratories are still the driving force. These are times of hardship; funds to support travel and per-diems are scarce. Yet, we expect the participation of at least 125 members, representing almost all of the 26 affiliated laboratories in the Association. The need to get together and the commitment to strengthen AMLC is obvious. Let's always try to give AMLC

renewed boosts, new hopes, new emphasis and future directions that will enable it to be the influential and leading force that we were meant to be, and should be, in the Caribbean region.

Welcome! Enjoy our hospitality. The UPR Sea Grant Program and the Department of Marine Sciences personnel have tried their best to make your visit a pleasurable and scientifically profitable occasion. Join me in thanking them for their efforts and dedication to ensure that the 22nd meeting would be a complete success.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Manuel L. Hernandez-Avila', written in dark ink.

Manuel L. Hernandez-Avila, Ph.D.
President (1989)

THE ASSOCIATION OF
MARINE LABORATORIES OF THE CARIBBEAN

The Association of Marine Laboratories of the Caribbean (AMLC) is an organization of 26 member laboratories, established in 1957. The purpose of the AMLC is to advance common interests and to promote communication and cooperation in Caribbean Marine Sciences. The Sea Grant Program and the Department of Marine Sciences of the University of Puerto Rico is pleased to host the twenty-second meeting of the Association.

AMLC EXECUTIVE BOARD OFFICERS

Manuel L. Hernández-Avila	President
Bert Williams	Executive Director
Bob Wicklund	President Elect
Mel Carriker	Vice President
Lucy Bunkley-Williams	Secretary-Treasurer
Jim Parrish	1st Member at Large
Arturo Acero	2nd Member at Large
Eric Jordan	3rd Member at Large
Charlene Long	Newsletter Editor
Karen Burns	Publicist

LABORATORY REPRESENTATIVES

Amado Acuna	Carlos A. Martinez
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Tania Cobo de Barany	Doon Ramsaroop
Jose Ferreras	Hernando Sanchez
Ivan M. Goodbody	Jeffrey Sybesma
Wayne Hunt	Jeremy Woodley
Yvonne Sadovy	John Hunt
Anthony Knapp	Claude Bouchon
Don Tindall	Donald Gerace
Jose M. Lopez	Chris Harrison
William MacLean	John Christy
Kumar Mahadevan	

ADMINISTRATIVE AND SOCIAL PROGRAM

MONDAY, MAY 8

1:00 - 6:00 pm Registration
8:00 - 10:00 pm Welcome Reception at the HVP

TUESDAY, MAY 9

8:00 - 10:00 am Late Registration
8:30 - 9:00 am Commencement Ceremonies
 Dr. Manuel L. Hernandez-Avila,
 President AMLC
 Dr. Jose L. Martinez-Pico, Chancellor
 UPR/Mayaguez Campus
 Dr. Alejandro Ruiz-Acevedo, Dean
 Faculty of Arts and Sciences
8:00 - 10:00 pm Executive Board Meeting
8:00 pm Field Trip to Phosphorescent Bay

WEDNESDAY, MAY 10

8:00 - 10:00 pm AMLC Banquet
 Atty. Fernando Agrait, President UPR
 Keynote Speaker

THURSDAY, MAY 11

5:40 - 6:40 pm General Assembly Meeting

FRIDAY, MAY 12

TBA Transportation to San Juan Airport
TBA Transportation to Mayaguez Airport
9:00 am Maricao Forest
9:00 am Aquaculture Facilities Visit
9:00 am Mangrove Channels

MONDAY, MAY 8 to FRIDAY, MAY 12

SCUBA diving and reef snorkeling,
time schedule and charges at the
Registration desk

MEETING COORDINATORS

REGISTRATION

Ms. Mariblanca Agüet
Ms. Laura Cotte

MESSAGES, FLIGHTS/RESERVATIONS

Mrs. Laura Acosta

TICKET SALE FOR SOCIAL ACTIVITIES

Mrs. Maritza Pagán

FIELD TRIPS

Dr. Dallas Alston

AUDIOVISUAL AIDS/POSTER SET UPS

Ms. Karen Burns
Ms. Linda Riggs

BANQUET

Dr. John Kubaryk
Mrs. Vangie F. Hernández

VISITS TO THE DEPT. OF MARINE SCIENCES LABS AT ISLA MAGUEYES

Dr. John Kubaryk

GENERAL MEETING INFORMATION

Dr. M. Valdés Pizzini
Dr. R. Lankford

INFORMATION ON P.R. SEA GRANT PROGRAM

Mrs. V. F. Hernández

INFORMATION ON DEPT. OF MARINE SCIENCES

Mrs. Maritza Pagán

TRANSPORTATION

Dr. M. Valdés-Pizzini
Dr. John Kubaryk
Mr. Ruperto Chaparro

22nd ANNUAL MEETING
La Parguera, Lajas, Puerto Rico
May 8-11, 1989

FINAL PROGRAM

MONDAY, MAY 8, 1989

1:00 - 6:00 pm Registration

8:00 - 10:00 pm Reception

TUESDAY, MAY 9, 1989

8:00 - 10:00 am Registration

8:30 - 9:00 am COMMENCEMENT CEREMONIES, Hotel Villa Parguera
Dr. Manuel L. Hernández-Avila, President AMLC
Dr. José L. Martínez-Picó, Chancellor, UPR at
Mayagüez, P.R.
Dr. Alejandro Ruiz-Acevedo, Dean, Faculty of
Arts and Sciences

SESSION A

CHEMISTRY, PHYSICS, GEOLOGY I

CHAIRPERSON:

Dr. Luis Soto, Univ. Nacional Autónoma de México

Soto, L.A., A.V. Botello, and G. Díaz -
ICMyL-UNAM.

LONG-TERM STUDY ON POLLUTION LEVELS OF
PETROLEUM HYDROCARBONS IN SHELF-FAUNA OF
CAMPECHE BANK, MEXICO (1979-1988)

Walker, W.W., C.S. Heard, and T.F. Lytle -
Gulf Coast Research Laboratory, Ocean
Springs, MS. REPRODUCTIVE EFFECTS IN MEDAKA
EXPOSED TO BIS (TRI-N-BUTYLTIN) OXIDE.

Morell, J.M., C. del Castillo and J.E.
Corredor - Univ. of Puerto Rico, Dept. of
Marine Sciences. PERSISTENCE OF SPILLED OIL
FRACTIONS IN A TROPICAL INTER-TIDAL ZONE.

Guzmán, H.M. and J.B.C. Jackson - Smithsonian
Tropical Research Institute, Republic of
Panama. SUBLETHAL EFFECTS OF OIL ON CORALS.

10:40 - 11:00 am COFFEE BREAK

Ray, M. and R. Appeldoorn - Univ. of Puerto
Rico, Dept. of Marine Sciences. AN EFFECTIVE
METHOD OF DYE RELEASE FOR SMALL SCALE CURRENT
TRACKING STUDIES.

SESSION B

CHEMISTRY, PHYSICS, GEOLOGY II

CHAIRPERSON:

Dr. Jorge Corredor, University of Puerto Rico

Escobar-Briones E. and L.A. Soto - Instituto
de Ciencias del Mar y Limnología, Univ.
Nacional Autónoma de Mexico. CARBON AND

Lapointe, B.E. - Harbor Branch Oceanographic Institution, Big Pine Key, FL. MESOSCALE VARIABILITY IN NUTRIENT-LIMITED PRODUCTIVITY OF PELAGIC SARGASSUM

Corredor, J.E. and J.M. Morell - Univ. of Puerto Rico, Dept. of Marine Sciences. SEDIMENTARY MICROBIAL NITROGEN TRANSFORMATIONS IN A COASTAL LAGOON.

Winter, A. and J. Briano. Dept. of Marine Sciences and Dept. of Chemical Engineering, UPR, Mayaguez, P.R. THE IMPORTANCE OF COCCOLITHOPHORES IN THE CARIBBEAN AND GLOBAL CO₂

Barreto, M. - Univ. of Puerto Rico, Dept. of Marine Sciences. CAMBIOS DE LINEA DE COSTA, PINONES, LOIZA, PUERTO RICO.

Barreto, M. - Univ. of Puerto Rico, Dept. of Marine Sciences. CAMBIOS DE LINEA DE COSTA, AREA SURESTE DE PUERTO RICO (1973-1988). Poster Presentation.

12:40 - 2:00 pm LUNCH

SESSION C

REMOTE SENSING

CHAIRPERSON:

Mr. Roy Armstrong, Univ. of Puerto Rico

Schwab, W.C., W.W. Danforth, R.W. Rodríguez, and S.B. Griscom - U.S. Geological Survey, Woods Hole, MA and San Juan, P.R. A LARGE SUBMARINE LANDSLIDE SCAR ON THE INSULAR SLOPE NORTH OF PUERTO RICO.

Armstrong, R.A. - Univ. of Puerto Rico, Dept. of Marine Sciences. REMOTE SENSING OF MANGROVE LEAF BIOCHEMICAL PARAMETERS

Armstrong, R.A. and L.L. Riggs. Dept. of Marine Sciences, UPR, Mayagüez, P.R. CHARACTERIZATION OF QUEEN CONCH HABITAT FEATURES USING REMOTE SENSING

3:40 - 4:00 pm COFFEE BREAK

SESSION D

MARINE BOTANY

CHAIRPERSON:

Dr. Alida Ortíz, Univ. of Puerto Rico

Smith, G.W. and D.T. Gerace - Bahamian Field Station, San Salvador, Bahamas. SEAGRASS RESEARCH AT THE BAHAMIAN FIELD STATION.

Kohler, S., C.C. Kohler, and J.M.B. Galvin - School for Field Studies, Beverly, MA and Southern Illinois Univ., Carbondale, IL. NEW

SURFACES FOR CIGUATOXIGENIC DINOFLAGELLATES PROVIDED BY DEAD BLEACHED CORAL.

Manjarrez, G. and A. Escobar - Univ. Tecnológica del Magdalena-INVEMAR, Santa Marta, Colombia. CARACTERISTICAS ESTRUCTURALES DE LOS MANGLARES DE LA CIENAGA GRANDE DE SANTA MARTA, CARIBE COLOMBIANO.

Klekowski, E.J., Godfrey, P.J. - Bahamian Field Station, San Salvador, Bahamas.

MUTATIONS, VIVIPARY AND AGING IN RED MANGROVES ON SAN SALVADOR.

Aponte, N.E. and D.L. Ballantine - Univ. of Puerto Rico, Dept. of Marine Sciences. LIFE HISTORY IN CULTURE OF A NEW SPECIES OF CALLITHAMNION FROM THE CARIBBEAN.

8:00 - 10:00 pm

EXECUTIVE BOARD MEETING

WEDNESDAY, MAY 10, 1989

SESSION E

POPULATION DYNAMICS

CHAIRPERSONS:

Dr. Raymond T. Bauer, Univ. of Southwest Louisiana and
Dr. Paul Yoshioka, Univ. of Puerto Rico

Bauer, R.T. - Univ. of Southwestern Louisiana, Lafayette, LA. REPRODUCTION AND RECRUITMENT PATTERNS IN NINE SHRIMP SPECIES INHABITING SEAGRASS MEADOWS, NORTH COAST OF PUERTO RICO.

García, J.R. - Marine Ecology Division, CEER- Univ. of Puerto Rico. POPULATION DYNAMICS AND PRODUCTIVITY OF PHYLLORHIZA PUNCTATA (SCYPHOZOA: RHIZOSTOMAE) IN LAGUNA JOYUDA, PUERTO RICO.

Cole, K.S. and Y. Sadovy - Univ. of Puerto Rico, Dept. of Marine Sciences and Fisheries Research Laboratory CODREMAR. INFLUENCE OF FEMALE FECUNDITY AND EMBRYO MORTALITY ON ESTIMATES OF REPRODUCTIVE SUCCESS IN THE BICOLOR DAMSELFISH STEGASTES PARTITUS.

Yoshioka, P.M. - Univ. of Puerto Rico, Dept. of Marine Sciences. THE POPULATION DYNAMICS OF SHALLOW-WATER GORGONIANS.

Alvey, M.E. - Univ. of Puerto Rico, Dept. of Marine Sciences. DIURNAL MOVEMENT PATTERNS AND THE DISTRIBUTION OF SPAWNING SITES OF THREE POPULATIONS OF THALASSOMA BIFASCIATUM AT SOUTHWESTERN PUERTO RICO.

Martínez, F.A. - Univ. of Puerto Rico, Dept. of Marine Sciences. REPRODUCTIVE BEHAVIOR AND THE BENEFITS OF SEX CHANGE.

10:40 - 11:00 am COFFEE BREAK

SESSION F

ENVIRONMENTAL DISTURBANCES I: CORAL BLEACHING

Gassman, N.J. and A.M. Szmant - Rosenstiel School of Marine and Atmospheric Science, Univ. of Miami, FL. THE EFFECT OF BLEACHING ON TISSUE COMPOSITION AND REPRODUCTION IN THE HERMATYPIC CORAL MONTASTREA ANNULARIS.

Ferrer, L.M. and A.M. Szmant - Rosenstiel School of Marine and Atmospheric Science, Univ. of Miami, FL. THE STRUCTURAL BASIS OF SKELETAL DENSITY BANDS IN MONTASTREA ANNULARIS.

Hayes, R.L. and P. Bush - Howard Univ., Washington, D.C. and Cayman Natural Resources Laboratory, George Town, Grand Cayman, B.W.I. RECOLORATION OF THE SCLERACTINIAN CORAL, MONTASTREA ANNULARIS.

Sandeman, I.M. - Trent Univ., Peterborough, Ont. and Discovery Bay Marine Lab., U.W.I. Jamaica. THE ULTRAVIOLET LIGHT RELATED PHYSIOLOGY OF ZOOXANTHELLAE AND CORAL BLEACHING.

Cook, C.B., A. Logan, J. Ward, B. Luckhurst, and C.J. Berg - Bermuda Biological Station, Univ. of New Brunswick, Bermuda, Dept. of Fisheries and Florida Dept. of Natural Resources. CORAL BLEACHING AND ELEVATED SEA TEMPERATURES: BERMUDA 1988.

12:40 - 2:00 pm LUNCH

SESSION G

ENVIRONMENTAL DISTURBANCES II: MASS MORTALITIES

CHAIRPERSON:

Dr. Susan B. Cook, Bermuda Biological Station
Dr. Lucy Bunkley-Williams, Univ. of Puerto Rico, Dept. of Marine Sciences

Vicente, V.P. - Marine Ecology Division, CEER-Univ. of Puerto Rico. RECENT SEA SURFACE TEMPERATURE CHANGES AND MASS MORTALITIES OF COMMERCIAL SPONGES AND SEAGRASSES.

CHAIRPERSON:

Dr. Ernest Williams, Univ. of Puerto Rico, Dept. of Marine Sciences.

Williams, E.H. and L. Bunkley-Williams, Caribbean Aquatic Animal Health Project, UPR, Dept. of Marine Sciences, Mayaguez, P.R. MAJOR MARINE ECOLOGICAL DISTURBANCES

FitzGerald, L.M., L.M. Ferrer, and A.M. Szmant - Rosenstiel School of Marine and Atmospheric Science, Univ. of Miami, FL. THE EFFECT OF CARBON SOURCE ON METABOLISM AND CALCIFICATION IN THE SCLERACTINIAN CORAL MONTASTREA ANNULARIS.

Vicente, V.P. Marine Ecology Division, CEER-Univ. of Puerto Rico. SPATIAL COMPETITION

AMONG CORAL REEF CLONAL INVERTEBRATES AND THE PROBLEM OF LOCAL DIVERSITY.

Ortiz, Edgardo y Cedar García-Ríos - Colegio Universitario de Humacao, Depto. de Biología. IMPACTO DE LA TORMENTA GILBERTO EN LAS PRADERAS DE FANEROGAMAS MARINAS EN LA COSTA ESTE DE PUERTO RICO.

Eakin, C.M., Div. of Biology and Living Resources, Rosenstiel School of Marine and Atmospheric Science, Univ. of Miami, FL. MICROHABITAT SELECTION IN JUVENILES OF THE DAMSELFISHES POMACENTRUS PLANIFRONS AND P. PARTITUS.

Hanisak, M.D., S.M. Blair, G.M. Burzycki, M.A. Samuel, J.K. Reed, and W.E. Wood - Harbor Branch Oceanographic Institution, Fort Pierce, FL. RECOLONIZATION OF THE BENTHIC ALGAL COMMUNITY AT THE WELLWOOD SITE, KEY LARGO NATIONAL MARINE SANCTUARY.

Woodley, J.D. Discovery Bay Marine Lab,

Jamaica. EFFECTS OF RECENT HURRICANES ON THE CORAL REEFS OF NORTH JAMAICA.

3:40 - 4:00 pm COFFEE BREAK

SESSION H MARINE AFFAIRS

CHAIRPERSON: Ms. Karen S. Burns, Mote Marine Laboratory, FL

Sybesma, J. - CARMABI Foundation, Curacao, Netherlands Antilles. A SHORT DESCRIPTION OF CARMABI.

Sybesma, J. STINAPA, Curacao, Netherlands Antilles. A SHORT DESCRIPTION OF STINAPA

Valdés-Pizzini, M. and R.L. Lankford, Sea Grant College Program, UPR, Mayaguez, P.R. UNIVERSITY OF PUERTO RICO SEA GRANT COLLEGE PROGRAM: AN OVERVIEW

8:00 - 10:00 pm BANQUET

THURSDAY, MAY 11, 1989

SESSION I INVERTEBRATES

CHAIRPERSON: Ms. Charlene Long, The Buffum Group, Salem, MA

Lacombe, D. and S. Jawoska, Instituto Oswaldo Cruz, Rio de Janeiro, Brazil, and Arz. Merino 154, Santo Domingo, D.R. CIRRIPIEDIA FROM THE CARIBBEAN COAST OF THE DOMINICAN REPUBLIC

Sastre, M.P. Depto. de Biología, UPR at Humacao, P.R. DINAMICA POBLACIONAL DE EMERITA PORTORICENSIS EN LAS BAHIAS DE MAYAGUEZ Y ANASCO, P.R.

Cortés, J. CIMAR, Univ. de Costa Rica, San Pedro, C.R. and Univ. of Miami, FL. THE CORAL REEFS OF THE GANDOCA-MANZANILLA NWR, LIMON, COSTA RICA

González, G. - Univ. of Puerto Rico, Dept. of Marine Sciences. EARLY LIFE HISTORY DEVELOPMENT OF THE GONADS OF A REEF FISH PARASITIC ISOPOD ANILOCRA CHROMIS WILLIAMS AND WILLIAMS.

Long, C.D. - The Buffum Group, Salem, MA. PUERTO RICAN NEREIDS (CLASS POLYCHAETA, FAMILY NEREIDAE) IN THE NMNH, WASHINGTON, DC.

Edmunds, P.J., D.A. Roberts and R. Singer - School for Field Studies, St. John, U.S.V.I. REEFS OF THE NORTHEASTERN CARIBBEAN I. SCLERATINIAN POPULATIONS.

Buchanan, B.A. and A.W. Stoner - CEER-Univ. of Puerto Rico. DISTRIBUTION OF TRAWLABLE DECAPODS ON THE WESTERN SHELF OF PUERTO RICO.

Goenaga, C. and E. Otero - Centro para Estudios Energéticos y Ambientales, Univ. de Puerto Rico, Mayagüez. THE CORAL REEFS OF LAGUNA JOYUDA.

10:40 - 11:00 am COFFEE BREAK

SESSION J

FISHES I

CHAIRPERSON:

Dr. Christopher C. Kohler, Southern Illinois Univ.

Phleger, C.F. and R.J. Laub - San Diego State Univ., CA. DEPTH, DIET, AND FATTY ACIDS IN JAMAICAN FISH.

Tosteson, T.R. and D.G. Baden. Dept. of Marine Sciences, UPR, Mayaguez, P.R. and Rosenstiel School of Marine and Atmospheric Science, Univ. of Miami, FL. BARRACUDA CIGUATOXINS: NUMBER AND DIVERSITY

Kohler, C.C., G.L. Paleudis, and D.R. Tindall - Southern Illinois Univ. Carbondale, IL. BEHAVIORAL ABNORMALITIES DISPLAYED BY OCEAN SURGEON FOLLOWING CONSUMPTION OF CIGUATOXIGENIC DINOFLAGELLATES.

Hartmann, J.X. and R.E. Waldner - Florida Atlantic Univ., Dept. of Biological Sciences, Boca Raton, FL. ELECTROPHORETIC COMPARISON OF ATLANTIC AND PACIFIC BLUE MARLIN (MAKAIIRA NIGRICANS) WHITE MUSCLE PROTEINS.

Poyer, J.C. and J.X. Hartmann - Florida Atlantic Univ., Dept. of Biological Sciences, Boca Raton, FL. IN VITRO CULTIVATION OF GONADAL CELLS FROM WESTERN ATLANTIC SAILFISH, ISTIOPHORUS PLATYPTERUS.

12:40 - 2:00 pm LUNCH

SESSION K

FISHES II

CHAIRPERSON:

Dr. Arturo Acero, Univ. Nacional de Colombia

Acero, P., A., J. Garzón-Ferreira and L. Silva Melo - Univ. Nacional de Colombia. THE AMERICAN EEL, ANGUILA ROSTRATA, IN COLOMBIAN WATERS.

Garzón-Ferreira, J. y A. Acero P. - INVEMAR, Colombia. LOS GOBIDOS ARRECIFALES DEL CARIBE COLOMBIANO PISCES: GOBIIDAE).

Eakin, C.M. - Univ. of Miami, FL, Div. of Biology and Living Resources, Rosenstiel School of Marine and Atmospheric Science. MICROHABITAT SELECTION IN JUVENILES OF THE DAMSELFISHES POMACENTRUS PLANIFRONS AND P. PARTITUS.

Clavijo, I.E. and D.G. Lindquist - Univ. of North Carolina at Wilmington, Dept. of Biological Sciences. TROPICAL REEF FISHES OFF NORTH CAROLINA: AN EXTENSION OF THE CARIBBEAN?

3:40 - 4:00 pm COFFEE BREAK

SESSION L

FISHERIES

CHAIRPERSON:

Dr. Yvonne Sadovy, CODREMAR and Dr. James D. Parrish, Univ. of Hawaii

Sadovy, Y. - Fisheries Research Lab., CODREMAR, Mayaguez, PR. THE FISHERIES RESEARCH LABORATORY OF CODREMAR: PROGRAMS AND PERSPECTIVES.

Lindquist, D.G., I.E. Clavijo, and S.W. Burk Dept. of Biological Sciences, Univ. of North Carolina at Wilmington. ASSEMBLAGES ON ADJACENT NEARSHORE ARTIFICIAL AND NATURAL REEFS IN ONSLOW BAY, NC: DIVER VISUAL SURVEYS, TAG RETURN STUDY AND PRELIMINARY GUT ANALYSES.

Turingan, R.G. and C.W. Recksiek - Univ. of Puerto Rico, Dept. of Marine Sciences and Dept. of Fisheries, Aquaculture, and Veterinary Sciences, Univ. of Rhode Island. VISUAL CENSUS SURVEY OF THE FISH ASSEMBLAGES OF CORONA DE LAUREL REEF, LA PARGUERA, PUERTO RICO.

Hunt, J.H. - Florida Marine Research
Institute, Marathon, FL. ABUNDANCE PATTERNS
OF SPINY LOBSTERS AT LOOE KEY NATIONAL MARINE
SANCTUARY, FLORIDA.

Parrish, J.D., W.R. Haight and M.P. Seki -
Hawaii Cooperative Fishery Research Unit/
National Marine Fisheries Service, Honolulu,
HI. TROPHIC PATTERNS OF DEEPWATER SNAPPERS.

McGowan, Michael F. Div. of Biology and
Living Resources, Rosenstiel School of Marine
and Atmospheric Science, Univ. of Miami, FL.
SEFCAR

5:40 - 6:40 pm GENERAL ASSEMBLY MEETING

ABSTRACTS

Session A CHEMISTRY, PHYSICS, GEOLOGY I
Hotel Villa Parguera Tuesday, May 9th
Chairperson: Dr. Alfonso Vazquez-Botello

Soto, L.A., A.V. Botello, and G. Díaz. ICMYL-UNAM México, D.F. LONG-TERM STUDY ON POLLUTION LEVELS OF PETROLEUM HYDROCARBONS IN SHELF-FAUNA OF CAMPECHE BANK, MEXICO (1979-1988). Shelf-fauna components from Campeche Bank have been exposed for almost a decade to chronic petroleum contamination in addition to acute effects caused by accidental oil spills such as the IXTOC-1 blow-out in 1979, and to less severe spills like YUM-II in 1988. Periodical analysis of a selected group of crustaceans and fish through capillary gas chromatography has revealed a progressive trend both in concentration and complexity of petroleum hydrocarbons attributed to the accelerated pace of oil exploration and production operations in the area. Background levels of total hydrocarbons in predominant shelf-components obtained in 1979 did not exceed critical values (>70 ppm.) However, since 1980 such values had a significant increase of nearly two orders of magnitude. Recent analyses conducted in 1988 have shown the presence of the most toxic portion of petroleum such as the polycyclic aromatic hydrocarbons (PAH's) which clearly indicates anthropogenic input of petroleum in the benthic trophic chain.

Walker, W.W., C.S. Heard, and T.F. Lytle. Gulf Research Laboratory, Ocean Springs, MS. REPRODUCTIVE EFFECTS IN MEDAKA EXPOSED TO BIS (TRI-N-BUTYLTIN) OXIDE. Japanese medaka (Oryzias latipes Temnick and Schlegel) were exposed under flow-through conditions for 90 days to sub-lethal concentrations of bis (tri-N-butyltin) oxide (TBTO), and reproductive effects determined. Exposure was initiated by placing 350 7-day post-hatch medaka fry into flowing artesian well water amended with 0.47 ± 0.14 and 3.25 ± 0.49 $\mu\text{g/L}$ TBTO under conditions of continuous exposure and 4.48 ± 0.67 $\mu\text{g/L}$ as weekly 24-h exposures. Two unamended well water controls, one located within the exposure chamber and the other physically separate but identical, were employed. As fry reached sexual maturity, eggs were collected during the final 18 days of the test, removed to TBTO-free hatching solution, and allowed to hatch. Viable embryos produced in control, 0.47, 3.25, and 4.48 $\mu\text{g/L}$ treatments were 434, 182, 182, and 46, respectively. No abnormal embryos or fry were detected in this study. Fecundity and percent hatch values decreased with increasing TBTO concentration.

Morell, J.M., C. Del Castillo, and J.E. Corredor. Univ. of Puerto Rico, Dept. of Marine Sciences, Mayaguez, P.R. PERSISTENCE OF SPILLED OIL FRACTIONS IN A TROPICAL INTERTIDAL ZONE. Bahia Sucia, on the southwest coast of Puerto Rico, was subjected to a major oil spill in 1973. Previous studies of

this spill site have concluded that petroleum hydrocarbons are rapidly degraded in this tropical environment. However, our survey of the petroleum hydrocarbons remaining in the intertidal sediments of a mangrove lined beach demonstrate the persistence of C-18 and higher unresolved aliphatic and aromatic hydrocarbons in these carbonate sediments. Persistence of hydrocarbons released to the environment is clearly a function of their solubility in water and their resistance to biodegradation. The possibility of vertical migration of some compounds by tidal transport is also discussed.

Guzman, H.M. and J.B.C. Jackson. Smithsonian Tropical Research Institute, Republic of Panama. SUBLETHAL EFFECTS OF OIL ON CORALS. Colonial animals like corals are frequently injured or harmed in patches by their natural enemies or by physical processes. These injuries expose patches of newly bared or gouged white skeleton on coral colonies. After a few weeks, the exposed skeleton is overgrown by algae and other organisms, and eventually the coral may regenerate the injury by over-growing these invaders, or the lesion may persist or increase due to further damage. On April 1986 more than 8 million liters of crude oil spilled into the sea on the central Caribbean coast of Panama. Both the frequency and size of injuries increased substantially on oiled versus unoiled reefs, and differences are still apparent after 31 months. Siderastrea siderea was more affected than Porites astreoides. An experiment was designed to measure the regeneration rates of injuries by corals on oiled and unoiled reefs. Preliminary results show that Porites recovers faster than Siderastrea on all reefs, but there is as yet no difference in regeneration rates on oiled versus unoiled reefs.

Ray, M. and R. Appeldoorn. UPR, Dept. of Marine Sciences, Mayaguez, P.R. AN EFFECTIVE METHOD OF DYE RELEASE FOR SMALL SCALE CURRENT TRACKING STUDIES. Fluorescent dyes are frequently employed in small-scale water flow studies. In environments such as coral reefs where variable substrate morphology causes complex flow patterns, such studies are especially valuable. In this paper we describe a clean, efficient method of releasing dye as a point source without imparting any initial velocity to it. Thick-walled balloons are filled with 8-14 liters of a saturated solution of Rhodamine B, tied to a line at the study site, and popped with a spear by a diver. Upon popping, the balloon material contracts, leaving a sphere of dye which is subsequently dispersed by currents. This method allows for precise positioning of dye release within boundary layers or complex density gradients.

Session B CHEMISTRY, PHYSICS, GEOLOGY II
Hotel Villa Parguera; Tuesday, May 9th
Chairperson: Dr. Jorge Corredor

Escobar-Briones E. and L.A. Soto. Instituto de Ciencias del Mar y Limnología, U.N.A.M., Mexico, D.F. CARBON AND NITROGEN STABLE ISOTOPES IN THE DOMINANT MACROCRUSTACEAN SPECIES OF A TROPICAL BENTHIC COMMUNITY. From a total number of 40 Crustacea species recorded for the epibenthic macroinvertebrate community at El Cayo site, Terminos Lagoon in the year 1984 the dominant components were Taphromysis villalobosi (20,608 inds.), Hippolyte pleuracanthus (16,415 inds.), Cymadusa compta (11,567 inds.), Penaeus duorarum (4,527 inds.), Elasmopus pocillimanus (1,623 inds.), Grandidierella bonnieroides (1,217 inds.), Thor dobkini (739 inds.), Palaemonetes octaviae (613 inds.), and Pagurus bonairensis (248 inds.), representing more than 95% of

the total abundance. After ontogenetic trophic units were recorded, the fractionation of the stable isotopes C^{13} and N^{15} supported the diets identified and ranged for both isotopes from 0.4 to 2.4‰ for each trophic level: primary producers (epiphytes $\delta^{13}C$ -13.27‰, $\delta^{15}N$ 3.29‰; Thalassia testudinum $\delta^{13}C$ -12.68‰, $\delta^{15}N$ 3.01‰), herbivores ($\delta^{13}C$ -12.28 to -11.44‰, $\delta^{15}N$ 2.58 to 4.30‰), omnivores ($\delta^{13}C$ -11.90 to -11.45‰, $\delta^{15}N$ 4.76 to 5.50‰). Values recorded for the trophic levels (except primary producers and detritus) showed no significant seasonal differences. The values were interpreted as the species differential metabolic processes of food carbon and nitrogen ratios in the community trophic structuring and served to establish the energy flow paths through the system.

Lapointe, B.E. Harbor Branch Oceanographic Institution, Big Pine Key, FL. MESOSCALE VARIABILITY IN NUTRIENT-LIMITED PRODUCTIVITY OF PELAGIC SARGASSUM. Productivity and nutrient-limitation bioassays were performed with Sargassum natans in neritic and oceanic areas of the western North Atlantic (17-40°N latitude). Gross productivity and respiration varied almost ten-fold throughout the study area, with consistently higher values in neritic waters compared to oceanic waters. Gross productivity and respiration were negatively correlated with molar C:N and C:P ratios, which ranged from 16:1 to 108:1 and 133:1 to 1551:1, respectively. Alkaline phosphatase activity was higher in oceanic compared to neritic S. natans and experimental pulses of N and P consistently enhanced productivity in oceanic, but not neritic S. natans. The N:P ratio of S. natans was remarkably similar to the Redfield ratio (16:1) in both neritic and oceanic locations. These results suggest that nutrient cycling within the Sargassum community is similar to surrounding pelagic ecosystems but that productivity and nutrient flux are relatively low in oceanic versus neritic waters.

Corredor, J.E. and J.M. Morell. UPR-Dept. of Marine Sciences, Mayaguez, P.R. SEDIMENTARY MICROBIAL NITROGEN TRANSFORMATIONS IN A COASTAL LAGOON. Sediments of Joyuda Lagoon, a highly productive shallow coastal lagoon, are anoxic and carry heavy organic loads. Pore water profiles show large concentrations of ammonium, typically around 0.5 mM, but very low concentrations of nitrate. Ammonification as determined by rates of ammonium diffusion from the sediments to the water column amounts to 54 $\mu\text{mole}/\text{m}^2/\text{h}$. Nitrification rates were below detection levels using a chlorate block technique; gradient computations indicate they are on the order of 1 $\mu\text{mole}/\text{m}^2/\text{h}$. Denitrification as measured by nitrate disappearance amounts to about 3.5 $\mu\text{mole}/\text{m}^2/\text{h}$. N-fixation measured by acetylene reduction amounts to 22 $\mu\text{mole}/\text{m}^2/\text{h}$. While our results for ammonification and N-fixation are similar to rates reported for comparable temperate environments, nitrification and denitrification are significantly lower. Year round high temperatures which decrease oxygen solubility and the lack of winter storm disturbances in the tropics may greatly inhibit nitrification and, consequently denitrification.

Winter, A. and J. Briano. Dept. of Marine Sciences and Dept. of Chemical Engineering, Univ. of Puerto Rico, Mayaguez, P.R. THE IMPORTANCE OF COCCOLITHOPHORES IN THE CARIBBEAN AND GLOBAL CO_2 . We have estimated the amount of carbon that is removed from the atmosphere by organisms that precipitate calcium carbonate in the oceans. Because of their short life spans these organisms are much faster in cycling CO_2 than nearly all of their terrigenous counterparts, including tropical rain forests.

Approximately 10^{15} grams of C per year are taken out of the atmosphere by calcareous organisms living in the oceans. Of these coccolithophores and planktonic foraminifera are the most important. However, coccolithophores get buried much more efficiently than foraminifera and thus they are one of the major sinks for C (10^{14} grams per year). Field work on coccolithophores should be just as intense as that being undertaken in tropical rain forests. However, nearly nothing is known about coccolithophore vertical and horizontal distribution in time and space, even though they are, overall, the most important primary procedures in the low and middle latitudes, including the Caribbean. Because of the Caribbean's small size and its proximity to major labs, Puerto Rico would be an ideal location to commence intense research on these organisms.

Barreto, M. UPR, Depto. de Ciencias Marinas, Mayaguez, P.R. CAMBIOS DE LINEA DE COSTA, PIÑONES, LOIZA, PUERTO RICO: 1936-1985. Este trabajo describe los cambios de línea de costa en el sector de Piñones en Loiza, Puerto Rico, durante un período de 49 años que comprende desde el 1936 al 1985. Se examinan las interrelaciones que representan las resistencias, las variables energéticas y antropogénicas como promotores de modelaje del sistema costero. Los cambios de línea de costa son interpretados en términos de magnitud y frecuencia de eventos geomórficos. Estos cambios en el sistema son a su vez relacionados con los cambios en los umbrales geomórficos. El examen de fotografías aéreas revela cambios significativos en la ubicación de la línea de costa entre el 1962 y 1971. El área presenció fenómenos atmosféricos como huracanes y tormentas tropicales que ocasionaron inundaciones, ventarrones y marejadas que desatan cambios en los componentes del sistema. Conjuntamente, para esta época la costa presenta la máxima intervención en actividades antropogénicas contribuyendo a disminuir el umbral geomórfico de la costa. En general, debido a la disminución de umbrales geomórficos, el sistema es más vulnerable a cambios de línea de costa causado por eventos que anteriormente no eran capaces de causarlo.

Session C REMOTE SENSING

Hotel Villa Parguera; Tuesday, May 9th

Chairperson: Mr. Roy Armstrong

Schwab, W.C., W.W. Danforth, R.W. Rodriguez, and S.B. Griscom. U.S. Geological Survey, Woods Hole, MA and San Juan, P.R. A LARGE SUBMARINE LANDSLIDE SCAR ON THE INSULAR SLOPE NORTH OF PUERTO RICO. A large amphitheater-shaped scarp, approximately 55-km across, was imaged using the GLORIA sidescan-sonar system and closely spaced bathymetric profiles on the northern insular slope of Puerto Rico (southern slope of the Puerto Rico Trench). This scarp represents the removal of more than $1,500 \text{ km}^3$ of Tertiary strata. The head of this scarp, which is in about 3,000 m water depth, coincides with the location of a zone of listric faulting observed on a nearby seismic-reflection profile. A review of available geophysical and stratigraphic data and tectonic-framework models suggests that the scarp formed as the consequence of a slope failure induced by the tectonic oversteepening of the insular slope of Puerto Rico. This oversteepening may be a result of the most recent episode of convergence of the Caribbean and North American plates, which began approximately 4 million years ago. The Tertiary strata have been tilted approximately 4° to the north in the last 4 million years and are apparently gravitationally unstable under

the present seismic climate. This example documents the type of slope failure commonly inferred to be a source of destructive tsunamis. If this slope failure was catastrophic, the volume of material involved is of sufficient size to have generated a tsunami large enough to have flooded the low ground of northern Puerto Rico.

Armstrong, R. UPR, Dept. of Marine Sciences, Mayaguez, P.R. REMOTE SENSING OF MANGROVE LEAF BIOCHEMICAL PARAMETERS. High spectral resolution remote sensing instruments can provide a wealth of information on mangrove canopy and leaf parameters. Subtle spectral changes in the visible and reflective infrared regions of the electromagnetic spectrum contain information on plant pigment concentration, leaf cellular structure, and leaf moisture content. A Collins GER spectroradiometer was used to obtain reflectance curves from individual red mangrove (Rhizophora mangle) leaves in the 400 to 2500 nm region of the spectrum. Leaves were sampled from mangroves receiving the effluent of a sewage treatment plant, a bird rookery site, reef-flat mangroves, a mangrove stand subjected to petroleum pollution, and two fringe mangrove sites. Extant nutrient conditions were determined by analyzing porewater for ammonia and nitrate. Leaf chlorophyll, carbon, nitrogen, phosphorus, and water content were measured. Percent leaf nitrogen ranged from 1.53 at the sewage plant effluent site to 0.80-1.08 at the low-nutrient sites. Reflectance at 540 nm was inversely correlated with leaf nitrogen content. Moisture stress indices were calculated.

Armstrong, R.A. and L.L. Riggs. Dept. of Marine Sciences, Univ. of Puerto Rico, Mayaguez, P.R. CHARACTERIZATION OF QUEEN CONCH HABITAT FEATURES USING REMOTE SENSING. Remote sensing techniques provide a cost effective method of extracting biological information from shallow-water bottom reflectances in the visible region of the spectrum. Landsat Thematic Mapper (TM) data are being used in the southern Exuma Cays, Bahamas, for characterizing the habitats of the queen conch, Strombus gigas. Empirical relationships between seagrass biomass, an important habitat feature determining the distribution of conch, and TM spectral data are being developed for the vicinity of Lee Stocking Island. Field sampling of seagrass beds was conducted in June 1988 and February 1989. Percent cover and macrophyte biomass were determined at each sampling site. An algorithm applied to the TM visible channels separated the bottom reflectance signal from the depth-dependent attenuation of the water column. Regression models will be developed equating seagrass parameters to the TM depth-invariant spectral signals. Other parameters which could influence the distribution of conch, such as water depth and distance to sand shoals and inlets, will be digitized into a geographic information system (GIS). The GIS will be used to predict the large-scale distribution of conch populations based on existing models.

Session D MARINE BOTANY

Hotel Villa Parguera, Tuesday, May 9th

Chairperson: Dr. Alida Ortiz

Smith, G.W. and D.T. Gerace. Bahamian Field Station, San Salvador, Bahamas. SEAGRASS RESEARCH AT THE BAHAMIAN FIELD STATION. Various aspects of seagrass growth in San Salvador have been studied in detail since 1984. These include, specific growth rate, species distribution, tissue chemistry and interactions among seagrass species, other organisms, sediment chemistry and the physical environment. Results of these

studies indicate the following: both nitrogen and phosphorus levels in the sediment and water column are very low compared to requirements predicted to maintain measured growth rates; nitrogen requirements appear to be of biogenic origin, i.e. nitrogen fixation; current energy appears to affect species distribution greatest followed by sedimentation rates; the presence of seagrasses appears to affect sediment chemistry more than sediment chemistry affects seagrass growth and distribution. Specific sampling sites have been selected for long-term monitoring of seasonal and other cyclic fluctuations.

Kohler, S., C.C. Kohler, and J.M.B. Galvin. School for Field Studies, Beverly, MA and Southern Illinois Univ., Carbondale, IL. NEW SURFACES FOR CIGUATOXIGENIC DINOFLAGELLATES PROVIDED BY DEAD BLEACHED CORAL. Dead sections of bleached corals in the United States and British Virgin Islands were found to be colonized by filamentous algae harboring epiphytic dinoflagellates implicated in ciguatera fish poisonings. The dinoflagellates Ostreopsis lenticularis, Prorocentrum concavum, and P. lima were all found in association with filamentous algae growing on dead sections of bleached Montastrea annularis and Acropora cervicornis. Several fish species from the families

Acanthuridae, Pomacentridae, and Scaridae, were observed to readily consume this filamentous algae/epiphytic dinoflagellate community. Such fishes are common forage for large piscivores inhabiting tropical reefs. An increased incidence of ciguatoxic fishes may occur on reefs where bleaching events have caused significant coral mortality.

Manjarrez, G. y A. Escobar. Univ. Tecnológica del Magdalena-INVEMAR, Santa Marta, Colombia. CARACTERISTICAS ESTRUCTURALES DE LOS MANGLARES DE LA CIENAGA GRANDE DE SANTA MARTA, CARIBE COLOMBIANO. Entre marzo y julio de 1986 se estudiaron las características estructurales del manglar de la CGSM. Para la caracterización se seleccionaron como áreas de muestreo parcelas de 0.1ha. y se registraron los atributos DAP, altura, densidad y área basal. Los resultados obtenidos (Área basal 0.01 m² -0.07m² /0.1ha; DAP 1.3-70.8 cm; altura 1.3-20.1 m y densidad 28-120 arboles/ 0.1ha) nos muestra un patrón de alta heterogeneidad estructural que es el resultado de la diversidad de condiciones ambientales existentes en cada sector del complejo lagunar. Se estudió además los diferentes tensores que han ocasionado la muerte masiva de extensas zonas de manglares y se dan recomendaciones al respecto.

Klekowski, E.J., Godfrey, P.J. Bahamian Field Station, San Salvador, Bahamas. MUTATIONS, VIVIPARY AND AGING IN RED MANGROVES ON SAN SALVADOR. Recently an hypothesis has been advanced that long-lived plants experience a greater loss of genetic integrity and, consequently, higher mutation rates than plants that are annuals. Since the frequency of plant birth defects is directly related to the magnitude of the mutation rate, plant age and life span may be a critical and generally unrecognized factor in the evolutionary equation. Estimates of mutation rates are very rare in long-lived plants. Mutations of genes expressed during embryo development are easily detected in the tropical tree Rhizophora mangle. This species is predominantly self-pollinated and forms viviparous seedlings; consequently two generations can be conveniently scored for genetic analysis in natural populations. Many plants in natural populations are heterozygous for recessive nuclear mutations affecting the photosynthetic process. The overall mutation rate

for such nuclear loci was calculated as 7.4×10^{-3} mutations per genome per generation. The mutation rate in the long-lived mangrove is 25 times higher than the rates in annuals.

Aponte, N.E. and D.L. Ballantine. UPR, Dept. of Marine Sciences, Mayaguez, P.R. LIFE HISTORY IN CULTURE OF A NEW SPECIES OF CALLITHAMNION FROM THE CARIBBEAN. The life history of the Caribbean plant presently referred to Callithamnion byssoides Arn. ex Harvey in Hooker was studied in culture. A regular "Polysiphonia-type" life history was demonstrated. Gametophytic plants matured 19 days after release of tetraspores, and mature carposporophytes were observed 13 days after formation of procarps. Tetrasporophytic plants matured 35 days after release of carpospores. Caribbean plants represent an undescribed taxon differing from C. byssoides on the basis of vegetative and reproductive morphology. Main differences are branching pattern, carposporophyte shape and structure of spermatangial clusters. Segregation of the new species is further supported by hybridization experiments conducted between Caribbean material with isolates referred to C. byssoides from the eastern and western Atlantic.

Session E POPULATION DYNAMICS

Hotel Villa Parguera; Wednesday, May 10th

Chairpersons: Dr. Raymond T. Bauer and Dr. Paul Yoshioka

Bauer, R.T. Univ. of Southwestern Louisiana, Lafayette, LA. REPRODUCTION AND RECRUITMENT PATTERNS IN NINE SHRIMP SPECIES INHABITING SEAGRASS MEADOWS, NORTH COAST OF PUERTO RICO. Shrimp populations were sampled monthly at night in Thalassia-Syringodium meadows at Dorado. Data on reproduction and recruitment were analysed to test the hypothesis of continuous reproduction and recruitment in these benthic tropical invertebrates. A high percentage of potentially mature females carried embryos in samples from all species and months of the year. The highs and lows in percent ovigerous were not concordant among species, i.e., there was no multispecies temporal pattern in reproduction. On the individual level, females produced successive spawns at short intervals (1-2 weeks) after reaching maturity. Females carrying embryos near hatching also had ovaries filled with ripe oocytes. Such females spawned a new brood within a few days after hatching a previously incubated brood of embryos. Although production of embryos and larvae was continuous throughout the year, recruitment was episodic in all species. Furthermore, the highs and lows of recruitment estimates were highly concordant, suggesting that similar environmental factors controlled recruitment of all species onto the seagrass meadows.

Garcia, J.R. Marine Ecology Division, CEER-UPR. POPULATION DYNAMICS AND PRODUCTIVITY OF PHYLLORHIZA PUNCTATA (SCYPHOZOA: RHIZOSTOMAE) IN LAGUNA JOYUDA, PUERTO RICO. Phyllorhiza punctata was the dominant gelatinous zooplankton population in Laguna Joyuda during the period between October 1985 and October 1986. Maximum numerical abundance ($160 \text{ individuals}/10^3 \text{ m}^3$) and population biomass ($530.6 \text{ mg AFDW}/\text{m}^3$) were observed during the summer, but it was present in 11 out of 13 months of sampling. Net increments in population biomass were associated only with growth of individual medusae from Oct. to Dec. ($1.3 \text{ mg AFDW}/\text{m}^3/\text{day}$) and with net recruitment and growth of individuals from May to Aug. ($5.4 \text{ mg AFDW}/\text{m}^3/\text{day}$). The net annual production by the population was estimated as $530 \text{ mg AFDW}/\text{m}^3$. Growth rates in mean bell diameter were exponential during both autumn (3.0% per day) and summer (1.3% per day). Differences in individual

growth rates between seasons appear to be mainly influenced by availability of food rather than temperature, since the highest growth rates were observed in the autumn, a period of lower water temperatures. There was a negative correlation between Phyllorhiza and zooplankton abundance during the summer suggesting that medusae had a significant predatory impact. The estimated net population production by Phyllorhiza in Laguna Joyuda is among the highest reported thus far for scyphozoans in coastal systems.

Cole, K.S. and Y. Sadovy. UPR, Dept. of Marine Sciences, Mayaguez, P.R. and Fisheries Research Laboratory, CODREMAR, Mayaguez, P.R. INFLUENCE OF FEMALE FECUNDITY AND EMBRYO MORTALITY ON ESTIMATES OF REPRODUCTIVE SUCCESS IN THE BICOLOR DAMSEL FISH Stegastes partitus. All male and female S. partitus comprising four reproductive colonies were identified, measured and observed for 40 consecutive days. The identities of spawning partners, and the fate of the egg batch were recorded for each spawning event. Using values calculated from a regression line of female fecundity versus female size (Sadovy and Cole, unpub. data), each egg batch was weighted according to the size of the maternal parent to obtain an estimate of the numbers of embryos present. Over a 40-day period, both female and male spawning success were strongly correlated with fish size. However, when numbers of embryos surviving to hatching were calculated, neither parental size, nor numbers of eggs produced or acquired, was correlated with numbers of embryos surviving to hatching. This study, although short-term in nature, suggests caution in using spawning success as a reliable prediction of reproductive success in benthic-spawning fishes.

Yoshioka, P.M. UPR, Dept. of Marine Sciences, Mayaguez, P.R. THE POPULATION DYNAMICS OF SHALLOW-WATER GORGONIANS. The dynamics of shallow-water gorgonian populations were monitored from 1983 to 1988 at two sites near La Parguera, P.R. Differences among species in colony growth, survival and recruitment rates were related to colony morphology. Thin-branched taxa as Pseudeopterogorgia grew faster (taller) than thick-branched forms as Plexaurella. Mortalities were significantly lower for faster- compared to the slower-growing forms. Faster-growing species displayed similar temporal patterns of recruitment compared to slower-growing taxa and vice versa. The latter result suggests that recruitment largely reflects variations in post-settlement (pre-recruitment) survivorship rather than the settlement of planula. In contrast to newly-recruited colonies, mortalities of larger (older) colonies was relatively low and not significantly different among species. The results of this study indicate that the survival of younger (smaller) colonies is the "bottleneck" in the dynamics of gorgonian populations and a key factor determining the species composition of this community.

Alvey, M.E. UPR, Dept. of Marine Sciences, Mayaguez, P.R. DIURNAL MOVEMENT PATTERNS AND THE DISTRIBUTION OF SPAWNING SITES OF THREE POPULATIONS OF THALASSOMA BIFASCIATUM AT SOUTHWESTERN PUERTO RICO. The distribution of spawning sites and the diurnal movement patterns of three populations of T. bifasciatum were examined. The study was conducted on three coral reefs at La Parguera, P.R. Movement patterns were assessed using visual transect line methods. Censuses were conducted at three different times during the day: before (8:00-9:00), during (12:00-13:00) and after (16:00-17:00) spawning. Spawning sites of T. bifasciatum populations are of two types: pair and group

spawning. Pair spawning sites were located by following terminal-phase males during spawning hours until spawning was observed. Group spawning was located by observing aggregations of initial-phase individuals. All spawning sites were spatially located on a plotted map of each reef. Movement patterns were found to differ among the reefs studied, and were related to the distribution of spawning sites. Spawning sites locations presented a different pattern from similar studies conducted at the San Blas Islands, off Panama.

Martínez, F.A. UPR, Dept. of Marine Sciences, Mayaguez, P.R. REPRODUCTIVE BEHAVIOR AND THE BENEFITS OF SEX CHANGE. The reproductive behavior of five one-male social groups of the small tropical serranid, Anthias squamipinnis, was studied in the coral reef off the coast of Eilat, Israel. The rate of performance of several male behaviors during spawning episodes was measured for the original male and after the male's removal, for the sex-changing female, in each of these groups. Also the mean spawning rate of females was recorded in each case. According to current sex-change theory, I hypothesized that original males should have substantially higher spawning rate than the females in its group and that following male removal, the female changing sex within the group will show an increase, at least up to the previous male's levels, in its spawning success once she becomes a full male. Also the gradual appearance of male-specific behaviors should be noted, reaching mean rates at the time of sex-change completion. Results were consistent with the predictions based on present theory though some exceptions were documented.

Session F ENVIRONMENTAL DISTURBANCES I: CORAL BLEACHING
Hotel Villa Parguera; Wednesday, May 10th
Chairpersons: Dr. Ernest Williams/Dr. Lucy Bunkley-Williams

Williams, Ernest H. and L. Bunkley Williams, Caribbean Aquatic Animal Health Project, UPR, Dept. of Marine Sciences, Mayaguez, P.R. MAJOR MARINE ECOLOGICAL DISTURBANCES. Major marine ecological disturbances (MMED's) seem to be increasing in both frequency and intensity. Last year the AMLC conducted a session on coral reef bleaching. This year we have a bleaching session and a mortality session. There is growing concern that many MMED's may have shared or related causes. Regional or world-wide MMED's may also be related to or indicative of global climatic changes. At least 14 MMED's are currently in progress. A die-off of brown pelicans and a new bout in the unending (?) coral reef bleaching have recently occurred in parts of the Caribbean.

FitzGerald, L.M., L.M. Ferrer, and A.M. Szmant. Rosenstiel School of Marine and Atmospheric Science, Univ. of Miami, FL. THE EFFECT OF CARBON SOURCE ON METABOLISM AND CALCIFICATION IN THE SCLERACTINIAN CORAL MONTASTREA ANNULARIS. Zooxanthellate scleractinian corals obtain nourishment from particulate feeding, but may depend more heavily on reduced carbon compounds translocated from their zooxanthellae for their energetic needs. Furthermore, these compounds may be incorporated into the skeletal organic matrix, thereby accounting for high calcification rates correlated with photosynthetic activity of the zooxanthellae. This study examined the effects of replacing the contribution of zooxanthellae with increased feeding on: tissue biomass (N and C per cm²), ammonium excretion, respiration and calcification rate. Specimens of Montastrea annularis, preconditioned to a high feeding regime (brine shrimp 3x per week), were induced to lose their zooxanthellae (bleach) in the

laboratory. Neither tissue biomass nor respiration rates differed between bleached and unbleached colonies, implying that an external energy supply can replace that normally provided by the zooxanthellae, and thereby support metabolic needs of the animal. The rate of nitrogen excretion by the bleached colonies was greater than that of the unbleached corals (13-16x - $p < 0.001$). Under conditions of high nitrogen availability, high rates of nitrogen loss should not affect the animal; however, during bleaching events, reduced recycling of nitrogen by bleached corals could affect the nitrogen budget of the reef ecosystem. Calcification rates of bleached corals were lower than that of unbleached corals (33% - $p < 0.05$), suggesting stimulation of calcification during photosynthesis must be related to a factor or combination of factors other than just the caloric value of the carbon compounds.

Gassman, N.J. and A.M. Szmant. Rosenstiel School of Marine and Atmospheric Science. Univ. of Miami, FL. THE EFFECT OF BLEACHING ON TISSUE COMPOSITION AND REPRODUCTION IN THE HERMATYPIC CORAL MONTASTREA ANNULARIS. Many corals are dependent on their algal symbiont, zooxanthellae, for part of their nutritional needs. During bleaching, loss of these algae or of their photosynthetic ability reduces the supply of available carbon and imposes metabolic stresses on the coral, potentially resulting in the consumption of storage reserves for metabolic energy. Colonies of Montastrea annularis from the Key Largo Marine Sanctuary, Florida, were examined nine months after the 1987 Caribbean bleaching event to determine the long-term effects of bleaching on processes such as tissue maintenance and reproduction. Colonies were classified as those which: 1) bleached and remained pale, 2) bleached and recovered normal coloration, and 3) did not bleach in 1987. Bleaching was caused by a 35% reduction in zooxanthellae density in two cases and a decrease in chlorophyll *a* per algal cell in a third. Zooxanthellae in bleached colonies were unusually distributed with populations concentrated in the basal portion of the animals rather than in the oral surface. Lower tissue biomass, 30% less tissue carbon (C) and 44% less tissue nitrogen (N) per skeletal surface area than the normal colonies, may have contributed to the inability of the bleached colonies to sustain oocytes through maturation. Recovered colonies showed no differences in zooxanthellae, chlorophyll *a* per algal cell, tissue C or N content, or gametogenesis from the normal colonies. Therefore, storage reserves, necessary for reproduction, may not be affected if zooxanthellae are regained soon after bleaching.

Ferrer, L.M. and A.M. Szmant. Rosenstiel School of Marine and Atmospheric Science, Univ. of Miami, FL. THE STRUCTURAL BASIS OF SKELETAL DENSITY BANDS IN MONTASTREA ANNULARIS. The density banding patterns of coral skeletons and the chemical and isotopic information contained in the bands have been extensively used to age and estimate the growth rates of corals and to study a variety of environmental parameters. However, the mechanism of band formation and how they affect the chemical and isotopic signal of the bands remain poorly understood. Both micro- (crystal arrangement) and meso-architectural (arrangement of skeletal elements) differences have been suggested to exist between high and low density skeletal carbonate. SEM examination of the skeleton of Montastrea annularis revealed that the thickness of the exothecal dissepiments is greater in the high density region. Endothecal dissepiments did not exhibit this variation and were uniformly thin throughout the skeleton. The areas where the exothecal dissepiments became

thickened and tended to fuse together corresponded to the high density bands. A t-test showed that the mean pore space of the high density bands (22.2%) was significantly lower than that of the low density bands (44.8%, $t=3.473$ $p<0.05$). High density bands appear to be formed by the secretion of thicker skeletal elements at the time of initial deposition. Infilling of the skeleton after initial deposition does not appear to play a major role in band formation.

Hayes, R.L. and P. Bush. Howard Univ., Washington, D.C. and Cayman Natural Resources Lab., George Town, Grand Cayman, B.W.I. RECOLORATION OF THE SCLERACTINIAN CORAL, MONTASTREA ANNULARIS, AFTER BLEACHING. Viable tissues of a single, massive colony of the reef-building coral, M. annularis, were sampled at one month intervals following the observation that random areas of marked discoloration (bleaching) had developed. Histological analysis of replicate plugs of tissue from bleached and unbleached regions of that colony allowed direct comparison of time-matched and zone-matched samples over a period of 6 months. During that interval, the entire colony was recolorized to a uniform and normal degree of pigmentation. Histological correlates to this recovery in the bleached zones reveal a gradual accumulation of a new, healthy population of zooxanthellae and the reconstitution of the gastrodermal epithelium of the coral. From algal counts/unit area of sectioned tissue, we have determined that bleached tissues harbor one third to one half of the number of algae in unbleached tissue. However, within a period of 3 to 4 months, the bleached tissues recover their algal densities to approximate those of unbleached tissues. Once repopulated with its algal symbiont, the previously bleached coenosarc is indistinguishable macroscopically from unbleached tissue in the colony.

Sandeman, I.M. Trent Univ. Peterborough, Ont. and Discovery Bay Marine Lab., U.W.I. Jamaica. THE ULTRAVIOLET LIGHT RELATED PHYSIOLOGY OF ZOOXANTHELLAE AND CORAL BLEACHING. Measurements were made of the penetration of 350 nm UV light on the fore reef waters at Discovery Bay. Laboratory studies were conducted of the UV related physiology of zooxanthellae isolated from a variety of hosts and depths. Whole cell absorption spectra indicated that the algae absorb 300-400 nm UV light and absorption peaks suggest the presence of UV absorbing (S-320) compounds. Action spectra demonstrated significant photosynthetic activity extending to 320-330 nm. P/I curves for 350 nm UV light showed, for most algae, strong inhibition of photosynthesis at UV levels found in shallow water. When 350 nm light was added to low levels of visible light production was increased, but at saturation levels of visible light production (P_{max}) was reduced for most algae. A similar effect was demonstrated with the UV component of sunlight. Thus, in low light situations the UV portion of the spectrum may contribute significantly to photosynthetic production. In high irradiance situations the algae, by absorbing UV light, and through their own reduced production, may help to protect their symbiotic partners from UV damage.

Cook, C.B.¹, A. Logan², J. Ward³, B. Luckhurst³, and C.J. Berg⁴. ¹Bermuda Biological Station. ²Univ. of New Brunswick, ³Bermuda, Dept. of Fisheries and ⁴Florida Dept. of Natural Resources. CORAL BLEACHING AND ELEVATED SEA TEMPERATURES: BERMUDA, 1988. Quantitative surveys assessed bleaching of zooxanthellae cnidarians (scleractinians, zoanths and Millepora alcicornis) on Bermuda reefs in 1988. Transects at three sites were monitored in May, July, Aug. - Sept. and Dec.: 1) North Rock

(northern rim); 2) Three Hill Shoals (lagoonal patch reef); 3) Natural Arches (South Shore rim reefs). Five replicate 20 m line transects were located on flat reef tops at 3-5 m depth; organisms under 10 cm points were assessed for bleaching. Tow surveys were also conducted at 25 randomly selected rim and lagoon reef sites. In May-July bleaching was seen only in the zoanthid Palythoa mammillosa. Tow surveys in mid-Aug. and the Aug.-Sep. transects revealed significant bleaching, particularly of M. alcicornis on rim reefs. Bleaching was reduced by Dec. The onset coincided with a period of elevated sea surface temperatures (29.5-31° C., 1.5-2.0° above normal). The data suggest that high-latitude reef corals, close to the lower limits of their thermal tolerance, may be sensitive to elevated temperatures which are within the normal thermal range of corals at lower latitudes.

Session G ENVIRONMENTAL DISTURBANCES II: MASS MORTALITIES
Hotel Villa Parguera; Wednesday, May 10th
Chairperson: Dr. Peter W. Glynn

Nichols, M. Coastal Resources Foundation and Virginia Institute of Marine Science, Gloucester Point, VA. and G. Brush, John Hopkins Univ., MD. LONG-TERM IMPACT OF SEDIMENTATION AND SEA LEVEL RISE: EVIDENCE FROM SWAMP AND POND DEPOSITS, ST. JOHN. Five sediment cores from Reef Bay swamp and Mandal salt pond were analyzed for pollen abundance, microfauna, lithology, organic content, radiocarbon age and stratigraphic relationships to discover if sedimentation rates have changed in response to man's historical activity in the watershed as deforestation of the sugar era. In Mandal Pond, with an undisturbed watershed, sedimentation rates are low, 0.4 g/cm² /yr but fluctuate 0.2 to 1.4 mm/yr with changes of sediment input, e.g. possibly associated with wet-dry periods. Submergence rates of global sea level rise since 3,300 years B.P. slightly exceed infilling by 0.1 mm/yr on average. At Reef Bay, with a disturbed watershed and small sink to watershed area ratio, rates are higher, 0.8 g/cm² /yr with a 4-fold increase since 560 years B.P. Infilling exceeds submergence by 0.2 mm/yr and deposits change upward from a lagoonal to mangrove peat, swamp clay and young alluvium. Despite man's historical activity, no massive sedimentation impact was observed. The changes are relatively small compared to the long-term sedimentologic evolution of the system.

Vicente, V.P. Marine Ecology Division, CEER-UPR, Mayaguez, P.R. RECENT SEA SURFACE TEMPERATURE CHANGES AND MASS MORTALITIES OF COMMERCIAL SPONGES AND SEAGRASSES. Long term changes in the distributional patterns of commercial sponges (Spongia spp. and Hippospongia spp.) within the West Indian Region indicate that: 1) commercial sponges had a widespread distribution throughout the whole West Indian Region and were ubiquitous in very shallow water until about the first half of the present century; 2) they were fished commercially not only in the traditional northern Caribbean sites (Florida, Gulf of Mexico, Bahamas) but also in the Greater (e.g. Hispaniola, Jamaica) and Lesser Antilles; and 3) they became extinct throughout most of the Lesser Antillean Region (e.g. Puerto Rico, Vieques, St. Thomas) sometime during the first half of this century. Mortalities of spongiids within the Antilles were found to differ from other marine mortalities reported in that: 1) species disappeared from a large region; 2) species vanished from different habitats and depths; and 3) natural populations never recovered. Species richness distributional patterns suggest that commercial sponge genera (Spongia and Hippospongia) had their center of origin in cooler,

northern latitudes. These sponges might have spread from these centers towards tropical West Indian islands when climatic conditions were cooler in the region, and then became extinct by direct or indirect effects of registered positive thermal anomalies in sea surface and atmospheric temperatures between 1900-50. Similarly, outbreaks of Labyrinthula which have caused widespread as well as local extinctions of eel grass (Zostera marina) have also been related to positive thermal anomalies by other authors.

Vicente, V.P. Marine Ecology Division, CEER-UPR, Mayaguez, P.R. SPATIAL COMPETITION AMONG CORAL REEF CLONAL INVERTEBRATES AND THE PROBLEM OF LOCAL DIVERSITY. A total of 572 interspecific and intraspecific interactions were found in the reef front of Cayo Enrique Reef, at La Parguera, P.R. All interspecific interactions among 49 species of sponges, corals, ascidians, and other sessile taxa, were evaluated by using a contact data matrix. The results of this analysis showed that the demosponge Chondrilla nucula was the single most aggressive species accounting for 55-67% of all the overgrowth interactions in the reef front. Corals were found to be most susceptible to become overgrown by the sponge. Corals that became overgrown included mussid corals, corals with varied structure, and corals with high calcification rates, which suggested that extracoelenteric digestion, coral shape, fast growth were not effective means of defense against C. nucula. The sponge overgrew live corals (Range = 8.5 - 11.0 cm) faster than live corals with algae (Range = 4.0-6.0 cm) or dead coral with algae (Range = 2.5-4.5 cm) in a 2.5 year period. Competitive abilities of species did not form a simple linear hierarchy and no examples of competitive networks (sensu Buss, 1976) were found. Factors related to the habitat complexity (refuges) of the reef front, as well as to changes in the relative abundance of keystone-like species (e.g. Diadema antillarum) help explain how local diversity is maintained (enhanced?) despite the occurrence of strong spatial competitors in the system.

Ortiz, Edgardo y C. García-Ríos. Colegio Universitario de Humacao, Depto. de Biología. Humacao, P.R. IMPACTO DE LA TORMENTA GILBERTO EN LAS PRADERAS DE FANEROGAMAS MARINAS EN LA COSTA ESTE DE PUERTO RICO. El fuerte oleaje que generó el viento asociado a la tormenta Gilberto depositó una gran cantidad de fanerógamas marinas sobre el supralitoral arenoso de la playa de Humacao. El 11 de sept. de 1988, dos días después del paso de la tormenta, cuando aún las plantas se hallaban frescas, se tomaron 13 muestras usando un cuadrante de 0.25 m² a lo largo de la playa de Humacao, desde Punta Santiago hasta el Morrillo. Las hierbas estaban depositadas en una franja de 15 m de ancho (n = 5), promedio; el largo del litoral examinado fue de 3.3 kms. aproximadamente. La densidad promedio de hierbas marinas fue calculada en 4.2 kilos de peso seco/m² (n=13). El total de la arribazón de fanerógamas debió ser de una magnitud cercana a las 230 toneladas de peso seco. El análisis de las muestras revela que la fracción de Syringodium filiforme (51%) tuvo una importancia relativa de la misma magnitud que la de Thalassia testudinum (49%). Solo trazas de otras hierbas fueron encontradas en las muestras. El análisis de la razón de peso seco de hojas a raíces muestra una relación de 10 a 90 en Thalassia y de 56 a 44 en Syringodium. Es conocida la gran capacidad de Thalassia para reponerse de la perdida de hojas, pero no parece tener la misma capacidad de recuperación cuando el disturbio alcanza el sistema de raíces. La abundante biomasa de raíces (principalmente de Thalassia) sugiere que la marejada de la tormenta causó daños a largo plazo en la estructura de la

pradera de fanerógamas marinas cercana a Cayo Santiago.

Eakin, C.M. Division of Biology and Living Resources, Rosenstiel School for Marine and Atmospheric Science, Univ. of Miami, FL. MICROHABITAT SELECTION IN JUVENILES OF THE DAMSELFISHES POMACENTRUS PLANIFRONS AND P. PARTITUS. In field surveys, the highest densities of juvenile Pomacentrus planifrons have been reported to be associated with live coral colonies, while the highest densities of juvenile P. partitus were reported in dead coral framework/rubble habitats. However, these distributions do not necessarily indicate preferences, but may result from differential mortality and other environmental factors. During field choice experiments, P. planifrons selected live Montastrea annularis colonies significantly more often than live M. annularis. This agrees with two years of field censuses of tract of > 87 m of live M. annularis in which 73% of the damselfish recruits were P. planifrons, and with random surveys of framework/rubble habitats where 100% of recruits were P. partitus. However, consistent, species-specific preferences were not exhibited during laboratory experiments. Data from the M. annularis tract also revealed that recruit density varied as functions of season, lunar period and colony size. Given these preferences, disturbances that reduce live coral cover should lead to increased densities of P. partitus, and reduced densities of P. planifrons recruits.

Hanisak, M.D., S.M. Blair, G.M. Burzycki, M.A. Samuel, J.K. Reed, and W.E. Wood. Harbor Branch Oceanographic Institution, Fort Pierce, FL. RECOLONIZATION OF THE BENTHIC ALGAL COMMUNITY AT THE WELLWOOD SITE, KEY LARGO NATIONAL MARINE SANCTUARY. Benthic algae quickly colonized the severely impacted area caused by the grounding of the freighter Wellwood on Molasses Reef. The initial colonizers of the site were opportunistic green algae (Cladophora spp., Enteromorpha spp., and Trichosolen parva) that were rapidly replaced by a red algal turf consisting of a suite of fine, filamentous species (e.g., Gelidiella spp., Lophosiphonia cristata, and Polysiphonia spp.). Cyanophytes (primarily Calothrix crustacea, Schizothrix calcicola, and S. mexicana) bloomed in the late summer. Considerable differences between the impacted site and adjacent unimpacted reef persisted four years after the grounding. Given the important roles of algae, their community structure has profound ecological impacts on the reef system.

Woodley, J.D. Discovery Bay Marine Laboratory, Jamaica. EFFECTS OF RECENT HURRICANES ON THE CORAL REEFS OF NORTH JAMAICA.

SESSION H MARINE AFFAIRS

Hotel Villa Parguera, Wednesday, May 10th
Chairperson: Ms. Karen M. Burns

Sybesma, J. CARMABI Foundation, Curaçao, Netherlands Antilles. A SHORT DESCRIPTION OF CARMABI. CARMABI (the Caribbean Marine Biological Institute) was founded in 1955. Its goals were to carry out and promote scientific research on organisms of the Caribbean sea and its coasts, especially those of the Netherlands Antilles. CARMABI carried out fisheries research until 1969 and at that time concluded that intensification of fisheries was not possible while marine culture was not feasible. In 1970 CARMABI started a scientific coral reef project. Motive was that knowledge gained through scientific research of the reef would be indispensable to the preservation of the reef and sustainable use of these resources especially when (marine)tourism was going to be stimulated. The coral reef

research program yielded a wealth of data which was most valuable in the planning and establishment of the marine parks in the Netherlands Antilles. In 1983 the coral reef program was concluded. CARMABI, because of funding reasons, changed its name (it is now called "CARMABI Foundation"; the acronym CARMABI has been maintained to aid recognition) and its objective which now became: "to carry out and promote marine and terrestrial scientific research on behalf of natural resource management in the Netherlands Antilles." The new objectives have broadened the area of research, but has limited the focus to natural resource management.

Sybesma, J. STINAPA, Curacao, Netherlands Antilles. A SHORT DESCRIPTION OF STINAPA. STINAPA (Netherlands Antilles National Parks Foundation) was founded in 1963 and has been closely related to CARMABI from the beginning. STINAPA has three main objectives. The first objective is protection of the natural and cultural resources. The second objective is to stimulate the recreational use of the management areas through sustainable use. The third objective is natural environmental education. Nowadays STINAPA is playing an important role in the Netherlands Antilles. It manages land parks like the Christoffel park in Curacao and Slagbaai-Washington in Bonaire, while it also makes marine parks in Curacao, Bonaire and Saba. Since 1986 STINAPA has an educational department which brings educational programs on the island. As STINAPA is situated in the different islands of the Netherlands Antilles, and since the tendency in the islands is to become more and more independent, the different local STINAPA commissions have become independent also. It started with Aruba, while at this moment Bonaire and Saba are also completely self supporting. STINAPA Netherlands Antilles nevertheless is, still having a good relationship with all islands.

Valdes-Pizzini, M. and R.L. Lankford, Sea Grant College Program, Univ. of Puerto Rico, Mayaguez, P.R. UNIVERSITY OF PUERTO RICO SEA GRANT COLLEGE PROGRAM: AN OVERVIEW. University of Puerto Rico Sea Grant is a component of the National Sea Grant College Program, a U.S. association of 30 university-based programs having a basic and common mandate to ensure the rational development and wise use of marine resources through research, education, and extension. UPR Sea Grant has adapted this mandate to meet the special requirements of Puerto Rico, the U.S. Virgin Islands and the region, as well as those of the nation. Our efforts are supported financially by federal funding and local matching funds and very significantly, through our contacts with and access to expertise and the broad information base of the Sea Grant Network. UPR Sea Grant supports a broad spectrum of research related to marine resources including living resource development, biotechnology, coastal processes and engineering, coastal pollution, environmental issues and others, as well as studies of the socio-economic impacts of coastal and marine resource utilization. In the education sector, our program activities are channeled primarily to the K-12 level, particularly addressing the need to increase the awareness, experience and capabilities of public school teachers to better present the subject fields of coastal environments, marine ecology and rational resource conservation. The necessary transfer of Sea Grant information and technology is accomplished through the efforts of our Marine Advisory Services and Communication/Publication Project which jointly serve a wide variety of marine resource users, managers and planners as well as educators and the concerned public. Being a Caribbean-based program, we have traditionally sought to involve other

countries in mutually beneficial activities -- either formally or informally. We firmly believe that the UPR Sea Grant has an important and influential role to play in the region.

SESSION I INVERTEBRATES

Hotel Villa Parguera,

Chairperson: Ms. Charlene Long

Lacombe, Dyrce and Sophie Jakowska. Instituto Oswaldo Cruz, Rio de Janeiro, Brazil, and Arz. Merino 154, Santo Domingo, Dominican Republic. CIRRIPIEDIA FROM THE CARIBBEAN COAST OF THE DOMINICAN REPUBLIC. Species reported below were collected in 1984 and characterized and identified using Spalteholz and other histological methods. Lepas anatifera Linneus, 1764, on mobile substrates in the Bay of Bani. Chthamalus proteus Dando & Soutward, 1980, abundant on shells in Boca Chica keys. Euraphia rhyzophorae Oliveira, 1940, with a dark smooth and depressed carapace, on mangrove roots at the mouth of San Andres Bay and in Canto Sagrado of Los Haitises National Park. Chthamalus augustetergum Pilsbry, 1916, small specimens frequent on mangrove roots in the Bay of Las Calderas. Balanus amphitrite amphitrite Darwin, 1854, considered in Brazil as indicator of coastal pollution, in the port of Haina and on top of shells, associated with Balanus eburneus Gould, 1841, featuring a white carapace with purple stripes.

Cortes, J. CIMAR. Univ. de Costa Rica, San Pedro, Costa Rica and the BLR-RSMAS, Univ. of Miami, FL. THE CORAL REEFS OF THE GANDOCA-MANZANILLO NATIONAL WILDLIFE REFUGE, LIMON, COSTA RICA. The Gandoca-Manzanillo Wildlife Refuge is located on the southeastern end of the Caribbean coast of Costa Rica. It was created in 1985 and includes 5,013 ha of terrestrial and 4,436 ha of marine environments. The marine portion can be divided into three types: coral reefs, grassbeds and sand/mud bottoms. Twenty-nine species of scleractinian corals, three species of hydrocorals and fifteen species of octocorals have been identified. Average life coral coverage ranged from less than 1% on silted reefs to over 7% on deep, clean water reefs. The predominant coral species in shallow areas were Diploria clivosa, Porites astreoides, Millepora complanata, and in some restricted areas Acropora palmata; in deeper areas the predominant species were Diploria strigosa, Siderastrea siderea, Dichocoenia stellaris, Montastrea cavernosa, and in some areas Agaricia agaricites. Some of the near-shore, shallow reefs are being stressed by sediments because of deforestation and there is evidence of coral harvesting for sale. The corals are protected by law but obviously stronger enforcement is necessary. Also, it is recommended that watersheds along the coast be protected to reduce soil loss and siltation.

Gonzalez, G. Dept. of Marine Sciences, UPR, Mayaguez, P.R. EARLY LIFE HISTORY DEVELOPMENT OF THE GONADS OF A REEF FISH PARASITIC ISOPOD ANILOCRA CHROMIS WILLIAMS AND WILLIAMS. The life history of Anilocra chromis, a protandrous hermaphrodite, was investigated. Parasites and hosts were collected from Laurel reef off La Parguera, P.R. Brood released "juvenile" isopods were reared in aquaria on recipient hosts.

Representative sizes of A. chromis from "juveniles" through females were collected in the field. A. chromis was capable of reproduction at the time of release from the female marsupium. These young males, called "micromales", measured 3.8 mm in length. Active spermatogenesis and reproductive capability was evidenced by cellular differentiation in the testis lobes and spermatozoa in the vas deferens respectively. The appendix

masculinum measured 1.125 times the length of the endopod and was considered fully developed at hatch time. The male stage ended from 9.5 mm to 9.6 mm in length and a transition stage began. Rapid ovary development and testis degeneration occurred until a completely developed ovary was formed. A. chromis approximately 11.4 mm and longer were females. Most micromales attached initially to the fins of their host (58%), site of highest parasite loss. Thirty nine percent of the parasites attached initially to the head region, site of lowest parasite loss. All A. chromis collected from the field were attached to the subocular region.

Long, C.D. The Buffum Group, Salem, MA. PUERTO RICAN NEREIDS (CLASS POLYCHAETA, FAMILY NEREIDS) IN THE NATIONAL MUSEUM OF NATURAL HISTORY, WASHINGTON, D.C. The National Museum of Natural History (formerly the United States National Museum) contains several hundred specimens of the polychaete family Nereidae that have been collected since the 1800's. The first 81 specimens examined, none of which had been previously identified, were 76.5% Neanthes micromma, 6.1% male Platynereis dumerilii, 4.8% three forms of Nereis nr pelagica, 3.7% Gymnereis sp. 3.7% an undescribed species of Nereis, and 1.2% each of P. dumerilii/P. massiliensis, Platynereis sp., Nicon sp., and one unknown genus. It is expected that identity of the last three species will be determined when more specimens are examined. Asexual forms of the sibling species P. dumerilii and P. massiliensis cannot be distinguished from one another. Identification of Puerto Rican polychaetes has been greatly facilitated by the Taxonomic Guide to the Polychaetes of the Northern Gulf of Mexico, Vittor & Associates, Inc., 8100 Cottage Hill Road, Mobile, AL 36609.

Edmunds, P.J., D.A. Roberts and R. Singer. School for Field Studies, St. John, USVI. REEFS OF THE NORTHEASTERN CARIBBEAN I. SCLERACTINIAN POPULATIONS. Scleractinian species composition and abundance was determined on 12 shallow reefs (< 6 m deep), located on a total of 8 different islands within the Virgin Islands and as far south as Saba, Netherlands Antilles. The size of scleractinian colonies was measured on 5 reefs. Twenty one species were found and there were no major variations in coral diversity or evenness throughout the region. Colony sizes were significantly different between sites although variations were not consistent between sites. The most common corals throughout the region were Agaricia agaricites, Montastrea annularis, Porites astreoides, P. porites, and Acropora cervicornis. On an average reef in the northeastern Caribbean these represent 25%, 17%, 16%, 15%, and 7% of the coral colonies and have mean diameters of 4.0 cm, 24.0 cm, 6.0 cm, 5.3 cm, and 12.4 cm, respectively. The value of this average reef description in determining the impact of species specific effects, such as Black Band Disease, is discussed.

Buchanan, B.A. and A.W. Stoner. CEER, Mayaguez, PR. DISTRIBUTION OF TRAWLABLE DECAPODS ON THE WESTERN SHELF OF PUERTO RICO. Decapods were trawled seasonally at 11 stations off western Puerto Rico. Stations ranged from Mayaguez Bay which drains two large rivers to relatively dry coastal areas off Boqueron Bay and Joyuda. The 7 most abundant species accounted for over 90% of the decapods taken and included Lupella forceps, Trachypenaeus similis, T. constrictus, Penaeus notialis, Xiphopenaeus kroyeri, and Processa hemphilli among others. Analysis of similarities in fauna for each sampling and station revealed both spatial and seasonal patterns for the stations. The two river mouth stations were quite different.

from other stations and each other, and showed high seasonal variation. Most of the remaining stations showed a tendency for inshore versus offshore groupings during the dry season in particular, which broke down somewhat in the height of the wet season. Analysis of the abundance and size frequency patterns of some of the most abundant species indicated that these seasonal patterns may be more directly a result of the life history patterns of the most abundant species, than salinity fluctuations.

Goenaga, C. and E. Otero. Centro para Estudios Energeticos y Ambientales, UPR, Mayaguez, PR. THE CORAL REEFS OF LAGUNA JOYUDA. We report the occurrence of fossil coral reefs buried 5-10 cm below a layer of dark, sulphur containing sediments. The reefs are dense Porites porites (Scleractinia) assemblages in growth position and in water depths of 1-1.5 m. Other species of scleractinians (Porites astreoides, Siderastrea sp., Oculina diffusa, Manicina areolata, Acropora cervicornis), and hydricorals (e.g. Millepora complanata, M. alcicornis) comprise a smaller portion of the reefal mass. Altogether these species are representative of shallow leeward habitats. Large lucinids (Lucinoma (?) sp.) occur slightly deeper (1.8 m) than the Porites biotope. The relationship between these reefs and coastal morphology as well as speculations on their origin and demise are discussed. We also compare them to similar adjacent and extant biotopes. Radiocarbon dates of specimens, indicating last connection of lagoon to open sea, are discussed.

SESSION J FISHES I

Hotel Villa Parguera, Thursday, May 11th
Chairperson: Dr. Christopher C. Kohler

Phleger, C.F., and R.J. Laub. San Diego State Univ. San Diego, CA. DEPTH, DIET, AND FATTY ACIDS IN JAMAICAN FISH. The cardinal snapper, Pristopomoides macrophthalmus, collected from 500 m depth off Jamaica, had 4.0-4.4% lipid in its neurocranium and vertebral centra, comprised of 85-86% triacylglycerol. The rare arrowtail, Melanonous zugmayeri, from 1,000 m depth, had 1.3-1.8% lipid in these same tissues, comprised of 47.6-76.7% triacylglycerol. Fatty acids of these deep fish when compared with two shallow reef herbivores, Acanthurus bahianus and A. chirurgus, were enriched in polyunsaturated fatty acids, particularly 22:6 ω 3, 20:5 ω 3, and 16:4 ω 3/ ω 1. Monosaturated fatty acids in Melanonous zugmayeri were 31.7-46.3% of the total fatty acids and were dominated by 18:1 ω 9 + 11 and 20:1. Monounsaturated fatty acids in the Acanthurus species were 27.0-36.4% and 23.3-30.7% in the bigeye, Priacanthus arenatus, a nocturnal carnivore from 25 m depth. The principal monounsaturated fatty acid in Acanthurus spp. was 16:1 ω 7 (8.7-24.6%) whereas P. arenatus was similar to the two deep fish with respect to monounsaturated fatty acids and polyunsaturated fatty acids. Fatty acid composition of P. arenatus is probably controlled by its diet consisting of larval forms from deeper colder water.

Tosteson, T.R., and D.G. Baden. Dept. of Marine Sciences, Univ. of Puerto Rico, Mayaguez, P.R., and Rosenstiel School of Marine and Atmospheric Science, Univ. of Miami, FL BARRACUDA CIGUATOXINS: NUMBER AND DIVERSITY. 180.4 kg of ciguatoxic

barracuda (Sphyraena barracuda) caught in Puerto Rico, were extracted in aqueous methanol (MeOH), followed by back-extraction of residual water with ethyl acetate (EtAC). 1080 ug toxic extract/g fish extracted were recovered, for a total of 195 gm. Toxic residues, fractionated on Bio-Sil A, showed activity in extract fractions unadsorbed on Bio-Sil A and those eluted with EtAC/MeOH mixtures from 90:10 to 0:100. Toxic Bio-Sil A fractions were further purified with Sephadex LH-20. Toxic materials from the different Bio-Sil A fractions all eluted from the LH-20 column at a similar V/V ratio, with peak toxicity fractions at 0.56 - 0.58. Adsorption to Bio-Sil A suggested differences in the chemical nature of toxic fractions, while their toxicities partitioned similarly on LH-20. Further chromatographic purification, followed by reverse phase HPLC analyses revealed that there were three toxic components in the ciguatera barracuda extracts. These data suggest that diverse, multiple toxins cause ciguatera fish poisoning.

Kohler, C.C., G.L. Paleudis, and D.R. Tindall. Southern Illinois Univ., Carbondale, IL. BEHAVIORAL ABNORMALITIES DISPLAYED BY OCEAN SURGEON FOLLOWING CONSUMPTION OF CIGUATOXIGENIC DINOFLAGELLATES. Ocean surgeon (Acanthurus bahianus) fed a diet containing freeze-dried Gambierdiscus toxicus (SIU strain 350) cells displayed distinct behavioral abnormalities, including inactivity, loss of equilibrium, erratic swimming, loss of orientation, and inability to feed. Behavioral disorders were similar to previously published accounts with bluehead (Thalassoma bifasciatum), though for ocean surgeon higher dosages (1.0-1.5 compared to 0.3 mg freeze dried cells/g wet weight fish) were required. Several weeks were generally required for ocean surgeon to recover following discontinuance of the toxic diet. Abnormal behavior associated with feeding was usually the last disorder to subside. Ocean surgeon, as well as other species in the family Acanthuridae, have frequently been implicated as major links in the ciguatera food chain. They and other herbivorous fishes displaying behavioral disorders would likely be more susceptible to secondary consumers resulting in an acceleration of the rate at which ciguatera toxins biomagnify.

Hartmann, J.X., and R.E. Waldner. Dept. of Biological Sciences. Florida Atlantic Univ., Boca Raton, FL. ELECTROPHORETIC COMPARISON OF ATLANTIC AND PACIFIC BLUE MARLIN (MAKAIRA NIGRICANS) WHITE MUSCLE PROTEINS. Currently one species of blue marlin is recognized worldwide. While morphologically similar, there is some controversy whether the Atlantic and Pacific members are different species. In an attempt to address this question, we utilized isoelectric focusing analysis to examine white muscle proteins from fishes taken in the Pacific (Hawaii) and Atlantic (Florida and the Bahamas). No differences in protein banding patterns were seen when the Pacific and Atlantic fish proteins were examined using a pH gradient from 5-8. However, when a pH gradient 3-9 was employed, protein bands which were clearly seen at the anodic position with Pacific samples were not present in the Atlantic samples. The differences in protein banding patterns could be indicative of population differences or a species difference.

Poyer, J.C., and J.X. Hartmann. Dept. of Biological Sciences, Florida Atlantic Univ. Boca Raton, FL. IN VITRO CULTIVATION OF GONADAL CELLS FROM WESTERN ATLANTIC SAILFISH, ISTIOPHORUS PLATYPTERUS. The present study was undertaken to determine the growth requirements for billfish cells as a first step toward the in vitro fertilization of ova. Heart, kidney, testis, and

ovary tissues were aseptically removed to a Dulbecco's phosphate buffered saline adjusted to 460 mOs with NaCl. After mincing, the tissues were plated both directly and after exposure to trypsin. The tissues were placed in Leibovitz medium containing 20% fetal bovine serum adjusted with NaCl to final osmolarities of 300, 350, 400, 450 and 500 mOs. Gentamicin, penicillin, streptomycin, and fungizone were added to all solutions. After 14 days, various cell types including fibroblast-like cells were seen to form a monolayer of growth around the directly plated and the trypsinized gonadal tissues. Growth was most rapid in the 350 mOs medium, although the cells were highly vacuolated. A slower growth rate of non-vacuolated cells occurred at 450 mOs. No growth occurred in heart or kidney cultures.

SESSION K FISHES II

Hotel Villa Parguera, Thursday, May 11th

Chairperson: Dr. Arturo Acero

Acero, P., A., J. Garzon-Ferreira and L. Silva Melo. Univ. Nacional de Colombia, (INVEVAR), Santa Marta, Colombia. THE AMERICAN EEL, ANGUILLA ROSTRATA, IN COLOMBIAN WATERS. The American eel has been reported from the southern Caribbean only on few occasions; Colombia is not an exception and it is absent from the last books written about ichthyofauna of this country. In any case, a significant population of that eel inhabits the short and fast streams around Santa Marta, which originate at the Sierra Nevada. The observations presented in this preliminary report were made at Quebrada Valencia where Anguilla rostrata is one of the 12 fish species seen and collected.

Garzon-Ferreira, J. y A. Acero P. INVEVAR. Santa Marta. Colombia. LOS GOBIDOS ARRECIFALES DEL CARIBE COLOMBIANO (PISCES: GOBIIDAE). Cuarenta y seis especies de peces de la familia Gobiidae se han encontrado en los ambientes arrecifales, principalmente coralinos del Caribe colombiano. De estas, 40 se conocen en la costa continental y 37 en la Isla de Providencia (Caribe occidental); 11 constituyen nuevos registros para el Caribe sur y 24 para la costa de Colombia y 2 son especies nuevas de los generos Lythrypnus y Quisquilius. Con base en los datos de numerosas colectas limitadas con rotenona se presenta y discute informacion sobre su distribucion, frecuencia y abundancia. En las formaciones coralinas, los gobidos constituyen en promedio mas de un cuarto de las especies, cerca de un tercio de los individuos y menos de un decimo de la biomasa de la fauna de peces pequenos y residentes. Las especies mas comunes en general son en su orden Coryphopterus personatus, Gnatholepis thompsoni, Quisquilius hipoliti, Coryphopterus eidolon y Elacatinus illecebrosus, presentes en mas del 50% de los muestreos. Los mas abundantes son C. personatus, Lythrypnus minimus, Q. hipoliti, Lythrypnus spilus y G. thompsoni, las unicas con un promedio superior a 5 especimenes por colecta. Existen, sin embargo, diferencias regionales en la composicion de especies y en su abundancia.

Eakin, C.M. Div. of Biology and Living Resources, Rosenstiel School of Marine and Atmospheric Science, Univ. of Miami, FL. MICROHABITAT SELECTION IN JUVENILES OF THE DAMSELFISHES POMACENTRUS PLANIFRONS AND P. PARTITUS. In field surveys, the highest densities of juvenile Pomacentrus planifrons have been reported to be associated with live coral colonies, while the highest densities of juvenile P. partitus were reported in dead coral framework/rubble habitats. However, these distributions do not necessarily indicate preferences, but may result from differential mortality and other environmental factors. During

field choice experiments, P. planifrons selected live Montastrea annularis colonies significantly more often than dead rubble habitats, while P. partitus selected rubble more often than live M. annularis. This agrees with two years of field censuses of a tract of >87 m of live M. annularis in which 73% of the damselfish recruits were P. planifrons, and with random surveys of framework/rubble habitats where 100% of recruits were P. partitus. However, consistent species-specific preferences were not exhibited during laboratory experiments. Data from the M. annularis tract also revealed that recruit density varied as functions of season, lunar period and colony size. Given these preferences, disturbances that reduce live coral cover should lead to increased densities of P. partitus, and reduced densities of P. planifrons recruits.

Clavijo, I. E. and D. G. Lindquist. Dept. of Biological Sciences, Univ. of North Carolina at Wilmington. TROPICAL REEF FISHES OFF NORTH CAROLINA: AN EXTENSION OF THE CARIBBEAN? Fish populations were studied on an offshore, 31m deep natural reef in Onslow Bay, NC during June 1988 using a modified stationary diver census technique and Nitrox gas mixture. Numerically, the dominant species was the purple reeffish, Chromis scotti. Other abundant fishes included two wrasses, Halichoeres spp., and the belted sandfish, Serranus subligarius. Presence of these fishes as well as representatives of other groups such as an apogonid, a pomacanthid and two other pomacentrids, indicates a close affinity of this fish fauna to Caribbean reef fish assemblages. Preliminary observations show that C. scotti actively spawns on this reef and probably recruits to the area by maintaining strategies that maximize juvenile survival such as demersal spawning and parental care of eggs. These reproductive strategies may be utilized by other reef fishes in NC to maintain separate populations from Caribbean stocks.

SESSION I FISHERIES

Hotel Villa Parguera, Thursday, May 11th
Chairperson: Dr. Yvonne Sadovy

Sadovy, Y. Fisheries Research Laboratory, CODREMAR, Mayaguez, P.R. THE FISHERIES RESEARCH LABORATORY OF CODREMAR: PROGRAMS AND PERSPECTIVES. Fish and shellfish landings collected over the past 10 years by the Fisheries Research Laboratory of CODREMAR, indicate that landings have been decreasing despite increasing fishing effort. Biological data collected on a number of commercially important species confirm that the shallow-water areas surrounding Puerto Rico are very probably being overfished. The Fisheries Laboratory, a government facility, is developing a number of programs designed to deal with this problem. Programs include studies on the age, growth and reproduction of important reeffish species and a fisherman-independent monitoring of reeffish resources. Such measures, however, are insufficient, alone, to respond to the needs of the fishing communities of the Island. To achieve this goal, and to ensure the continued long-term use of the fishery, a public policy on fisheries is badly needed in Puerto Rico.

Lindquist, D.G., I.E. Clavijo, and S.W. Burk. Dept. of Biological Sciences, Univ. of North Carolina at Wilmington. FISH ASSEMBLAGES ON ADJACENT NEARSHORE ARTIFICIAL AND NATURAL REEFS IN ONSLOW BAY, NC: DIVER VISUAL SURVEYS, TAG RETURN STUDY AND PRELIMINARY GUT ANALYSES. This preliminary report of a larger on-going study to assess the relative importance of hard and soft bottom and planktonic (demersal and holoplankton) food resources to the numerically dominant reef forage fishes

addresses the abundance of the non-cryptic forage species, movements of the black sea bass, Centropristis striata, and early gut content data. A modification of the stationary diver census technique was used to assess species abundances at each reef during the summer of 1988. Black sea bass were tagged with color and number coded internal anchor tags for each reef during summer and fall 1988. Tag returns indicate limited movement between reefs (primarily from natural to artificial) and a small number traveling up to 18 km to the southeast during late fall and winter months. Early gut analyses show a variety of feeding patterns: zooplanktivory (Decapterus punctatus), soft bottom carnivory (Stenotomus chrysops), and hard bottom carnivory (C. striata) and mixed hard bottom herbivory and carnivory (Diplodus holbrooki).

Turingan, R.G. and C.W. Recksiek. Dept. of Marine Sciences, Univ. of Puerto Rico, Mayaguez, PR and Dept. of Fisheries, Aquaculture and Veterinary Sciences, Univ. of Rhode Island, RI, respectively. VISUAL CENSUS SURVEY OF THE FISH ASSEMBLAGES OF CORONA DE LAUREL REEF, LA PARGUERA, PUERTO RICO. The visual census technique was used to sample the fish assemblages of the Corona de Laurel patch coral reef. A total of 960 fishes belonging to 49 species and 13 families were censused. The Shannon-Weiner diversity (H') and species evenness (J) indices of community structure were also calculated. The high H' of 2.96 was attributed to the high number of species and the apparent even distribution of the numbers of individuals within their species categories, as exemplified by a high J value of 0.81. The low percentage similarity between pairs of transect counts suggested that variation in species composition and distribution within the entire study site was apparent over a short period of time.

Hunt, J.H. Florida Marine Research Institute, Marathon, FL. ABUNDANCE PATTERNS OF SPINY LOBSTERS AT LOOE KEY NATIONAL MARINE SANCTUARY, FLORIDA. A study designed to delineate abundance patterns of two spiny lobsters, Panulirus argus and Panulirus guttatus, was conducted at Looe Key National Marine Sanctuary from April 1987-March 1988. Twenty-three sites were sampled biweekly in 4 habitat zones, the intermediate reef (15-20 m depth), fore reef (2-8 m), patch reefs (6-9 m), and on the reef flat (1-3 m). A total of 2658 P. argus and 1199 P. guttatus observations were made during this year. Mean number of P. argus was 2.1/site on the intermediate reef, 9.0/site on the fore reef, 7.1/site on patch reefs and 1.9/site on the reef flat. P. guttatus was most abundant on the fore reef where mean number/site was 7.5. On the fore reef, P. argus abundance decreased from 10.5/site during Spring and early Summer to 4.9/site during late Summer and Fall. An influx of P. argus occurred on the fore reef during late Fall and Winter (11.3/site). Similar abundance patterns were observed on the reef flat. On patch reefs, P. argus abundance increased from Spring/early Summer levels of 5.7/site to 10.7/site during late Summer. Abundance then slowly decreased to Winter levels of 5.4/site. P. guttatus abundance remained relatively constant throughout the year (Summer=6.9/site, Winter=8.4/site). Size, sex ratio and reproductive indicators were widely disparate across habitat zones and seasons.

Parrish, J.D., W.R. Haight and M.P. Seki. Hawaii Cooperative Fishery Research Unit/National Marine Fisheries Service, Honolulu, HI. TROPHIC PATTERNS OF DEEPWATER SNAPPERS. Although fisheries for deepwater snappers are commercially important in tropical seas throughout the world, the ecology of the primary

species caught is poorly known. The present study produced a major increase in the total knowledge of diets of deepwater snappers. Gut samples from 46-305 m depths in both the Mariana Islands and Hawaii indicated a trend to distinct feeding guilds. In the Marianas, Pristipomoides zonatus ate primarily benthic prey: 59% invertebrates and 41% (primarily demersal) fishes. P. auricilla took primarily pelagic prey: 88% invertebrates such as heteropods, pteropods, and Pyrosoma, and 12% fishes. Dietary overlap by Morisita's (Horn's) $C\lambda$ index was only 0.04. For the guild of benthic/demersal feeders at Penguin Bank, Etelis carbunculus, E. coruscans and Aprion virescens, fish comprised 96%, 78%, and 87% of the diets, respectively. The pelagic feeding guild included Pristipomoides filamentosus and P. sieboldii, with diets containing 89% and 97% zooplankton respectively. $C\lambda$ analysis separated these guilds at Penguin Bank cleanly, with $C\lambda$ values of 0.66 to 0.94 within guilds. P. zonatus was closer to the pelagic guild, with 53% zooplankton in the diet and $C\lambda$ of 0.66 to 0.89, but also had affinities with the benthic/demersal guild.

McGowan, Michael F. Div. of Biology and Living Resources, Rosenstiel School of Marine and Atmospheric Science, Univ. of Miami, FL. SEFCAR: THE UNIVERSITY OF MIAMI'S SOUTHEASTERN FLORIDA AND CARIBBEAN RECRUITMENT STUDY. Beginning in 1989 a multidisciplinary program to study recruitment of reef fishes and lobsters to the Florida Keys will focus on the effects of coastal oceanography on distribution, periodicity, and intensity of subsequent recruitment. Separate components of the study will include plankton collecting, monitoring settlement of juveniles, biochemical characterization of population genetics, laboratory experiments on reared larvae, documenting the physical oceanography on multiple time and space scales, and synthesis through simulation modelling. Interactions between a gyre, coastal countercurrents, and vertical migrations of larvae and juveniles will be considered. SEFCAR will interface with and complement ongoing research at other Florida universities and by state and federal agencies. Anticipated results should be generally applicable to downstream regions such as the South Atlantic Bight and to upstream regions in the wider Caribbean in addition to helping to understand and predict recruitment of coastal species in Florida.

POSTER SESSION

Kohler, S., C.C. Kohler, and J.M.B. Galvin. School for Field Studies, Beverly, MA and Southern Illinois Univ. Carbondale, IL. NEW SURFACES FOR CIGUATOXIGENIC DINOFLAGELLATES PROVIDED BY DEAD BLEACHED CORAL. Dead sections of bleached corals in the United States and British Virgin Islands were found to be colonized by filamentous algae harboring epiphytic dinoflagellates implicated in ciguatera fish poisonings. The dinoflagellates Ostreopsis lenticularis, Prorocentrum concavum, and P. lima were all found in association with filamentous algae growing on dead sections of bleached Montastrea annularis and Acropora cervicornis. Several fish species from the families Acanthuridae, Pomacentridae, and Scaridae, were observed to readily consume this filamentous algae/epiphytic dinoflagellate community. Such fishes are common forage for large piscivores inhabiting tropical reefs. An increased incidence of ciguatoxic fishes may occur on reefs where bleaching events have caused significant coral mortality.

Barreto, M. Univ. of Puerto Rico, Dept. of Marine Sciences, Mayagüez, P.R. CAMBIOS DE LINEA DE COSTA, AREA SURESTE DE PUERTO RICO (1973-1988). Las costas de Puerto Rico son zonas dinámicas expuestas a grandes cambios geomórficos donde el proceso de erosión ha imperado los últimos cincuenta años en varios puntos de la isla (cartelón #1). Estos cambios han sido relacionados a la intervención de elementos climáticos, oceanográficos e intervención humana dentro del sistema. El área sureste de Puerto Rico, zona muy poco estudiada por estar localizada en un área de baja energía marítima - presenta cambios de línea de costa significativos (cartelón #2). Estos cambios corresponden en varios de los casos a intervención humana en la construcción de infraestructura en la costa. Entre las áreas más afectadas se encuentran: Río Blanco, Yabucoa, Arroyo, Pozuela, Punta Pastillo, El Tuque (cartelón # 3, 4 y 5).

The shoreline of Puerto Rico undergoes rapid changes in position with changes in the annual wave regime. Changes in the shoreline configuration and composition resulting from erosion alter the rate of erosion. The east and south coastal dynamics from Naguabo to Ponce are presented in a series of five posters which describe specifically: the potential erosion areas of the entire island, the southeast area, Río Blanco and Yabucoa, Arroyo and Pozuela, Punta Pastillo and El Tuque.

Sastre, M.P. Depto. de Biología, Univ. de Puerto Rico, Humacao, P.R. DINAMICA POBLACIONAL DE EMERITA PORTORICENSIS EN LAS BAHIAS DE MAYAGUEZ Y ANASCO, PUERTO RICO. El crustáceo Emerita portoricensis (Anomura: Hippidae) se encuentra comúnmente en el litoral de las playas arenosas de las Antillas Occidentales. En este trabajo se examina la dinámica poblacional de esta especie con el objetivo de determinar posibles causas de sus fluctuaciones poblacionales. Se tomaron muestras durante dos años en las bahías de Mayagüez y Anasco, P.R. La densidad poblacional fue altamente estacional siendo mayor la abundancia desde abril hasta octubre y menor desde noviembre hasta marzo. La densidad de los reclutas fue menor durante el otoño tardío hasta temprano en el invierno de 1983-84 y 1984-85, y durante mayo y junio de 1985. Se observó una mayor abundancia de reclutas durante los meses de primavera y verano. La densidad de los huevos producidos en la población fue mayor durante el verano. Las fluctuaciones poblacionales fueron determinadas

mayormente por la densidad de las megalopas, ya que esta estuvo correlacionada significativamente con la densidad poblacional. Sin embargo, no se observó ninguna correlación significativa entre la densidad de reclutas y la densidad de huevos producidos por la generación parental. Tampoco se encontró ninguna correlación significativa entre la densidad de reclutas y la densidad de huevos producidos por estos reclutas. Este estudio refleja la importancia del reclutamiento para determinar las fluctuaciones poblacionales de Emerita portoricensis.

ACKNOWLEDGEMENTS

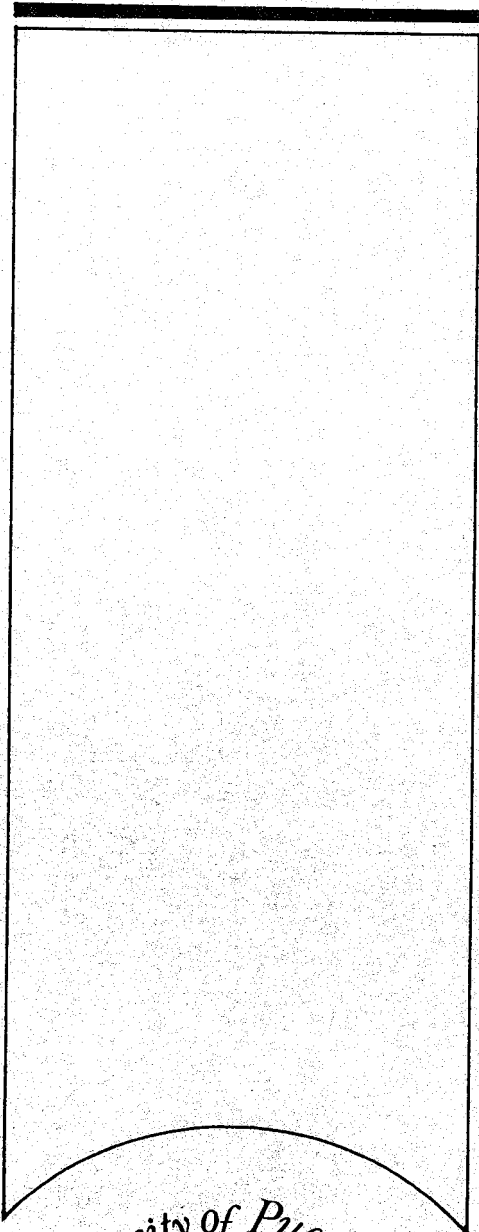
The 1988-1989 President especially wishes to acknowledge the contribution, cooperation and dedication of the Sea Grant College Program and the Department of Marine Sciences administrative personnel that made the planning, organization and arrangements of this meeting possible.

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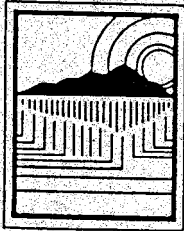
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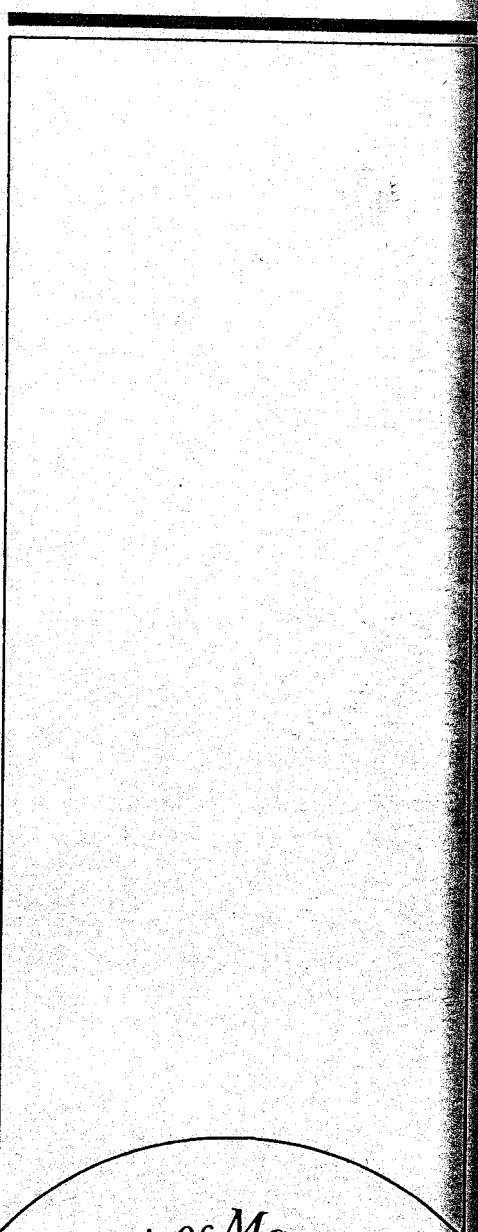
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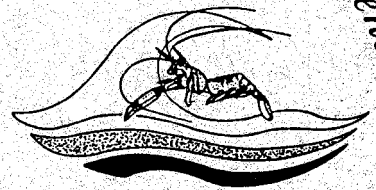
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