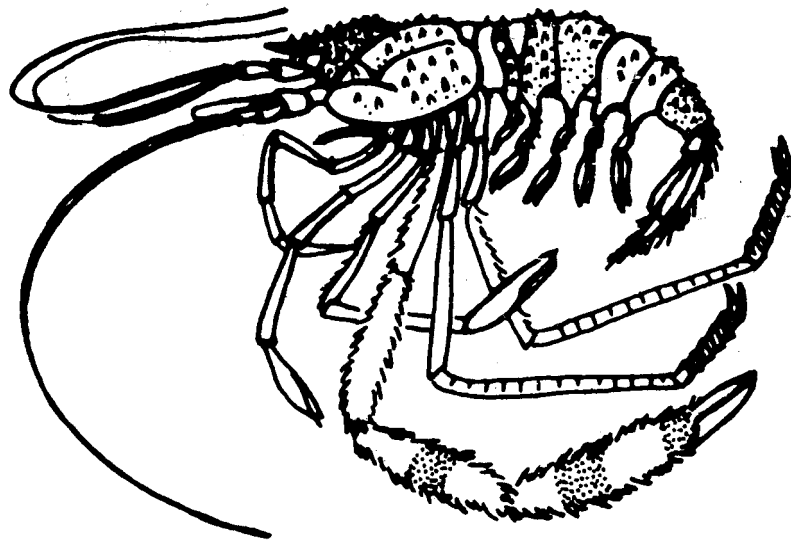


ASSOCIATION OF ISLAND MARINE LABORATORIES
OF
THE CARIBBEAN
FIFTEENTH MEETING



Port Royal Marine Laboratory
University of the West Indies

Runaway Bay, Jamaica

Jan. 7 - 10, 1980

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INTRODUCTION

The fifteenth meeting of the Association of Island Marine Laboratories of the Caribbean was hosted by the Port Royal Marine Laboratory of the University of the West Indies, with the assistance from the Discovery Bay Laboratory, at Runaway Bay, Jamaica 7 to 10 January, 1980. Members were welcomed to the meeting with a rum punch party at the Swinging Bar of Club Caribbean on the evening of 7 January. Early the next morning, and each morning of the meeting, scuba diving was organized at Discovery Bay Laboratory for participants in the meeting. The meetings began with welcoming addresses presented on behalf of the Government of Jamaica by Dr. Arnoldo Ventura, Director of the Scientific Research Council, Jamaica; and on behalf of the University of the West Indies by Dr. Ivan Goodbody, Director of the Port Royal Laboratory. A summary of the activities of the Port Royal Laboratory was presented by Dr. Barry Wade; and a summary for the Discovery Bay Laboratory by Dr. Jeremy Woodley. After lunch, Dr. Goodbody opened the scientific sessions, which extended over four days in seven sessions with thirty presentations. Participants were treated to a buffet supper party including a live band at Discovery Bay Laboratory on the evening of the 7th and a rum punch party underground in the Green Grotto Cave along with a tour of the caves on the evening of the 9th. After the close of the scientific sessions, field trips were conducted to the Blue Mountains and a diving trip to Chalet Caribe, Montego Bay on 11 January, 1980.

A meeting of the Executive Board was conducted on the evening of 8 January by:

Ivan Goodbody - President	Robert Dill, St. Croix
Meredith Jones - 1st Vice Pres.	Harilaos Lessios, Panama
Ernest Williams - Sec.-Treas.	José Lozano, Colombia
Rolf Bak - 1st Member at Large	Richard Robins, Miami
Sophie Jakowska - 2nd Mem. at Lg.	Jeremy Woodley, Discovery Bay
Raymond Hayes - 3rd Mem. at Lg.	Euna Moore, Barbados

The Fisheries Research Laboratory of Mayaguez, Puerto Rico and the Discovery Bay Laboratory, Jamaica, were invited to Association Membership. The Guidelines for Institutional Membership and Publication Policy were approved. Partial support for travel of a student from the last host institution to the next meeting was approved. The following labs offered to host Association meetings: (1) Barbados, 1981; (2) Bermuda, 1982; and (3) Miami, 1984.

The General Business Meeting was held on the evening of 10 January, 1980. The invitations of Finn Sander, Wolfgang Sterrer, and Richard Robins to host Association meetings were accepted. Robert Dill was appointed to continue his work with the Incorporation Committee; and Paul Yoshioka with the Advertisement Committee. Proc. Assoc. Is. Mar. Labs. Carib. 15:1 (1980)

Jeremy Woodley was appointed Chairman of the Communications Committee and Deborah Weiler and Raymond Hayes volunteered to be members of the Committee. Sophie Jakowska reported on her ByLaws Translation Committee (enclosed in this volume) and Charlene Long reported on the Student Support Committee. New Officers were elected:

President-Finn Sander	1st Mem.-at-Lg.-Charlene Long
1st Vice Pres.-Meredith Jones	2nd Mem.-at-Lg.-Raymond Hayes
2nd Vice Pres.-Wolfgang Sterrer	3rd Mem.-at-Lg.-Sofia Jakowska
Sec.-Treas.-Ernest Williams	

The meeting was highly productive and extremely enjoyable. The innovation of diving excursions every morning enhanced the amount of field work which could be accomplished; and was greatly appreciated by those who took advantage of this opportunity. The Association is very grateful to Ivan Goodbody, Jeremy Woodley, Barry Wade, and all the staff and students of the Port Royal and Discovery Bay Laboratories, University of the West Indies, for making the fifteenth meeting a success.

NEW RECORDS OF SCLERACTINIAN
CORALS FROM PUERTO RICO

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Recent SCUBA collections of the shallow-water scleractinian fauna of Puerto Rico have added a number of new coral records to the 35 previously reported species.

Twenty-one unrecorded species, belonging to nine genera, have been found in the last three years at La Parguera, and Mona, Monito, Desecheo, and Caja de Muertos Islands. These include the hermatypic corals *Madracis decactis*, *M. mirabilis*, *M. myriaster*, *Agaricia fragilis*, *A. tenuifolia*, *A. undata*, *A. lamarcki*, *A. grahamae*, *A. cailleti*, *Porites branneri*, *Oculina valenciennesi*, *Dichocoenia stellaris*, *Scolymia lacera*, *S. cubensis*, *Mycetophyllia dannana*, *M. ferox*, *M. aliciae*, *M. reesi*, and the ahermatypic corals *Madracis pharensis*, *Rhizosmilia (=Caryophyllia) maculata*, and *Thalamophyllia (=Desmophyllum) riisei*.

Most of these corals are common along the shelf edge and slope off La Parguera at 20-50m depths. However, *Porites branneri* appears to be restricted to depths of less than 3m. The hydrocoral *Stylaster roseous* is widely distributed and found in abundance at 13-21m depths at Desecheo Island. While not a scleractinian, it is also previously unrecorded from Puerto Rico.

The Puerto Rican scleractinian fauna, once considered to be depauperate, appears to compare favorably with other tropical Western Atlantic areas with rich coral faunas. As more detailed studies are done, especially in deeper waters, the number of scleractinian species reported from Puerto Rico will undoubtedly increase.

A FIVE YEAR STUDY OF THE STABILITY
OF THE SUBSTRATA IN PERMANENT QUADRATS
ON THE REEF SLOPE AT CURACAO

Rolf P.M. Bak and Brian E. Luckhurst
Caribbean Marine Biological Institute, Netherlands Antilles

We photographically surveyed twelve 3 x 3m quadrats on the reef slope at Curacao at 8-10 month intervals. An analysis of changes in cover as well as spatial change in the substratum components after a five year period shows cover to be a very stable characteristic of these quadrats. However, the reef habitats appeared to be unstable with respect to spatial arrangement.

Both change in cover and spatial change appear to be more significant in shallower depths of 10 and 20m and are relatively unimportant in the deep reef at depths of 30 and 40m.

Life history phenomena of coral species (Scleractinia), such as recruitment, survival and mortality are indicated by differences in magnitude of spatial change, i.e. in mobility through time, as well as differences in the rate of mortality of colonies of the various coral species.

AGGRESSIVE AND DEFENSIVE INTERACTIONS IN THREE
SPECIES OF STONY CORALS (SCLERACTINIA)

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Observations in Curacao on deviations from the interspecific aggressive hierarchy (*sensu* Lang 1973, Bull. Mar. Sci. 23: 260-279) in scleractinian corals, led us to examine the results of interactions along 30 transects from 10 - 30m depths over the fringing reef at the southwest coast of Curacao. Common deviations occurred between *Montastrea annularis* (Ellis and Solander), *Eusmilia fastigiata* (Pallas) and *Madracis mirabilis* (Duchassaing and Michelotti). These species were subsequently used in *in situ* interaction experiments.

We found two parameters that can reverse or alter the interaction patterns, i.e., time and location on the living tissue. The influence of time is demonstrated by a change in dominance (by unknown mechanisms) between the species after a two month experimental period. The results of interactions of *E. fastigiata* and *Madracis mirabilis* with the columnar growth form of *M. annularis* were depending on the location of the contact area; the top of the colony appeared to be more aggressive than the peripheral parts.

Our investigations are being continued.

POLARIZING MICROSCOPIC EXAMINATION OF THE BASAL SKELETAL PLATE OF SCLERACTINIAN CORALS

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The basal plate of the juvenile coral skeleton is the first mineralized exoskeletal deposit of the newly-settled scleractinian planula. This plate is deposited between the calicoblastic epithelium and its mucoid secretion which adheres the organism to a substrate. Vertical concretions from the basal plate later emerge as the septa and epitheca of the definitive primary skeleton.

We examined basal skeletal plates of: *Porites porites*, *Porites astroides*, *Porites furcata* and *Tubastrea coccinea*. Polarized light microscopy was used to determine crystallinity, cluster size and orientation, partial birefringence, plate thickness and retardation with data recorded for each basal plate, allowing inter-specific and intra-generic comparisons to be made.

Basal plates of all skeletons studied consist of anisotropic crystals and crystal clusters. The individual crystals are needle-shaped and are distributed singly or in small clusters. Cluster mass, shape and distribution vary with species. In *P. porites* and *P. astroides*, individual crystals predominate in central and juxta-septal regions while crystal clusters fill interseptal and peripheral regions of the basal plate. In *P. furcata* and *T. coccinea* the crystals and clusters are randomly distributed. Deficiencies in the integrity of the basal plate are observed in all specimens, indicating the mosaic origin and sporadic construction of this skeletal foundation. In *T. coccinea*, many small round holes are distributed throughout the peripheral zone of the plate. From interference colors in plane polarized light, the thickness of the basal plate in all corals is estimated to be 25 μ m. The plate surface, however, is studded with nodules which are distributed irregularly through all regions. These nodules are 20 μ m in height.

From our data, the basal plate of the larval coral skeleton is best described as highly crystalline, non-randomly organized and characteristic for each genus and species examined in this study. *P. porites* and *astroides* both have small crystal clusters (9 μ m) oriented radially, although some clusters of *porites* are vertical. *P. furcata* has small crystal clusters (3 μ m) arranged vertically, imparting a fine granularity to the basal plate. For *T. coccinea*, the basal plate is of greatest diameter and the small crystal clusters (3-5 μ m) are predominantly in a vertical orientation with some radial clusters. Hence, taxonomic specificity is imprinted within the coral skeleton from the appearance of the initial mineral deposition.

*author presenting paper

MICROPROBE ANALYSIS OF THE BASAL SKELETAL PLATE OF SCLERACTINIAN CORALS

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Chemical information from biological specimens may be obtained with several types of microprobe instruments. Most commonly applied in conjunction with scanning electron microscopy is the energy dispersive X-ray analysis probe which provides elemental composition. A new microprobe instrument which is used with light microscopy is the Raman microprobe. This analyzer utilizes high intensity monochromatic light from an Argon-krypton ion laser to stimulate molecular vibration and rotation. Inelastic scattering of the light and shifts in the optical wave lengths may be analyzed spectrophotometrically and recorded by computer to provide a molecular fingerprint of a biological specimen.

Raman data may be used to identify carbonate radicals and to determine the poly-morphism and the crystalline or amorphous nature of the carbonate sample. Also, from Raman data, the organic constituents of a skeletal specimen may be characterized. Several questions appear in the coral skeletal literature which may be addressed through the application of Raman spectroscopy. These include (1) is calcite as well as aragonite found in the larval coral skeleton? (2) is the organic skeletal matrix chitinous? (3) is the mineralized larval skeletal plate amorphous or crystalline?

Analysis of our spectrophotometric data from juvenile coral skeletal larval plates of *Tubastrea coccinea* indicates that four carbonate peaks are produced and these are sharp and narrow, reflecting a highly crystalline form of mineral salts. Organic peaks appear at several places in the Raman spectrum and may indicate several organic constituents. Among other information from this spectrum, a peak is observed at 1130cm^{-1} which coincides with Huntite, a magnesium-calcium carbonate complex thought to be an early deposit in vertebrate mineralizing systems. Although some peaks in the spectral analysis are currently uninterpretable, these data shall eventually be deciphered by comparison with known standards. Application of this new microprobe technique is certain to provide pioneering data about marine biogenic carbonates and their associated organic compounds.

ARE THE SWEEPER TENTACLES OF *MONTASTRAEA CAVERNOSA*
POLYFUNCTIONAL ORGANS?*

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The "sweeper tentacles" of *Montastraea cavernosa* have recently been considered as structures that have specialized for feeding; for competition and for interspecific and intraspecific segregation; or as specialized defensive organs. I should like to attempt a sort of reconciliation of these various suggestions. Our evidence, although preliminary, indicates that these elongate tentacles can be used for feeding (itself perhaps a form of competition), and can also be used defensively against at least one digestive dominant (*Montastraea annularis*) and against at least some overtopping foliose corals (*Agaricia* spp.). In so doing, separation of different species is ensured. At present we do not know if sweeper tentacles are employed in any other forms of competition, nor how they affect intraspecific interactions. Further studies of *M. cavernosa* and of other corals with these enigmatic tentacles should help to resolve questions such as these.

*Presented by Elizabeth Chronesky

PLANULATION AND SETTLEMENT OF THE
STONY CORAL *AGARICIA AGARICITES*

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To study aspects of the poorly known life histories of juvenile Scleractinia, artificial substrata were placed on the fringing reef of Curacao. They consisted of sets of plastic cube-cell grates (total surface 20,9 m²/set). Sets were placed at 5, 15 and 30m depth on February 1, 1979. The first juveniles of *Tubastrea coccinea* Lesson were found after seven months. One month later, the first hermatypic species, *Agaricia agaricites* (Linnaeus), appeared on the grates. In December 1979, the total coral population consisted of 202 juveniles, 78% belonging to *A. agaricites* (at 5 and 15m depth only, 125 and 32 juveniles respectively). At both depths, about 54% of these settled on crustose coralline algae.

Colonies of *A. agaricites* were collected from the reef regularly during 1979 to observe the possible release of planula larvae in the laboratory. *A. agaricites* var. *purpurea* appeared to be planulating to a depth of 35m from April up to August inclusive. During this time, 17% of the colonies sampled (n=72) released planulae. *A. agaricities* var. *crassa* planulated from May up to December inclusive, but no samples were taken earlier in the year so this variety might be planulating continually. Planulae were released by 68% of the colonies sampled (n=19). The var. *crassa* planulates at a minimum colony size which is about ten times smaller than such colonies of the var. *purpurea*. There is also a marked difference in length of planula: var. *purpurea*: 1.5 - 2.5mm, var. *crassa*: 0.8mm.

The great abundance of *A. agaricites* on the experimental grates seems to be the result of the opportunistic life strategy of the var. *crassa* of this species.

EXCAVATING RATES OF THE TWO MOST COMMON CLIONID SPONGES OF CURACAO

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I found fourteen species of boring sponges, belonging to four different families on the coral reef of Curacao. The most common boring sponges were *Cliona caribbaea* Carter and *Cliona laticavicola* Pang. At a depth of 12m, 88% of the sponge surface-area was occupied by these two species. At a depth of 25m, *Cliona laticavicola* had lost its dominance to *Siphonodictyon coralliphagum* Ruetzler. The excavating rates of *Cliona laticavicola* and *Cliona caribbaea* were determined measuring the weight decrease of small blocks of three different coral substrata; which had been attached to *Cliona*-infested slabs for various lengths of time. Thirty-six blocks with sponges attached and twelve controls were suspended at depths of 3, 12, and 27m at the reef. At intervals of 3 to 4 weeks, four attached blocks and two controls were removed and weighed. At this moment, the experiment with *Cliona laticavicola* are finished and show the following results:

1. A positive correlation exists between weight decrease of the blocks and the time they were submerged.
2. The excavating rate is significantly higher at 3 and 12m than at a depth of 27m.
3. There are no differences in excavating rates between 3 and 12m.
4. The excavating rate in the substratum *Acropora palmata* is significantly higher than in the substratum *Montastrea annularis*.

DIVERSITY AND COEXISTENCE IN AN ASSEMBLAGE OF
DEPOSIT-FEEDING HOLOTHURIANS AND SPATANGOIDS
IN THE REEF LAGOON, DISCOVERY BAY, JAMAICA

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Analyses of dispersion patterns, habitat preferences, diel activity and feeding cycles, grain size selection when feeding and the source of the organic carbon utilised, have been used to assess the niche dimension of six holothurians, *Holothuria mexicana*, *H. arenicola*, *H. thomasi*, *Isostichopus badionotus*, *Actinopyga agassizi* and *Euapta lappa*, and two spatangoid urchins, *Meoma ventricosa* and *Plagiobrissus grandis*. The species are characterised by: aggregated dispersions and recognisable habitat associations, except in *A. agassizi*, which was randomly dispersed; nocturnal activity and/or feeding, with varying degrees of diurnal crypsis, except in the infaunal *H. arenicola* and *P. grandis*; non-selective feeding with respect to grain size, and; exploitation of bacteria and, perhaps, detritus as a source of organic carbon. Two pairs of species coexisting at different locations, *H. mexicana/I. badionotus* and *M. ventricosa/P. grandis*, showed virtually complete overlap of resource utilisation, in circumstances in which food resources were non-limiting due to the low densities of the species. Resources were probably also not limiting for other species in the assemblage, which nevertheless showed niche separation based on microhabitat differences. An hypothesis is advanced which accounts for these phenomena as results of predation, operating in two ways; by maintaining population levels sufficiently low for coexistence of the species with mutually indistinguishable niches, and, by regulating the habitat preferences in species which require diurnal cover to avoid predation.

*presented by Jeremy Woodley

ON THE VESTIMENTIFERAN FROM THE GEOTHERMAL
VENTS OF THE GALAPAGOS RIFT AREA

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About 40 adult and at least 23 juvenile specimens of a new species of vestimentiferan worm have been collected during three expeditions to geothermal vents near the Galapagos Islands (March 1977, February 1979, December 1979). The largest of these is a female 1.5m in length and about 37mm in diameter, occupying a tube 2.65m in length. These worms live in the vents and are exposed to water of up to 17°C (the surrounding sea water is about 2°C); at temperatures greater than 8-10°C the water is anoxic and has H₂S levels up to 120 micromols/liter. The vents are at about 2500m depth and their associated fauna was collected with the mechanical arm of *Alvin*, the ONR/NSF/NOAA submersible.

The vestimentiferan worms have four body regions: 1. An anterior "obturaculum", bearing as many as 270,000 tentacles, protrudes from a tough white tube and is red due to the hemoglobin in solution in the blood; 2. The "vestmentum" is a collar-like region, quite solid, mainly muscle and connective tissue, and is provided with numerous glands on its external surface which are the primary source of secretions forming the tube; 3. The "trunk", the longest region, has a relatively thin body wall provided with circular muscles and two types of longitudinal muscles, as well as some tube-secreting glands, and consists, internally, of a single pair of coelomic spaces with gonads and the so-called trophosome lying between their medial dorsoventral mesentery; and 4. The "opisthosome" is segmented, with as many as 103 internal septa, and bears setae on the anterior segments (up to about 75% of the total number).

There is no mouth nor digestive tract; "food" is thought to be organic molecules and its uptake is probably across the surface of the tentacles of the obturaculum.

Sexes are separate and both male and female genital apertures are at the most anterior part of the trunk, on the dorsal surface, where the trunk overlaps the posterior portion of the vestimentum. Eggs are about 78 microns in diameter and sperm are of a "modified" type, with elongated, corkscrew-shaped bodies and tails, each about 9 microns long.

It is felt that these animals, along with two previously described species of vestimentiferans comprise a subphylum in the phylum Pogonophora.

SEXUAL SELECTION AND SEXUAL DIMORPHISM IN A SNAPPING
SHRIMP SYMBIONT OF THE ANEMONE *BARTHOLOMEA ANNULATA*

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Sexually mature *Alpheus armatus* are typically found in male-female pairs. Both sexes are territorial and defend the anemone against conspecifics of the same sex. Reproduction occurs year round, and females must molt and mate prior to each egg laying. Each clutch is brooded for nearly three weeks, and clutch size is steeply, linearly correlated with female length. These features of the species' reproductive biology suggest that sexual selection should be felt more strongly by males, because males invest less in the offspring and because females vary more in quality as mates.

I studied the extent of sexual dimorphism in two areas in Discovery Bay, Jamaica by censusing the shrimp and anemone populations periodically and by marking individual shrimp and noting their presence at anemones which were monitored at 10 day intervals. I marked shrimp by injecting small amounts of India ink into two of 12 possible locations in the abdominal musculature; shrimp were restrained inside a plastic bag during marking and were returned to their anemones before sunset.

The two areas appeared to differ in the intensity of predation on moving shrimp. In the area where movement was often successful, males had proportionately larger claws, had more conspicuously blackened uropod spines, moved more often than females, moved to both larger and smaller anemones, and tended to shuttle between anemones (females moved randomly in direction through the area but generally to larger anemones). In the area where movement was less often successful, many males lacked darkened spines and there was no difference between the sexes in movement rate.

The mechanism for the establishment and maintenance of these differences between areas is unclear, as little is known about gene flow via larval dispersal. Even within areas panmixia is not achieved because of strong tendencies towards assortative mating.

LIFE HISTORY PATTERNS OF THE GEMINATE SPECIES
OF *ECHINOMETRA* ON THE TWO SIDES OF THE ISTHMUS OF PANAMA

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The intertidal echinoid genus *Echinometra* is represented on the two sides of Central America by geminate species, believed to have resulted from the rise of the Isthmus of Panama in the Pleiocene. Their life history patterns were assessed in order to gain an understanding of the effect of different physical environments on initially similar genomes. The Atlantic species, *E. lucunter*, which has been shown by Hendler to suffer severe, unpredictable, physically induced mortality as the result of sudden midday exposures of the reef flat, displays some "r characteristics" in comparison to its Pacific geminate, *E. vanbrunti*. Ratio of reproductive to somatic tissue, averaged over the course of the year, is higher in *E. lucunter* than in *E. vanbrunti*; its weight at a given age, as determined on the basis of growth lines in the genital plates, is smaller, as are maximum attainable size and age. It also reaches sexual maturity at a smaller size (but not younger age) than its geminate. However, contrary to theoretical predictions, *E. lucunter* parcels its reproductive effort into fewer and larger eggs than *E. vanbrunti*; such a "prudent" strategy may be an adaptation to the lower availability of food for larvae in the Caribbean and is duplicated by the subtidal species *Echinometra viridis*.

ANNELIDA FROM A WESTERN PUERTO
RICAN ESTUARY: PRELIMINARY SURVEY

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As part of a one-year survey of the Laguna Joyuda on the west coast of Puerto Rico, more than 8000 annelids were separated into two classes, at least six families, and more than 10 species.

Seventy-nine percent of the annelids were undescribed species of Capitellidae, 7% were oligochaetes, 5% were *Stenoninereis martini* Wesenberg-Lund, 1958, 4% were *Dasybranchus* sp., 3% were *Nereis (Nereis) occidentalis* Hartman, 1945, and 3% were a mixture of four polychaete species.

Nineteen stations were sampled at various locations and depths in the lagoon, the physical characteristics of which, along with experimental methods, are described in a separate presentation by the second author.

Although this lagoon differs significantly in shape from the Rio Espiritu Santo River (Long and Bhajan, 1979, Proc. Assoc. Is. Mar. Labs. Carib. 14:7) on the north coast of Puerto Rico, comparison of the fauna of the two estuarine bodies of water indicated that the oligochaetes, three undescribed species of capitellids, and *S. martini* were found in both, although in different percentages of the total fauna. At least two species, *Dasybranchus* sp. and *Nereis (N.) occidentalis*, were found in the Laguna Joyuda and not in the Rio Espiritu Santo, while *Tharyx* sp. and *Sigambra tentaculata* were found in the Rio Espiritu Santo and not in the Laguna Joyuda.

The data from the Laguna Joyuda will be analyzed with regard to season and station when the balance of the annelids, some 20,000, are sorted. In the meantime, attempts are being made to determine the affinities of the undescribed capitellid species, which appear to be common in the Caribbean and associated waters.

OBSERVATIONS ON THE REPRODUCTIVE BIOLOGY OF THE
WEST INDIAN SPECIES OF *AIPTASIA* (ACTINIARIA)

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Aiptasia tagetes is a common but poorly known sea anemone which inhabits reefs and mangrove roots in the West Indies.

Under normal ambient conditions at La Parguera, Puerto Rico, *A. tagetes* is dioecious and oviparous. Asexual reproduction by pedal laceration is continuous and is affected little by population density or spawning. Male and female pairs of *A. tagetes* in six inch aquaria spawned synchronously during July, August, and December. Eggs are spherical, smooth, and average 109μ . Cleavage is total, equal and radial. Within 18 hrs., most embryos had developed a stomodeum and an apical tuft. Planulae are ovoid, flagellated and measure up to $127 \times 175\mu$ at age 21 days (oldest to survive); most lack zooxanthellae.

Cnidae appear between 24 and 38 hrs. and consist of spirocysts, aborally concentrated; small microbasic b-rhabdoids, numerous in mid-region; large microbasic b-rhabdoids, common but scattered; microbasic p-rhabdoids, common and usually oral; and up to ten atrichs, usually oral. The latter do not occur in the adult cnidom.

Closely related European species of *Aiptasia*, one possibly conspecific, have been reported to be both oviparous and viviparous as well as to pedal lacerate and divide by transverse and longitudinal fission. Extrinsic factors such as temperature are thought to be responsible for these observed variable modes of reproduction.

LIFE HISTORIES OF CRYPTIC REEF BRYOZOANS

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Various and conflicting predictions have been made relating patterns of abundance and distribution of organisms to their life history strategies, but empirical evidence has been lacking. This paper reports the results of a preliminary two year investigation of patterns of abundance, competitive abilities and life history characteristics of cheilostome bryozoans in the cryptic reef environment of Jamaica. The natural community in 10 and 20 M depth at Rio Bueno was studied by line transects and detailed census of 6 M² of coral undersurface. The life history attributes of the bryozoans were ascertained over time by the use of fouling panels. The natural community on the undersurfaces of foliaceous corals at Rio Bueno is highly diverse, consisting primarily of sponges, sheet-like cheilostomes, other colonial organisms and algae. The community is characterized by intense competition for space. Among the bryozoans, two species, a *Steginoporella* species, and a *Reptadeonella* species are abundant and the rest are rare. The abundance of the two dominant species is due to the presence of a few very large colonies, but the ways in which the two species achieve their dominance are very different. Competitive ability helps to explain the success of these two species, but does not account for the differences between them or the reason the uncommon species persist. All species have very low recruitment rates. Only one, *Drepanophora tuberculatum*, could be considered a classical r-selected species. The uncommon species had almost nothing in common except these very low recruitment rates and the fact that few of them were good competitors. Some of these species do have a fairly high median survivorship (>6 months), and this, combined with a fairly early age of first reproduction (<1 year), may explain their persistence in the community.

PRODUCTOS DE HIDRÓLISIS DE LAS CLOROFICOFITAS
ULVA FASCIATA Y *CHAETOMORPHA MEDIA*
RECOLECTADAS EN GUIBIA, D.N., REPUBLICA DOMINICANA

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Estos estudios fueron realizados como parte de la caracterización química de dos especies de algas cuya composición química es muy distinta en cuanto a su contenido de proteínas, alcaloides, lípidos, carbohidratos y cenizas. Mientras su nitrógeno total es casi igual (1.4-1.5% del peso seco) *U. fasciata* contiene los alcaloides de ergotamina, y *C. media* los de aloina.

La separación de los extractos hidrolizados en cromatografía de papel (Whatmann No. 1) con un sistema de butanol, agua y ácido acético (40:50:10) a temperatura ambiente reveló, con ninhidrina, diferentes fracciones cuyos valores R_f fueron calculados.

Se observó la diferencia en el número de amino ácidos entre el material recolectado en el 1977 y en el 1978 en el mismo lugar. Fueron identificados tentativamente en *U. fasciata* ácido glutámico, valina y leucina, y en *C. media*, serina y treonina.

Con una hidrólisis ácida progresiva a 100°C realizada en 4 etapas, se obtuvieron varias fracciones con R_f diferentes. En las 6 fracciones obtenidas después de la 2ª etapa solamente se observaron valores de R_f idénticos para ambas especies.

Considerando el uso potencial de estas algas como fármacos o aditivos alimenticios, es interesante la posibilidad de producir fracciones con determinadas características moleculares por medio de hidrólisis controlada.

Pese a la abundancia de ambas especies en la Playa de Guibia estos estudios fueron interrumpidos a fines de febrero de 1979 debido a la aparición de algas epifitas del género *Acrochaetum* (identificadas por el Dr. Luis R. Almodovar de la Universidad de Puerto Rico, Recinto de Mayaguez) sobre las puntas de los talos recortados de *C. media*. Estas epifitas permanecieron hasta fines de agosto de 1979 cuando fué evacuado el laboratorio por causa del huracán David.

LIFE HISTORY OF THE ZOOXANTHELLAE OF *AIPTASIA TAGETES*
AND OTHER CNIDARIANS

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Specimens of the sea anemone *Aiptasia tagetes* were maintained under a 12h light/12h dark photoperiod; tentacle tips were excised at intervals in order to observe the zooxanthellae *in situ*. Vegetative forms only were seen, including newly-divided forms. Division was phased; highest percentages of divided forms were observed at the end of dark periods.

Zooxanthellae extracted from *A. tagetes* were incubated in sea-water under the same light regime, starting with 12h light. Division *in vitro* was phased as *in situ*. Conversion of many vegetative forms to zoosporangia occurred during the dark period. Early in the following light period the zoosporangia converted to motile gymnodinoid forms. After a few hours these reverted to the vegetative form and the cycle was repeated during the next 24h. The same sequence of events was observed in zooxanthellae liberated naturally from *A. tagetes* in pellets. Some inhibitory effect upon the life cycle of the zooxanthellae therefore seems to operate *in situ*.

Comparative studies, using several other species of Jamaican shallow-water cnidarians containing zooxanthellae, showed that the degree of expression of the algal life cycle *in situ* and *in vitro* was not the same in all cases. This may be due to differences in host environment, algal characteristics (in this case providing evidence for the existence of host specificity in these associations), or both.

EFFECT OF OCEAN THERMAL ENERGY CONVERSION (OTEC)
PLANTS ON GROWTH AND SURVIVAL OF ATTACHED MACROALGAE

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Biofouling is an important consideration when aiming for successful maintenance and operation of the rapidly developing technology of utilizing the heat gradient of the ocean as an energy source through OTEC (Ocean Thermal Energy Conversion) plants. Organisms that attach to the hull and/or intake structures could affect both the buoyancy and efficiency of OTEC. Conversely, the operation of the OTEC plant could significantly alter the surrounding environment.

Light projected from an OTEC plant, in addition to ambient light, would provide for augmentation of primary productivity. Discharge of warm surface water or cold nutrient-rich water pumped from depths of 600 m or more may also alter ambient water temperature.

This paper addresses itself to some effects that the OTEC plant may have on potential fouling macroalgae. The algae used for this investigation are found in the vicinity of some proposed OTEC sites, i.e., Punta Tuna, Puerto Rico, and in surrounding water of southern Florida. Representatives of red (*Laurencia*, *Gracilaria*), brown (*Sargassum*), and green (*Ulva*) algae are grown in the laboratory at temperatures ranging from 20 to 29°C under various light intensities between 40 and 174 microeinsteins $m^{-2} sec^{-1}$. Preliminary results show that during 28 days in the laboratory both *Laurencia poitei* (Lam.) Howe and *Gracilaria ferox* J. Agardh achieve a higher growth rate at lower temperatures (20°C) and higher light intensity (174 microeinsteins $M^{-2} sec^{-1}$). The growth of *L. poitei* is simultaneously being monitored at depths of 0 to 18 m in the Gulf Stream near Key Biscayne, Florida. The ranges of light intensity, temperature and nutrient level used in the experimental design are similar to *in situ* conditions at OTEC test sites.

SEXUAL VERSUS VEGETATIVE REPRODUCTION:
IMPORTANCE IN THE SEAGRASS *THALASSIA TESTUDINUM*

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Thalassia testudinum is the dominant seagrass in the Caribbean region. Little is known about the establishment and development of *T. testudinum* stands. The present study investigated the role of vegetative and sexual reproduction in the life history of *T. testudinum*.

Twelve stands of *T. testudinum* in Discovery Bay, Jamaica, were regularly censused for fragmentation rates and the production of flowers, fruits and seeds. Manipulative field experiments investigated survivorship of seedlings, detached shoots and rhizome fragments under various environmental conditions. Laboratory experiments investigated seed germination rates.

Flowering occurred only in patches, from June through to November. The density of flowers varied from one to 10 per m², and most were female. Pollination rates averaged 75%. One to five ($\bar{x} = 2.02$) large seeds ($\bar{x} = 0.37\text{gm}$) were released from the fruit approximately 60 days after pollination. Germination rates were high and the interval between seed release and germination was short. Survivorship of seedlings was dependent on substrate type, urchin density, rates of biogenic reworking and intensity of wave action. Dispersal by vegetative means was rare.

It is suggested *T. testudinum* maintains a reservoir of persistent seedlings which functions somewhat analogously to a persistent seed bank. Disturbance and/or senescence are critical for the release of seedlings from the bank.

REGULATION OF ALGAL SYMBIONTS IN SEA ANEMONE/ALGAL SYMBIOSES

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Variations in the density of symbiotic algae in freshly collected specimens of the sea anemone *Aiptasia tagetes* appear to be related to ambient levels of illumination, temperature and salinity.

The influence of illumination was investigated by determining the algal densities in groups of animals kept at 27°C under alternating 12 hr. light, 12 hr. dark regimes using three light intensities viz: 1000, 1600, and 1800 Lux. Algal density was also monitored in other animals kept continuously in the dark.

The effect of temperature on algal density was also investigated in animals treated with high (34°C) and low (4°C) temperatures under both the 1600 Lux and constant dark regimes.

The experimental results show that both light and temperature affect algal density in this symbiotic association.

The intensity of the ambient illumination determines the density of algal symbionts in the host, higher illumination producing higher densities and vice-versa.

Dark, raised, and lowered temperatures uniformly produce extremely low algal densities within 14 days. Cessation of these treatments leads to repopulation of the host animals by symbionts.

Loss of algae is always by extrusion. The algae extruded during the light experiments were for the most part normal in appearance (95.3% on day 14), whereas those extruded in other experiments were mainly degenerate (100% on day 14).

Symbionts grow within host animals at a rate which is dependent on the ambient illumination: 3.7% at 1000 Lux, 50% at 1600 Lux, and 63.6% at 1800 Lux over 14 days.

Since 34°C, 4°C, and dark treatments produce massive and, if prolonged, total algal loss, it would seem that the phenomenon is not a regulatory one as appears to be the case with illumination, but, rather, that in these cases the algae are malfunctioning and are recognized as such by the host tissues and ejected.

Support for this is to be found in the fact that D.C.M.U. which inhibits photosynthesis also causes bleaching in *A. tagetes*.

INFLUENCE OF POPULATION DENSITY ON
THE BEHAVIOUR OF *CHROMIS CYANEA* (POEY)

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The population of *C. cyanea* is distributed unevenly on the reefs off the coast of Curacao. In the shallow area the population density is low, while over the drop-off, the population density is high. This offered the opportunity to study the influence of population density on the behaviour of *C. cyanea* in a natural environment. Data on the behaviour were gathered by taking protocols by means of an underwater tape-recorder. The protocols were analyzed and comparisons of the territorial courtship and mating behaviour were made between the high and the low density area.

Differences in behaviour could be ascribed partly to the external stimuli being different in the two areas, partly by the population density having an effect on the internal state of the territorial males. The single most important factor affecting this internal state was the presence of many intruders in the high density area, causing a high level of aggression in the males there with consequences for the courtship behaviour. These effects on the courtship are countered by the existence of a special mechanism in the females which enables them to assemble courtship information from different sources. The evolutionary trend to higher aggressiveness in territorial males which could have negative side-effects on the courtship behaviour is checked by the development of this mechanism in the females.

PRELIMINARY STUDIES OF THE COASTAL PELAGIC FISHES OF JAMAICA

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The objectives of this programme are to obtain biological and management data on stocks of coastal pelagic fishes in the Caribbean with the intention of providing base-line data on which individual territories in the region may make management decisions in relation to their own stocks.

The commonly occurring, and therefore economically important, species of coastal pelagic fishes around Jamaica belong to the families Clupeidae, Engraulidae, Carangidae, Mugilidae, Scombridae, Hemiramphidae and Exocoetidae. This study has concentrated on the biology, ecology and fishery of *Opisthonema oglinum*, *Harengula humeralis* and *H. jaguana*. *Harengula clupeola*, *Sardinella brasiliensis*, *S. aurita* and *Jenkinsia lamprotaenia* are other clupeids under consideration. The distribution of these species is island-wide within the 20-fathom shelf area.

Samples are collected from various points around the coast from commercial fishermen. Fishing by the programme is conducted from Port Royal Marine Laboratory using gill-nets, beach seines, lift nets, dip nets and hook and line. Laboratory procedure includes taking measurements of length, weight, meristic characters, gonads, stomach contents and mesenteric fat weight. Aging is investigated using scales (*H. jaguana*) and otoliths (*O. oglinum*, *H. humeralis*, *Sardinella* spp.).

Gonad indices show that these clupeids have a well-defined but protracted breeding season (April to September) in contrast to the engraulids which spawn all year round. Mean length at first maturity for *O. oglinum* shows that commercial fishermen in Kingston Harbour are taking individuals that have not matured (less than 17 cm). Studies on fecundity are continuing.

Clupeids and engraulids are important prey for larger predatory fishes, especially carangids and scombrids, and diving birds.

The results of the investigations so far indicate that if the new cannery in the Kingston Free Zone is to be regularly supplied from local fish stocks, then this would possibly impose a more serious strain on the standing stock of *O. oglinum*. The destruction of large nursery areas, the use of nets with a fine mesh and the continuing use of dynamite all contribute to the present low catches by commercial fishermen.

ECOLOGY OF SOME EXOTIC MARINE FISH SPECIES INTRODUCED TO HAWAII

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At least 71 aquatic species have been introduced to Hawaii; 36 have become established, 20 have definitely failed, and the remainder are doubtful. Eleven of the marine fish species introduced in the period 1955-1960 are edible snappers and groupers. *Epinephelus fasciatus*, *E. spiniger* and a *Lethrinus* species received very little previous study, were introduced in numbers from 22 to 51, and apparently did not reproduce. *Lutjanus guttatus* received no previous study, nearly 3500 were introduced, and it disappeared quickly. *Lutjanus gibbus* came in small numbers (177), persisted for many years (and may still persist), but no sizable population seems established. *Epinephelus merra*, *E. hexagonatus* and *Cephalopholis urodelus* were initially well studied, introduced in number from 978 to 1811, persisted in small numbers for some years, and now are in an uncertain status. *Cephalopholis argus* was well studied initially. From 2385 introduced, they spread in 18 years to all the inhabited high Hawaiian islands. They now occur in limited populations and appear occasionally in the fishery. *Lutjanus fulvus* was well studied initially before 4010 were introduced. The species spread rapidly half way up the archipelago and survives a small fishery, making a welcome but minor contribution to catches. *Lutjanus kasmira* was very little studied initially before 3170 were introduced. It has spread very rapidly over most of the archipelago, and its population has exploded. Although it produces large catches, its economic value is low, and it has been suggested that its success may come at the expense of native species. It appears to feed nocturnally and demersally, mostly on fish and a few groups of larger adult crustaceans. Decapods are very important prey, especially portunid crabs. No great variation is found in the diet at three locations or over a limited size range of adults (144-221 mm SL). Its diet does not seem to overlap much with that of the sympatric squirrelfish, *Myripristis kuntee*.

The Hawaiian experience with marine introductions suggests that (1) ecological success of a species cannot be predicted with much certainty; (2) for most species, the minimum, critical complement of colonists is more than a few dozen, although large numbers do not insure success; (3) the amount and speed of geographic spread vary greatly, but even among demersal species, it may be several hundred miles; spanning some deepwater channels in a period of only several years; and (4) serious preliminary study is necessary, although not necessarily sufficient to prevent widespread and permanent ecological damage.

ADICIONES A LA COLECCION DE PECES MARINOS DEL
CENTRO DE INVESTIGACIONES DE BIOLOGIA MARINA, UASD

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Esta lista representa 25 especies adquiridas desde que se publicó en octubre de 1978 el primer catálogo de la colección ictiológica de CIBIMA (Terrero y Bonnelli, 1978). Todos estos ejemplares, excepto *Sphyrna mokarran* y *Pomadasys crocro* fueron capturados algunos a profundidades hasta de 150 brazas por IDECOOP en su expedición de junio de 1978. Por causa del huracán David en agosto de 1979 se perdieron cinco especies (marcadas con*) que fueron identificadas y registradas anteriormente.

CLUPEIDAE *Sardinella aurita* CONGRIDAE *Congrina flava*.
SYNODONTIDAE *Synodus poeyi**. OGCOEPHALIDAE *Hali euthichthys caribbaeus*. EXOCOETIDAE *Parexocoetus brachypterus*. HOLOCENTRIDAE *Ostichthys trachypomus** SCORPAENIDAE *Scorpaena brasiliensis*. TRIGLIDAE *Bellator brachychir*. SERRANIDAE *Serranus fuscus*. PRIACANTHIDAE *Priacanthus arenatus*. GERREIDAE *Eucinostomus argenteus**. POMADASYIDAE *Pomadasys crocro*. SCIAENIDAE *Menticirrhus martini censis*. GEMPYLIDAE *Neoepinnula*. BOTHIDAE *Cyclopsetta chittendeni*. *Citharichthys cornutu**. *Citharichthys unicornis*. BALISTIDAE *Balistes capriscus*. TETRAODONTIDAE *Sphoeroides testudineus*.

Ademas como familias nuevas para la colección se han adquirido: PERISTEDIIDAE *Peristedion gracile*, POLYMIIXIDAE *Polymixia lowei**, URANOSCOPIDAE *Kathetostoma cubana*, AULOPIDAE *Aulopus nanae*. SPHYRNIDAE *Sphyrna mokarran*, TRACHICHTHYIDAE *Gephyroberyx darwinii*. Se anadieron 6 familias, 16 géneros y 25 especies. Con esta ad-
quisición se eleva el número en el catálogo a 67 familias, 143 generos y 196 especies.

*Presented by Sophie Jakowska

POTENTIAL TECHNIQUE FOR AGING OF
SILK SNAPPER, *LUTJANUS VIVANUS*

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Silk snapper, *Lutjanus vivanus*, is a valuable deepwater species, and as with most tropical fishes, age determination is difficult. Otoliths (sagittae) were examined using dissecting microscope. Otolith length proved to be proportional to fish length. Visible patterns of growth were found but no time span relating to these patterns was discovered.

Examination of the fine crystalline structure demonstrated the presence of increments that, based on previous work, were assumed to be daily growth lines. A generalized early life growth pattern was established. Silk snapper reach about 16 cm fork length during their first year which corresponds to a 9 mm otolith. After about one year of age, daily increments averaged three microns per increment. The increase in microns over 9 mm of otolith length was divided by three to give an estimate of the days over one year of age. Age estimates derived with this method appear to be valid.

GROWTH RATES OF THE MANGROVE OYSTER (*CRASSOSTREA*
RHIZOPHORAE) UNDER CULTURE CONDITIONS

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Detailed studies on the growth of the mangrove oyster *Crassostrea rhizophorae* under culture conditions have been conducted since October 1978. The effects of depth, orientation, spacing and other factors, on individual growth have been studied. A technique of photographic analysis provided data on the growth of nearly 700 oysters over a period of three months. Supplementing this was a study of basic shell and tissue size/weight parameters of individuals growing under both crowded and well-spaced conditions. This paper presents a preliminary analysis of the data.

A multivariate analysis of factors affecting growth (mean weekly growth of each individual over the experimental period) revealed that depth was the most important factor affecting growth, and that individuals in the more brackish and nutrient-rich surface layers grew faster. Other important factors were initial size and the spacing of cultch, where increased spacing produced faster growth. In spite of these factors, it seems likely that economic considerations in oyster farming will probably necessitate the use of long lines of closely spaced cultch in deeper waters.

Whilst oysters produced essentially the same quantity of shell material regardless of the degree of crowding, the precise way this material was utilized differed markedly in the two conditions. Crowded individuals tended to be attached to the cultch by a relatively small base and to have very high shells - presumably to assist in competition with, and to prevent being overgrown by, their neighbors. Such oysters had brittle shells and tended to fall off easily. Well spaced individuals (not in contact with each other) generally retained a low profile whilst having a large base. These differences have considerable implications for the oyster farmer in his attempt to reduce mortality.

These results suggest that whilst economic considerations may override the importance of some factors affecting growth (i.e. depth and cultch spacing), overcrowding of individuals is likely to be detrimental to the survival and growth of cultivated oysters.

ARTEMIA DE PUNTA SALINAS, BAHIA DE LAS CALDERAS Y
SU USO POTENCIAL EN REPUBLICA DOMINICANA

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Quistes, larvas y adultos de *Artemia* fueron recolectados en noviembre de 1978 por Bonnelly de Calventi en la superficie del agua en los canales que conectan los estanques artificiales utilizados para la producción de sal en Punta Salinas, Bahía de las Calderas, a unos 100 km de Santo Domingo.

Los cultivos fueron mantenidos en cilindros de vidrio con 1 litro de agua del sitio de recolección (donde la salinidad superaba 150% o en soluciones de sal del lugar de recolección a 30 y 50%. Estos cultivos fueron terminados en septiembre de 1979 cuando el laboratorio fué evacuado por causa del huracan David.

En noviembre de 1979 los quistes secos almacenados en envases de vidrio sellados desde la fecha de recolección fueron evaluados de acuerdo con las normas establecidas por el Centro de Investigaciones sobre *Artemia* de las Universidad Estatal de Ghent en Belgica. El ensayo de la Eficiencia de Eclosion (Sorgeloos et al., 1978) es la base de la certificacion por ese centro de artemias de diferente origen para su uso en maricultura en los paises europeos. Fué modificado sólo con respecto al grado de iluminacion y sustituyendo la rotacion mecanica a 5 rpm durante las primeras 48 horas con la rotacion manual. Se aplicó la formula de Sorgeloos et al. para calcular la Eficiencia de Eclosion, como los gramos de material seco necesario para producir 1 millón de nauplii vivos.

En las tres pruebas con el material de Punta Salinas, la cantidad de material secó necesaria para producir 1 millón de larvas fué de 2.7g, 2.7g, y 1.9g, respectivamente. La comparacion con los datos obtenidos por el Centro de Investigacion sobre *Artemia* con 5 diferentes fuentes comerciales de quistes (entre 3.7 y 56, Ogramos), indica que el material de Republica Dominicana podría ser considerado de muy buena calidad.

Por tanto, se propone un plan de explotacion racional de *Artemia* como subproducto de la industria de la sal en Punta Salinas y el establecimiento de los cultivos intensivos de esta cepa para el uso en acuacultura.

THE DEVELOPMENT OF OYSTERCULTURE TECHNIQUES FOR JAMAICA

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Since July 1977, the Oysterculture (Jamaica) Project has been conducting research in order to determine the feasibility of establishing an oyster industry in Jamaica. The system of culture being investigated is based on the collection on artificial substrates (cultch) of spat produced by wild populations of the mangrove oyster *Crassostrea rhizophorae*, and their growing out to marketable sizes while suspended subtidally from floating rafts. This method of spat production avoids the high capital outlay and technological requirements of artificial hatcheries. Subtidal growing out is considered superior to intertidal culture since the oysters remain permanently submerged, feed up to twice as long, and grow considerably faster and larger. However, competition and fouling by other sessile organisms must be controlled.

Results show that spat collection may be successfully carried out for about eight months of the year and the peak periods of spatfall correspond roughly with the rainy seasons. Cut rubber tire rims (8cm x 8cm) strung together and suspended intertidally from racks have proved to be a very attractive substrate for settling spat while having the added advantage of being readily obtainable and very durable and reusable. Furthermore, when the oysters reach a marketable size, they may be easily dislodged without being damaged.

When spat density on the cultch has reached acceptable levels, the cultch are removed from the racks, restrung on long lines for growing out, and hung from bamboo rafts anchored in deeper water. Critical factors affecting growing out success are the density of oysters on the cultch and the nature and degree of fouling. Growth rates obtained so far compare well with those from elsewhere and indicate an approximate maximum size of 80mm shell length obtainable in 6-8 months. However, marketable oysters according to present practices may be grown in four months. This rapid growth should allow for two crops of oysters per raft per year in commercial operations.

Present results indicate a high feasibility for this system of oysterculture in Jamaica and encourage the development of pilot scale commercial operations during 1980.

*Author presenting paper.

IOCARIBE MARINE POLLUTION MONITORING PROGRAM (CARIPOL)

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The Intergovernmental Oceanographic Commission (IOC) through its Regional Association for the Caribbean and Adjacent Regions (IOCARIBE) has established a marine pollution monitoring program throughout the Caribbean and Gulf of Mexico called CARIPOL. The program resulted from a joint FAO, UNEP, IOC Workshop held in Trinidad in 1976 and, as its first effort, addresses the primary pollutant identified by that Workshop, i.e., petroleum. The methods used are those established for the IOC Integrated Global Ocean Station System (IGOSS) Marine Pollution Monitoring (Petroleum) Program (MAPMOPP). Observations include visual sighting and reporting of petroleum slicks, neuston tow measurement of floating tar and oil, measurement of dissolved/dispersed hydrocarbons at 1 meter depth by CCl_4 /hexane extraction followed by spectrofluorometric measurement, and gravimetric measurement of tar and oil on beaches. To date approximately 15 member states have indicated that they will participate in the program and more than 35 participants for a training and intercalibration workshop have been identified. This workshop will be held in mid-1980.

Early results in the program are from the waters of the Gulf of Mexico and Straits of Florida and the beaches of the Florida peninsula. Levels of dissolved/dispersed petroleum in the western Gulf in summer 1979 were exceptionally high due to the effects of the IXTOC-I blowout. However, November/December 1979 values in the eastern Gulf within the Gulf Loop Current, just off the Mississippi Delta, and along the western Florida shelf were all exceptionally low as were values for floating tar and oil. Tar levels measured on beaches around the Florida peninsula showed lower levels on the west (Gulf) coast than the east. Beach tar levels in southeast Florida and the Florida Keys are higher and as great or greater than values measured by the API in 1959 and the early 1970's. These higher values are apparently due to the concentrated small tanker traffic through the Straits of Florida.

PHOSPHOROUS - NOT NITROGEN - AS THE MOST IMPORTANT
LIMITING FACTOR TO PRODUCTION IN THE CARIBBEAN SEA

Euna Moore and Finn Sander

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Bellairs Research Institute of McGill University, Barbados

Recent work on phytoplankton nutrient consumption in nutrient-poor waters has shown that many tropical species have evolved special mechanisms for surviving very low concentrations of required substances, while at the same time, retaining their potential for functioning efficiently when higher concentrations become available, i.e. they have become opportunistic autotrophs. The evidence strongly indicates that phytoplankters can utilise the various forms of inorganic and organic nitrogen, and some form of biological accommodation has been made so that many species can thrive together in what seems to be below-threshold values of essential nutrients.

The abundance of the critical nutrients is usually calculated on ambient $\text{NO}_3\text{-N}$ and $\text{PO}_4\text{-P}$ alone. In a 21 month study off Barbados, the absolute average values of these substances was shown to be characteristically low, the integrated values from surface to 100 m being 0.59 and $0.06\mu\text{g at}/\ell$ for $\text{NO}_3\text{-N}$ and $\text{PO}_4\text{-P}$ respectively and the N:P ratio calculated on these values being 9.8:1.

However, when ammonia was included as a nitrogen source, the ratio became 28.8:1. This value, derived from 42 samples, says immediately that relative to phosphorous, nitrogen was generally high in concentrations, much higher than the 15:1 ratio generally described as the assimilation ratio, hence it is suggested that phosphorous is the more critical nutrient in phytoplankton growth off Barbados.

ANNOUNCEMENTS

A MARINE PARK ON BONAIRE*

Tom van't Hof and Eric C. Newton,
Netherlands Antilles National Parks Foundation,
Bonaire, Netherlands Antilles.

A marine park is being established on Bonaire with financial assistance of the World Wildlife Fund (WWF). The marine park is unique in that it comprises all coral reefs around Bonaire instead of designating a specific area for which protective measures are taken. Therefore, it should be regarded a resource management programme for an island reef complex rather than a park as a limited unit in the traditional sense of the word. Formal establishment will take place on the basis of existing island legislation that enables additional rules to be set for the park.

The management programme comprises four major elements: (1) To carry out research, including reef mapping, photo-monitoring of selected quadrats with the objective of comparing diversity and stability of heavily dived areas with totally closed areas (reserves) and monitoring of regeneration of man-induced and natural damage. (2) To prepare recommendations and guidelines to the government on reef management on the basis of research results. (3) Law enforcement. Park staff members will obtain police authority and have a boat at their disposal for patrolling. (4) Services. These will include: (a) Environmental education programmes directed towards both tourists and the local population. (b) A system of fixed moorings on the reef so that anchoring may be completely prohibited. (c) A snorkel trail. (d) Tourist brochures on the "do's and don'ts" in the park. (e) The publication of a diving guide describing all dive sites in the park.

Implementation of the WWF project, the field phase of which started in May, 1979, will take three years. Although the WWF budget does not allow for continuation of the project beyond that period, the Bonaire Marine Park is meant to be permanent. Funds will have to be secured from other sources, e.g., a special tax per tank fill.

FUTURE ASSOCIATION MEETINGS

The 16th meeting of the AIMLC, Bellairs Research Institute
will be held 3-9 September 1981, Bermuda Biological Station
at the Bermuda Biological Station, University of Miami (RSMAS)

*An Announcement, not an abstract or research note.

Proc. Assoc. Is. Mar. Labs. Carib. 15:33 (1980)

BYLAWS OF THE ASSOCIATION OF ISLAND MARINE LABORATORIES
OF THE CARIBBEAN

ARTICLE I - Name

- Section 1. The name of the association shall be Association of Island Marine Laboratories of the Caribbean.

ARTICLE II - Purpose

- Section 1. The purpose of the Association is to advance common interest in the marine sciences:
- a. by arranging meetings
 - b. by fostering personal and official relations between members
 - c. by assisting or initiating cooperative research programs
 - d. by publishing the proceedings of meetings
 - e. and in any other way that may be desirable

ARTICLE III- Members

- Section 1. Institutional members shall be those marine laboratories of the tropical and subtropical Atlantic that the Association invites to membership, or those laboratories that were members prior to the approval of these Bylaws.
- Section 2. Representation of institutional members at meetings and other activities of the Association shall be through the directors of the respective institutions or their representatives. One person may be permitted to represent more than one institution, but may exercise one vote only (unless, carrying a written proxy from the director of the absent institution).
- Section 3. Only representatives of institutional members are eligible for the post of president of the Association.
- Section 4. Individual members shall be staff members of the different marine laboratories or scientists who have worked in any of the member stations or have special interest in problems pertaining to the marine sciences of the Tropical Atlantic and Caribbean.
- Section 5. Individual members may vote at all meetings except on matters of major policy as may be determined by the Executive Board.
- Section 6. Applicants for individual membership will be accepted upon payment of dues.
- Section 7. Annual dues of Institutional and individual members shall be determined by the Executive Board and approved by the general membership. Any institution accepted for membership who shall fail to pay dues within six months after notification shall be deemed to have declined the invitation for membership.

- Section 8. Any member whose dues are in arrears for one year will be retired from membership. After two years a member will be removed from membership, unless application for inactive membership status is received. In order to re-apply for membership at a later date, a member must pay two years of back dues at the rate of annual dues in effect at the time of reapplication.
- Section 9. A member may apply in writing for inactive membership status when unable to actively participate in the affairs of the Association. Inactive members are granted only under unusual circumstances. Decisions on institutional members will be made by the Executive Board; decisions on individual members will be made by the Secretary-Treasurer. Inactive members are retained on the membership rolls of the Association, but are indicated as inactive; they may attend any meetings that a full member may attend, but are not granted voting privileges. To regain active status, a member must pay all outstanding dues incurred prior to becoming inactive.

ARTICLE IV - MEETINGS

- Section 1. The Association shall meet at one of the member institutions to be chosen at the previous meeting or subsequently by the Executive Board in the case that an invitation had not previously been received.
- Section 2. Robert's "Rules of Order" shall govern the meetings of the Association, except where inconsistent with these Bylaws.
- Section 3. Meetings of the Association will include a meeting of the Executive Board, a business meeting of the Association, as well as sessions for the presentation of scientific papers.

ARTICLE V - OFFICERS

- Section 1. There shall be an Executive Board composed of President, First and Second Vice-Presidents, Secretary-Treasurer, three Members-at-Large, and directors of institutional laboratories or their representatives not represented by the elected officers.
- Section 2. A vacancy on the Executive Board can be filled by appointment by the Board.
- Section 3. The following shall be the duties of the President: Preside at the meetings of the Association; represent the Association in meetings, international congresses

and legal affairs; exercise general supervision over affairs of the Association; call to the attention of the Executive Board such subjects as in his opinion require consideration, determine the order of the day in administrative sessions of the Association and Board and give, annually, a report on the status of the Association and its plans for the future. He shall be ex-officio member of all standing committees.

Section 4. The following shall be the duties of the Vice-Presidents: The Vice-Presidents, in order of seniority, in case of death, absence, resignation, or disability of the President, shall perform his duties and exercise his powers.

Section 5. The following are the duties of the Secretary-Treasurer: The Secretary-Treasurer shall cause notices to be issued of all meetings of the Association in collaboration with the host institution (see Sec. 1, Art. IV) and the President, prepare the program for the meetings of the Association, attend all such meetings and keep the minutes thereof. He shall publish the Proceedings of each meeting. He shall conduct the correspondence of the Association; have custody of the archives and books of account and collect, receive and have custody of the funds and securities of the Association. He shall pay all bills and appropriations, shall keep regular and correct accounts and shall submit reports to the Association at its annual meetings. The fiscal year of the Association shall be from July 1 to June 30.

Section 6. The following shall be the duties of Members-at-Large: Members-at-Large shall be expected to attend all meetings of the Association and shall, in order or priority in appointment, substitute for the Secretary-Treasurer in case of death, absences, resignation or disability.

Section 7. Half of the elected officers and one fourth of the Institutional representatives will constitute a quorum of the Executive Board.

ARTICLE VI - COMMITTEES

Section 1: The President may appoint committees as authorized by the Association or as he feels desirable in order to guarantee the smooth operation of the Association.

ARTICLE VII - AMENDMENTS

Section 1: These Bylaws may be amended, either by change or repeal of any provisions or the adoption of new provisions, at any business meeting of the Association by majority vote of members present.

Section 2: Amendments to the Bylaws will take effect immediately upon approval.

ESTATUTOS DE LA ASOCIACION DE LOS LABORATORIOS
MARINOS DE LAS ISLAS DEL CARIBE (AIMLC)

TITULO 1 - NOMBRE

Artículo 1. La Asociación se llamará Asociación de los Laboratorios Marinos de las Islas del Caribe.

TITULO II - OBJETIVOS

Artículo 1. El objetivo de la Asociación es el de fomentar el interés común en las ciencias del mar, a través de los siguientes medios:

- a. organización de reuniones
- b. promoción de relaciones personales y oficiales entre los miembros,
- c. ayuda o inicio de programas cooperativos de investigación
- d. publicación de las memorias de las reuniones y
- e. dedicarse a cualquier otra actividad sea deseable.

TITULO III - MIEMBROS

Artículo 1. Serán Miembros Institucionales los Laboratorios marinos del Atlántico tropical y sub-tropical que la Asociación invite a ser miembros or que eran miembros antes de aprobarse estos estatutos.

Artículo 2. Los miembros institucionales seran representados en las reuniones y otras actividades de la Asociación por los directores de las respectivas instituciones o por sus delegados. Una persona podrá representar mas de una institución pero tendrá derecho a un sólo voto, excepto cuando ejerza el voto por poder con la autorización escrita del director de la institución ausente.

Artículo 3. Solamente los representates de los Miembros Institucionales serán elegibles para el cargo de presidente de la Asociación.

Artículo 4. Serán Miembros Individuales los que formen parte del personal de los laboratorios marinos, o los científicos que hayan trabajado en una estación miembro o que tengan interés especial en los problemas relacionados con las ciencias marinas del Atlántico Tropical y del Mar Caribe.

- Artículo 5. Los Miembros Individuales tienen el derecho de votar en todas las reuniones excepto en asunto de mayor trascendencia, lo que será determinado por el Consejo Ejecutivo.
- Artículo 6. Los aspirantes a Miembros Individuales serán admitidos después del pago de su cuota.
- Artículo 7. Las cuotas anuales de los Miembros Institucionales e Individuales serán fijadas por el Consejo Ejecutivo y aprobadas por los miembros en asamblea general. Cualquier institución admitida como miembro que no pague su cuota dentro de los seis meses siguientes a la notificación, se considerará que ha declinado la invitación a ser miembro.
- Artículo 8. Cualquier miembro que se retrase en su pago por un año será suspendido. Después de dos años perderá su condición de miembro a menos que se haya recibido su solicitud para ser admitido como miembro pasivo. Para reingresar como miembro debe pagar dos años de cuotas atrasadas con la tarifa de la cuota anual en efectivo en el momento de hacer la solicitud de reintegrarse.
- Artículo 9. Un miembro puede solicitar por escrito la condición de pasivo cuando este incapacitado para participar activamente en las labores de la Asociación. La condición de miembro pasivo se otorgará sólo bajo circunstancias excepcionales. Las decisiones con respecto a los miembros institucionales estarán a cargo del Consejo Ejecutivo y las decisiones que se refieren a los miembros individuales estarán a cargo del Secretario/Tesorero. Los miembros inactivos serán mantenidos en la lista de miembros de la Asociación pero con la designación de pasivos; podran asistir sin voto a todos las reuniones. Para recuperar su condición de activo el miembro deberá pagar todas las cuotas que tenía pendientes antes de pasar a la condición de pasivo.

TITULO IV - REUNIONES

- Artículo 1. La Asociación se reunirá en una de las instituciones miembros seleccionada en la reunión anterior o subsecuentemente por la convocación del Consejo Ejecutivo en caso de que no se haya recibido previamente una invitación oficial al respecto.
- Artículo 2. En las reuniones de la Asociación regirán las normas parlamentarias de "Robert's Rules of Order", excepto cuando esten en contradicción con estos estatutos.
- Artículo 3. Las reuniones de la Asociación incluirán una reunion del Consejo Ejecutivo, una reunion administrativa, así como las sesiones para la presentación de los trabajos científicos.
- Proc. Assoc. Is. Mar. Labs. Carib. 15:38 (1980)

TITULO V - LA DIRECTIVA

- Artículo 1. El Consejo Ejecutivo estará integrado por el Presidente, el Primer y Segundo Vice-Presidente, el Secretario-Tesorero, tres Vocales y por los directores de los laboratorios Miembros Institucionales o sus representantes cuando no hayan sido elegidos para otras cargos.
- Artículo 2. Cuando se produzca cualquier vacante en el Consejo Ejecutivo, se llenará por nombramiento del propio Consejo.
- Artículo 3. Los deberes del Presidente serán los siguientes: Presidir las reuniones de la Asociación; representar la Asociación en reuniones, congresos internacionales y en asuntos de carácter legal; ejercer la supervisión general acerca de los asuntos de la Asociación; llamar la atención del Consejo Ejecutivo en relación a problemas que en su opinión requieran ser conocidos; establecer la agenda de las sesiones administrativas de la Asociación y del Consejo Ejecutivo y presentar cada año un informe sobre el estado de la Asociación y sus planes para el futuro. El Presidente será miembro ex-officio de todos los comites vigentes.
- Artículo 4. Los deberes de los Vice-Presidentes serán los siguientes: Sustituir al Presidente en orden de antigüedad, cumpliendo sus deberes y ejerciendo sus poderes en caso de muerte, ausencia, renuncia o incapacitación del Presidente.
- Artículo 5. Los deberes del Secretario-Tesorero serán los siguientes: Hacer mandar memorandums de todas las reuniones de la Asociación en colaboración con la institución anfitriona (ver Artículo 12, Título IV) y el Presidente; preparar el programa de las reuniones de la Asociación; asistir a todas las reuniones y elaborar las minutas de las mismas; publicar las memorias de cada reunión; encargarse de la correspondencia de la Asociación; custodiar los archivos y libros de contabilidad; recibir y cuidar los fondos y valores de la Asociación; pagar todas las cuentas; mantener las cuentas al día y presentar un informe a la Asociación durante las reuniones anuales. El Año Fiscal de la Asociación será del 1 de julio al 30 de junio.
- Artículo 6. Los deberes de los Vocales serán los siguientes: Asistir a todas las reuniones de la Asociación y, en orden de prioridad de su nombramiento, sustituir al Secretario-Tesorero en caso de muerte, ausencia, renuncia or incapacidad.
- Artículo 7. El cuorum del Consejo Ejecutivo estará constituido por la mitad de sus miembros y un cuarto de los representantes de los Miembros Institucionales.

TITULO VI - COMITES

Artículo 1. El Presidente podrá nombrar comites por autorización de la Asociación o cuando lo considere necesario para garantizar el mejor desenvolvimiento de la Asociación.

TITULO VII - ENMIENDAS

Artículo 1. Estos Estatutos podran ser enmiendas por cambio o rechazo de cualquiera de las provisiones, o por adopción de nuevas provisiones durante cualquier reunion administrativa de la Asociación, por el voto mayoritario de los miembros presentes.

Artículo 2. Las enmiendas de los Estatutos tendran vigencia inmediatamente después de su aprobación.

ASSOCIATION OF ISLAND MARINE LABORATORIES OF THE CARIBBEAN

INSTITUTIONAL MEMBERS

1. THE BELLAIRS RESEARCH INSTITUTE OF MCGILL UNIVERSITY
St. James, Barbados, W.I.
Finn Sander, Director
2. BERMUDA BIOLOGICAL STATION
St. George's West, Bermuda
Wolfgang E. Sterrer, Director
3. CARAIBISCH MARIEN BIOLOGISCH INSTITUUT
Piscadera Bay
Curacao, Netherlands Antilles
Ingvar Kristensen, Director
4. DEPARTMENT OF MARINE SCIENCES UNIVERSITY OF PUERTO RICO
Mayaguez, Puerto Rico 00708
Manuel L. Hernández-Ávila, Director
5. ESTACIÓN DE INVESTIGACIONES MARINAS DE MARGARITA FUNDACIÓN LA SALLE DE CIENCIAS NATURALES
Apartado 144
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José A. Monente, Director
6. PORT ROYAL MARINE LABORATORY UNIVERSITY OF THE WEST INDIES
P. O. Box 12, Mona, Kingston 7, Jamaica
Ivan Goodbody, Director
7. DISCOVERY BAY MARINE LABORATORY, UNIVERSITY OF THE WEST INDIES
P. O. Box 35
Discovery Bay, Jamaica
Jeremy D. Woodley, Director
8. INSTITUTO OCEANOGRÁFICO UNIVERSIDAD DE ORIENTE
Apartado 94
Cumaná, Venezuela
Amado Acuña, Director
9. FUNDACIÓN CIENTÍFICA LOS ROQUES
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Caracas, Venezuela
Tania Cobo de Barany, Director
10. INSTITUTO DE BIOLOGÍA MARINA UNIVERSIDAD AUTÓNOMA
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Idelisa Bonnelly de Calventi, Director
11. INSTITUTO DE INVESTIGACIONES MARINAS PUNTA BETÍN
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Panama, 00000
Ira Rubinoff, Director
13. WEST INDIES LABORATORY FARLEIGH DICKINSON UNIVERSITY
P. O. Annex 4010
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U. S. Virgin Islands 00820
Robert Dill, Director

AIMLC INSTITUTIONAL MEMBERS (continued)

14. BITTER END FIELD STATION
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British Virgin Islands
Norman J. Doorenbos, Director
15. ROSENSTIEL SCHOOL OF MARINE
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