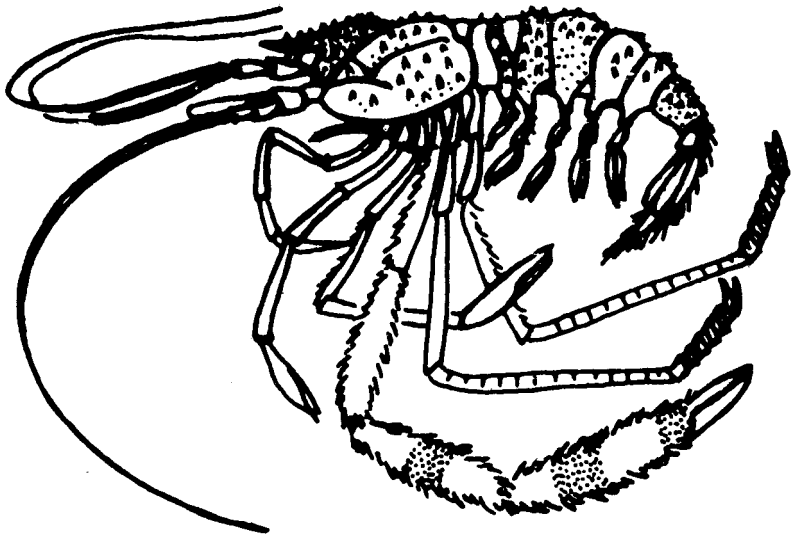
Ray Waldner

ASSOCIATION OF ISLAND MARINE LABORATORIES

OF

THE CARIBBEAN

Fourteenth Meeting



Centro de Investigaciones de Biología Marina

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INTRODUCTION

The fourteenth meeting of the Association began with an inaugural address by the Rector of the Universidad Autónoma de Santo Domingo, Dr. Antonio Rosario, and a welcoming address by the Director of Centro de Investigaciones de Biología Marina, Dra. Idelisa Bonnelly de Calventi, on the morning of 20 November, 1978. The Dean of the Faculty of Sciences of the Universidad Autónoma de Santo Domingo, Lic. Melba Baez de Erazo, presented a Diploma de Reconocimiento de parte de Universidad Autónoma de Santo Domingo to Luis A. Almodóvar for his support and services to the University. After a short break, the President of the Association, Idelisa Bonnelly de Calventi, opened the scientific sessions which extended over three days in eight sessions with 39 simultaneously translated presentations. In the evening, the Director of National Parks, Ing. Merilio Morel, invited the participants to a cocktail party at Dirección Nacional de Parques in the historical building Casa de Bastidas in the beautiful and historic old portion of the city. For part of the evening, the halls and garden of this ancient and impressive place were illuminated picturesquely with only candles. In the evening of the following day, Dr. Dato Pagán presented a special seminar, "Los peces en el arte rupestre indígena de la Hispaniola" to the participants in the Dentro de Investigaciones de Biología Marina. Following the seminar, the President, Idelisa Bonnelly, convened a special Panel Session concerning the activities of member marine laboratories of the Association. The Panel Session was chaired by Manuel Hernandez-Avila and included the following speakers:

Robert F. Dill and Dennis Hubbard, Hydro-Lab. A tool for marine scientists at the West Indies Laboratory, St. Croix, U.S.V.I.

Anaisa Delgado y Alida Ortiz. El programa Sea Grant en Puerto Rico.

Narciso Almonte. El Departamento de Recursos Bioacuáticos, Secretaria de Estado de Agricultura.

Amado Acuña. Instituto Oceanografico, Universidad de Oriente, Cumaná, Venezuela.

Idelisa Bonnelly de Calventi. El Centro de Investigaciones de Biología Marina, Universidad Autónoma de Santo Domingo.

Manuel Hernandez-Avila. Departamento de Ciencias Marinas, Universidad de Puerto Rico, Recinto de Mayaguez.

Refreshments were served in the laboratory following the Panel Session. On the evening of November 22, the Secretary of Agriculture, Agr. Hipolito Mejía, invited the participants to a dinner party at the Restaurant Antoine at the Hotel Santo Domingo Sheraton. During four sessions of the Executive Board: the Center for Energy and Environment Research, University of Puerto Rico, Mayaguez, Puerto Rico, was invited to joint the Association; The Port Royal Laboratory, Jamaica, was selected to host the next meeting; the Bylaws of the Association were revised; progress

toward obtaining outside funding for student travel was discussed; and dues regulations and the proceedings policy were revised. The revised Bylaws were presented to the members by the First Vice President and the Secretary Treasurer during the General Business Meeting on the morning of 23 November. The new Bylaws were accepted. Three committees were designated: (1) Sophie Jakowska to form a Spanish translation of the Bylaws; (2) Charlene Long to seek support for student travel to Association meetings; and (3) Paul and Beverly Yoshioka to advertize the next meeting of the Association. The First Vice President thanked all the organizations which supported the meeting and all the members who contributed to the success of the scientific sessions. The President closed the Fourteenth Meeting of the Association. Excellent field trips were provided for the participants to the Botanical Gardens in the afternoon of 23 November; to Bahía de las Calderas on 24 November; and to the National Zoological Park on 25 November. A special concert was conducted by the National Symphonic Orchestra for the participants on the evening of November 24.

The Fourteenth Meeting of the Association was exciting, enjoyable, and very productive. The entertainment was probably the most sophisticated and maginificent ever provided for an Association Meeting. The participants are deeply grateful to Idelisa Bonnelly de Calventi, Sophie Jakowska, Francisco X. Geraldes, Valentin Rivas, Venecia Alvarez, Nidia Terrero, Mayra Garcia de Geraldes, Manuel Montero, Nirva Nuñez de Ricart, Elizabeth Navarro y Rosa Forzani and others of the Centro de Investigaciones be Biología Marina for producing an excellent meeting.

Ernest H. Williams, Jr. - Editor

ECOLOGIA DE Thalassia testudinum EN LA PARGUERA, LAJAS, PUERTO RICO

Anaïsa Delgado Hyland

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Tres praderas de Thalassia testudinum (Banks) ex Konig fueron estudiadas en las plataformas de los arrecifes de coral Laurel y Enrique y en las aguas de Isla Guayacán en La Parguera, Puerto Rico, de septiembre, 1976 a septiembre, 1977.

La distribución horizontal de las macroalgas bentónicas, las lecturas de biomasa y de morfometría de follaje de Thalassia se efectuaron a lo largo de un transepto mensual de 91.4 m de longitud y de 61 cm de ancho. La macroflora bentónica se muestreó y se identificó cada tres metros, en un intervalo de 0.15 a 0.9 m de profundidad.

La Isla Guayacán exhibió la mayor diversidad de especies de macroalgas bentónicas estando representadas por 35 especies distintas siguiéndole en orden descendente Cayo Enrique, con 28 especies y el Cayo Laurel con 17 especies. Del punto de vista taxonómico, Guayacán exhibió la mayor estabilidad, pues mostró un número mayor de especies (11) con una frecuencia constante de aparición de ocho meses o más del período de estudio. La baja diversidad de especies conspicuas y abundantes en las plataformas de los arrecifes puede deberse a la actividad de dehesa de peces de las familias Scaridae y Acanthuridae (Randall, 1965) y del equinoideo Diadema antillarum (Philippi, 1845) (Odgen 1976) y a la selectividad de la flora marina adaptada a sobrevivir en las condiciones fluctuantes del mesolitoral.

La pradera de la Isla Guayacán establecida en la zona del infralitoral, presentó los valores más altos de cosecha en pie (95.93 g seco/1/5m^2; 33.93 g seco /1/5m^2; 8.75 g seco/1/625 m^2 en el mes de febrero, 1977), de biomasa total con valores promedios de 3.38 $\pm$ 1.69 (g seco hoja/1/785m^2), 2.6$\pm$ 0.64 (g seco rizoma/1/785m^2), 3,43+ 2.98 (g seco raices/1/785m^2) y de 3.02 $\pm$ 1.65 (g seco tallo/1/785m^2) y de mayor longitud de follaje, con un ámbito de fluctuación de 12.5 a 28.6 cm. Los valores mayores de biomasa y de longitud de follaje de Thalassia en Isla Guayacán puede deberse a la poca actividad humana desarrollada y a la presencia de poblaciones pequeñas de equinoideos que tienen como elemento dominante al Lytechinus variegatus (Lamarck, 1778).

Proc. Assoc. Is. Mar. Labs. Carib. 14:3

NOTAS SOBRE LIPIDOS Y ALCALOIDES DE ALGAS Y FANEROGAMAS ACUATICAS*

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Este estudio indica la factibilidad de uasr ciertas algas y fanerogamas acuáticas como fuentes no-tradicionales de lípidos y alcaloides para uso medicinal o como alimento.

Se analizan las siguientes especies: algas verdes, Chaetomorpha media,Ulva fasciata, Ulva lactuca y Caulerpa racemosa; algas pardas, Sargassum polyceratium y Dictyopteris delicatula; algas rojas, Laurencia obtusa y Hypnea musciformis, y dos fanerogamas Thalassia testudinum y Ruppia maritima.

La cantidad de lípidos constituyó la porción más significativa de los componentes orgánicos: Sargassum polyceratium, 22.53; Caulerpa racemosa, 15.0; Dictyopteris delicatula, 12.1; Ulva fasciata y U. lactuca, 10.0 y Hypnea musciformis, 8.9. Por otra parte, los lípidos fueron más bajos en Chaetomorpha media, 5.0; Thalassia testudinum, 4.55; Ruppia maritima, 4.0 y Laurencia obtusa 3.57, todos en por ciento (%) de peso seco.

Los lípidos de Chaetomorpha media, Ulva lactuca, Hypnea musciformis y Ruppia maritima presentaron caracterísiticas parecidas a la cera, con un índice de Yodo bajo: 63.5, 85.0; 88.0, respectivamente. También se parecían a las ceras los lípidos de las algas pardas, pero no fué posible determinar el Indice de Yodo. Los lípidos de las otras especies se asemejaban a los aceites vegetales, con un Indice de Yodo más alto, ej. Thalassia testudinum, 98.9 Ulva fasciata, 100.4; Caulerpa racemosa, 110.0 y Laurencia obtusa 120.0.

Los estudios sobre los alcaloides se iniciaron con la detección de ergotamina en el extracto de Ulva fasciata. Se obtuvieron mayores cantidades de alcaloides crudos en Ulva lactuca (14% de peso seco), Laurencia obtusa (10.1%), Ruppia maritima (9.8%) y Chaetomorpha media (9.59%). Sin embargo, sólo 1.0-1.5% en Hypnea musciformis, y no más de 0.1% en Sargassum polyceratium y Thalassia testudinum.

En Chaetomorpha media, Ulva lactuca y Hypnea musciformis se observaron cristales de alcaloides. Los alcaloides de Laurencia obtusa fueron predominantemente resinosos y los de Ruppia maritima resinosos y cristalinos.

Proc. Assoc. Is. Mar. Labs. Carib. 14:4

*Este trabajo fué realizado bajo el Proyecto de Educación Profesional , Secretaría de Estado de Agricultura.

LA VEGETACION MARINA DE LOS CAYOS 7 HERMANOS DE LA BAHIA DE* MONTECRISTI

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El presente trabajo llevado a cabo en cuatro de los Cayos Siete Hermanos de la Bahía de Monte Cristi (Cayo Monte Chico, Ratas, Arenas y Cayo Muertos) describe la vegetación marina de dichos cayos.

Estos cayos constituyen un ecosistema donde las aves Sterna fuscata y Anus stolidus se refugian para anidar en los meses de abril a junio sólo en los cayos Monte Chico y Ratas.

Además se incluyen datos sobre Isla Cabra y Caño del Embarcadero, ambos situados en la misma zona, con la finalidad de comparar su vegetación marina con la de los Cayos.

Finalmente comparamos de una manera muy general la vegetación marina de los Cayos de la Bahía de Monte Cristi con otros Cayos de Puerto Viejo, Azua en la región sur del país y Cayo Willy y Cueva Arena en la Bahía de Samaná en la región este.

Se plantean normas para la protección y mejor utilización de estos cayos.

*Este proyecto se realizó bajo los auspicios del Proyecto de Educación Profesional, Secretaría Estado de Agricultura.

Proc. Assoc. Is. Mar. Labs. Carib. 14:5

THE DISTRIBUTION OF Trididemnum cf solidum, AN ALGAE CONTAINING COMPOUND ASCIDIAN, ALONG THE COAST OF CURACAO (N.A.).

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The distribution of Trididemnum cf solidum was recorded scuba-diving on 42 transects along the southwest coast of Curaçao. The transects were 5 m wide and perpendicular to the coast, running from the shore line to a depth of 50 m.

The species was absent over the first ± 17 km from the eastern tip and the first ± 6 km from the western tip of the island. A high abundance was reached around the middle of the 69 km. long coast. We suggest this pattern to be caused by the combined effects of larval behavior and the uniform structure of the current regime along the coast. Vertically over the reef, the ascidians were most commen from 10 to 25 m. The mean abundance between these depths was ± 20 colonies/transect. We did not find any colonies shallower than 2 m and deeper than 45 m.

Trididemnum cf solidum competes with scleractinians for hard substrata. Edges of colonies protruded most commenly over Eusmilia fastigiata, Montastrea annularis and Agaricia agaricites.

We found the test of this ascidian to contain high densities of uni-cellular algae (diameter ± 7 um), a new phenomenon in Atlantic didemnid ascidians. The relationship between algae and host is under investigation.

Proc. Assoc. Is. Mar. Labs. Carib. 14:6

LAS ALGAS MARINAS MACROSCOPICAS DE LA BAHIA DE ANDRES, D.N.

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La Bahía de Andrés de Boca Chica, se encuentra en la costa sur de Santo Domingo (18°27' Norte, 69°37' Oeste).

Cinco estaciones fueron designadas que incluyen todos los habítaculos encontrados en la bahía. Estos son 1) zona del litoral desde entrada del puerto hasta el Ingenio Boca Chica; 2) zona desde el Ingenio hasta el extremo Sur-este de Isla Piedra, siguiendo Noreste hasta el Río Brujuelas; 3) desembocadura Río Brujuelas hacia el este de la laguna; 4) poblado Boca Chica hasta Hotel Hamaca; 5) arrecife coralino.

Un total de 59 especies fueron recolectadas que se distribuyen en los 4 grupos de la siguiente forma: Cloroficofitas, 13 géneros y 24 especies; Rodoficofitas, 19 géneros y 27 especies; Faecofitas, 4 géneros con 6 especies; y las Cianofitas, 2 géneros con 2 especies. Las 59 especies están distribuidas en 20 familias, siendo las familias Caulerpaceae (alga verde) y Rhodomelaceae (alga roja) con 9 especies cada una las más respresentadas . De estas 59 especies, hay 10 que pueden ser indicadoras de contaminación.

Proc. Assoc. Is. Mar. Labs. Carib. 14:7

NUEVO RECORD DE ESPONJAS MARINAS PARA LA REPUBLICA DOMINICANA Y DISCUSION DE SU IMPORTANCIA EN EL AMBIENTE MARINO

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Dieciseis especies de esponjas marinas son informadas como un nuevo record tentativo de demoesponjas para la República Dominicana. De los especímenes coleccionados, dos especies, Haliclona rubens (Duch & Mich) de Laubenfels, y Smenospongia aurea (Hyatt) ya antes habían sido informadas en la literatura. El record nuevo consiste de las siguientes especies colectadas en la Costa Sur: Tedania ignis (Duch & Mich), Desmacella meliorata (Wiedenmeyer) colectados en las raíces de mangle de la "islita" en Boca Chica; Chondrilla nucula (Schmidt), Tethya actinia (de Laubenfels) asociadas a la pradera de Thalassia al norte de la islita en Boca Chica; Ircinia strobilina (Lamarck) colectada en la pradera de Thalassia en la Bahía Calderas; y Iotrochota birotulata (Higgin), Spinosella vaginalis (Lamarck) forma vaginalis, Callyspongia fallax (Duch & Mich) forma fallax, Niphates (Duch & Mich) sp., Spheciospongia vesparium (Lamarck), Desmapsamma anchorata (Carter) Burton, Aplysina fistularis (Pallas) forma fistularis, Aplysina lacunosa (Lamarck), Thalysias juniperina (Duch & Mich), Cinachyra (Sollas) sp., Xestospongia muta (Schmidt) colectadas en substrato rocoso expuesto a ambiente oceánico en la Malena. Este proyecto se pudo llevar a cabo a través de la cooperación mutua entre el Centro de Estudios Energéticos y Ambientales de la Universidad de Puerto Rico y el Centro de Investigación de Biología Marina de la República Dominicana.

Se discute la importancia de las esponjas desde un punto de vista sinecológico en las comunidades de los manglares, las praderas de Thalassia, y los arrecifes, con énfasis en el arrecife donde se trata de elucidar la influencia de las esponjas en dicho ambiente utilizando la especie Anthosigmella varians (Duch & Mich) de Laubenfels (Hadromerida: Spirastrellidae) como modelo.

Proc. Assoc. Is. Mar. Labs. Carib. 14:8

POPULATION DYNAMICS AND CLUSTERING BY CORAL PLANULAE OF *Porites porites*

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Population dynamics of recently settled Scleractinian coral larvae deserve considerable attention since little is known about survivorship patterns observed under controlled conditions. We followed settlement of nearly one thousand planulae released from a single parental colony of *Porites porites* under a monitored regime. The majority of planulae were released during the first few weeks and the experiment terminated after eleven weeks, settled spats counted, and their distribution mapped. Nearly half of the corals settled on sides of the aquarium, but over 96% of these died before forming a basal skeletal plate, leaving only a mucoid attachment. Of those larvae settling on the bottom of the aquarium, 40% died prior to basal plate formation. We enumerated individuals forming 1) mucoid attachments, 2) basal plates without epithecae, 3) six-septate skeletons, 4) nine-septate skeletons and 5) twelve-septate skeletons to determine a relative age distribution for all individuals at the end of the experiment. These data provide a time-specific "survivorship" curve with a minimum at the six-septal stage, indicating that age distribution changes with time. These data suggest that population mortality is high prior to initiation of calcification but decreases markedly once skeletogenesis begins. We also calculated an age-specific "survivorship" curve which decreases concavely to 16% at the twelve-septal state but tends to flatten out as experimental duration is extended. The numbers of mucoid imprints and corallites were counted in quadrats of one cm^2 and nine cm^2 sizes and compared to Poisson distributions with the same mean. Conventional indices of dispersion, variance to mean ratio, correlation coefficient and Lloyd's measures of intraspecific crowding and patchiness were calculated for each distribution and for the total population. Novel approaches to segregation analysis and to determination of length scales of patchiness were developed (T.J.G.) and applied to these data. Our results show non-random clumping of each group with a bimodal skeletal distribution. Those individuals surviving to form skeletons are more clumped than those which died after adhesion, and the clumps of the two populations are markedly segregated.
Proc. Assoc. Is. Mar. Labs. Carib. 14:9

A POSSIBLE NEW SPECIES OF *Podocoryne* (HYDROIDA) IN THE CARIBBEAN

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Podocoryne sp. has been collected off La Parguera, Puerto Rico and Salt River Canyon, St. Croix. The polyps occur most commonly on shells of *Polinices* sp. occupied by as yet an unidentified pagurid crab. Specimens were collected at night at depths of 15 to 33 meters near coral rubble usually adjacent to sandy areas covered by *Halophila* and *Caulerpa*.

Polyps arise from a fleshy hydrorhizal mat present on the inside of the upper edge of the shell aperture and on the columella. Vestigial spines occur as flat chitinous pads within the hydrorhiza on the columella. Their diameter and length are respectively, in mm., 0.05 and 0.125. In some colonies they are spherical.

Three kinds of polyps are present. Gonozooids occur on the upper edge of the shell aperture. Their diameter and length respectively, in mm., range from 0.33-0.45 and 1.25-2.5. Tentacles are short, claviform and number from five to seven, occasionally ten. Developing medusae number to 25 per polyp. Tentaculozooids occasionally occur behind the gonozooids on the upper edge of the shell aperture and on the columella near the gastrozooids. They range from 0.075-0.125 mm. in diameter. Gastrozooids occur primarily on the columella of the shell. The column is salmon colored and length and midcolumn diameter respectively, in mm., range from 2.5-7.5 and 0.5-1.0. Tentacles are long, filiform and number to 100. The gastrozooids bear up to 30 developing medusae per polyp, a feature that distinguishes this species from other species of *Podocoryne*.

At time of release medusae from either gonozooid or gastrozooid measure in diameter and length respectively, in mm., 0.625-0.75 and 0.625-0.875. The manubrium, one third to one half the length of the bell cavity, bears four oral lips, each terminating in a cluster of nematocysts. Initially four radial tentacles of equal length are present. Length of extended tentacles is three times the bell length. In 11 days four interradial tentacles of varying stages of development and mature eggs are present.

Proc. Assoc. Is. Mar. Labs. Carib. 14:10

ANNELIDA FROM A NORTHERN PUERTO RICAN ESTUARY: A ONE-YEAR SURVEY

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As part of an ecological study of the Rio Espiritu Santo estuary on the north coast of Puerto Rico, more than 2,000 annelids were separated into 16 species in thirteen families. Sixty-three percent were Tharyx sp., 20% were three Capitellidae species, 9% Oligochaeta sp., 6% were Sigambra tentaculata (Traedwall, 1941), and 2% were Stenoninereis martini (Wesenberg-Lund, 1949). Fifty percent of the capitelids belong to two new genera and the oligochaete is a new species.

Eighteen stations were sampled along six kilometers of the estuary up to the Atlantic Ocean. Most were clustered around river mouths one of which, about mid-way to the ocean, receives sewage outfall.

All species had a pattern of delimited distribution by station. Tharyx sp. and S. tentaculata were found from the outfall north to the Atlantic Ocean; the oligochaete accompanied them except at the mouth of the estuary. The Capitellidae species and S. martini were found from the outfall south to the head of the estuary.

Because of its river-like shape and the composition of its inhabitants, this estuary is apparently not comparable to others in the Caribbean and associated waters, for most are bays with shallow flats overgrown by sea-grass beds.

The lack of species definition for the most common annelids in the estuary makes it difficult to utilize previous studies of annelid biology. From the groups for which there is information (capitellids, S. tentaculata and S. martini), it is likely that the estuary is affected by extreme changes in physical parameters such as salinity and dissolved oxygen. Based on this, we can speculate that the other species are likewise characterized by an affinity for extremes.

Proc. Assoc. Is. Mar. Labs. Carib. 14:11

LARVAL BEHAVIOUR AND GROWTH PATTERNS OF THE COMPOUND ASCIDIAN *Trididemnum cf solidum*

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Trididemnum cf solidum is a common viviparous compound ascidian on the reefs of Curaçao.

The tadpole larvae develop outside the zooids in brood pouches in the test. Mature colonies release larvae from 9.30 to 13.00 hours daily during the reproductive period. The larvae change from photo-positive to photo-negative during their free-living phase. Fifty percent settle within 15 minutes, ninety percent within 1 hour after release.

The larvae prefer dark substrata and substrata covered with biological slime for settlement. They do not settle on living coral surfaces. The settled metamorphosing larvae grow very slowly to small ($\pm$ 3 mm) budding colonies in $\geq$ 30 days.

We study the growth, measuring maximal length and width monthly, of more than 50 colonies distributed over two reef areas (depth 5 to 37 meter) on the southwest coast of Curaçao. The preliminary data (june till october 1978) show that at the relatively sheltered reef (Vaersenbaai) growing colonies increase much more rapid in mean size ($\pm$ 2.8 cm/month) than at the more exposed and more turbid Piscadera reef ($\pm$ 1.3 cm/month).

The growth patterns of T. cf solidum are complicated by short-time phenomena ($<$ 2 weeks) such as the disappearance of colonies and parts of colonies through desintegration or resorption. Remains of colonies do regenerate. Partial desintegration and fission cause colonies to split up in parts. Also colonies are capable of fusing.

Small amphipods (2-3 mm length) live in association with *T. cf solidum*. They are situated in fissures in the common test of the tunicate. The fissures are capable of closing in case of danger. In a stress situation in tanks they leave the protection of the fissure and swim around freely.

Our investigations are being continued.

Proc. Assoc. Is. Mar. Labs. Carib. 14:12

GROWTH AND REGENERATION IN THE SCLERACTINIAN REEF CORAL *Acropora palmata*

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Regeneration and growth of *Acropora palmata* were studied *in situ* at the fringing reef on the southwest coast of Curaçao.

Two types of circular lesions were artificially inflicted on the terminal parts of the coral branches: 1 square cm tissue lesions and 1 square cm tissue + skeleton lesions. All lesions were 100% recovered within 80 days. This is both a remarkable recovery efficiency and a very rapid regeneration compared with similar data on other scleractinian species. Regeneration rates (area covered/ 10 days) were significantly higher in the earlier part of the recovery period.

The process of regeneration involves the simultaneous formation of both a new layer of calcium carbonate and a layer of living tissue. Alien material is trapped under the regenerating surface.

During regeneration normal growth in length of the branch is significantly slower than that in control branches. In case of repeated damage, as in damselfish territories, growth in length of the affected branches will stop completely.

Proc. Assoc. Is. Mar. Labs. Carib. 14:13

ECOLOGICAL ASPECTS OF ANTIPATHARIA (black corals) IN CURACAO

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Knowledge of the ecology of Antipatharia (black corals) is needed in view of their possible overexploitation. In Curaçao two species, tentatively identified as Antipathes pennacea Pallas and Antipathes dichotoma Pallas, are used in the jewelry industry. In this study emphasis was put on Antipathes pennacea.

To estimate distribution and standing crop, forty three 20 m wide transects were run over the reef profile to a depth of 65 m along the southwest coast of Curaçao. A. pennacea occured between 10 to 65 m with peak densities at 35 to 40 m. The central-eastern part of the coast has relatively few black corals. On a local scale, A. pennacea is more abundant on parts exposed to currents.

Growth, of length of colony and stem diameter, was measured at 4 month intervals during one year. Mean length increments were ± 10 cm/year. Increase of stem diameter was too small to measure but correlation with the length of the colonies indicates a ± 0.5 mm yearly increment.

Gonad measurement showed July to December to be the reproductive period. No gonads were found in colonies less than 1 m in height.

Transplants in PVC pipes survived in their original habitat, but no growth was recorded nor did they attach to their substratum. Transplanted to depths of less than 10 m, A. pennacea died rapidly.

Proc. Assoc. Is. Mar. Labs. Carib. 14:14

SPECULATIONS ON POTENTIAL EFFECTS OF MOLLUSCAN CORALLIVORE INTRODUCTIONS ACROSS THE ISTHMUS OF PANAMA

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and
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Panamá, República de Panamá

The construction of a sea-level canal linking tropical waters of the Pacific and Caribbean would make it possible for marine species separated since Pliocene time to again come into contact. Numerous corallivore species on either side of the Isthmus feed on reef-building corals and should be identified as a potential threat to present Panamanian coral communities. A study of two molluscan gastropod corallivores, the Pacific ovulid Jenneria pustulata [Lightfoot, 1786] and the Caribbean coralliophilid Coralliophila abbreviata Lamarck, 1816, was undertaken in an attempt to predict some possible ecological effects following an introduction of these species. Two aspects of this work are reported: (1) the extent of predation on adult corallivores in a foreign environment with a new set of predators, and (2) the feeding preferences of corallivores and their ability to feed on novel coral prey.

Laboratory and field evidence indicate that pufferfishes are important predators of gastropod corallivores. Four large pufferfishes (Diodon and Arothron) are abundant on the Pacific reefs of Panama, whereas only two species (Diodon) occur commonly on Caribbean reefs in Panama. Census data indicate a greater abundance of pufferfishes on Pacific than Caribbean reefs: mean number and range = 3.4 (0-7.5) individ./man hr (Pacific, n = 8 censuses) versus 0.07 (0-0.5) individ./man hr (Caribbean, n = 7). To assess predation rates on corallivores in native and foreign environments, snails (both live and dead) were cemented to blocks in comparable Pacific and Caribbean habitats. Results for both species indicate a significantly higher ($p < 0.01$, χ^2 test) attack rate in the Pacific than in the Caribbean. Predation in the Caribbean occurred at night.

Laboratory feeding experiments indicate that the Pacific Jenneria has a strong ($p < 0.01$, χ^2 test) preference for native Pacific Pocillopora damicornis (L.) when offered in equal proportions with a variety of Caribbean coral species. Both Jenneria and Coralliophila, however, will feed on novel coral prey when denied any choice.

These preliminary results suggest that adult Jenneria would be subject to relatively low levels of predation on Caribbean reefs and, with the abundance and variety of coral prey there, may experience a dramatic increase in numbers. On the other hand, Coralliophila was attacked more in the Pacific than in the Caribbean and therefore we conclude that the introduction of this species would probably not seriously affect Pacific coral communities.

Proc. Assoc. Is. Mar. Labs. Carib. 14:15

CONSIDERATIONS ON THE EFFECTS OF INTRODUCED FISHES IN THE FRESH WATERS OF THE DOMINICAN REPUBLIC

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Since 1953 four culture species have been introduced to the Dominican fresh water: Tilapia mossambica, Tilapia melanopleura, Micropterus salmoides, Cyprinus carpio. Three million fishes of the first above mentioned have been liberated in the past seven years, 1970-77. Cichla ocellaris and Ictalurus punctatus have been kept in experimental ponds. There is no data showing if they have been stocked in natural waters.

With the purpose of evaluating the presence and conditions of these species, three bodies of water of the southern region of the Dominican Republic were selected. The populations were sampled with experimental gill nets, seines, and hook and line.

Rio Haina shows a poor population of introduced species, and large numbers of native cichlides, Cichlasoma spp. It has been restricted by overfishing and polluting. In the Laguna El Manati, La Victoria D. N. the fish population it's stunted by an overabundance of predators, M. salmoides. Also the nutrients in this laggon are been used by the macrophytes. The Valdesia Reservoir due to its young nature still has a population in expansion. This stock can be depleted at this stage by overfishing.

Proc. Assoc. Is. Mar. Labs. Carib. 14:16

GUIBIA: UNA PLAYA URBANA. SUS AGUAS, FLORA Y FAUNA (Santo Domingo, República Dominicana)

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La Playa de Guibia, balneario tradicional de la ciudad de Santo Domingo, a la orilla del Mar Caribe, parece deteriorarse progresivamente a pesar de que sigue siendo usado por los bañistas y algunos pescadores locales.

Entre febrero y octubre de 1977 se realizaron estudios sobre sus aguas, flora y fauna en una zona de 350 m de extensión frente al edificio del Centro de Investigaciones de Biología Marina de la Universidad Autónoma de Santo Domingo.

Esta playa se caracteriza por un fuerte oleaje, aunque está protegida por una barrera de unos 1,000 m de lo que fuera un arrecife de coral; la profundidad varía entre 1.10 a 2.10 metros y la temperatura fué relativamente constante de 27.6-28.9°C. promedio mensual, al igual que el oxígeno disuelto con valores de hasta 3.77ml/l. Las variaciones en la salinidad son bastante amplias de 22.47-35.62°/$_{oo}$. Las salinidades más bajas corresponden a la época de lluvias cuando las aguas son muy turbias y cambian de verde a amarillo o verde-amarillo. Otros autores han reportado que la contaminación bacteriana sube drásticamente en el período de lluvia.

Actualmente la playa de Guibia se debe considerar como una zona en crisis. Sin embargo, los organismos encontrados parecen tolerar las condiciones de sus aguas y la intervención humana, a pesar de que no alcanzan poblaciones de tamaño significativo. La flora y fauna incluye unas 101 especies: 29 macroalgas, 28 moluscos, 10 equinodermos, 6 crustáceos y 27 peces, La variedad relativa de peces e invertebrados, entre ellos erizos, estrellas y peces típicos de ambiente coralino que viven en las aguas de Guibia sugiere la posibilidad de reacondicionar la playa, optimizando su uso con la organización de un acuario público de caracter recreativo y educativo.

Este proyecto se realizó bajo los auspicios del Proyecto Multinacional de Ciencias del Mar, OEA y el Proyecto de Educación Profesional, Secretaría Estado de Agricultura.

Proc. Assoc. Is. Mar. Labs. Carib. 14:17

RESTORATION OF HEAVILY IMPACTED TROPICAL ESTUARIES VIA SEAGRASS TRANSPLANTATION

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Biscayne Bay, an estuary surrounded by the rapidly growing Dade County and cities of Miami and Miami Beach, has been increasingly impacted since 1896. In an 82 square mile area called north Biscayne Bay, far heavier impacts have occurred than southward. Channelization and land and causeway construction caused more than 40% of the bottom to be either dredged or filled. Fifty million gallons of sewage were dumped into the bay per day for 20 years. Circulation was drastically altered by causeway construction and artificial inlets. Turbidity increased due to sediment left uncompacted in channels and dredged islands.

A successful technique of restoring the climax vegetational species, Thalassia testudinum, was developed. It was demonstrated to restore a replanted area in south Biscayne Bay within four years in an area completely denuded by power plant effluents. A series of ten test plots in the impacted bay were set up and evaluated. 80,000 seedlings have now been placed into sublittoral areas adjacent to publically accessible shoreline and are growing.

Proc. Assoc. Is. Mar. Labs. Carib. 14:18

COMMUNITY STRUCTURE OF CORAL REEF FISHES: COMPARISON BETWEEN TROPICAL ATLANTIC AND PACIFIC PATCH REEFS

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The fish assemblages of two groups of natural coral patch reefs were censused visually during the summers of 1976 and 1978. Twenty-five reefs lay off the northeastern end of St. Croix, Virgin Islands in the northeastern Caribbean Sea and fifteen were located at the southern end of Enewetak Atoll, Marshall Islands in the central Pacific Ocean. Reef fish diversity was greater at Enewetak (mean no. species/reef = 93; H' = 1.62) than at St. Croix (mean no. species/reef = 64; H' = 1.45), but equitability values were the same in the two areas (0.82 and 0.85, respectively). The degree of similarity among the faunas in each group of reefs using an index of similarity based on the log of individual species abundances) was correlated with environmental parameters of the reefs in both cases surface topography, reef height, position with respect to currents). The mean degree of similarity among all the fish faunas in each area was the same at both sites (0.61 at Enewetak, 0.62 at St. Croix), as was the similarity among the faunas of the most uniform subset of reefs in each area (0.68 at Enewetak, 0.72 at St. Croix).

These comparable levels of similarity suggest similar levels of predictability in the composition of reef fish communities in the two areas, in contrast to previous studies on very small reefs, which suggested a low level of predictability among Pacific reefs (Sale, 1978). The discrepancy between our results and those of previous workers in the Pacific is probably a result of differences in the sizes of the reefs studied, those studied in the present case being several orders of magnitude larger.

Proc. Assoc. Is. Mar. Labs. Carib. 14:19

FISHES AT A PUERTO RICAN CORAL REEF: DISTRIBUTION, BEHAVIOR, AND RESPONSE TO PASSIVE FISHING GEAR

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The communities of fishes on a coral reef and on the adjacent sand flat were sampled by 6 bottom-set gill nets and 7 fish traps fished continuously for 7-10 days. An estimated 46% of the species large enough to be vulnerable to the gear were collected (40% of all species known to be present). Of 47 species collected, 20 were taken in nets but not traps, and 9 were taken in traps but not nets. Traps on the reef and sand flat and nets on the reef apparently collected with constant efficiency throughout the study. Damage and fouling may have reduced efficiency of nets on the flat. Nets were much more productive on the reef than on the flat, apparently because of heavy concentrations of fish on the reef--particularly demersal and mid-water species that use the reef as habitat. Traps on the reef also produced larger catches, but traps on the open flat appeared to strongly attract fish. Based on time and location of collection and on underwater observation, a number of species could be classified with regard to their habitat dependence on the reef. Fish were observed in the act of avoiding or becoming entangled in nets. Behaviors of fish accompanying those caught were recorded. Good visibility did not appear to improve net avoidance. General diel activity cycles and movement patterns between reef and sand flat were identified for a number of species. A high level of activity occurs at the interface between the base of the reef and the sand flat; this junction apparently provides a "corridor" for fish movement.

Proc. Assoc. Is. Mar. Labs. Carib. 14:20

SOME ASPECTS OF TRANSITIONALS OF THE GROUPER *Epinephelus cruentatus*

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Most of the marine serranid fishes are hermaphroditic.Some are synchronously hermaphroditic, others are proterogynous hermaphroditic. Most groupers, including *Epinephelus cruentatus* (the Graysby), are proterogynous hermaphroditic: the entire gonad transforms with increasing age from an ovary into a testis.

In this study gonads of about eight hundred specimens of *E. cruentatus* were examined histologically to study the transitionals and other aspects of the sexual development of this species.

Sexual transition in females of the Graysby mostly takes place immediately after spawning. The percentage of transitionals found during July through October (the spawning season for this species) is 14.4%. Most transitionals are found between a length of about 14 and 26 cm. Transition occurs, however, especially between 20 and 23 cm. Maximum length of this species is about 31 cm.

There is a coincidence of a high transition rate and a strong increase in the percentage of males in the length-classes from 20 up to 23 cm, corresponding with age groups 4 and 5.

For several stations it is shown that a strong dominance of females coincides with a relatively low transition rate and vice versa, and that in the stations with few males also a relatively low mean length of the males is found.

It is probable that trap-fishery has a great influence upon the sex-ratio of Graysbys, because it works selectively. This is shown for some stations by a sex-ratio with relatively many females coinciding with a low transition rate and a low mean total length of the males.

Proc. Assoc. Is. Mar. Labs. Carib. 14:21

ON THE CAUSES OF SEX REVERSAL IN CORAL REEF FISH

by
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Several hypotheses have been proposed to explain the causal initiation of female-to-male sex reversal in protogynous fish. The size hypothesis states that females change sex upon attaining a critical size. The evidence for this consists of sex separated size distributions in which males tend to be larger than females. However, where different populations of the same species have been sampled, as in Anthias squamipinnis, an Indo-Pacific Anthiine fish, the maximum female-minimum male size has varied widely between populations. Species in which sex reversal is known to be under social control also have sex separated size distributions and no experimental evidence exists that females change sex upon reaching a critical size. The evidence supporting the size hypothesis is thus weak and circumstantial. Modifications of the size hypothesis such as that females change sex when reaching a critical age or stage of development are equally poorly supported by present evidence. In several species, including A. squamipinnis, sex reversal can be initiated by removing a male from a social group containing multiple females. These findings have led to the inhibition hypothesis, which states that females have a physiological tendency to change sex which is inhibited by the presence or behavior of a male. In A. squamipinnis, all-female groups have been found in which no sex reversal occurred for the 2-3 months for which they were observed. This contrasts strikingly with groups from which a male has been removed where one female changes sex within two weeks of male removal. Furthermore, multi-male groups have been found in which one female changed sex following the removal of one male, even though multiple males remained in the group. Thus, sex reversal in this species is not controlled simply by the presence (behavioral or otherwise) or absence of a male. The inhibition hypothesis could not apply. Since, in all-female groups the dominant female did not change sex, sex reversal could not be a function of the dominance rank of the female, as has been suggested for other species. Removing the male from a group in which he is the dominant fish results in all remaining fish increasing their dominance rank by one position. Since, in these circumstances, only one female changes sex, sex reversal could also not be initiated simply by an increase in dominance, another suggested theory. For A. squamipinnis, behavioral data suggest that male-female interactions result in one or several females being primed to change sex long before any male is removed from the social group. Under this theory, removing a male would alter a particular behavioral measure of the primed female by a critical amount sufficient to stimulate her to change sex. At present, the priming hypothesis appears to be more clearly supported in A. squamipinnis than the size, development, age, inhibition, or aggressive dominance hypotheses postulated for other species.

Proc. Assoc. Is. Mar. Labs. Carib. 14:22

HABITAT UTILIZATION OF A GUILD OF DAMSELFISHES (PISCES: POMACENTRIDAE) OFF SOUTHWEST PUERTO RICO

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Several hypotheses have been offered to explain community structure in coral reef fish assemblages. These include: 1) Reef fishes are generalists, and opportunism, coupled with environmental instability, disallows any one species from totally excluding another (the "chaos" hypothesis), 2) Reef fishes are specialists, showing differential resource utilization patterns which serve to alleviate competition (the "order" hypothesis), and 3) Various models which combine elements of the order and chaos views.

These possibilities have been studied off southwest Puerto Rico in a group consisting of seven species of apparently ecologically-similar damselfishes. The methods employed included transects and removal/recolonization experiments. The data thus obtained indicate 1) Each species, other than Eupomacentrus mellis, occupies a habitat in which it far outnumbers all the other species, 2) Differential habitat utilization is less apparent in heterogeneous, patchy reef zones, 3) Rapid recolonization following the creation of vacant space may provide evidence of saturation in some reef areas, and 4) Vacant space in heterogeneous reef areas is not always recolonized by an individual of the same species as the prior resident. These data suggest a system similar to the "Money-in-the-bank" model of Dale (1978) rather than a strict order-chaos system.

Literature Cited

Dale, George. 1978. Money-in-the-bank: A model for coral reef fish coexistence. Env. Biol. Fish. 3(1): 103-108.

Proc. Assoc. Is. Mar. Labs. Carib. 14:23

DIEL AND DEPTH VARIATION IN THE POPULATION DENSITIES OF HERBIVOROUS FISHES ON THE WALLS IN SALT RIVER SUBMARINE CANYON, ST. CROIX

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The distribution and abundance of three families of herbivorous fishes, damselfishes (Pomacentridae), surgeonfishes (Acanthuridae), and parrotfishes (Scaridae), were studied on the east and west walls of Salt River Submarine Canyon by means of repetitive counts of transects placed at the depths of 15, 30 and 45m. Counts were made shortly after sunrise, during midday, and before sunset. Results obtained show that the diversity as well as the abundance of herbivorous fishes decreases with increasing depth. Available foods were sampled by harvesting the benthic algae within quadrats. These data, as well as observations on feeding, indicate that adequate foods are available at the depth range studied. A decrease in the algal biomass with increasing depth is due mainly to the topography of the canyon walls.

Some herbivorous fishes do not utilize the food resources on the walls, but migrate to the area shortly before sunset and sleep in caves at night. These fishes include the largest of the parrotfishes, Scarus coelestinus and S. guacamaia, which are not present on the canyon walls during the day, but migrate away from the area after dawn and presumably feed on the adjacent shelf.

Proc. Assoc. Is. Mar. Labs. Carib. 14:24

NOTAS ICTIOLOGICAS SOBRE LA COLECCION DEL CENTRO DE INVESTIGACIONES DE BIOLOGIA MARINA, UASD

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La colección ictiológica del Centro de Investigaciones de Biología Marina (CIBIMA) no es extensa, pero es la primera colección de estudio a nivel institucional en la República Dominicana.

Llena un vacio en los conocimientos sobre los peces marinos del país, limitados a los trabajos de Fowler (1952), Arvelo (1974-1977), Rosario (1977) y Terrero & Bonnelly de Calventi (1978).

Incluye ejemplares de 18 órdenes, 61 familias, 127 géneros y 171 especies, en su mayoría especies costeras de 13 localidades de la costa sur y 3 de la costa norte. Peces de aguas más profundas recolectados en 1978 en la Bahía de Samaná y en la costa sur esté fueron donados por el Instituto de Desarrollo y Crédito Cooperativo (IDECOOP).

La colección cuenta con las principales especies comestibles como carites Scomberomorus maculatus y S. cavalla; los jureles Caranx latus y Chippos; las cojinuas C. crysos y C. ruber; las palometas Trachinotus goodei y Peprilus paru; el chicharo Selar crumenophthalmus y los casabes Vomer septapinnis y Selene vomer; los bocayates con 9 especies del género Haemulon, 2 de Anisotremus y una de Conodon; varias especies de pargos del género Lutjanus, y de meros, Epinephelus, Paranthias, Cephalopholis, Diplectrum y Serranus.

La colección incluye peces comestibles en otros paises pero no explotados en República Dominicana: Bothus lunatus, B. maculiferus, Syacium micrurum, etc. (familia Bothidae); peces planos Achirus lineatus, Trinecetes inscriptus (familia Soleidae)y Symphurus plagusia (familia Cynoglossidae).

Los peces venenosos incluyen el rascacio Scorpaena plumieri y los que producen ciguatera, el medregal Seriola falcata y la barracuda Sphyraena barracuda. Formas muy peculiares se encuentran entre los peces de fondo : Lophius americanus, el pez murciélago Ogcocephalus vespertilio y Halieutichthys sp. En 1978 en la playa de Palenque Provincia San Cristobal, fué capturado a 600 pies de profundidad un pez muy raro en el Caribe, Chiamera cubana Howell River, que representa un nuevo record para la República Dominicana.

Proc. Assoc. Is. Mar. Labs. Carib. 14:25

MONOGENETIC TREMATODE PARASITES OF WEST INDIAN DAMSELFISHES (POMACENTRIDAE: *Eupomacentrus* AND *Microspathodon*), WITH POSSIBLE PHYLOGENETIC IMPLICATIONS

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An examination of the metazoan parasites of seven species of West Indian damselfishes of the genera *Eupomacentrus* and *Microspathodon* was initiated in order to assess the role of parasites as a possible limiting factor to the host damselfishes. During the course of this study an unusual distribution of monogenetic trematodes among the hosts was noted. Due to the high degree of host specificity which monogenetics normally display, inferences regarding interspecific affinities of the hosts can be made from the presence of "shared" monogenetics.

Three undescribed species of monogenetics belonging to three undescribed genera and two undescribed species belonging to the genus *Haliotrema* will be discussed in regard to their distribution among the seven host species. The distributional patterns indicate that 1) *E. mellis* differs in some regard from the other damselfishes, and 2) *E. mellis* and *E. dorsopunicans* show an apparent affinity. Based on these data as well as morphology, behavior, abundance and field distribution, and the apparent absence of females, *E. mellis* is regarded as a questionable species and as a possible hybrid of *E. dorsopunicans* x *E. leucostictus*.

Proc. Assoc. Is. Mar. Labs. Carib. 14:26

THE RESPONSE OF TWO SPECIES OF JACKS, *Caranx latus* AND *C. hippos* TO THE ISOPOD ECTOPARASITE, *Cymothoa oestrum*

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Caranx latus and *C. hippos* (Family Carangidae) collected from Guayanilla Bay, Puerto Rico, were found to be parasitized by the isopod ectoparasite, *Cymothoa oestrum* at levels of 70 and 66% respectively. This isopod lives in the buccal cavity of its host and often occupies as much as 80% of the available space when the host's mouth is closed and 25% of the available space when the buccal cavity is expanded. Adult females of *C. oestrum* are always attached to the gular complex (tongue) of its hosts while the smaller juveniles and males live in association with the gill rakers. The parasite is a protandrous hermaphrodite metamorphosing to the female condition between 14-17mm. in length. This species of isopod has its mouth parts modified for piercing and sucking and its feeding habit is described as haemophagous.

The response of *C. latus* and *C. hippos* to this parasite was nearly identical. No significant difference ($p=.05$) in either condition factor (K_{fl}), a measure of relative robustness, qualitative or quantitative food habits, or overall size class distribution between parasitized and non-parasitized fishes were noted. Nor was there any obvious tissue necrosis due to the presence of the parasite. A significant difference in abundance ($p=.05$) of the 161-180mm. size class did exist between parasitized and non-parasitized fishes of both *C. latus* and *C. hippos*. This difference in size class still remains to be explained.

The occurrence of *Cymothoa oestrum* on *Caranx hippos* represents a new host record.

Proc. Assoc. Is. Mar. Labs. Carib. 14:27

THE ABILITY OF VARIOUS WEST INDIAN CLEANERS TO REMOVE PARASITIC ISOPOD JUVENILES OF THE GENUS Anilocra--A PRELIMINARY REPORT

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Two species of cleaner fishes (Gobiosoma evelynae and Thalassoma bifasciatum, juveniles) and four species of cleaner shrimps (Periclimenes pedersoni, Stenopus hispidus, Stenopus scutellatus, and Lysmata grabhami) were evaluated in the laboratory for thier ability to remove juvenile isopods of the genus Anilocra (Family Cymothoidae) attached to the French grunt, Haemulon flavolineatum.

Cleaners were established in 40 liter aquaria with one species per aquarium. French grunts with gravid female isopods were held until the juveniles matured, were shed from the marsupium, and attached to previously uninfested French grunts. These infested fish were then introduced into an aquarium with each cleaner.

Periclimenes pedersoni was the only cleaner to successfully remove the Anilocra juveniles from the fish. The other cleaner shrimp did not clean the infested fish in the aquarium situation so their potential cleaning ability is unknown. Although Thalassoma bifasciatum juveniles did not attempt to clean in the small aquarium, cymothoid isopods have been found in their guts. Gobiosoma evelynae is known to clean many of the fishes which are potential hosts for Anilocra but several gut content analyses found no cymothoid isopods. In this study the gobies were not successful in removing the juvenile isopods and therefore are probably not an Anilocra juvenile remover.

More study is needed to understand the role that cleaner organisms play in limiting the parasitic infestations of fishes by Anilocra juveniles.

Proc. Assoc. Is. Mar. Labs. Carib. 14:28

PETROLEUM REFINERY IMPACTS ON NEARSHORE MARINE ENVIRONMENT

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A one year biological monitoring program was conducted in Tallaboa and Guayanilla Bays, Puerto Rico by the Laboratorio de Analisis Ambiental, Inc. (LAA) to assess the impacts of petroleum refinery facility operations on the nearshore marine life of Tallaboa and Guayanilla Bays. Topics covered are (1) impacts from impingement of nektonic organisms on cooling water intake screens; (2) quantity of zooplankton available for entrainment in cooling water system; (3) assessment of nearshore fish populations; (4) sampling of fouling and interstitial organisms; (5) water quality of Tallaboa and Guayanilla Bays; (6) toxicity testing of heated effluent water. Results of the monitoring program indicated that (1) impingement of nektonic organisms was not significant; (2) there was more zooplankton available for entrainment at Station 1 (Guayanilla Bay) than at Station 7 (Tallaboa Bay) due to both higher pumping rates at Station 1 and more dense populations at Station 1; (3) the nearshore fish populations in Tallaboa Bay were evidently normal and healthy; (4) there was a gradient of increasing species diversity downstream from the canal discharge in Tallaboa Bay; (5) the surface water quality was severely degraded near the mouth of the canal discharge but improved downstream; (6) the canal discharge water was not toxic at ambient temperatures but the high $+\Delta T$ was in itself toxic.

Proc. Assoc. Is. Mar. Labs. Carib. 14:29

AN ORDINATION OF SOFT-BOTTOM BENTHIC COMMUNITIES OF GUAYANILLA AND TALLABOA BAYS, PUERTO RICO

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The soft-bottom benthos were sampled at 41 stations in Guayanilla and Tallaboa Bays with an Ekman grab and sieved through a .500 mm screen. A total of about 160 taxa including some 60 polychaet, 45 crustacean, and 30 mollusc species were represented in the samples.

The distributional data were analyzed by the Bray-Curtis polar ordination technique. Three major environmental factors were determined. These were: (1) pollution, including thermal effluents, heavy metals, and petroleum residues; (2) water mass type, involving coastal versus embayment environments; and (3) depth.

The effect of these environmental factors on the distribution patterns of selected species were then determined and separated. For instance, the most abundant organism, a polychaet, *Armandia maculata*, occurred in unpolluted deep and shallow areas in the embayment waters of Guayanilla Bay. Its absence from the polluted areas of Guayanilla is then attributable to pollution. However, its absence from the polluted areas of Tallaboa cannot be attributable solely to pollution since this species does not normally occur in this coastal environment.

Proc. Assoc. Is. Mar. Labs. Carib. 14:30

MERCURY CONTAMINATION IN PUERTO RICAN WATERS

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Contamination of marine aquatic environments by mercury is of great concern owing to the highly toxic effects of this element and to its tendency for biomagnification in food webs. In areas affected by mercury discharges, components of the biosphere may become laden with mercury to levels which are potentially hazardous to the human consumer of seafood. In Guayanilla Bay on the south coast of Puerto Rico, a mercury-containing wastewater effluent from a Chlor-Alkali plant operation has been discharged for several years at a maximum allowable rate of 0.5 lbs/day (0.23 kg/day). We, at the Center for Energy and Environment Research, have been studying the sources, fate and significance of mercury in this coastal region as part of our research on the potential for biological availability of hazardous chemicals emanating from energy production from petroleum and the associated petrochemical complex of industries established in the Guayanilla area. In this paper, I discuss the distribution of mercury in the area water, sediment and biota. Materials were analyzed after wet digestion by the cold vapor, flameless atomic absorption technique. Results show increased levels of mercury in sediments closer to the source and decreasing levels away from the source. Mercury is accumulated to levels approaching one ug/kg in parts of Guayanilla Bay and in adjacent Tallaboa Bay. Concentrations of mercury in water varied with location and depth through a year period and occasionally exceeded one ug/1, the level beyond which a hazard to aquatic life may exist. Mercury also became available to biological tissues in Guayanilla Bay where it accumulated in parts of red mangrove trees which becomes, as detritus, an important source of food to marine communities. Commercially important fish and invertebrates appeared to be accumulating mercury in their edible tissues with an apparent magnification of this effect in higher trophic levels. Some seafood flesh was found to contain in excess of 0.5 ug-Hg/kg, the maximum acceptable limit in the U.S.A. Mercury contamination permeates the hydro, litho and biospheres in the study area posing a potential health hazard problem. Transfer of mercury through the mangrove detrital food chain may be an important contamination route.

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ESTUDIOS ECOLOGICOS EN EL AREA MARINA COSTERA ALEDAÑA A LA PLANTA TERMOELECTRICA DE PUNTA MORON, ESTADO CARABOBO, VENEZUELA

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Se ha comenzado el estudio del impacto ecológico en el medio marino costero de la gran Planta Termoeléctrica de Punta Morón, construída por la Empresa CADAFE.

Dicho programa comprende una primera etapa, de caracterización ecológica de 0 - 10 metros de profundidad, en Punta Morón y adyacencias. Para tal fin se ha diseñado un programa de muestreo periódico cuyos resultados serán la caracterización de las distintas comunidades bentónicas del área, la identificación de las poblaciones de peces más importantes y cuantificación e identificación del ictioplancton. También se cuenta obtener una precisa descripción de la estructura trófica de cada unidad biocenológica.

Esta fase brindará el marco ecológico preoperacional. La segunda etapa es de medición del impacto. Integra esta presentación una discusión de las diversas metodologías empleadas.

El grupo de trabajo está constituído por especialistas de distintas disciplinas, a los que se le suman alumnos de la Universidad Simón Bolívar.

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LA INFORMACION ESTADISTICA EN LAS PESQUERIAS ARTESANALES

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La recolección de datos estadísticos en las pesquerías artesanales constituye una tarea difícil y, a veces, muy costosa. Sin embargo, esta información es esencial para el desarrollo pesquero, principalmente en los países de la cuenca del Caribe, donde esos datos son escasos y, en la mayoría de los casos, sólo puede ofrecerse un estimado bastante erróneo de la actividad pesquera en todos sus aspectos.

En Puerto Rico hemos desarrollado un sistema de estadísticas pesqueras a base de boletos de venta, procedentes de pescadores o compradores, que contiene los datos necesarios del desembarco por especie, valor, arte empleado, banco de pesca y otra información complementaria al respecto.

En las regiones norte, sur, este y oeste de la Isla, agentes estadísticos del Laboratorio de Pesquería Comercial del Departamento de Agricultura de Puerto Rico, entrevistan semanalmente a los pescadores en los centros pesqueros de cada zona. Seguidamente envían al Laboratorio todos los boletos de venta recogidos durante la semana y, además, aquella información necesaria para conocer la situación de la pesquería asignada a cada uno.

Los datos procedentes de los boletos se procesan, tabulan y divulgan por medio de boletines informativos, mensuales, trimestrales y contribuciones anuales a fin de que toda la comunidad pesquera conozca la situación y tendencias de nuestras pesquerías.

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ASPECTOS DE LAS POBLACIONES DE LOS PECES COMERCIALES CARNIVOROS

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Las poblaciones de peces comerciales carnívoros se estudiaron en las dos laderas de un cañón submarino. Se establecieron líneas paralelas al veril de 50 metros de largo en cada ladera, en profundidades de 15, 30 y 45 metros.

Tres veces al día, al amanecer, en el mediodía y en el anochecer, utilizando SCUBA, se contaron los peces que se hallaron en dos metros a un lado de las líneas (100 m^2). Se observaron 37 especies de peces pertenecientes a 11 familias.

Se encontró que no había diferencias significativas en cuanto a la hora del día y la profundidad entre el número de los peces estudiados. Sin embargo los resultados indicaron que el tipo del fondo sí influye en la abundancia de los peces presentes. En las áreas con un relieve más pronunciado se encontró un mayor número de peces.

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INFORME PRELIMINAR SOBRE LA PESCA EXPLORATORIA DEL CAMARON BLANCO EN LA COSTA OESTE DE PUERTO RICO

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Durante los meses de agosto, septiembre, octubre y principios de noviembre de 1978, se efectuaron 5 cruceros de pesca exploratoria en la costa oeste de Puerto Rico. Dicha pesca se realizó con el fin de evaluar el potencial pesquero del camarón blanco Penaeus schmitti.

La pesca se realizó en dos localidades principales: la bahía de Boquerón-laguna de Rincón (18°00' N y 67° 12' 39" W) y Añasco-El Maní (18° 15' y 67° 12' W), próximo a la desembocadura del río Añasco, Mayaguez.

Penaeus schmitti, se capturó mayormente en Boquerón-laguna de Rincón, con una captura por unidad de esfuerzo de 7 Kg/hora, definiendo este parámetro como captura por hora de arrastre, para una red de 12 metros de largo y a una velocidad de arrastre de 2.2 nudos. El total de la muestra fue de 222 especímenes, en la cual predominaron hembras adultas.

Los datos biométricos determinados para los especímenes capturados fueron: longitud total (l.t.) y longitud del caparazón (l.c.). Se encontró un tamaño máximo de 200 mm y un mínimo de 50 mm para la longitud total y un máximo y un mínimo de 50 mm y 13.5 mm respectivamente para la longitud del caparazón.

Entre otras especies, se capturaron el camarón rosado Penaeus (M) duorarum notialis (Pérez Farfante); Xiphopenaeus kroyeri (Heller), Trachypenaeus similis (Smith) de la familia Penaeidae y el camarón de piedra Sicyonia brevirostris Stimpson de la familia Sycionidae.

El Penaeus (M) duorarum notialis se capturó en aguas de salinidades de 34-35 ‰ incluyendo una laguna artificial en comunicación con el mar, localizada en las proximidades de la bahía de Boquerón. En cambio el Penaeus schmitti, se pescó en aguas de 28-30 ‰, junto a Sicyonia brevirostris. Las restantes especies fueron capturadas en 35 ‰ próximo a la desembocadura del río Añasco. En esta localidad se capturaron más de 2,000 juveniles y postlarvas de Xiphopenaeus kroyeri.

La mayor profundidad de pesca fue de 40 metros, próximo a la pendiente continental en la zona de Añasco-El Maní, mientras que la mínima se realizó a 1.9 metros en la Laguna de Rincón-bahía de Boquerón.

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EVALUACION DE POLICULTIVO EN PISCINAS PLASTICAS UTILIZANDO EL BAGRE DE CANAL (Ictalurus punctatus Rafinesque) Y LA TILAPIA AZUL (Sarotherodon aureus Steindachner) ALIMENTADOS CON ALIMENTO PARA AVES

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Se evaluó el policultivo utilizando el bagre de canal (Ictalurus punctatus) junto a la tilapia (Sarotherodon aureus). Se usó un alimento comercial para aves de 17% de proteína. El experimento duró 104 días. Se obtuvo 2.4 veces mayor producción de bagre en las dos unidades de policultivo que en los dos monocultivos de control. La producción total de los policultivo fue 22% más alta con un promedio de 87 g/m^2 mientras que en los monocultivos fue de 19 g/m^2. La producción total promedio fue 22% más alta en los policultivos. Las conversiones alimenticias de los monocultivos fueron de 14.6 y 19.4 y la de los policultivos 5.1 y 9.3, demostrando que el alimento no es el más apropiado. Se logró una mejor utilización de este en los policultivos. Se obtuvo una reducción en las muertes. Los resultados obtenidos comparan con trabajos realizados por otros autores, en que los policultivo son más productivos que los monocultivos, producen un cosecho extra con menos alimento y mayor densidad de siembra, se obtiene menor mortandad y se mejora la calidad del agua.

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EVALUATION OF MALE HYBRIDS OF Sarotherodon spp. IN POLYCULTURE WITH CHANNEL CATFISH (Ictalurus punctatus; Rafinesque) IN EARTHEN PONDS IN PUERTO RICO

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An experiment of 316 duration was conducted to evaluate the efficiency of all-male hybrids of Sarotherodon spp. in polyculture with channel catfish (Ictalurus punctatus) in earthen ponds in Puerto Rico.

The method of partial harvesting or removal of a portion of the standing crop at regular intervals was tested in three 0.08 ha. ponds. The effect on the system and the growth of both species is reported. Stocking densities in the present study ranged from 5,756 to 7,759 catfish per hectare and from 11,174 to 13,897 Sarotherodon hybrids per hectare. At these densities considerable competition between both species was noticed.

Net production of channel catfish ranged from 2,907 kg. per hectare in the least stocked pond to 3,364 in the most heavily stocked one. Sarotherodon hybrid production ranged from 2,510 to 4,250 kg. per hectare. Marketable size channel catfish were obtained in all the ponds. Based on Puerto Rico market standards, the percent of utilizable Sarotherodon hybrid varied from 73% to 100%. Daily growth increments for both species were below those reported for previous monoculture experiments. A high degree of mortality (17 to 23 percent) was observed among the hybrids. Channel catfish survival percent ranged from 83 to 100%. S-conversions for channel catfish fluctuated from 1.9 to 2.3. Combined conversions for both species were in the range of 1.0 to 1.2.

The results of this study show the practically of stocking hybrid males of Sarotherodon spp. along with channel catfish in a polyculture system. The hybrids had better growth increments, A_t values, survival rates and feeding conversions than previous polyculture experiments with Tilapia aurea (S. aureus) in Puerto Rico (Pagán, 1975; Cortés, 1976 and Olson, 1976 and other S. hybrids (Bonilla, 1978). Growth of the channel catfish was influenced by: S. hybrid density, competition for feed by the hybrid, water quality and partial harvesting. S. hybrids should not be completely removed without an equivalent replacement since the cleaning system must be continued. This method not only helps in maintaining good water quality but also allows for an extra harvest of Sarotherodon per year. Feeding rates of up to 70 Kg./ha. apparently did not affect the water quality of the ponds, but it might have contributed to lower the DO at post harvest time.

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VIABILIDAD ECONOMICA DEL CULTIVO DE PECES EN ESTANQUES RURALES DE POCO TAMAÑO EN PUERTO RICO

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Los experimentos se efectuaron en ocho estanques de arcilla localizados en diferentes fincas del oeste de Puerto Rico. Sus tamaños variaron desde 0.037 hasta 0.17 hectáreas. Se evaluaron tres diferentes tipos de cultivos, monocultivo de bagre de canal (Ictalurus punctatus), de híbridos de tilapia Sarotherodon policultivo del bagre de canal con híbridos de tilapia. El producto obtenido fue procesado y vendido al por mayor a una cadena de supermercados locales a $1.95 (USA) el kilo, irrespectivamente de la especie. El tipo de cultivo menos atractivo económicamente fue el monocultivo de bagre. Todas las condiciones de cultivo evaluados resultaron ser económicamente viables. Se recuperó la inversión en un tiempo promedio de 4 años (40% anual) para el monocultivo de bagres, 2.46 (53% anual) para los policultivos y de 0.81 (146% anual) para los monocultivos de híbridos de tilapia. La ganancia anual neta máxima obtenida fue de $7,637.08 (policultivo) y la mínima $4219.40 (monocultivo de bagre de canal).

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GROWTH AND FEED CONVERSION EFFICIENCY OF YOUNG GREEN TURTLES, *Chelonia mydas* (LINNAEUS), IN SEAWATER AND DILUTE SEAWATER

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The diminishing populations of green turtles, *Chelonia mydas* (Linnaeus), have been a cause of concern among naturalists and conservationists who foresee extinction of these marine reptiles. Information on captive-rearing techniques is limited yet essential for successful management and conservation of the species.

A study was undertaken to examine the techniques involved in rearing green turtles to one year of age. The objectives of the study were: 1) determine first-year growth rates of green turtles fed primarily a dry pelleted diet, and 2) compare growth of turtles in 35 ppt salinity seawater with growth of turtles in diluted seawater.

Two dry, proprietary pelleted feeds of 25% and 30% protein content were tested for one year with a group of days-old green turtle hatchlings received from the Cayman Turtle Farm, Grand Cayman, Cayman Islands, British West Indies. Mean first-year total weight increase (N=12) was 1.734 kgs. Water temperatures ranged from 25-30°C.

Weekly feed conversion coefficients were calculated for ten turtles in freshwater dilutions of seawater. Turtles kept for two months in each percent dilution of 75% seawater, 50% seawater, and 25% seawater converted feed to flesh as efficiently as 12 turtles kept concomitantly in 100% seawater (35 ppt salinity). Turtles kept for two months in six percent seawater had significantly higher feed conversions than 100% seawater turtles ($P=0.05$). Rearing of 12 hatchlings in freshwater resulted in 100% mortality. Mean survival time in freshwater was 48 $\pm$ 17 days. Gradual acclimation to freshwater did not increase the survival time of the hatchlings.

The satisfactory growth of green sea turtles under one year of age in dilutions as low as 25% seawater could be a valuable handling characteristic applicable to artificial culture. Conservation, management, and husbandry programs should be aware of the possibilities and limitations of green turtle culture at sites typified by low salinities.

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