

STOMATOPOD AND DECAPOD CRUSTACEANS OF
THE ARCHIPELAGO OF FERNANDO DE NORONHA,
NORTHEAST BRAZIL

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A Thesis submitted to the Faculty of the
DEPARTMENT OF BIOLOGICAL SCIENCES
In Partial Fulfillment of the Requirements
For the Degree of
MASTER OF SCIENCE
WITH A MAJOR IN ZOOLOGY
In the Graduate College
THE UNIVERSITY OF ARIZONA

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ACKNOWLEDGMENTS

The author thanks Dr. Peter E. Pickens, his advisor, as well as the other members of his committee, Drs. Walter B. Miller and Albert R. Mead, for their assistance during the course of this study.

The author is especially grateful also to Dr. Lipke B. Holthuis of the Rijksmuseum van Natuurlijke Historie, The Netherlands, and to Dr. Raymond B. Manning of the Smithsonian Institute, Washington, D.C., for their collaboration during the identification of the decapod and stomatopod crustaceans.

In addition, acknowledgment is given to Dr. José Santiago Lima Verde of the University of Rio Grande do Norte, Brazil and to Mr. Henry R. Matthews from the Laboratório de Ciências do Mar da Universidade Federal do Ceará, Brazil, for their help during the time that data were collected in the Archipelago.

The author is grateful as well to federal organizations that supported him with scholarships, such as the United States Agency for International Development (USAID) and Universidade Federal do Ceará (UFC)/University of Arizona (UA) Contract.

The author also thanks the Governor of the Território Federal do Archipelago de Fernando de Noronha for facilities provided during the collecting period in the islands.

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ABSTRACT

Three species of stomatopod and sixty-three species of decapod crustaceans are found in the Archipelago of Fernando de Noronha, northeast Brazil. These species were collected by the author, collaborators, or were recorded in the literature, principally in reports of the "Challenger", "Calypso", "Canopus" and Almirante Saldanha" Expeditions.

The islands shown are relatively rich and most of the species are concentrated on the windward side of the Archipelago. Formation of reefs by vermetids and melobesioids and the presence of many species that require a dynamic aquatic environment are probably responsible for this concentration. There are differences in the onset of changes in color and annual cycle of reproduction for certain species in the islands when compared with similar ones on the continental shelf. There are no euryhaline species in the islands due to the absence of rivers.

The species Petrolisthes ? serratus, Panopeus harttii, Pachygrapsus transversus, Cyclograpsus interger, Geograpsus lividus and Percnon ? gibbesi are new records for the islands and Upogebia noronhensis and Munida spinifrons are thought to be endemic. General comments on the systematics, biology, ecology, geographic and bathymetric distribution of each

species are included in the text and the historical, oceanographic and physical settings of the islands are given in the introduction.

INTRODUCTION

The Archipelago of Fernando de Noronha is located off the northeast coast of Brazil. These islands have been visited by a number of famous explorers, scientists and expeditions. However, there are relatively few reports and papers available. Those of biological interest are primarily of a taxonomic nature.

The purpose of this study is to describe the stomatopod and decapod crustaceans of the Archipelago. This paper is more than just a check list and includes information about the systematics, ecology, bathymetric and geographical distribution of the species included. The bulk of the data was obtained during four expeditions made since 1963, each expedition lasting about one week. The author made two of them, in March 1963 and August 1968. The other two were completed in November 1969 by Dr. José Santiago Lima Verde and in January 1971 by Mr. Henry Ramos Matthews. In addition, other authorities who had identified specimens collected from the islands were contacted and an exchange of data was accomplished. Also an intense bibliographical search was made for all papers relating to the islands. This study, then, has been an effort to fill in the existing blanks and to assemble

a report on these important groups from observations scattered throughout the literature. The author recognizes that reports such as this can become incomplete as new species are discovered, but at least this report is the first comprehensive study of the stomatopods and decapods of the Archipelago and provides an understanding of the ecology of the islands and of the zoogeographical affinities of the species studied.

Historical Summary

The few papers about the Archipelago of Fernando de Noronha include information on the physical, oceanographic and zoogeographical features of the islands.

According to Ridley (1890) the first description of the Archipelago was written by Americo Vespucci in 1503 when he discovered it. However, Paiva (1967) in his comments on the Fernando de Noronha Archipelago considered Gaspar de Lemos as the discoverer of the islands, probably based on Imbiriba's paper in 1951 on the history of the Archipelago. Darwin in 1846 made some comments on the physical and oceanographic aspects of the Archipelago (Darwin, 1897). After Darwin there were the papers by Rohan in 1865 and Ridley (1890) on the terrestrial and aquatic fauna. Pocock's (1890) report on the decapod crustaceans of the Fernando de Noronha is included in Ridley's paper.

Among the oldest expeditions during which crustaceans were collected in this area we can list the Hartt Expedition (1877) and Branner-Agassiz Expedition (1876-1877). The results of these expeditions were reported by Smith (1869) and Rathbun (1892, 1893, 1900, 1901, 1918, 1925, 1930, 1933 and 1937) in their treatises on decapod crustaceans.

The famous "Challenger" Expedition (1873-1876) also explored the Archipelago. The crustaceans collected during this exploration were described by Miers (1886), Brooks (1886), Henderson (1888) and Bate (1888).

Among the most recent expeditions that of the "Calypso" (1961-1962) is noteworthy. Reports on the stomatopod and decapod crustaceans collected during this expedition appear in the papers of Manning (1966), Forest (1966), Forest and Guinot (1966), Forest and Saint-Laurent (1967), Haig (1966) and Costa (1968).

Recently two Brazilian Expeditions (1967-1969) were made in the fishing boat "Canopus" under direction of the University of Recife, Brazil, and in the oceanographic vessel "Almirante Saldanha" owned by the Diretoria de Hidrografia e Navegação da Marinha do Brasil. These explored the continental shelf of Brazil and Fernando de Noronha Archipelago. The results of these expeditions appear in scattered papers written by Coêlho between 1967 and 1969.

Oceanographic and Physical Settings

Fernando de Noronha Archipelago has all the characteristics of oceanic islands; there are no geological connections with the continent and all the islands are volcanic in origin. About 360 kilometers separate them from the mainland (Figure 1). The Archipelago lies at Lat. $03^{\circ}51'S$ and Long. $32^{\circ}25'W$, off the State of Rio Grande do Norte, Northeast Brazil. The Archipelago has one main island called Fernando de Noronha. This island is nine kilometers in length and three in breadth. Five small islands are located at the northeast extremity of the main island, which is oriented in a NE-SW direction.

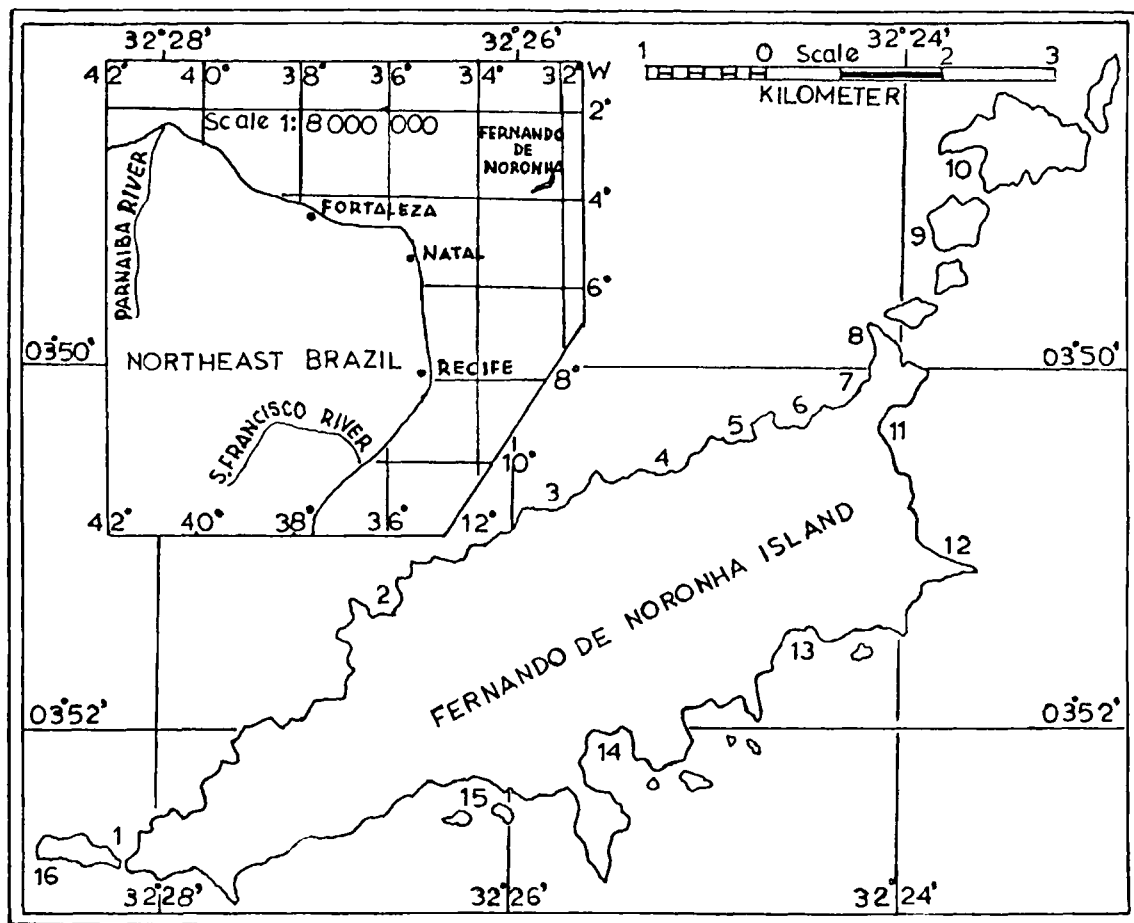


Figure 1. Map of Fernando de Noronha Archipelago; its position in relation to the northeast coast of Brazil, and the collecting localities as follows: (1) Buracão, (2) Sancho, (3) Boldró, (4) Conceição, (5) Cachorro, (6) Biboca, (7) Santo Antônio, (8) Chapeu Nordeste, (9) Ilha Raza, (10) Ilha Rata, (11) Caieira, (12) Pontinha, (13) Atalaia, (14) Sueste, (15) Leão, (16) Sapata.

The Fernando de Noronha Archipelago is crossed by the North branch of the South Equatorial current. This current meets the northeast coast of Brazil and proceeds northward following the coast. The warm water of the Equatorial current, as well as its high salinity and great transparency are responsible for the oceanic characteristics of the fauna of the Archipelago.

The littoral of the Archipelago is exposed to strong winds and waves, mainly in its southeast part where the predominant winds meet the Archipelago.

MATERIALS AND METHODS

All the species listed in this paper were collected in and around the Archipelago of Fernando de Noronha, Brazil. They are found in collections made by the author and other investigators who visited the islands. Names of other species have been extracted from the numerous papers listed in the bibliography.

The species collected by the author were obtained subtidally by dredging and diving and intertidally by exploring the beaches of the Archipelago during the low tides. Most of the species were collected intertidally. Immediately after collection, the specimens were placed in 70 percent ethyl alcohol. Data, such as locality, date of capture, and general observations were placed on a small label and included with the specimens.

The identification of the material was made in the laboratory on the mainland. Most of the species collected were compared with the material from the continental shelf of northeast Brazil collected in the area between the mouths of Parnaíba and São Francisco Rivers. The main papers used by the author for identifying the material were those of Pocock (1890), Rathbun (1901, 1918, 1925, 1930, 1933 and 1937), Schmitt (1935), Holthuis (1959), and Williams (1965). Also,

all reports on stomatopod and decapod crustaceans of the "Challenger" and "Calypso" Expeditions were useful for this purpose.

Among the material examined only one species was reported as a new species. Its description has been recorded in a separate paper by Fausto-Filho (1969b). Some species were only tentatively identified due to the lack of the original references, an inadequate number of specimens, or the poor condition of the material. Others were sent to specialists in order to confirm identification.

The localities where the species were collected by the author were numbered to facilitate locating them on the map of the Archipelago (Figure 1). Their names are placed in the text and in the tables with corresponding numbers in parentheses. The rocks located at the extremity of the Archipelago were not visited. In the localities visited the position of the specimens in the intertidal area were recorded as well as the nature of the bottom, the degree of abundance of the species, and animals and algae associated with them. Geological descriptions of the nature of the bottom are found in the papers of Matthews and Kempf (1970) and Coutinho and Morais (1970) and these were consulted. Due to the difficulty of dredging in hard bottoms and diving in strong currents most of the material is from the littoral of the Archipelago, which is characterized by its hard substratum. Only a few species were captured by dredging and

diving. Sandy areas and therefore intertidal species from these areas are rare in the Archipelago. It should be emphasized here that most of the species listed in this paper as having been collected around the Archipelago on previous expeditions were obtained by dredging.

The geographical distribution of the species mentioned from the Archipelago is based on the bibliography consulted. In the discussion about the zoogeographical affinities of the species, more emphasis was given to those from the eastern Atlantic (west coast of Africa), western Atlantic (northeast coast of Brazil) and Pacific Coast of America, rather than to all South America or the rest of the world. The principal papers used for this purpose were those of Rathbun from 1900 to 1937, those of the "Challenger" and "Calypso" Expeditions, and those of Holthuis (1959), Williams (1965) and Coêlho, from 1967 to 1969.

Species are listed in the text with information provided in the following sequence: (1) the main papers used to identify the species collected; (2) the material examined, with the number of specimens, sex of each, locality and date of collection; (3) geographical distribution; and (4) remarks which include comments on the systematics, biology, ecology, bathymetric and geographical distribution of the species, as well as a description of the color of the living species noted during daylight.

LIST OF SPECIES

Order Stomatopoda

Family Squillidae

Meiosquilla tricarinata (Holthuis, 1941).

Squilla tricarinata, Manning, 1966, p. 369, fig. 5.

Squilla tricarinata, Manning, 1968, p. 125.

Meiosquilla tricarinata Manning, 1969, p. 114, figs. 33c, 34.

Material

None.

Distribution

Western Atlantic: from Miami, Florida to Brazil, Fernando de Noronha, Mogiquiçaba and Abrolhos Islands (Manning, 1969).

Remarks

This species was reported from Fernando de Noronha Archipelago by Manning (1966) during his first report on stomatopods collected by the vessel "Calypso." Only one specimen was collected by the vessel "Calypso" at a depth of 31 meters. This mantis shrimp has not been yet recorded for the northeast coast of Brazil.

Family Gonodactylidae

Gonodactylus minutus Manning, 1969.

Gonodactylus minutus Manning, 1969, p. 305, fig. 84.

Material

Two males, collected at Leão Beach (15) on Aug. 8, 1968.

Distribution

Western Atlantic: Brazil, Fernando de Noronha, Rocas, off Pernambuco, and Cape St. Roque (Manning, 1969).

Remarks

Prior to 1969 this species was provisionally identified as G. spinulosus Schmitt by Manning (1969) and was collected from Fernando de Noronha Archipelago at a depth of 66 meters. However, Manning (1969) changed his opinion and described the species as G. minutus.

The specimens collected by the author were two small males, 13 and 14 mm. in length. This small stomatopod is abundant on Leão Beach and is found in tufts of algae (Valonia sp.). The individuals are extremely agile and they escape by going back rapidly to the algae or to the rocks to which the algae are attached.

The colors of the living animals were dark and light green.

Gonodactylus austrinus Manning, 1969.

Gonodactylus chiragra, Pocock, 1890, p. 526.

Gonodactylus oerstedii, Manning, 1966, p. 371, Text-fig.6a.

Gonodactylus austrinus Manning, 1969, p. 338, fig. 91

Material

Two males and 4 females collected at Sueste Bay (14) on Aug. 7, 1968; 1 male collected at Caieira Beach (11) on Aug. 9, 1968.

Distribution

Western Atlantic: Brazil, Fernando de Noronha, Rocas, Abrolhos Islands (Manning, 1969).

Remarks

This mantis shrip is relatively abundant in the Archipelago. The specimens were found and collected on the lower shore when it was exposed by the low tide, under rocks near tide pools. The color of the specimens captured in Sueste Bay was white-green and the color of the one collected on Caieira beach was dark green, almost black. The characteristics of the telson of the specimens from Sueste Bay differ slightly from those of G. austrinus described by Manning (1969).

Probably these differences are due to the differences in the age of the specimens. As Manning worked with considerable material from the Archipelago, northeast Brazil, and the

rest of the world, I think that he is right in stating that G. oerstedii (Hansen, 1895) does not occur in the islands and the northeast coast of Brazil and that G. austrinus was mis-identified as the former species.

This species was collected at a depth of 52 meters around the islands and at a depth of 45 meters on the continental shelf of northeast Brazil (Manning, 1969).

Order Decapoda
Suborder Macrura

Family Sergestidae

Lucifer faxoni Borradaile, 1915.

Lucifer faxoni, Holthuis, 1959, p. 52.

Material

None.

Distribution

Eastern Atlantic, Western Atlantic and Indo-West Pacific. Western Atlantic: North America; Bahamas; West Indies; Venezuela and Brazil, Pará State, Fernando de Noronha, and Rio de Janeiro (Holthuis, 1959)

Remarks

This species has been found recently on the northeast coast of Brazil among the stomach contents of some estuarine fishes.

Family Penaeidae

Artemesia longinaris Bate, 1888.

Artemesia longinaris, Bate, 1888, p. 343.

Artemesia longinaris, Moreira, 1901, p. 7.

Material

None.

Distribution

Western Atlantic: Brazil, Fernando de Noronha; Uruguay, Montevideo; Argentina, Mar del Plata and Bahia Blanca. (Moreira, 1901).

Remarks

The occurrence of this penaeid around the Archipelago is based on Bate's (1888) paper. It was collected at a depth of 14 to 50 meters by scientists aboard the "Challenger."

There is no record of this shrimp from the northeast coast of Brazil, even though it is found further south.

Family Alpheidae

Alpheus bouvieri A. Milne-Edwards, 1878.

Alpheus edwardsii, Pocock, 1890, p. 518.

Alpheus bouvieri, Rathbun, 1900, p. 312.

Alpheus bouvieri, Crosnier and Forest, 1966, p. 273, fig. 22.

Material

Three males, collected at Caieira Beach (11) on August 9, 1968.

Distribution

Eastern Atlantic: Senegal, Guinea, Congo, Cabo Verde, Azores (?) and Madeira (?) Islands. Western Atlantic: Brazil, Fernando de Noronha and Atol das Rocas (Crosnier and Forest, 1966).

Remarks

This species seems to be the most abundant species of the family. The specimens studied were collected in the lower shore exposed by the lowest tide, in sandstone rocks. The color of the living specimens was light yellow. The inner part of the palm of the claw was dark yellow. There was one white band on the superior border of the palm that followed the border of the palm down to the inferior groove. The external surface of the palm was dark yellow and the borders of the mobile finger of the chela were dark yellow, almost gray.

Alpheus cristulifrons Rathbun, 1900.

Alpheus obeso-manus, Pocock, 1890, p. 520.

Alpheus cristulifrons, Rathbun, 1901, p. 106.

Alpheus cristulifrons, Crosnier and Forest, 1966, p. 260, fig. 17-18a-4.

Alpheus cristulifrons, Fausto-Filho, 1970, p. 56.

Material

One male, collected at Atalaia beach (13) on Aug. 8, 1968.

Distribution

Eastern Atlantic: Principe Islands, São Tomé and Annobon. Western Atlantic: Brazil, Fernando de Noronha and Rocas Islands (Crosnier and Forest, 1966).

Remarks

This species seems to be rare in the Archipelago and on the continental shelf of the northeast coast of Brazil. Fausto-Filho (1970) reported it for this area based on material from the State of Rio Grande do Norte. Only one specimen was collected from a hole in a sandstone rock during low tide.

The color of the specimen was light yellow.

Alpheus ?rostratripes Pocock, 1890.

Alpheus rostratripes Pocock, 1890, p. 522.

Alpheus rostratripes, Crosnier and Forest, 1966, p. 246, fig. 12-14.

Material

One male, collected at Atalaia beach (13) on Aug. 8, 1968.

Distribution

Pacific Coast: littoral of Americas. Eastern Atlantic: São Tomé and Annobon. Western Atlantic: Brazil, Fernando de Noronha and Atol das Rocas (Crosnier and Forest, 1966).

Remarks

This species seems to be rare in the islands. Only one mutilated specimen was collected. This is another species that has not been collected from the northeast coast of Brazil.

Alpheus ridleyi Pocock, 1890.

Alpheus ridleyi Pocock, 1890, p. 518.

Material

None.

Distribution

Pacific Coast: littoral of California ?, Western Atlantic: Brazil, Fernando de Noronha. (Pocock, 1890; Crosnier and Forest, 1966).

Remarks

This species was described from the Archipelago by Pocock (1890). There is no record of it for the northeast coast of Brazil. Recently Crosnier and Forest (1966) stated that they were almost certain that A. ridleyi and A. arenensis from the Pacific Coast are the same species. To quote them,

"Par contre, la comparaison que nous avons effectuee entre un specimen d' A.arenensis (cf. p.236) et les types d' A.ridleyi nous incite a penser qu'il sagit d'une seule et meme espece."

Alpheus panamensis Kingsley, 1878.

Alpheus panamensis Kingsley, 1878b, p. 192.

Alpheus panamensis, Pocock, 1890, p. 519.

Material

None.

Distribution

Pacific Coast: Acajutla, Central America and Panama.
Western Atlantic; Brazil, Fernando de Noronha (Kingsley, 1879b; Pocock, 1890).

Remarks

Because no specimens were collected, it is difficult to comment on this species. Kingsley (1878b) did not specify the exact locality in Panama in which the species was collected because he obtained his information from F.H. Bradley, probably the collector of the material. Pocock (1890), having only one specimen, may have mixed up this species with a close relative from the Archipelago.

There is no record of this species from the northeast coast of Brazil.

Synalpheus minus (Say, 1818).

Alpheus minor, Pocock, 1890, p. 518.

Synalpheus minus, Williams, 1965, p. fig. 57.

Material

None.

Distribution

Western Atlantic: Cape Hatteras, N.C.; West Indies; Bermuda and Brazil, Alagoas, (Williams, 1965).

Remarks

This species was reported to occur in the Fernando de Noronha Archipelago by Pocock (1890) and on the northeast coast of Brazil by Williams (1965).

Family Stneopodidae

Microprosthema semilaeve (von Martens, 1872).

Stenopusculus spinosus, Pocock, 1890, p. 253.

Microprosthema semilaeve, Holthuis, 1946, p. 54, pl. IV, fig. i.

Material

One male and 1 female, collected at Sueste Bay (14) on Aug. 7, 1968.

Distribution

Western Atlantic: North America, Florida; Bahamas and Brazil, Fernando de Noronha (Holthuis, 1946; Manning, 1961).

Remarks

The specimens from the Archipelago were collected under stones in the lower shore exposed by the lowest tides. They were found among specimens of Petrolisthes ? serratus and ophiuroids. This species seems to be abundant, at least in Sueste Bay.

Pocock (1890) collected only two specimens and he did not specify the collecting locality nor the color of the specimens.

The color of the specimens collected recently was dark red like that of Florida specimens described in great detail by Manning (1961).

Up to now there has been no record of this species from the northeast coast of Brazil.

Stenopus hispidus (Olivier, 1811).

Stenopus hispidus, Coêlho, 1969a, p. 250.

Material

None.

Distribution

Indo-Pacific and tropical Atlantic. Western Atlantic: North America, Florida; Bermuda and Brazil, Fernando de Noronha and Pernambuco. (Coêlho, 1966).

Remarks

Coêlho (1966) reported the occurrence of this species on Ilha Rata in Fernando de Noronha and on the northeast coast of Brazil. Fausto-Filho (1970) found the species in the littoral of Ceará, Brazil, where it seems to be abundant. In Ceará it is found living at depths from 1-10 meters on substrata covered with calcareous algae.

Stenopus scutellatus Rankin, 1898.

Stenopus scutellatus, Limbaugh, Pederson and Chace (1961), p. 253.

Stenopus scutellatus, Coêlho, 1966, p. 139.

Material

None.

Distribution

Tropical Atlantic. Western Atlantic: From Bermuda to Brazil, Fernando de Noronha and Bahia (Coêlho, 1966).

Remarks

The record of this species for the Archipelago and the northeast coast of Brazil is based on Limbaugh, et al., (1961) and Coêlho (1966). According to these authors this stenopodian can be found in shallow water at Bahia and down to depths of 55 meters elsewhere.

Family Palinuridae

Panulirus argus (Latreille, 1804).

Senex argus, Moreira, 1901, p. 46.

Panulirus argus, Rathbun, 1901, p. 98.

Panulirus argus, Faria and Silva, 1937, p. 7, fig. 14-19.

Panulirus argus, Williams, 1965, p. 91, fig. 73.

Material

One female, collected at Ilha Rata (10) on Oct. 8, 1968.

Distribution

Western Atlantic: North America, from North Carolina to Gulf of Mexico; the West Indies; Bermuda; and Brazil, from northeast to São Paulo (Fausto-Filho and Costa, 1969).

Remarks

The specimen was collected from a depth of 10 meters by diving.

This species is the least abundant member of the family in the Archipelago, although on the mainland it is the most abundant. In the islands it is found between depths of 1 and 30 meters. In the beaches of Conceição (4), Biboca (6), Cachorro (5) and Caieira (11) it is rarely seen. It is more frequently seen on the beaches of Buracão (1) and Santo Antônio (7).

Ovigerous females are observed mainly during the months of November, December and January on the beaches of Buracão (1), Caieira (11) and Pontinha (12). On the north-east coast of Brazil the period of reproduction begins in January and finishes in late April.

The color of living specimens from the Archipelago varies from dark brown to light brown, yellow or reddish.

Panulirus echinatus Smith, 1869.

Panulirus echinatus, Pocock, 1890, p. 516.

Senex guttatus, Moreira, 1901, p. 17.

Panulirus gattatus brasiliensis, Faria and Silva, 1937, p. 10, figs. 20-25.

Panulirus echinatus, Holthuis, 1961, p. 223, fig. 1.

Panulirus echinatus, Chace, p. 629, figs. 3-4.

Panulirus echinatus, Fausto-Filho and Costa, 1969, p. 105, fig. 2.

Material

One male, collected at Caieira Beach (11) on Aug. 9, 1968.

Distribution

Eastern Atlantic: Cabo Verde and Santa Helena Island. Western Atlantic: Brazil, São Pedro and São Paulo Rocks, Fernando de Noronha, Rocas Islands and northeast Brazil (Fausto-Filho and Costa, 1969).

Remarks

This spiny lobster is relatively abundant in the islands. It seems to be more abundant than P. argus. In the Archipelago it has been observed at depths from 2 to 25 meters. Ovigerous females are found during the months of November and December mainly on the beaches of Caieira (11) and Pontinha (12).

The color of the species varies between a dark and light brown in the males and is dark greenish in the females. Fausto-Filho and Costa (1969) described in detail the color and added, after reviewing Holthuis (1968 in litt.): "Probably the species described by Pocock (1890) as P. inermis from the Archipelago is P. echinatus." On the other hand, in the same paper the author agrees with the suggestion presented by Chace, (1966) who described this species from St. Helena Island, that subspecific variations of P. echinatus may be found on the islands and on the mainland.

This species is relatively rare on the northeast coast of Brazil, being found mainly in the State of Rio Grande do Norte and Pernambuco.

Panulirus laevicauda (Latreille, 1817).

Panulirus ornatus, Pocock, 1890, p. 516

Senex laevicauda, Moreira, 1901, p. 17, fig. 1.

Panulirus laevicauda, Faria and Silva, 1937, p. 6, figs. 9-13.

Panulirus laevicauda, Holthuis, 1959, p. 123.

Panulirus laevicauda, Fausto-Filho and Costa, 1969, p. 106).

Material

One ovigerous female, collected at Leão Beach (15) on Aug. 11, 1968.

Distribution

Western Atlantic: North America, Florida; Caribbean region; Cuba; Jamaica; Curaçao; Surinamé; French Guiana and Brazil, from the northern coast to the State of São Paulo in the south. (Fausto-Filho and Costa, 1969).

Remarks

Of the three species of the family Palinuridae found in the Archipelago this is the most abundant.

The color of the living lobster is dark or light green.

Ovigerous females are found during the months of January, February and March.

As was previously stated by Fausto-Filho and Costa (1969), the species mentioned as Panulirus ornatus by Pocock (1890) could be P. laevicauda.

This species is relatively abundant in the northeast coast of Brazil, but is less abundant than P. argus.

Family Callianassidae

Upogebia noronhensis Fausto-Filho, 1969.

Gebia spinigera, Pocock, 1890, p. 515.

Upogebia spinigera, Corrêa, 1968, p. 98.

Upogebia noronhensis Fausto-Filho, 1969, pp. 1-7, figs. 1-15.

Material

Two males and 7 females, collected at Sueste Bay (14) on Aug. 7, 1968.

Distribution

Western Atlantic: Brazil, Fernando de Noronha.
(Fausto-Filho, 1969).

Remarks

This species was described by the author in 1969. In the Archipelago it was collected in the middle and lower shores under sandstone rocks or in holes in the substratum near runoffs from fresh water ponds.

Corrêa (1968), in her paper on the Callianassids of Brazil, says that U. spinigera is known from the Pacific Coast of the Americas, from Nicaragua and Colombia.

U. noronhensis has not been recorded from the north-east coast of Brazil so that probably it is endemic to the Archipelago.

Suborder Anomura

Family Galatheidae

Munida spinifrons Henderson, 1885.

Munida spinifrons, Moreira, 1901, p. 21.

Material

None.

Distribution

Western Atlantic: Brazil, Fernando de Noronha
(Moreira, 1901).

Remarks

The only reference to the occurrence of this species in the Archipelago is found in Moreira's (1901) paper based on the Challenger report of 1888. At that time the species was found at depths of 14 and 50 meters. This species has not been recorded yet from the northeast coast of Brazil.

Family Procellanidae

Petrolisthes ? serratus Henderson, 1888.

Petrolisthes ? amoenus, Haig, 1956, p. 25.

Petrolisthes serratus, Coêlho, 1964a, p. 58.

Material

One female, collected at Sueste Bay (14) on Aug. 7,
1968.

Distribution

Western Atlantic: Brazil, Alagoas, Bahia and Fernando de Noronha (Coêlho, 1964a).

Remarks

This porcellanid does not seem to be abundant in the islands. Pocock (1890) did not refer to it. Also Coêlho (1966) did not mention anything about it in his paper on the porcellanids of the northeast of Brazil and the Fernando de Noronha Archipelago.

The exact taxonomy of this species has been discussed thoroughly. It is very close to Petrolisthes amoenus Guerin, 1855. According to Rathbun (1900) these two species are probably the same. Haig (1956) and Coêlho (1964a) considered the species from Pernambuco and Bahia, Brazil as P. serratus. Although the specimen collected in the Archipelago has most of the characteristics described by Coêlho (1964a), the color is different from his description and the rostrum of the specimen is serrated rather than smooth. The living specimen from the islands was rose colored in the center and dark rose on the borders.

Petrolisthes armatus (Gibbes, 1850).

Petrolisthes marginatus, Pocock, 1890, p. 513.

Petrolisthes armatus, Coêlho, 1964a, p. 55.

Material

None.

Distribution

Indo-Pacific region and eastern Pacific: from Gulf of California to Peru and Galapagos Islands. Eastern Atlantic: from Senegal to Angola and Ascencion Islands. Western Atlantic: east coast of the United States from Connecticut to Gulf of Mexico; Bermudas; Bahamas; Antilles; Central America; northern South America; and Brazil, from the north to Santa Catarina (Coelho, 1964a).

Remarks

This procellanid was recorded for the Archipelago by Pocock (1890). Coelho (1964a) identified the single specimen of this species examined by Pocock (1890) as P. armatus.

This species is abundant in the northeast coast of Brazil, but in the Archipelago it seems to be rare.

Pachycheles riisei (Stimpson, 1959).

Pachycheles riisei, Coelho, 1964a, p. 54.

Material

None.

Distribution

Western Atlantic: Florida; Antilles and Brazil, Alagoas and Trinidade Islands (Coelho, 1964a).

Remarks

A single specimen of this species was recorded for the Archipelago by Coêlho (1964a). As noted by Rathbun (1900), this species is found on the northeast coast of Brazil and in that area it is common in colonies of the sabellarid worm, Sabellaria nanella.

Family Diogenidae

Clibanarius tricolor (Gibbes, 1850).

Clibanarius tricolor, Provenzano, 1959, p. 336, fig. 5A.

Clibanarius tricolor tricolor Forest and Saint-Laurent, 1967, p. 102, fig. 61.

Material

Two males and 3 females, collected at Sueste Bay (14) on Aug. 7, 1968; 1 male and 3 females collected at Atalaia Beach (13) on Aug. 8, 1968; 1 female collected at Leão Beach (15) on Aug. 12, 1968.

Distribution

Western Atlantic: Southern Florida; Bermudas; Antilles; and Brazil, Fernando de Noronha (Gibbes, 1850).

Remarks

This species was found in the Archipelago by Coêlho (1964a). It is abundant, mainly between the upper and middle shores. The pereipods are reddish and the superior and anterior parts of the carapace are dark yellow in specimens

preserved in alcohol. The abdomen is yellow and the articulations of the dactylus with the propods are dark brown.

Forest and Saint-Laurent (1967) also noted that this species occurs on the northeast coast of Brazil, in Cabedelo, State of Paraiba.

Calcinus tibicen (Herbst, 1791).

Calcinus tibicen, Schmitt, 1939, p. 29.

Calcinus tibicen, Provenzano, 1959, p. 363.

Calcinus tibicen, Coêlho, 1964a, p. 60.

Calcinus tibicen, Forest and Saint-Laurent, 1967, p. 106.

Material

None.

Distribution

Western Atlantic: U.S.A., Florida; Colombia, Providence Island; Bermuda and Brazil, Abrolhos (Forest and Saint-Laurent, 1967).

Remarks

This species was recorded for the Archipelago by Coêlho (1966) in his paper on the procellanids of Pernambuco and neighboring states.

This species seems to be rare in the Archipelago.

Dardanus venosus (H. Milne-Edwards, 1848).

Dardanus venosus, Forest and Saint-Laurent, 1967, p. 94.

Material

None.

Distribution

Western Atlantic: from North Carolina, Beaufort to Brazil. Bermuda; Antilles; Cuba; Haiti; Puerto Rico; Guadalupe; Barbados; Virgin Islands; Surinam; and Brazil, Maceió, Fernando de Noronha, Atol das Rocas, Turiagu and São Luiz (Coelho, 1969b).

Remarks

This species was reported for the Archipelago in Forest and Saint-Laurent's (1967) paper, in which several specimens were collected at an average depth of 20 meters. On the northeast coast of Brazil this species is also abundant and it lives in the same type of bottom, one that is formed by calcareous algae. In the State of Ceará, Brazil, this species is easily collected when it enters cages used to capture lobsters. Usually it is found in shells of Tonna maculosa (Fausto-Filho, Matthews and Lima, 1969).

Family Paguridae

Pagurus brevidactylus (Stimpson, 1862).

Pagurus brevidactylus, Coelho, 1964b, p. 255.

Material

None.

Distribution

Western Atlantic: U.S.A., North Carolina and Florida; Barbados; Antilles and Brazil, Bahia and Fernando de Noronha (Provenzano, 1959; Coêlho, 1964b)

Remarks

This species is found in the Archipelago and on the northeast coast of Brazil (Coêlho, 1964b), but seems to be rare in both places. The only comment on the ecology made by Coêlho (1964b) is that the species lives in shallow water. The southern limit of distribution of this species for the western South Atlantic is the central littoral of Brazil in the State of Bahia.

Pagurus provenzanoi Forest and Saint-Laurent, 1967.
Pagurus provenzanoi Forest and Saint-Laurent, 1967, p. 118, figs. 72-77, 93-94.

Material

None.

Distribution

Western Atlantic: Brazil, Fernando de Noronha; Uruguay (?) (Forest and Saint-Laurent, 1967).

Remarks

The only record of this species in the Archipelago is from Forest and Saint-Laurent's (1967) paper in which they described the species. It was collected at a depth of 31 meters in the Archipelago and at 30 to 52 meters depth on the continental shelf of Brazil. The authors have doubts about the identification of the species from Uruguay.

There is no record of this species on the northeast coast of Brazil.

Iridopagurus violaceus Saint-Laurent, 1966.

Iridopagurus violaceus, Forest and Saint-Laurent, 1967,
p. 162, figs. 147-150.

Material

None.

Distribution

Western Atlantic: Brazil, Maranhão, Pernambuco and Fernando de Noronha (Forest and Saint-Laurent, 1967; Coêlho, 1969b).

Remarks

This species is recorded for the Archipelago by Forest and Saint-Laurent (1967) and was collected at a depth of 31 meters on sandy bottoms. Off Pernambuco the species was collected at a depth of 39 meters on a substratum of

calcareous algae. Coêlho (1969b) reported this pagurid from Maranhão, North Brazil.

Family Hippidae

Hippa cubensis (Saussure, 1857).

Remippes scutellatus, Pocock, 1890, p. 515.

Hippa cubensis, Schmitt, 1939, p. 29.

Hippa cubensis, Costa, 1962, p. 3, pl. I fig. 1, pl. II figs. 6-8.

Hippa cubensis, Fausto-Filho, 1966, p. 35.

Material

Three males and 26 females (2 with eggs) collected at Conceição Beach (4) on Aug. 10, 1968.

Distribution

Eastern Atlantic: Africa, Congo. Western Atlantic from Florida to Brazil, Rio Grande do Norte; and Colombia, Old Providence Island. (Pocock, 1890; Schmitt, 1939; Costa, 1962; Fausto-Filho, 1966).

Remarks

This species is abundant in the Archipelago in only one locality, Conceição Beach (4), from the upper middle to the upper lower shore.

The color of the specimens was light brown, the color of sand, with scattered brown spots on the carapace.

Fausto-Filho (1966) found this species on the north-east coast of Brazil. Costa (1962) in his paper on the hippids of Brazil did not mention Pocock's (1890) paper.

Suborder Brachyura

Family Raninidae

Symethis variolosa (Fabricius, 1793).

Symethis variolosa, Coêlho, 1969b, p. 233.

Material

None.

Distribution

Pacific Coast and western Atlantic: From Florida to Brazil, mouth of Tocantins River, Maranhão, Ceará and Rio Grande do Norte (Coêlho, 1969b).

Remarks

Rathbun (1933) wrote a description and gave a detailed list of the distribution of this species. Its northern limit is Miami, Florida, and its southern limit is São Paulo State, Brazil.

Coêlho (1969b) completed the record of distribution of this species along the coast of Brazil, where it occurs from Cape Orange to Maceió and Fernando de Noronha Archipelago. This species had been found previously to live in depths between 10 and 60 meters, dwelling on corals and under stones. (Rathbun, 1937). However, the specimens reported by

Coelho (1969b) were collected between depths of 52 and 66 meters in mud and calcareous algae bottoms.

Family Calappidae

Calappa gallus (Herbst, 1803).

Calappa gallus, Miers, 1886, p. 44.

Material

None.

Distribution

Pacific Ocean; Red Sea and Persian Gulf; Indian Islands; West Africa; and western Atlantic: from Florida to Brazil, Ceará, Rocas Islands, Rio Grande do Norte, and Fernando de Noronha (Costa, 1968; Fausto-Filho, 1969; Coelho, 1969b).

Remarks

Rathbun (1900, 1901, 1933 table 70) described in detail the general distribution of this species. Reports of additional localities in its distribution are found in the papers of Fausto-Filho (1966, 1967b), and Coelho (1969b).

The first record of this species for the Archipelago was made by Miers (1886).

In the northeast coast of Brazil the species lives at depths between 20 and 53 meters on calcareous algae substrata, the same kind on which Coelho (1969b) found them in Rocas. At Camocim, Ceará, the species was collected on a

sandy bottom. The kinds of habitats recorded by Rathbun (1933) for this species are quite varied (grass, reefs, algae, sand, reef flats).

Cycloes bairdii Stimpson, 1960.

Cycloes bairdii, Costa, 1968.

Cycloes bairdii, Coêlho, 1969b, p. 234.

Material

None.

Distribution

Eastern Pacific; Mexico; Ecuador; Galapagos Islands. Western Atlantic: U.S.A., North Carolina and Brazil, Pará, Maranhão, Rio Grande do Norte, Paraíba, Pernambuco, Alagoas, Sergipe and Fernando de Noronha (Costa, 1968; Coêlho, 1967).

Remarks

As a result of the "Calypso" exploration, this species was recorded for the islands by Costa (1968) from a depth of 50 meters. One year later Coêlho (1969a, -b) reported the localities in which the vessels "Canopus" and "Almirante Saldanha" collected this species. No specimens were collected around the islands but some were taken near the Island of Rocas. The bottoms in which this species was collected were composed of calcareous algae, sand, and the remains of shells. Fausto-Filho (1967a) noted the occurrence of this species on

the Brazilian littoral and along the northeast coast of Brazil, but commented that C. bairdii seemed to be rare in this area. On the other hand, Coêlho (1969a) said that this species is abundant on the basis of the material collected by the two vessels referred to above.

Family Portunidae

Portunus (Achelous) ordwayi (Stimpson, 1860).

Portunus (Achelous) ordwayi, Coêlho, 1969b, p. 235.

Material

None.

Distribution

Western Atlantic: North Carolina; Gulf of Mexico; Caribbean region; West Indies; Bermudas and Brazil, Bahia, Maranhão, Piauí, Ceará and Fernando de Noronha (Williams, 1965; Coêlho, 1969b).

Remarks

This species is recorded from the Archipelago by Coêlho (1969b). According to him, this species lives in substrata composed of calcareous algae and shell remains, and at depths from 24 to 90 meters.

Family Xanthidae

Carpilius corallinus (Herbst, 1703).

Carpilius corallinus, Pocock, 1890, p. 510.

Carpilius corallinus, Rathbun, 1901, p. 25.

Carpilius corallinus, Rathbun, 1930, p. 240, pls. 97-99.

Carpilius corallinus, Fausto-Filho, 1966, p. 33.

Material

One female, collected at Rata Island (10) on Aug. 10, 1968.

Distribution

Western Atlantic: Bahamas; Cuba; Jamaica; Puerto Rico; Virgin Islands; Curaçao Islands and Brazil, Pernambuco and Fernando de Noronha (Rathbun, 1901, 1930).

Remarks

This coral crab is so abundant along the northeast coast of Brazil on bottoms of calcareous algae that it is of great economic value (Fausto-Filho, 1968b). In the Archipelago it seems to be rare.

Platypodia spectabilis (Herbst, 1794).

Lophactaea lobata, Pocock, 1890, p. 511.

Lophactaea lobata, Moreira, 1901, p. 61.

Platypodia spectabilis, Rathbun, 1901, p. 61.

Platypodia spectabilis, Rathbun, 1930, p. 247, pl. 102, fig. 4.

Material

One male and 2 females (1 with eggs), collected at Caieira Beach (11) on Aug. 9, 1968; 2 males and 2 females collected at Sueste Bay (14) on Aug. 7, 1968; 1 male, collected at Atalaia Beach (13) on Aug. 8, 1968.

Distribution

Western Atlantic: Florida; Bahamas; Jamaica; Puerto Rico; Virgin Islands; Barbados; Curaçao and Brazil, Fernando de Noronha and Pernambuco (Rathbun, 1930; Coêlho, 1966).

Remarks

This species is abundant in the Archipelago. It is found under stones in the lower middle shore. Rathbun (1930) reported that the specimens from the Virgin Islands were collected at a depth of 5 meters.

The color of the species varies from light to dark yellow. The chelipeds are dark pink. The carpus of the specimens from the Archipelago are rougher than those from the northeast coast of Brazil.

Leptodius parvulus (Fabricius, 1793).

Leptodius americanus, Pocock, 1890, p. 511.

Xanthodius parvulus, Rathbun, 1901, p. 27.

Leptodius parvulus, Rathbun, 1930, p. 305, pl. 141, figs. 1-3.

Leptodius parvulus, Fausto-Filho, 1968a, p. 44.

Material

One male, collected at Sueste Bay (14) on March 16, 1963; 5 males and 10 females, collected at Sueste Bay (14) on Aug. 7, 1968; 41 males and 61 females (13 with eggs), collected at Atalaia Beach (13) on Aug. 8, 1968; 2 females

collected at Caieira Beach (11) on Aug. 8, 1968; 4 ovigerous females, collected at Pontinha Beach (12) on Aug. 9, 1968.

Distribution

Western Atlantic: Bermudas; Bahamas; Florida and Brazil, Fernando de Noronha (Rathbun, 1930).

Remarks

This species is the most abundant xanthid of the Archipelago, being found mainly on the beaches of Atalaia (13) and Sueste Bay (14). Fausto-Filho (1968a) reported only one specimen from these beaches in 1963. At that time the species had been shown to be rare in the Archipelago, probably because it was looked for during the rainy season when it was in hiding. August seems to be the best time of the year for reproduction to occur in this species. This is just after the rainy season, which lasts from February to July.

On the beaches, the crabs are found from the upper middle shore to the upper lower shore, living under stones. Rathbun (1930) reported that the specimens from Curaçao were collected from a depth of 1.5 meters.

The color varies from light to dark brown. In some specimens there is one white, longitudinal band on the middle of the carapace. In a few the carapace is light brown anteriorly and dark brown posteriorly. Most of the specimens from the continent are dark or light brown all over the

carapace and only a few specimens bear the white band.

Leptodius floridanus (Gibbes, 1850).

Leptodius floridanus, Rathbun, 1901, p. 27.

Leptodius floridanus, Rathbun, 1930, p. 297, pl. 137, figs. 1-2; pl. 138, fig. 1.

Leptodius floridanus, Fausto-Filho, 1968a, p. 44.

Material

One male, collected at Sueste Bay (14) on March 16, 1963; 5 males and 6 females (3 with eggs), collected at Sueste Bay (14) on Aug. 7, 1968; 2 males, collected at Atalaia Beach (13) on Aug. 8, 1968; 1 male, collected at Pontinha Beach (12) on Aug. 9, 1968; 2 males and 4 females (2 with eggs), collected at Caieira Beach (11) on Aug. 8, 1968.

Distribution

Western Atlantic: Bermudas; Bahamas; Florida; Tortugas; Cuba; Santo Domingo; Jamaica; Puerto Rico; Barbados; Curaçao; Colombia; Panama and Brazil, Ceará, Pernambuco, Paraíba, Maceió, Bahia, Abrolhos Islands, Rio de Janeiro and São Paulo (Rathbun, 1930).

Remarks

This species is less abundant in the Archipelago than Leptodius parvulus. It is found from the lower middle shore to the upper lower shore line, under stones. According

to Rathbun (1930) it has been found from shallow to deep water in the Tortugas.

The color is light gray or pinkish. Some specimens bear a white longitudinal band on the anterior half of the central portion of the carapace.

Actaea acantha (H. Milne-Edwards, 1934).

Actaea acantha, Pocock, 1890, p. 511.

Actaea acantha, Rathbun, 1901, p. 34.

Actaea acantha, Rathbun, 1930, p. 261, pl. 105, fig. 5; pl. 106, figs. 1-2.

Material

One male, collected at Leão Beach (15) on Aug. 11, 1968.

Distribution

Western Atlantic: Florida; Tortugas; Bahamas; Cuba; Jamaica; Haiti; Puerto Rico and Brazil, Fernando de Noronha (Rathbun, 1930).

Remarks

This species was recorded for the Archipelago by Pocock (1890) and later by Rathbun (1901, 1930), who examined the material collected from 20 meters by the Hartt Expedition. The specimen collected was not in good condition and other material was not available because this species is not abundant in the islands.

The color of the carapace was dark red with some small areas light red, almost yellow. The chelipeds were dark red on the outer and light red on the inner surface. The long hairs of the carapace and chelipeds were yellow. The dactyli were black with their extremities white. The black color of the mobile dactyli extended over the palms for about one third of their length. As of today there is no record of this species on the northeast coast of Brazil.

Panopeus harttii Smith, 1869.

Panopeus harttii, Rathbun, 1930, p. 355, pl. 164, figs. 1, 2 and 5.

Material

One male and one female, collected at Sueste Bay (14) on Aug. 7, 1968.

Distribution

Western Atlantic: Florida; Cuba; Puerto Rico; Lesser Antilles; Barbados and Brazil, Pernambuco, Maceió, Bahia, Abrolhos, São Paulo (Rathbun, 1930).

Remarks

This is the first record of this species for the Archipelago. It was collected under stones in the middle shore, but does not seem to be abundant.

The overall color is greenish with the tips of the fingers white. The record of this species for the

Brazilian coast is based on the results of the Hartt Exploration (1876-1877) (Rathbun, 1930).

Family Hapalocarcinidae

Cryptochirus corallicola (Verrill, 1908).

Troglocarcinus corallicola Verrill, 1908, p. 47, figs. 49, 49a, b, c, pl. 28, fig. 8.

Cryptochirus corallicola, Rathbun, 1937, fig. 47; pl. 78, figs. 5-7.

Troglocarcinus corallicola, Coêlho, 1969b, p. 234.

Material

None.

Distribution

Eastern Atlantic: Gulf of Guinea. Western Atlantic: Bermudas; Straits of Florida; Dominica; Ilha das Rolas off St. Thomas Islands; and Brazil, Maranhão, Fernando de Noronha, Rocas, Pernambuco (Tamandaré), Alagoas (Maceió), and Bahia (Mar Grande) (Coêlho, 1966, 1969b).

Remarks

This species was recorded for the Archipelago and the northeast coast of Brazil by Coêlho (1966). The species from Pernambuco was collected in the coral, Mussismilia cf. tenuisepta (Verrill). Each colony of this coral has from one to three burrows in which C. corallicola lives (Coêlho, 1966). Coêlho (1969b) reported that this species is found from the

zero level to a depth of 75 meters and on bottoms consisting of corals and calcareous algae.

According to Rathbun (1937) the species from the Tortugas, Florida, live symbiotically in the corals Meandra areolata and Meandrina sp.

Family Grapsidae

Pachygrapsus transversus (Gibbes, 1850).

Pachygrapsus transversus, Rathbun, 1901, p. 17.

Pachygrapsus transversus, Rathbun, 1918, p. 244, pl. 61, figs. 2-3.

Pachygrapsus transversus, Williams, 1965, p. 217, fig. 202.

Pachygrapsus transversus, Fausto-Filho, 1966, p. 34.

Material

One ovigerous female, collected at Caieira Beach (11) on Aug. 8, 1968.

Distribution

West Africa and Oriental region; Pacific Ocean: California to Peru and Galapagos Islands. Western Atlantic: Massachusetts, Cape Cod and Florida Keys; Bahamas; Uruguay, Montevideo and Brazil, from Paraiba River to São Paulo (Rathbun, 1918; Williams, 1965).

Remarks

A search of the literature reveals that this is the first time this species has been found in the Archipelago.

In the islands it seems to be rare; only one specimen was collected on the middle shore on rocks. On the northeast coast of Brazil it is abundant and its record for this area dates from Marcgrave, in 1648, according to Castro (1962).

Grapsus grapsus (Linnaeus, 1758).

Grapsus maculatus, Pocock, 1890, p. 16.

Grapsus grapsus, Rathbun, 1901, p. 16.

Grapsus grapsus, Moreira, 1901, p. 512.

Grapsus grapsus, Rathbun, 1918, p. 227, pls. 53 and 54.

Grapsus grapsus, Fausto-Filho, 1966, p. 34.

Grapsus grapsus, Forest and Guinot, 1966, p. 90.

Material

Two males and 3 females, collected at Caieira Beach (11) on June 29, 1963; 1 female, collected at Atalaia Beach (13) on Aug. 8, 1968; 3 males and 1 female, collected at Caieira Beach (11) on Aug. 9, 1968.

Distribution

Indo-Pacific; Eastern Pacific: Lower California, San Benito Islands; and Chile. Eastern and Western Atlantic: from South Florida and Bahamas to Brazil, Fernando de Noronha (Rathbun, 1918; Chace, 1966).

Remarks

This species is extremely abundant in the Archipelago where it is found on all the beaches in all intertidal zones.

Its color is variable. It was observed that young specimens are dark gray, almost black, and the old ones are dark green, greenish and sometimes brownish, with a tendency for the pigments to be concentrated in spots. It was also observed that young specimens seemed to form into groups by size and coloration and sometimes they were separated from other groups of different sizes gathered a short distance away.

This species was recorded for the northeast coast of Brazil, Pernambuco, by Moreira (1901). Fausto-Filho (1966) found it in the littoral of Ceará, northeast Brazil.

Cyclograpsus interger (H. Milne-Edwards, 1937).

Cyclograpsus interger, Rathbun, 1901, p. 18.

Cyclograpsus interger, Rathbun, 1918, p. 326, pl. 97, figs. 1-2.

Cyclograpsus interger, Fausto-Filho, 1967b, p. 13.

Material

Three males and 2 females (ovigerous), collected at Sueste Bay (14) on Aug. 7, 1968; 3 males and 1 female (ovigerous), collected at Caieira Beach (11) on Sept. 8, 1968.

Distribution

Western Atlantic: Bermudas; Bahamas; Florida; Jamaica; Puerto Rico; Colombia and Brazil, Ceará, Pernambuco, and Paraiba (Rathbun, 1918; Fausto-Filho, 1967b).

Remarks

This is the first record of the species for the Archipelago where it is relatively abundant. It is found under stones from the mid-littoral to the upper littoral.

The color of the specimens examined varied from dark yellow to light or dark brown.

Probably Fausto-Filho's (1967b) paper is the only one to record this species for the northeast coast of Brazil. Rathbun (1901 and 1918) reported that it occurred in Brazil in referring to the paper of Milne-Edwards, but did not specify the place where it was collected.

Geograpsus lividus (H. Milne-Edwards, 1937).

Geograpsus lividus, Rathbun, 1901, p. 16.

Geograpsus lividus, Rathbun, 1918, p. 232, pl. 55.

Geograpsus lividus, Forest and Guinot, 1966, p. 91.

Material

One female, collected at Sueste Bay (14) on Aug. 7, 1968; 1 female, collected at Atalaia Beach (13) on Aug. 8, 1968.

Distribution

Pacific Coast of California to Peru, Chile and Galapagos Islands. Western Atlantic: Bermudas; Florida; Cuba; Jamaica; Puerto Rico; West Indies; Trinidad; Colombia and Brazil, São Paulo (Verrill, 1908; Rathbun, 1918; Forest and Guinot, 1966).

Remarks

This is the first record of the species for the Archipelago, where it seems to be abundant. Most of the crabs were observed on and among loose stones from the middle shore to upper shore.

Of the two specimens collected, the younger was light brown on the top of the carapace and dark brown on the front. Its abdomen was light gray in the center and dark gray on the borders. The merus, ischium, bases and coxae of the pereopods were yellow ventrally and dark gray dorsally. The larger specimen was dark brown, almost black and the bases of its pereopods were dark yellow. The chelipeds were dark brown dorsally and light brown ventrally.

There is no record of this species occurring on the northeast coast of Brazil.

Plagusia depressa (Fabricius, 1775).

Plagusia depressa, Pocock, 1890, p. 513.

Plagusia depressa, Rathbun, 1901, p. 19.

Plagusia depressa, Moreira, 1901, p. 42.

Plagusia depressa, Rathbun, 1918, p. 333, pl. 101.

Plagusia depressa, Williams, 1965, p. 223, fig. 207.

Plagusia depressa, Fausto-Filho, 1966, p. 35.

Material

Four males, collected on Atalaia Beach (13) on Aug. 8, 1968.

Distribution

Eastern Atlantic: Azores; Madeira and St. Helena Island. Western Atlantic: Bermudas; Florida; Bahamas; West Indies; Puerto Rico; Curaçao, and Brazil, Ceara, Rio Grande do Norte, Pernambuco, Mamanguape, Rio Goyana, Fernando de Noronha and Rocas Islands (Rathbun, 1918; Chace, 1966; Fausto-Filho, 1966; Coêlho, 1969b).

Remarks

The first record of this grapsoid crab in the Archipelago was reported by Pocock (1890).

The specimens were collected between the lower shore and middle shore in tide pools and this species seems to be abundant in the Archipelago. Forest and Guinot (1966) reported finding this species at depths of 6 to 10 meters. The color of the living crabs varied from a light blue-green to a dark blue-green.

On the northeast coast of Brazil this species is relatively abundant.

Percnon ? gibbesi H. Milne-Edwards, 1953.

? Leiolophus planissimus, Pocock, 1890, p. 513.

Percnon gibbesi, Rathbun, 1900, p. 281.

Percnon gibbesi, Rathbun, 1918, p. 337, pl. 105.

Percnon gibbesi, Rathbun, 1933, p. 93, fig. 88.

Percnon gibbesi, Crosnier, 1965, p. 91, fig. 138.

Percnon gibbesi, Williams, 1965, p. 225.

Material

Three males, collected at Sueste Bay (14) on Aug. 7, 1968; 1 male, collected at Atalaia Beach (13) on Aug. 8, 1968; 1 male and 2 females, collected at Atalaia on Caieira Beach (11) on Aug. 9, 1968.

Distribution

Pacific Ocean: Cape San Lucas, lower California to Chile and Galapagos Islands. Eastern Atlantic: Azores to Cape of Good Hope. Western Atlantic: Fort Macon, North Carolina; Bermuda; southern Florida; Bahamas to Brazil (Williams, 1965).

Remarks

This is the first record of the species for the Fernando de Noronha Archipelago. Pocock (1890) identified this species as ? Leiolophus planissimus, basing his identification on only one specimen. Rathbun (1901, 1918, 1933), Crosnier (1965) and Williams (1965) made no comment about Pocock's identification. According to Crosnier (1965), Forest and Guinot (1966) also considered L. planissimum to be identical to P. gibbesi. However, Crosnier (1965) disagreed and stated that P. gibbesi and P. planissimum are different species and he enumerated the principal differences between the two. The specimens from the Archipelago are similar to those described by Williams (1965). Holthuis (1968, in litt.), after examining the drawings

of the chela sent to him by the author, stated that he was almost certain that this was P. gibbesi.

The chelae of the specimens studied have on the posterior half a triangular, hairy zone that extends from the upper border of the palm to a point half way down the inner surface. In the middle of this zone in the females there are three small spines; the males have only one. A comparison between the chela of the specimens from the Archipelago with the drawing of the chela of P. planissimum made by Crosnier (1965, fig. 138) shows that the fingers of P. gibbesi are longer than those of P. planissimum and the mobile fingers are more arched or curved.

The color of the carapace of living P. gibbesi is greenish or light green and there is one light, central, longitudinal band on its dorsal surface. This band has a blue hue.

This grapsid crab is relatively abundant on the islands, mainly in Sueste Bay (14). It lives in rocks on the lower shore which are washed by spray. It is very difficult to collect due to its agility. It is also camouflaged because its color is the same as that of the green substratum.

The record of this species found on Mamanguape on the northeast coast of Brazil is based on Rathbun (1918) from the material of the Branner-Agassiz Expedition (1876-1877).

Percnon planissimum (Herbst, 1804).

Percnon planissimum, Coêlho, 1969b, p. 235.

Material

None.

Distribution

Eastern Atlantic: Portugal; Morocco; Senegal; Ghana; Africa du Sud; Azores; Canaries; Cape Verde Island; Principe; St. Tomé and Annobon. Western Atlantic: Brazil, Fernando de Noronha (Forest and Guinot, 1966; Coêlho, 1969b).

Remarks

Unfortunately Coêlho (1969b) did not indicate the bibliographic source he used to identify this species. Forest and Guinot's (1966) paper did not mention that the geographical distribution of this species included Brazil. Rathbun (1918) reported that P. planissimum described by Miers in 1878 and by herself in 1900 was synonymous with P. gibbesi.

Family Ocypodidae

Ocypode quadrata (Fabricius, 1787).

Ocypode arenaria, Pocock, 1890, p. 512.

Ocypode albicans, Rathbun, 1918, p. 367, pls. 127-128.

Ocypode quadrata, Williams, 1965, p. 225, fig. 208.

Material

Two males, collected at Boldró Beach (3) on Aug. 8, 1968; 1 male, collected at Sueste Bay (14) on Aug. 7, 1968.

Distribution

Western Atlantic: Block Island, Rhode Island; Massachusetts; North Carolina; Florida; Texas; Mexico; Honduras; Bermudas; Bahamas; Caribbean Sea; Nicaragua; Brazil, from Maranhão to Santa Catarina in the south (Rathbun, 1918; Williams, 1965).

Remarks

This ghost crab is not abundant in the Archipelago. However, it seems to exist in greater abundance in Sueste Bay (14) than in Boldró Beach (3).

On the coast of northeast Brazil it is extremely abundant on sandy beaches.

Family Majidae

Teleophrys pococki Rathbun, 1925.

Mithrax (Teleophrys) crisulipes, Pocock, 1890, p. 508.

Mithrax crisulipes, Moreira, 1901, p. 63.

Teleophrys pococki Rathbun, 1925, p. 443, pl. 159, figs. 5-6.

Material

None.

Distribution

Western Atlantic: Curaçao and Brazil, Pernambuco Maceió, and Fernando de Noronha (Rathbun, 1925).

Remarks

This spider crab was recorded for the Archipelago by Pocock (1890) with some uncertainty as Mithrax (Teleophrys) cristulipes (Stimpson, 1860). Moreira also (1901) identified the specimens from the northeast coast of Brazil by using Pocock's (1890) paper. According to Rathbun (1925), T. pococki is a different species than Teleophrys cristulipes Stimpson which is found on the Pacific Coast, being distributed from lower California, Mexico to Panama Bay. Rathbun also (1925) stated that the Brazilian crab is found in sponges and coral reefs.

Teleophrys ornatus Rathbun, 1901.

Mithrax sp. Miers, 1886, p. 89, pl. 10.

Teleophrys ornatus Rathbun, 1901, p. 65, text-fig. 11.

Material

None.

Distribution

Western Atlantic: Yucatan Channel; West Indies and Brazil, Fernando de Noronha (Rathbun, 1925).

Remarks

During the "Challenger" Expedition this majid was collected between depths of 14 and 40 meters around the Archipelago (Miers, 1886).

Up to now, there has been no record of this species for the continental shelf of the northeast coast of Brazil.

Pitho lherminieri (Schramm, 1867)

Pitho lherminieri, Rathbun, 1925, p. 362, pl. 128, figs. 1-2; pl. 129, fig. 1-2; pl. 252, fig. 2

Pitho lherminieri, Williams, 1965, 246, fig. 224.

Material

One female, collected at Sueste Bay (14) on Aug. 7, 1968.

Distribution

Western Atlantic: off Beaufort Islet, North Carolina; West Indies; Florida; Vera Cruz, Mexico and Brazil, Ilha de São Sebastião (São Paulo) (Williams, 1965).

Remarks

Only one specimen was collected in the islands by the author by dredging through a sandy bottom about 5 meters of water. According to Williams (1965) this spider crab may reach depths from "one-half to 56 meters, rarely 240 meters." Coêlho (1969b) reported that this species lives in the Archipelago from the intertidal zone to a depth of 49 meters.

The living specimens have an almost uniform reddish color.

On the continental shelf of the northeast coast of Brazil this spider crab is relatively abundant and is found on calcareous algae bottoms, at depths of 15 to 20 meters.

Mithrax (Mithraculus) forceps (A. Milne-Edwards), 1875).

Mithrax forceps, Miers, 1886, p. 87.

Mithrax forceps, Rathbun, 1901, p. 70.

Mithrax (Mithraculus) forceps, Rathbun, 1925, p. 431, pl. 156.

Material

None.

Distribution

Western Atlantic: Bermudas; from Cape Hatteras, North Carolina through the Gulf of Mexico and Brazil, Fernando de Noronha and Rio de Janeiro (Miers, 1886; Williams, 1965).

Remarks

This spider crab was reported to occur in the Archipelago by Miers (1886) who described specimens from the Challenger Expedition that were collected at depths from 14 to 50 meters. Moreira (1901) and Rathbun (1901, 1925) stated that this crab occurred on the northeast, central, and southern coasts of Brazil, at Pernambuco, Rio Grande do Norte, Bahia and Rio de Janeiro. Williams (1965) in his

paper also did not mention the occurrence of this majid from the Archipelago. Coêlho (1969b) collected this majid crab from the Archipelago at depths between 20 and 50 meters.

Mithrax (Mithraculus) sculptus (Lamarck, 1818).

Mithrax sculptus, Miers, 1886, p. 44.

Mithrax sculptus, Moreira, 1901, p. 63.

Material

None.

Distribution

Western Atlantic: Bahamas; and from Florida to Brazil, Rio Grande do Norte and Abrolhos (Rathbun, 1925; Fausto-Filho, 1967b).

Remarks

Up to now this majid has been recorded from the islands only by Miers (1886) and Moreira (1901). According to these authors these spider crabs were captured from depths of 14 to 40 meters.

Fausto-Filho (1967b) recorded the occurrence of this species on the northeast coast of Brazil. Prior to this, the species was known to occur no further north than Abrolhos, Bahia, east coast of Brazil, where they are found down to depths of 60 meters (Rathbun, 1925).

Mithrax (Mithraculus) coryphe (Herbst, 1785).

Mithrax (Mithraculus) coronatus, Pocock, 1890, p. 510.

Mithrax coronatus, Miers, 1886, p. 87.

Mithrax coronatus, Moreira, 1901, p. 68.

Mithrax (Mithraculus) coryphe, Rathbun, 1925, p. 425, pl. 153.

Mithrax (Mithraculus) coryphe, Rathbun, 1933, p. 31.

Material

None.

Distribution

Western Atlantic: Bahamas; from Miami, Florida to Brazil, Fernando de Noronha and São Paulo (Rathbun, 1925, 1933).

Remarks

The occurrence of this majid crab in the Archipelago was reported by Miers (1886). It was collected at depths from 14 to 40 meters. Moreira (1901) stated that this species occurred from Florida to Pernambuco, northeast Brazil. Rathbun (1925) extended the range of distribution of this spider crab by recording it as far south as the south coast of Brazil in São Paulo. According to her, this species lives in shallow water down to depths of 60 meters.

Mithrax (Mithrax) ? verrucosus (H. Milne-Edwards, 1832).

Mithrax verrucosus, Pocock, 1890, p. 507.

Mithrax aculeatus, Rathbun, 1892, p. 264.

Mithrax aculeatus, Moreira, 1901, p. 63.

Mithrax plumosus Rathbun, 1901, p. 67.

Mithrax (Mithrax) verrucosus Rathbun, 1925, p. 400, pl. 144.

Mithrax (Mithrax) verrucosus, Rathbun, 1933, p. 30.

Mithrax (Mithrax) verrucosus, Williams, 1965, p. 255, fig.235.

Material

One carapace collected at Leão Beach (15) on Aug. 8, 1968.

Distribution

Western Atlantic: Charleston, S.C.; through the West Indies to Brazil, Fernando de Noronha (Williams, 1965).

Remarks

This spider crab was recorded for the Archipelago by Pocock (1890). Moreira (1901) identified it as M. aculeatus based on Rathbun (1892). Later, Rathbun (1901) described it as a new species, Mithrax plumosus. Subsequently (1925) this same author recognized that M. plumosus was the same species described by H. Milne-Edwards in 1832 as Mithrax verrucosus.

The material from the Archipelago was identified tentatively as this species because only the carapace was collected. But it showed most of the characteristics described by Rathbun (1901, 1925) and Williams (1965).

Williams (1965) gives some ecological notes on this majid crab. He points out that it lives near shore among rocks, where it hides in holes, and that it is nocturnal. The only carapace of this spider crab was collected among small stones on the lower shore. The color was like that of a dark red wine.

There is no record of this species for the northeast coast of Brazil and in the Archipelago it seems to be rare.

Microphrys bicornutus (Latreille, 1825).

Microphrys bicornutus, Pocock, 1890, p. 507.

Microphrys bicornutus, Rathbun, 1901, p. 72.

Microphrys bicornutus, Rathbun, 1925, p. 489, pl. 175.

Microphrys bicornutus, Rathbun, 1933, p. 37, fig. 32.

Microphrys bicornutus, Williams, 1965, 259, fig. 233.

Microphrys bicornutus, Fausto-Filho, 1967b, p. 12.

Material

Five males and 1 female (ovigerous) collected at Sueste Bay (14) on Aug. 7, 1968; 2 males collected at Atalaia Beach (13) on Aug. 8, 1968; 15 males, and 10 females (9 ovigerous) collected at Biboca Beach (16) on Aug. 12, 1968.

Distribution

Western Atlantic: near Beauford, North Carolina to Cedar Keys, Florida; Bermudas; Bahamas to Brazil, Fernando de Noronha and Santa Catarina. (Williams, 1965).

Remarks

This species was recorded from the islands by Pocock, (1890) and later by Rathbun (1925). The spider crab is very abundant in the Archipelago mainly at Biboca Beach. The individuals are found in tide pools on the lower shore. They move slowly on a substratum that is the same color as they are. The individuals stop abruptly and grip the substratum firmly when they are suddenly shaded from the sun or see something approach.

The period of reproduction for this spider crab in the Archipelago appears to be July. Williams (1965) cites Rathbun (1925) in reporting that ovigerous females have been found from March to August in the Caribbean area, and from November to January in the West Indies, Venezuela, and Brazil.

The color of the living specimens of the crab was gray or brownish-gray and the part of the carapace under the hairs was reddish. The chelae were gray or reddish with scattered small gray or brown spots. It was observed that in some young males the finger of the chela is straight rather than curved.

Fausto-Filho (1967b) reported the occurrence of this species in the shallow water of the northeast coast of Brazil in which specimens were collected from the State of Rio Grande do Norte. In the littoral of Ceara this spider

crab is abundant on calcareous algae bottoms, from depths between 15 and 20 meters.

Stenocionops spinosissima (Saussure, 1857).

Stenocionops spinosissima, Coêlho, 1969b, p. 237.

Material

None.

Distribution

Western Atlantic: Southern Florida; Haiti; West Indies and Brazil, Fernando de Noronha and Rio de Janeiro (Rathbun, 1925; Coêlho, 1969b).

Remarks

This species was recorded from the Archipelago by Coêlho (1969b). The number of specimens, locality, depth and type of bottom were not mentioned. This spider crab has not been recorded yet for the northeast coast of Brazil, even though it is found further south.

Macrocoeloma ? subparallelum (Stimpson, 1860).

Macrocoeloma subparallela, Miers, 1886, p. 79.

Macrocoeloma subparallelum, Rathbun, 1901, p. 74.

Macrocoeloma subparallelum, Rathbun, 1925, p. 48, pl. 172.

Material

One female, collected at Sueste Bay (14) on Aug. 11, 1968.

Distribution

Western Atlantic: Cuba; Jamaica; Haiti; Puerto Rico; Guadeloupe; Barbados; Old Providence Island, and the Caribbean region (Rathbun, 1925).

Remarks

This seems to be the first record of the species for the Archipelago and Brazilian coast. Before this date this majid crab was known only in the Caribbean, West Indies, from Cuba to Old Providence Island, Columbia. Although most of the characteristics of the specimen from the islands agree with the Rathbun (1925) description, the spines of the internal corner of the basal joint of the antenna are visible in dorsal view, under the rostral horns.

In the living animal the color of the carapace and chelipeds is dirty yellow or brownish, the same color as the hairs that cover it.

This majid crab does not seem to be abundant in the islands.

Macrocoeloma trispinosum (Latreille, 1825).

Macrocoeloma trispinosum, Moreira, 1901, p. 64.

Material

None.

Distribution

Western Atlantic: North Carolina; Florida Keys; Gulf of Mexico; West Indies and Brazil, Fernando de Noronha (Rathbun, 1925).

Remarks

This grass crab was recorded for the Archipelago by Rathbun (1925) from specimens collected on the "Challenger" Expedition. No data about the locality, type of bottom or depths are given. Coêlho (1969b) reported the bathymetric distribution of this species to be from 49 to 59 meters.

There is no record of this majid crab from the north-east coast of Brazil.

Macrocoeloma concavum (Miers, 1886).

Macrocoeloma concava Miers, 1886, p. 79.

Macrocoeloma concavum, Moreira, 1901, p. 64.

Macrocoeloma concavum, Rathbun, 1901, p. 75.

Macrocoeloma concavum, Rathbun, 1925, p. 487, pl. 170, fig. 3; pl. 171, fig. 3.

Material

None.

Distribution

Western Atlantic: Puerto Rico and Brazil, Cape St. Roque, Bahia and Fernando de Noronha (Miers, 1886; Moreira, 1901).

Remarks

This species was described and recorded for the Archipelago by Miers (1886). The islands are the type locality of this species which was collected in depths of 14 to 40 meters.

According to Rathbun (1925) the material from the continental shelf of northeast Brazil, Cape St. Roque, was collected at a depth of 40 meters. Coêlho (1969b) reported that this majid is found in northern Brazil in the States of Maranhão and Piauí. In these localities the species was collected at depths between 52 and 80 meters on detritus and calcareous algae bottoms.

Aepinus septemspinosus (A. Milne-Edwards, 1879).

Apocremus septemspinosus, Miers, 1886, p. 17.

Apocremus septemspinosus, Moreira, 1901, p. 67.

Aepinus septemspinosus, Rathbun, 1901, p. 54.

Aepinus septemspinosus, Rathbun, 1925, p. 92, pl. 32, figs. 3-4, pl. 219, figs. 1-3.

Aepinus septemspinosus, Coêlho, 1969b, p. 236.

Material

None.

Distribution

Western Atlantic: Bahama Bank; Straits of Florida; Gulf of Mexico; St. Thomas; Puerto Rico and Brazil, mouth of the Amazon River and Fernando de Noronha (Rathbun, 1925; Coêlho, 1969b).

Remarks

This species was recorded for the islands by Miers (1886) and collected from a depth of 74 meters. Moreira (1901) gave no details about this species. Rathbun (1925) reported that it could be found at depths from 15 to 37 meters in the Bahamas, Gulf of Mexico, St. Thomas and Puerto Rico. Coêlho (1969b) collected it from depths of 17 to 85 meters on bottoms of sand, calcareous algae, and mud on the continental shelf of the north and northeast coasts of Brazil.

Hemus cristulipes A. Milne-Edwards, 1785.

Hemus cristulipes, Coêlho, 1969b, p. 237.

Material

None.

Distribution

Western Atlantic: Gulf of Mexico; Central America; Puerto Rico; Curaçao and Brazil, Tutoia (Maranhão) and Fernando de Noronha (Coêlho, 1969b).

Remarks

The record of this species for the northeast coast of Brazil, and Fernando de Noronha Archipelago is based on a report by Coêlho (1969b). According to this author the spider crab was found on substrata of calcareous algae and mud from depths of 47 to 69 meters. Rathbun (1925), referring to the specimens from the Caribbean region, reported that they ranged from depths of 2 to 27 meters.

Eucinetopus garthi Castro, 1953.

Eucinetopus garthi, Coêlho, 1966, p. 139.

Material

None.

Distribution

Western Atlantic: Brazil, Piedade (Pernambuco), Atalaia (Fernando de Noronha) and Guaratiba (Rio de Janeiro) (Coêlho, 1966).

Remarks

Prior to 1966 this species was known only from Rio de Janeiro, southern Brazil. Recently Coêlho (1966) reported it from the Archipelago and Pernambuco, northeast Brazil. In an ecological note Coêlho stated that it was found covered by algae in the islands and by sponges in Piedade, Pernambuco.

Picroceroides tubularis Miers, 1866.

Picrocaroides tubularis Miers, 1886, p. 77.

Picroceroides tubularis, Moreira, 1901, p. 64.

Picroceroides tubularis, Rathbun, 1901, p. 76.

Picroceroides tubularis, Rathbun, 1925, p. 354, pl. 126;
pl. 254, figs. 2-5.

Picroceroides tubularis, Coêlho, 1969b. p. 236.

Material

None.

Distribution

Western Atlantic: North Carolina; South Carolina; Bahama Banks; Florida; Mexico; Cuba; Jamaica; Puerto Rico; Lesser Antilles; West Indies; Caribbean Sea and Brazil, Turiagu (Maranhão), Ceará State (Acarauá, Paracuru, Fortaleza and Aracati), Rio Grande do Norte State (Macau and Cape St. Roque), Fernando de Noronha, Bahia, and Islet of São Sebastião in São Paulo (Coêlho, 1969b).

Remarks

This species was described and recorded for the Archipelago by Miers (1886) during the "Challenger" explorations. It is reported for the northeast Brazilian coast by Rathbun (1901, 1925). Moreira (1901) cited Mier's (1886) paper in reporting that this species was collected in shallow water in the islands. According to Rathbun (1925) the

specimens collected from the Brazilian coast, except from Bahia, were captured at depths of 10 to 40 meters. According to Coêlho (1969b) the material from the north and northeast coast of Brazil was collected at depths of 41 and 71 meters on detritus and on calcareous algae bottoms, respectively.

Family Gecarcinidae

Gecarcinus lagostoma A. Milne-Edwards, 1837.

Gecarcinus lagostoma, Moreira, 1901, p. 49.

Gecarcinus lagostoma, Rathbun, 1918, p. 361, pls. 125-126.

Gecarcinus lagostoma, Fausto-Filho, 1966, p. 34.

Material

One female collected at Atalaia Beach (13) on March 6, 1963; 1 male and 2 females, collected on Aug. 7, 1968.

Distribution

Indian Ocean: Australasia; Mauritius; and Madagascar.
Eastern Atlantic: Ascension Island. Western Atlantic: Antilles; West Indies; Trinidad; and Brazil, Fernando de Noronha (Rathbun, 1918; Forest and Guinot, 1966).

Remarks

Branner in 1887, cited by Moreira (1901), was the first to report this species from the Archipelago. Pocock (1890) did not mention that this land crab occurred in the islands although it is relatively abundant on them. Possibly Pocock, when examining Ridley's notes, confused this species with

Carpilius corallinus since he referred to C. corallinus as a land crab, which it is not. Although Gecarcinus lagostoma is abundant on the islands, its biology and ecology are not well known. Even the data on its geographic distribution are not complete. Rathbun (1918) doubted the occurrence of this crab in Bermuda since Verrill (1908) had not mentioned it when he described the geographic distribution and origin of the Bermudan decapod fauna. According to Forest and Guinot (1966) this land crab occurs in the Antilles also.

The fishermen of the Archipelago say that these crabs live on land in holes and they come to the sea only to wet and release the eggs during the rainy season. The beaches where the crabs have been seen to release eggs most frequently are Buracão (1), Sancho (2), Boldró (3), Conceição (4), Biboca (6), Ilha Rata (10), Pontinha (12), Atalaia (13), Sueste (14), Leão (15) and Sapata (16).

The color of the living individuals is dark red, brownish or yellow. The last color is seen more frequently in females.

There is no record of this species from the northeast coast of Brazil.

DISCUSSION

Distribution and Ecology

Although research on the carcinological fauna of the Archipelago has only just begun, it is apparent that these islands have relatively rich fauna, especially if we consider the small size of the islands, their distance from the mainland and their origin. These preliminary findings show that a certain number of scientific expeditions are still necessary to increase our knowledge of the marine fauna of the Archipelago and to complement previous discoveries. Many aspects of the biology, ecology, distribution and systematics of the species need to be studied more accurately. The same could be said for the oceanographic and geologic features of the Archipelago.

Some general oceanographic and physical characteristics of the beaches on the islands that form the Archipelago are shown in Figure 1 and Table 1. The collecting localities, the scientific names, and the zonation of the species are shown in Table 2. The intertidal and subtidal distribution of the species are shown in Table 3.

The data obtained by the author and his collaborators and from the literature show that the groups of crustaceans studied are more concentrated on the windward side of the Archipelago (Table 2). Of the 66 species and subspecies

TABLE 1. Characteristics and numbers of the collecting localities explored on the Archipelago of Fernando de Noronha, Brazil.

COLLECTING LOCALITIES	NUMBERS	CHARACTERISTICS
Buracão	1	rocky and cliffed beach
Sancho	2	rocky and cliffed beach
Boldro'	3	sandy and rocky beach
Conceição	4	sandy beach
Cachorro	5	rocky beach
Biboca	6	rocky beach with scattered boulders
Santo Antônio	7	sandy beach and scattered boulders
Chapeu Nordeste	8	rocky beach and boulders
Ilha Raza	9	rocky and cliffed beach
Ilha Rata	10	rocky and cliffed beach
Caieira	11	rocky beach with scattered boulders and reefs of vermetids and calcareous algae
Pontinha	12	rocky beach
Atalaia	13	rocky beach with reefs of vermetids and calcareous algae
Sueste	14	sandy and rocky beach with scattered boulders
Leão	15	rocky beach with boulders and reefs of vermetids and calcareous algae
Sapata	16	rocky and cliffed beach

TABLE 2. Stomatopods and decapods collected by the author or listed in earlier reports. -- The abundance and the intertidal or subtidal location of each species is given (C-common, U-uncommon, R-rare, X-degree of abundance not given in earlier reports, ?-collecting locality not specified). The localities in which they were collected are given by numbers (See Table 1).

ORDERS, FAMILIES AND SPECIES	COLLECTING LOCALITIES																ZONATION							
	LEE SIDE								WINDWARD SIDE								UPPER SHORE	MIDDLE SHORE	LOWER SHORE	SUB-TIDAL				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16								
Stomatopoda																								
Squillidae																								
<u>Meiosquilla tricarinata</u> (Holthuis)																								X
<u>Gonodactylus minutus</u> Manning																							C	X
<u>Gonodactylus austrinus</u> Manning																			R			C		X
Decapoda																								
Sergestidae																								
<u>Lucifer faxoni</u> Borradaile																								X
Penaeidae																								
<u>Artemesia longinaris</u> Bate																								X
Alpheidae																								
<u>Alpheus bouvieri</u> A.Milne-Edwards																	U							X
<u>Alpheus cristulifrons</u> Rathbun																					R			X
<u>Alpheus ? rostratipes</u> Pocock																			R					X
<u>Alpheus ridleyi</u> Pocock																								?
<u>Alpheus panamensis</u> Kingsley																								?
<u>Synalpheus minus</u> (Say)																								X
Stenopodidae																								
<u>Microprosthema semilaeve</u> (von Martens)																							C	X

TABLE 2. (Continued)
Stomatopods and decapods collected.

ORDERS. FAMILIES AND SPECIES	COLLECTING LOCALITIES																ZONATION			
	LEE SIDE								WINDWARD SIDE								UPPER SHORE	MIDDLE SHORE	LOWER SHORE	SUB-TIDAL
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16				
<u>Stenopus hispidus</u> (Olivier)									X											X
<u>Stenopus scutellatus</u> Rankin																				X
Palinuridae																				
<u>Panulirus argus</u> (Latreille)	U	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R				R
<u>Panulirus echinatus</u> Smith	R	U	U	R	R	U	R	R	U	U	R	C	U	U	U	U				U
<u>Panulirus laevicauda</u> (Latreille)	C	C	C	U	U	C	C	U	C	C	U	U	C	C	C	C				C
Callianassidae																				
<u>Upogebia noronhensis</u> Fausto-Filho														C				C	U	?
Galatheidae																				
<u>Munida spinifrons</u> Henderson																				X
Porcellanidae																				
<u>Petrolisthes ? serratus</u> Henderson															C		R	C	U	?
<u>Petrolisthes armatus</u> (Gibbes)																				?
<u>Pachycheles riisei</u> (Stimpson)																				?
Diogenidae																				
<u>Clibanarius tricolor</u> (Gibbes)								X									C	C		
<u>Calcinus tibicen</u> (Herbst)																				?
<u>Dardanus venosus</u> (H. Milne-Edwards)																				X
Paguridae																				
<u>Pagurus brevidactylus</u> (Stimpson)																				X

TABLE 2. (Continued)
Stomatopods and decapods collected.

ORDERS, FAMILIES AND SPECIES	COLLECTING LOCALITIES																ZONATION			
	LEE SIDE								WINDWARD SIDE								UPPER SHORE	MIDDLE SHORE	LOWER SHORE	SUB-TIDAL
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16				
<u>Pagurus provenzanoi</u> Forest and S. Laurent Hippidae																				X
<u>Hippa cubensis</u> (Saussure) Raninidae			C															C		
<u>Symethis variolosa</u> (Fabricius) Callappidae																				X
<u>Calappa gallus</u> (Herbst)																				X
<u>Cycloes bairdii</u> Stimpson Portunidae																				X
<u>Portunus ordwayi</u> (Stimpson) Xanthidae																				X
<u>Carpilius corallinus</u> (Herbst)										U										U
<u>Platypodia spectabilis</u> (Herbst)											C		R	U				U	U	X
<u>Leptodius parvulus</u> (Fabricius)								U			U		C	C			R	C	U	?
<u>Leptodius floridanus</u> (Gibbes)											C	U	U	C				C	R	X
<u>Actaea acantha</u> (H. Milne-Edwards)																			R	X
<u>Panopeus harttii</u> Smith Hapalocarcinidae														R				R		
<u>Cryptochirus corallicola</u> (Verrill)																				X

TABLE 2. (Continued)
Stomatopods and decapods collected.

ORDERS, FAMILIES AND SPECIES	COLLECTING LOCALITIES																ZONATION			
	LEE SIDE								WINDWARD SIDE								UPPER SHORE	MIDDLE SHORE	LOWER SHORE	SUB-TIDAL
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16				
Grapsidae																				
<u>Pachygrapsus transversus</u> (Gibbes)											R							R		
<u>Grapsus grapsus</u> (Linnaeus)			C	U	C	C		U			C		C	C	C		R	U	C	?
<u>Cyclograpsus interger</u> (H.Milne-Edwards)											C		R	C			C			
<u>Geograpsus lividus</u> (H.Milne-Edwards)													R	R			R			
<u>Plagusia depressa</u> (Fabricius)													U						U	?
<u>Percnon ? gibbesi</u> (H.Milne-Edwards)											U		U	C				R	C	
<u>Percnon planissimum</u> (Herbst)																	X	X	X	
Ocypodidae																				
<u>Ocypode quadrata</u> (Fabricius)			R												U					
Majidae																				
<u>Teleophrys pococki</u> Rathbun																				?
<u>Teleophrys ornatus</u> Rathbun																				X
<u>Pitho lherminieri</u> (Schramm)															R					R
<u>Mithrax forceps</u> (A.Milne-Edwards)																				X
<u>Mithrax sculptus</u> (Lamarck)																				X
<u>Mithrax coryphe</u> (Herbst)																				X
<u>Mithrax ? verrucosus</u> (H.Milne-Edwards)																R			R	
<u>Microphrys bicornutus</u> (Latreille)						C							U	C				U	C	?

TABLE 2. (Continued)
Stomatopods and decapods collected.

ORDERS, FAMILIES AND SPECIES	COLLECTING LOCALITIES																ZONATION					
	LEE SIDE								WINDWARD SIDE								UPPER SHORE	MIDDLE SHORE	LOWER SHORE	SUB-TIDAL		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16						
<u>Stenocionops spinosissima</u> (Saussure)																					?	
<u>Macrocoeloma ? subparallelum</u> (Stimpson)														R							R	?
<u>Macrocoeloma trispinosum</u> (Latreille)																						?
<u>Macrocoeloma trispinosum</u> <u>nodipes</u> (Desbonne)																						?
<u>Macrocoeloma concavum</u> (Miers)																						X
<u>Aepinus septemspinosus</u> (A.Milne-Edwards)																						X
<u>Hemus cristulipes</u> (A.Milne-Edwards)																						X
<u>Eucinetopus garthi</u> Castro														X								?
<u>Picroceroides tubularis</u> Miers																						X
Gecarcinidae																						
<u>Gecarcinus lagostoma</u> A.Milne-Edwards														C					C			

TABLE 3. Bathymetric distribution of the stomatopods and decapods of the Archipelago of Fernando de Noronha, Brazil, based on original and earlier data.

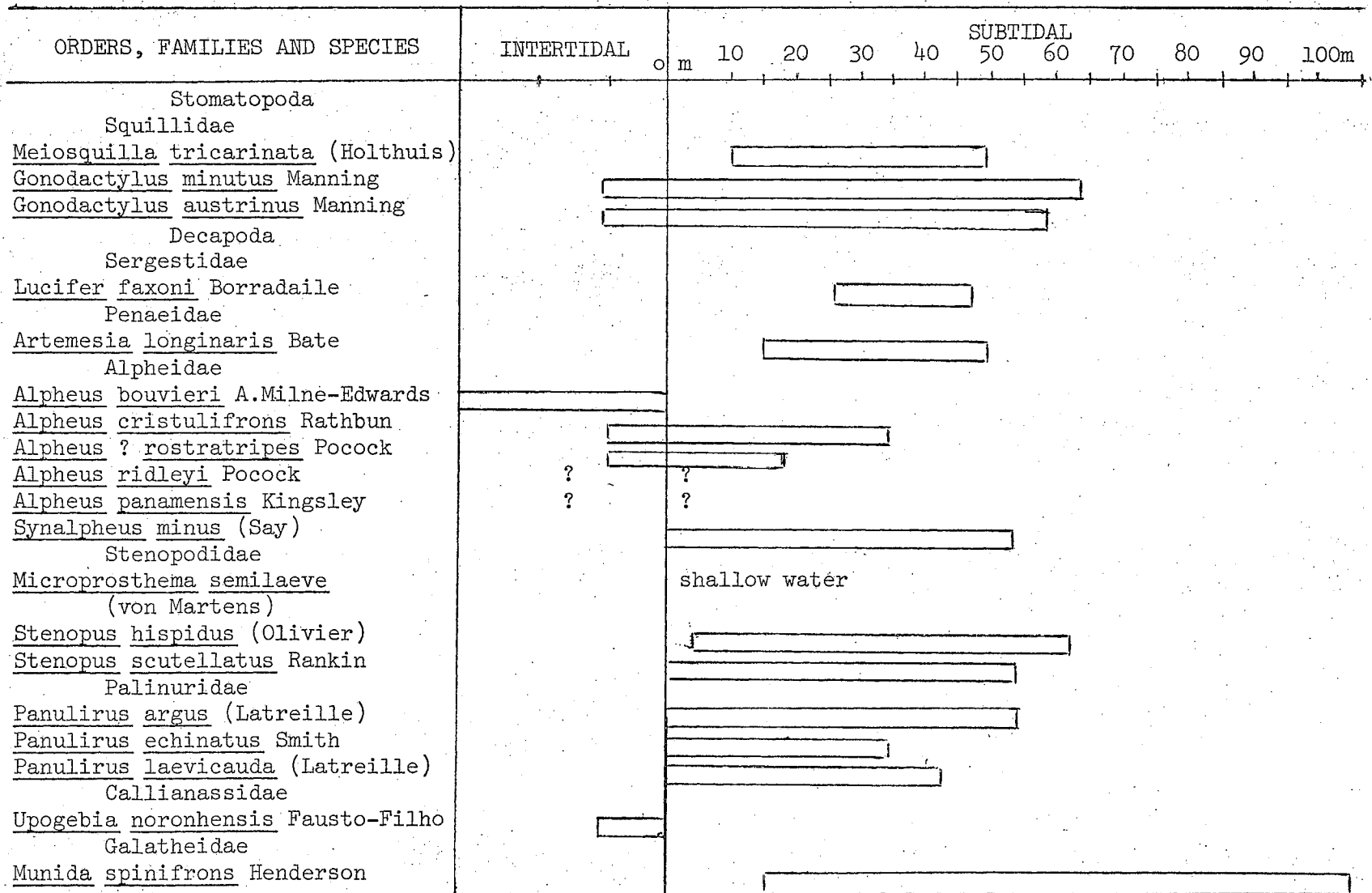


Table 3. (Continued)
Bathymetric distribution of stomatopods and decapods.

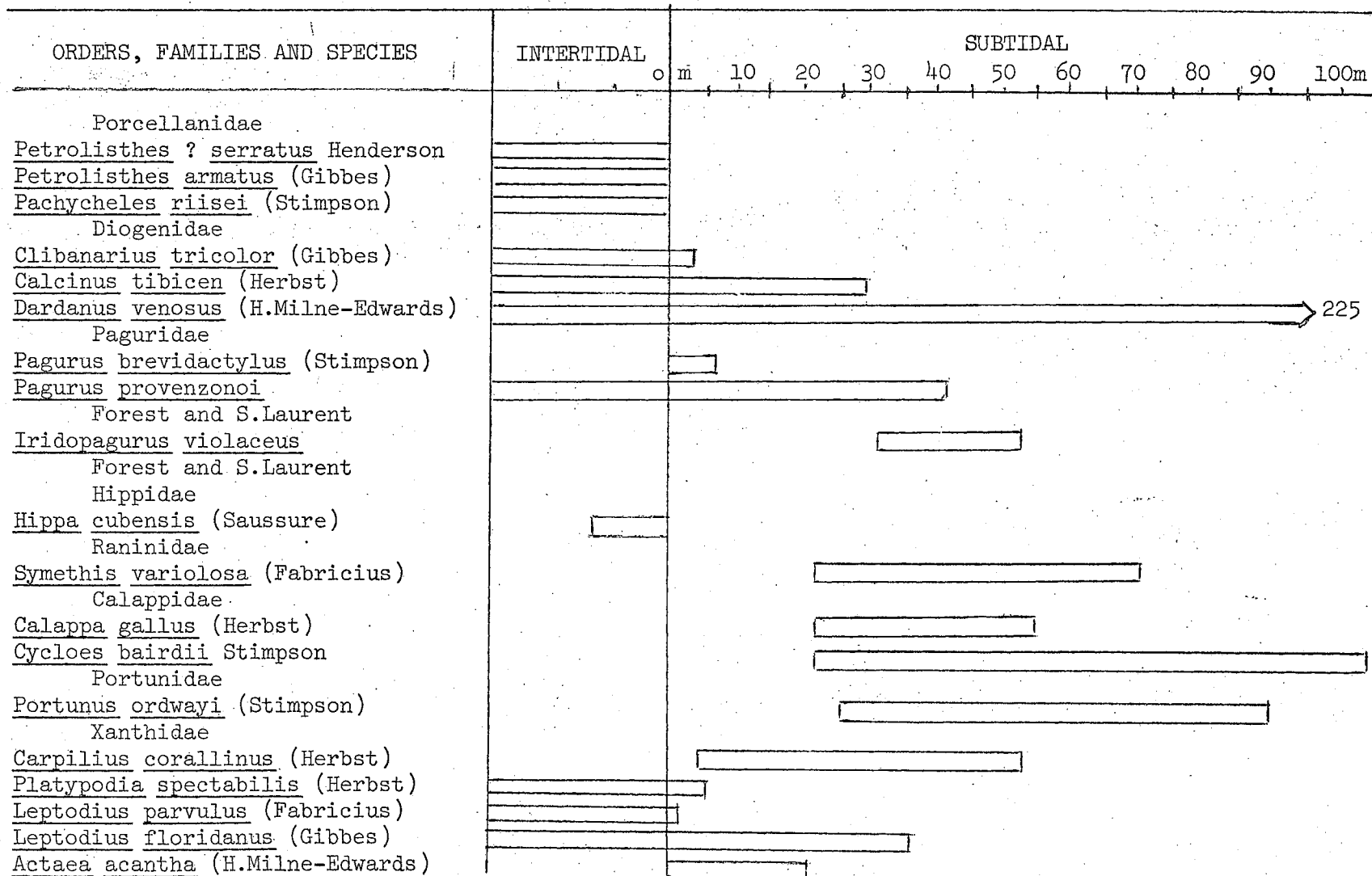


TABLE 3. (Continued)
Bathymetric distribution of stomatopods and decapods.

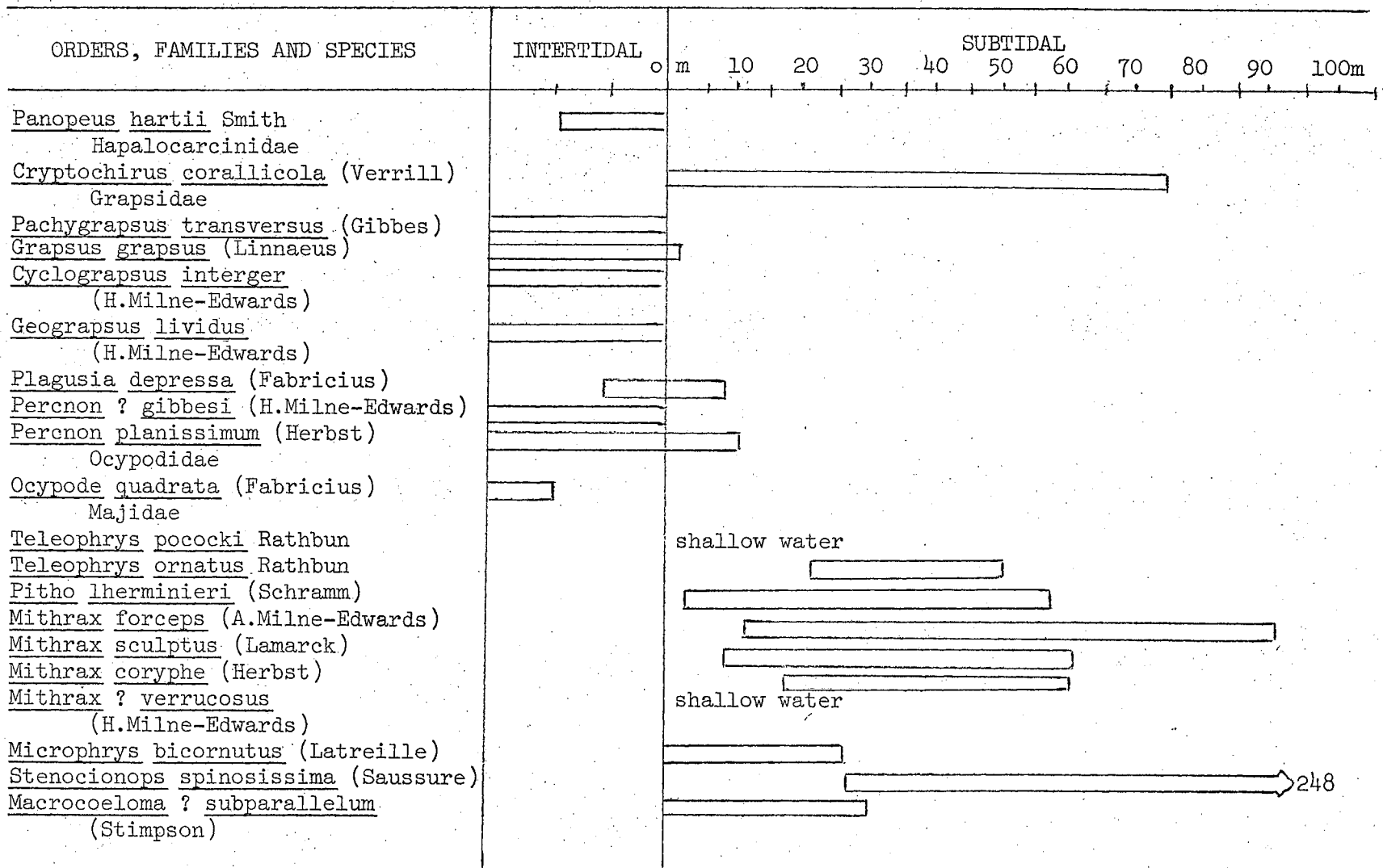
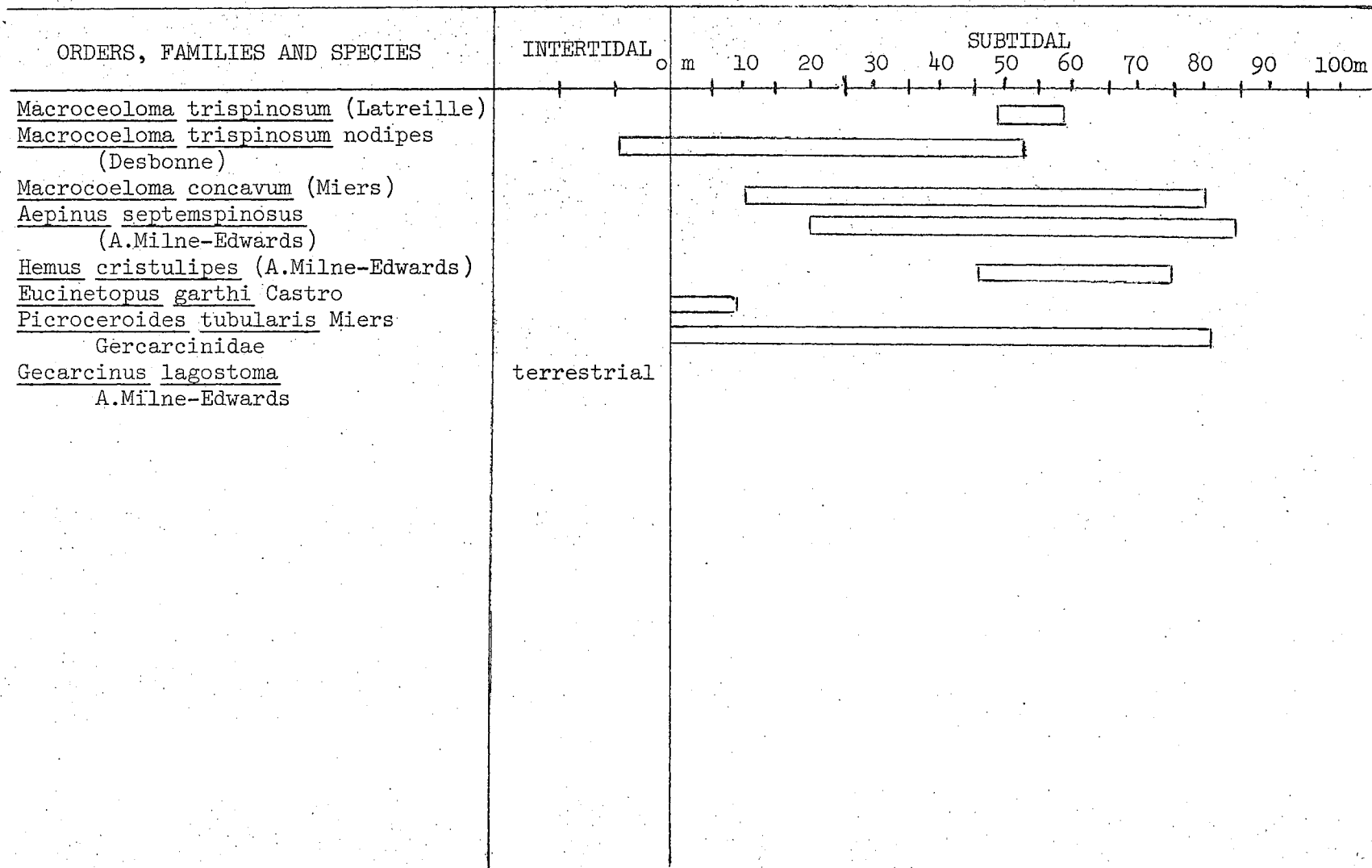


TABLE 3. (Continued)
Bathmetric distribution of stomatopods and decapods.



occurring on the islands, the exact collecting localities of only 32 are known. Out of these 32 species, 30 species (93%) occur on the windward side of the islands and seven species occur on both sides. Only nine species are found on the leeward side and of these only two have been shown to occur exclusively in that area.

The large concentration and abundance of the species on the windward side of the islands could be explained by the fact that this area is affected by strong surf, currents and winds.

The combined action of these meteorological and oceanographic elements results in a high degree of erosion of the volcanic rocks of the Archipelago, as well as the formation of small bays. The presence of these factors may explain the large formation of reefs made up of vermetid mollusks and melobesoid algae on the main island of the Archipelago. The subsequent microenvironment that is formed as a result of these associations provides an enormous amount of substratum and food supply for many wandering organisms. Reefs formed by vermetids and melobesoids are found principally in the beaches of Caieira (11), Leão (15) and Atalaia (13) (Table 1). The formation of these beaches, as well as those of Sueste Bay (14), and Pontinha (12) was due probably to the interaction of the previously mentioned factors.

According to Ricketts and Calvin (1968), these beaches could be classified as follows: Caieira and Atalaia

beaches form almost a single enclosed bay; Sueste could be a typical enclosed bay, and Pontinha a stretch of protected outer coast. These kinds of beaches are highly favorable to the establishment of prosperous ecosystems that are characterized by organisms that require a strong surf, or at the other extreme, a high degree of protection against the surf, such as that of Sueste. This may explain why the greatest numbers of animals captured occur in those bays (Table 2).

On the leeward side of the Archipelago most of the beaches are characterized as cliffed beaches or rocky beaches with large contiguous boulders or scattered small boulders. A few, like Conceição (4), and Boldró (3), are sandy beaches. On these beaches the carcinological fauna is poorly represented but there is a good distribution of palinurids, grapsids, hippids and ocypodids. The palinurids are abundant subtidally, the grapsids are widely distributed intertidally and the hippids and ocypodids are frequently found on the sandy beaches in the intertidal zone. The few remaining groups reported as occurring on this side are most of the species that live in deep water, such as the majids and palinurids. The xanthids are poorly represented probably due to the absence or sufficiently eroded or rolled stones, or an inappropriate substratum. The same could be said for the alpheids, diogenids, pagurids and stomatopods. But among the xanthids and gonodactylids, the species Platypodia spectabilis, Leptodius parvulus and Gonodactylus minutus are

abundant intertidally, on the windward side of the islands where the appropriate substrata are available. The lack of sufficient data on the distribution of the planktonic and benthonic groups such as the sergestids, palinurids, stenopodids, portunids, penaeids and most of the majids precludes a more detailed discussion about their distribution around the islands. However, the penaeids seem to be scarce in the islands because this group generally requires soft mud bottoms, which are completely absent around the Archipelago.

The climatic conditions of the Archipelago could be considered one important factor in determining the presence or absence of some species during certain times of the year. For example, this could explain why relatively few species have been collected or reported during the rainy season (February to July). During this period of time the water is murky, and most of the species seem to be hiding. However, it is also difficult to reach the beaches and to collect material during this season of the year. In contrast, during the dry season, from August to January, the water is clean, excellent for diving, and the weather is ideal for collecting and studying the species in detail, especially those from the intertidal zone.

Differences in color and reproductive seasons exist between some species from the Archipelago and similar ones from the continental shelf. These may be explained by differences in climatic, oceanographic and ecological conditions.

Zoogeography

The general features of the zoogeographic distribution of the species from the Archipelago are listed in Table 4.

In this paper the demarcation of the zoogeographic regions is based on the papers of Verrill (1908), Ekman (1953), Holthuis (1959), Williams (1965), Fausto-Filho (1967a) and Coêlho (1969b).

Verrill (1908) considered the Bermudan decapod fauna to be an offshoot of the Caribbean fauna. Ekman (1953) included it in the Caribbean region, an area that ranges from the Guianas to Cape Hatteras, North Carolina, and includes the Antilles. Williams (1965) classified the area between northeast Florida and Cape Hatteras as the Carolinian Province. Although in this paper this latter zoogeographic division is not being used, it deserves to be mentioned because it corresponds to the northern limit of the Caribbean region of Ekman (1953).

Fausto-Filho (1967a) identified the northern region of Brazil as that part of the continental shelf located between the Oiapoque River and the Parnaíba River and the northeast region as that area that is contained between the São Francisco River and Parnaíba River. As these areas are the closest geographically to the islands, they merit more detailed discussion. These two regions are very distinctive natural areas. The former is influenced by a high volume of

TABLE 4. Geographic distribution of the stomatopods and decapods of the Archipelago of Fernando de Noronha, Brazil.--Regions are: South Brazil, from Cabo Frio to Chui River; Northeast Brazil, from São Francisco River to Parnaíba River; North Brazil, from Parnaíba River to Oiapoque River; Caribbean Region, from French Guiana to Cape Hatteras; Eastern U.S.A., from North Carolina to Bay of Fundy; Africa, from Morocco to the Cape of Good Hope; Panama, from Colombia to Guatemala; other regions, the West Coast of the Americas, the Indo-Pacific, etc.

ORDERS, FAMILIES AND SPECIES	WESTERN ATLANTIC					AFRICA	PACIFIC	
	SOUTH BRAZIL	NORTHEAST BRAZIL	NORTH BRAZIL	CARIBBEAN REGION	EASTERN U.S.A.		PANAMA	OTHER REGIONS
Stomatopoda								
Squillidae								
<u>Meiosquilla tricarinata</u> (Holthuis)				X				
<u>Gonodactylus minutus</u> Manning		X						
<u>Gonodactylus austrinus</u> Manning								
Decapoda								
Sergestidae								
<u>Lucifer faxoni</u> Borradaile	X	X	X	X				X
Penaeidae								
<u>Artemesia longinaris</u> Bate	X							
Alpheidae								
<u>Alpheus bouvieri</u> A.Milne- Edwards						X		
<u>Alpheus cristulifrons</u> Rathbun		X				X		
<u>Alpheus ? rostratipes</u> Pocock						X		
<u>Alpheus ridleyi</u> Pocock							?	
<u>Alpheus panamensis</u> Kingsley							X	
<u>Synalpheus minus</u> (Say)		X	X	X				

TABLE 4. (Continued)
Geographic distribution of stomatopods and decapods.

ORDERS, FAMILIES AND SPECIES	WESTERN ATLANTIC					EASTERN ATLANTIC	PACIFIC	
	SOUTH BRAZIL	NORTHEAST BRAZIL	NORTH BRAZIL	CARIBBEAN REGION	EASTERN U.S.A.	AFRICA	PANAMA	OTHER REGIONS
Stenopodidae								
<u>Microprosthema semilaeve</u> (von Martens)				X				
<u>Stenopus hispidus</u> (Olivier)		X		X				X
<u>Stenopus scutellatus</u> Rankin		X	X					
Palinuridae								
<u>Panulirus argus</u> (Latreille)	X	X	X	X				
<u>Panulirus echinatus</u> Smith		X				X		
<u>Panulirus laevicauda</u> (Latreille)	X	X	X	X				
Callianassidae								
<u>Upogebia noronhensis</u> Fausto-Filho								
Galatheidae								
<u>Munida spinifrons</u> Henderson								
Porcellanidae								
<u>Petrolisthes ? serratus</u> Henderson		X						
<u>Petrolisthes armatus</u> (Gibbes)	X	X	X	X	X	X		X
<u>Pachycheles riisei</u> (Stimpson)		X	X					
Diogenidae								
<u>Clibanarius tricolor</u> (Gibbes)				X				
<u>Calcinus tibicen</u> (Herbst)		X	X		X			
<u>Dardanus venosus</u> (H. Milne-Edwards)		X	X	X				

TABLE 4. (Continued)
Geographic distribution of stomatopods and decapods.

ORDERS, FAMILIES AND SPECIES	WESTERN ATLANTIC					EASTERN ATLANTIC	PACIFIC	
	SOUTH BRAZIL	NORTHEAST BRAZIL	NORTH BRAZIL	CARIBBEAN REGION	EASTERN U.S.A.	AFRICA	PANAMA	OTHER REGIONS
Paguridae								
<u>Pagurus brevidactylus</u> (Stimpson)		X		X				
<u>Pagurus provenaznoi</u> Forest and S.Laurent	?							
<u>Iridopagurus violaceus</u> Forest and S.Laurent		X						
Hippidae								
<u>Hippa cubensis</u> (Saussure)	X	X		X	X	X		
Raninidae								
<u>Symethis variolosa</u> (Fabricius)	X	X	X	X			X	
Calappidae								
<u>Calappa gallus</u> (Herbst)		X	X	X		X		X
<u>Cycloes bairdii</u> Stimpson		X	X	X				X
Portunidae								
<u>Portunus ordwayi</u> (Stimpson)		X	X	X				
Xanthidae								
<u>Carpilius corallinus</u> (Herbst)		X		X				
<u>Platypodia spectabilis</u> (Herbst)		X		X				
<u>Leptodius parvulus</u> (Fabricius)		X		X			X	
<u>Leptodius floridanus</u> (Gibbes)	X	X		X			X	
<u>Actaea acanthus</u> (H.Milne-Edwards)		X		X				
<u>Panopeus hartii</u> Smith	X	X		X				

TABLE 4. (Continued)
Geographic distribution of stomatopods and decapods.

ORDERS, FAMILIES AND SPECIES	WESTERN ATLANTIC					EASTERN ATLANTIC	PACIFIC	
	SOUTH BRAZIL	NORTHEAST BRAZIL	NORTH BRAZIL	CARIBBEAN REGION	EASTERN U.S.A.	AFRICA	PANAMA	OTHER REGIONS
Hapalocarcinidae								
<u>Cryptochirus corallicola</u> (Verrill)		X	X	X		X		
Grapsidae								
<u>Pachygrapsus transversus</u> (Gibbes)	X	X	X	X	X	X	X	X
<u>Grapsus grapsus</u> (Linnaeus)		X		X		X	X	X
<u>Cyclograpsus interger</u> (H.Milne-Edwards)		X		X				
<u>Geograpsus lividus</u> (H.Milne-Edwards)	X			X				
<u>Plagusia depressa</u> (Fabricius)		X		X		X		
<u>Percnon ? gibbesi</u> (H.Milne-Edwards)		X		X		X		X
<u>Percnon planissimum</u> (Herbst)						X		
Ocypodidae								
<u>Ocypode quadrata</u> (Fabricius)	X	X	X	X	X			
Majidae								
<u>Teleophrys pococki</u> Rathbun		X		X				
<u>Teleophrys ornatus</u> Rathbun				X				
<u>Pitho lherminieri</u> (Schramm)	X			X				
<u>Mithrax forceps</u> (A.Milne-Edwards)	X	X		X	X			
<u>Mithrax sculptus</u> (Lamarck)		X		X				
<u>Mithrax coryphe</u> (Herbst)	X	X						

TABLE 4. (Continued)
Geographic distribution of stomatopods and decapods.

ORDERS, FAMILIES AND SPECIES	WESTERN ATLANTIC					EASTERN ATLANTIC	PACIFIC	
	SOUTH BRAZIL	NORTHEAST BRAZIL	NORTH BRAZIL	CARIBBEAN REGION	EASTERN U.S.A.	AFRICA	PANAMA	OTHER REGIONS
<u>Mithrax ? verrucosus</u> (H.Milne-Edwards)				X				
<u>Microphrys bicornutus</u> (Latreille)	X			X				
<u>Stenocionops spinosissima</u> (Saussure)	X			X				
<u>Macrocoeloma ? subparallelum</u> (Stimpson)								
<u>Macrocoeloma trispinosum</u> (Latreille)				X				
<u>Macrocoeloma trispinosum</u> <u>nodipes</u> (Desbonne)		X		X				
<u>Macrocoeloma concavum</u> (Miers)		X		X				
<u>Aepinus septemspinosus</u> (A.Milne-Edwards)			X	X				
<u>Hemus cristulipes</u> (A.Milne-Edwards)			X	X				
<u>Eucinetopus garthi</u> Castro	X							
<u>Picroceroides tubularis</u> Miers	X	X	X	X				
Gecarcinidae								
<u>Gecarcinus lagostoma</u> A.Milne-Edwards				X		X		

fresh water that comes from a great number of permanent rivers that are periodically enlarged with torrential rains. The continental shelf in this region is wide and its bottom is composed primarily of mud. The second region is distinguished by the presence of rivers with little water and some that are periodically dry. The continental shelf in this area is comparatively narrow and has primarily a hard substratum or bottoms covered with calcareous algae. The affinities of the stomatopod and decapod fauna of the Archipelago lie more with species in this latter area. This correlation will be discussed below.

According to Coêlho (1969b), Balech in 1951 divided the South American continent into four provinces: Magalhanian, Argentinian, South Brazilian and Antillian. In order to simplify the discussion, one of these zoogeographic provinces will be mentioned, that is, that of Southern Brazil. This region ranges from Cabo Frio, Rio de Janeiro to the State of Rio Grande do Sul. According to Coêlho (1969b), citing Costa (1968), the Cabo Frio region is the zoogeographic barrier that separates the Patagonian fauna from that of northeast Brazil. Due to the lack of data available, the area between the São Francisco River and Cabo Frio will be considered a transitional area or an extension of the Northeast region because it is also characterized by warm water and hard substrata. Coêlho (1969b), on the basis of the geological and biological material collected by the vessels "Canopus"

and "Almirante Saldanha", stated that zoogeographic delimitation of the littoral of Brazil is more complex than suggested by Balech in 1951. He divided the region between Macau, in the State of Rio Grande do Norte, and the Oiapoque River, including the Fernando de Noronha Archipelago, into four regions: The Guianan Province, from Cape Orange to the mouth of the Tocantins River; a transitional area, from Salinópolis to the Parnaíba River; the Tropical Brazilian Province, from Camocim to Macau; and the insular province, which includes the Fernando de Noronha Archipelago and the Atol da Rocas. The other zoogeographic division will be described only superficially. The eastern Atlantic includes most of the west coast of Africa, both the tropical and subtropical zones, from Morocco to the Cape of Good Hope, as well as St. Helena Island. The caribbean or West Indian region (Ekman's division) also includes the Antilles and Bermuda, and it could extend from Cape Hatteras, North Carolina to Brazil.

The eastern province of the United States ranges above Cape Hatteras while the Panamanian region includes a restricted area of the Pacific Coast of Central America around the Gulf of Panama and Colombia. "Other regions of the Pacific" are the Galapagos Islands and the Indo-Pacific. This last covers the area between the Red Sea and the Hawaiian Islands, according to Holthuis (1959).

The zoogeographic distributions of the species referred to in the text are listed in Table 4. First, it should be noted that the following species are recorded for the islands for the first time: Petrolisthes ? serratus, Panopeus harttii, Pachygrapsus transversus, Cyclograpsus interger, Geograpsus lividus, and Percnon ? gibbesi. All of them had been found prior to this in the northeast area of Brazil, except G. lividus, known to occur in the southern region of Brazil. Only two species seem to be endemic to the islands, Upogebia noronhensis and Munida spinifrons. On the other hand, many species known to occur on the mainland do not occur in the Archipelago, primarily those that require soft mud bottoms and sea water with low salinity. There is a greater affinity between the fauna of the islands and that of the northeast coast of Brazil than between the islands and any other region. This is due to their proximity and to the fact that similarities exist between the kind of bottom and oceanographic conditions found in both areas, since both are exposed to the south equatorial current that comes from the west coast of Africa. This last factor could explain why a relatively large number of species is common to both areas. Many of these species have the kinds of larvae that can travel long distances without dying. Others are cosmopolitan or pantropical, presumably because the adults are strong swimmers and can sometimes be carried from one continent to another. Many of the grapsid crabs are in such a category.

Few species are common to both the Archipelago and northern Brazil. This could be due to the existence of barriers of water with low salinity and mud substrate. In this area the species that live in mud bottoms, the vasicolate or euryhaline species, are dominant. The predominant fauna of the islands on the other hand is stenohaline, and mud-bottom dwelling species are absent. However, the north coast of Brazil has been poorly studied and the lack of data precludes analysis in detail of its fauna or the biogeographic affinities of the area. The southern region of Brazil shows more affinity with the Archipelago than the previous area, although there are greater differences in physical and oceanographic conditions between these two areas than there are between those of the northern region and the Archipelago. The cold water found surrounding Cabo Frio in the south of Brazil and the different kinds of substrata that exist in this region constitute enormous barriers for dispersal of warm water and coral-inhabiting forms from the Archipelago and the northeast coast of Brazil. The presence of many scientific institutions in the southern region of Brazil explains why the occasional occurrence of species from other areas is so readily reported and why there is a relatively high number of species listed for this area. The same can be said if we compare the fauna of the Archipelago or that of northern Brazil with that of the Caribbean region. Almost 70 percent of the species recorded for the islands are

also found in the Caribbean region and undoubtedly one of the reasons is that a great number of marine laboratories is located in that area. However, this region also resembles more that of the Archipelago than does southern Brazil due to the fact that the temperature of the water is almost the same in both the Caribbean region and the islands. The crustacean fauna of Bermuda is also included in the Caribbean area in the present work because many species, about 27 percent that occur in the Archipelago are also found in Bermuda. Verrill (1908) stated that 68 percent of the fauna from Florida to Pernambuco, northeast Brazil, and 93 percent of that from Florida and the West Indies are represented in the Bermudan fauna. He also stated that the fauna of Bermuda "is an offshoot or colony of the West Indies fauna, with only a slight admixture of species from other regions." The author states that this is due to the flow of the Gulf Stream current that transports free-swimming larvae and animals from the Caribbean region to the Bermudas. Only a small percentage, about nine percent, of the species from the islands are found also in the eastern region of the United States. This can be explained on the basis of the region's great distance from the Archipelago and by the oceanographic barriers that exist between these two regions. Williams (1965) stated that Cape Hatteras and Cape Lookout, but mainly the latter, are strong barriers to northward distribution of the decapod crustaceans, principally for those forms that live in shallow water. The

presence of some species from the Caribbean area could be due to accidental events. Of course, the cosmopolitan organisms, such as Pachygrapsus transversus and the widespread western Atlantic species Ocypode quadrata, can cross the interface where the warm water from the Gulf Stream meets the cold Labrador current in Cape Hatteras. However, Forest and Saint-Laurent (1967), in studying the pagurids collected by the "Calypso" Expedition in the western Atlantic, stated that there are no geographic or thermal barriers that separate the north Atlantic fauna from that of the south Atlantic. Of the diogenids, a group closely related to the pagurids, only one species, Calcinus tibicen, ranges from the islands and north-east region of Brazil to the eastern province of the United States. None of the pagurids was reported for this same area.

Only seven species from the Archipelago are found in the Panamic region. The occurrence of the pistol shrimp Alpheus ridleyi in this area is doubtful. According to Crosnier and Forest (1966), this species is probably synonymous with A. arenensis from the Gulf of California on the Pacific Coast. According to Ekman (1953) the Panamic region is an area that is typically very different from the other areas of the Pacific Coast. It embraces the Gulf of Panama and is characterized by a high number of endemic species. Only the species Symethis variolosa, Leptodius floridanus, Pachygrapsus transversus and Grapsus grapsus are also found on the coast of Panama and they are cosmopolitan.

Only about 12 percent of the species recorded from the Archipelago are found in "other regions", primarily in the Indo-Pacific area. All of them are cosmopolitan or pan-tropical.

Manning (1969) concludes that the stomatopods have close affinities with western and eastern Atlantic species as well as with those of the eastern Pacific. Of the 66 species of crustaceans living in the Archipelago, only three belong to this group. Meiosquilla tricarinata is most widespread, occurring from Miami, Florida, to the Abrolhos Islands on the east coast of Brazil. Its presence in the littoral of north-east Brazil has not been recorded yet. The other two species, Gonodactylus minutus and G. austrinus, are restricted to the islands and the northeast and east coasts of Brazil. According to Manning (1969), G. oerstedii, previously recorded from the islands, now is known to be distributed from southern Florida throughout the Caribbean as far south as Curaçao, Bonaire and Aruba. It is also found in the eastern Pacific (Schmitt, in 1940, according to Manning).

Bathymetric Distribution

The vertical distribution of the species from the Archipelago is shown in Table 3. The table includes inter-tidal as well as subtidal zones. The zonation and the degree of abundance of the organisms are listed in Table 2. From these tables we can see that most of the forms, about 55 percent, are distributed subtidally. One of them, Stenocionops

spinosissima is recorded to a depth of 248 meters, and Dardanus venosus ranges from 15 to 255 meters. Only these two species occur below 100 meters and they are considered in this paper as eurybathic forms, although Forest and Saint-Laurent (1967) classified the last species as a littoral form. These authors stated that collections of D. venosus in depths below 55 meters are rare. The other bathymetric divisions of the subtidal zone are classified here as follows: shallow water, from depths of zero to ten meters; littoral zone, from ten to 50 meters; great depths, from 50 to 200 meters; and finally, the bathyal zone that includes depths beyond 200 meters. Based on this somewhat arbitrary classification, 22 percent live in shallow water, about 33 percent of the species recorded from the Archipelago inhabit the littoral zone, 18 percent are found at great depths and 22 percent are distributed in both intertidal and subtidal zones. For example, Pagurus provenzanoi is found from the highest levels of the intertidal zone to about a depth of 40 meters.

The bathymetric distribution of the stomatopods of the islands is relatively well known. As is true with the decapods, their vertical distribution is closely related to the kind of substratum available in addition to other factors. Within the stomatopod group, Meiosquilla tricarinata is a subtidal species that does not appear to be particularly demanding in its choice of substrate. Gonodactylus minutus and G. austrinus are both intertidal and subtidal. They can be

found from the upper zone of the lower shore to depths of 66 and 33 meters, respectively. These two species appear to be more limited by the type of bottom than M. tricarinata. Until now they have been found only on hard or calcareous algae bottoms. Their occurrence in the intertidal zone is reported here for the first time.

The vertical distribution of the decapod group is more complex because they are more abundant and the lack of complete data prevents us from making a better analysis or reaching more extensive conclusions. According to Coêlho (1969b), the euryhaline species that have wide geographical distribution are also widely vertically distributed and found at greater depths on the continental shelf. Matthews and Kempf (1970), in their study on the malacofauna of the islands, stated that the oceanic characteristics of the islands are responsible for the establishment of many species in shallow water around the Archipelago. These same species, when they are found on the continental shelf, live far from the coast on calcareous algae bottoms and in deep water.

The bathymetric distribution of the sergestids and the penaeids of the islands is shown in Table 3. These groups seem to be poorly represented in the islands and the vertical and horizontal distribution, particularly of the former group, is now well known. The latter group is very abundant on the

continental shelf of northern Brazil where they are found on mud bottoms from depths of 10 to over 200 meters.

The alpheids are common in both intertidal and subtidal zones, except that the sandy form Alpheus bouvieri occurs exclusively in the intertidal. The vertical distributions of the species A. rostratripes and A. ridleyi are not well known and Synalpheus minus has only been found subtidally. In general, rocky-bottom-dwelling alpheids have a small vertical distribution while those that live in sandy bottoms have a greater bathymetric dispersion. The alpheids that live on corals and calcareous algae bottoms, e.g., A. cristulifrons and A. rostratripes are not as widely distributed vertically as the mud or euryhaline forms.

The only stenopodid known as an intertidal and subtidal form is Microprosthema semilaeve. In the islands it was collected on the lower shore, but according to Manning (1961) the species is found in shallow water in Florida. The other stenopodids, Stenopus hispidus and S. scutellatus are found in shallow water and from depths of about 55 and 65 meters.

The palinurids are known exclusively as subtidal forms although young specimens can be found in tide pools during the lowest tide. All the spiny lobsters that live in the islands can be captured in shallow waters from 5 to 10 meters. On the continental shelf of northeast Brazil, the average depth of capture for this group is 20 to 30 meters.

The families Callianassidae, Hippidae, Ocypodidae and Gecarcinidae are all intertidal groups except that the land crab Gecarcinus lagostoma is considered a terrestrial or semiterrestrial form. The hippids and the ocypodids are represented only by Hippa cubensis and Ocypode quadrata, respectively. They are relatively abundant in spite of the scarcity of the sandy beaches that they inhabit.

Only one callianassid species is reported from the Archipelago. It was collected intertidally from the middle to lower shore.

Munida spinifrons, a galatheid, is known to occur between depths of 14 and 100 meters. In the islands it has been found at 50 meters.

All the procellanids recorded for the islands are intertidal forms and their vertical distribution is closely correlated with the kind of substratum. Most of them live on hard bottoms.

The pagurids and diogenids are either intertidal, subtidal, or both. The first group is associated more with soft substrata and the second is usually found on hard bottoms. However, some species can be found in both types of substrata. As the distribution of most of the species in these groups is based on reports in the literature, only a few comments will be made. The diogenid crab Clibanarius tricolor and Calcinus tibicen occur in both intertidal and subtidal zones. The latter species has a large vertical depth

range. Dardanus venosus is exclusively subtidal. In the islands it is generally found in shallow water, while on the continental shelf it is usually collected at greater depths and generally in shells of Tonna maculosa (Dillwyn). Of the pagurids, only Pagarus brevidactylus and P. provenzanoi are intertidal and subtidal simultaneously. The former is found from the lower line of the lower shore and the latter from the upper margin of upper shore to about 40 meters depth. Iridopagurus violaceus is strictly a subtidal form found between depths of about 25 to 50 meters.

All the species belonging to the families Raninidae, Calappidae, Portunidae, Galatheidae and Haplocarcinidae and found in the islands are subtidal inhabitants living from shallow water to a depth of about 100 meters.

Most of the grapsids are intertidal, living from the upper shore line to the lower limit of the lower shore. Only Grapsus grapsus, Plagusia depressa and Percnon planissimum extend subtidally for a few meters. P. depressa, however, is usually found between the middle shore and lower shore and sometimes a few meters below this line. Pachygrapsus transversus, is reported for the first time from the islands. It is rare, although on the northeast coast of Brazil it is extremely abundant; it inhabits all the zones of the intertidal area and it is sometimes found subtidally at depths of a few meters.

The majids and xanthids, that comprise about 26 and nine percent of the species recorded for the islands, respectively, have their vertical distribution closely correlated with the kind of substratum in which they live. The latter group is associated with hard substratum and most of them are intertidal dwellers or are found just below the lowest limit of the lower shore. The species Actaea acantha is essentially a subtidal form, but lives in shallow water. Leptodius floridans can live in both zones although its lower limit seems never to exceed a depth of 40 meters. While the xanthids are primarily an intertidal group, the second group, that is, the majids, are mostly a subtidal group, nearly all inhabiting the hard and calcareous algae bottoms of the islands. Only one species Macrocoeloma trispinosum nodipes is found from the lower shore to a depth of about 50 meters. The rest of the species could be classified as littoral or dwellers at great depths, and Stenocionopus spinosissima is an eurybathic species.

CONCLUSIONS

The results obtained from this study are discussed in the text and are shown in Tables 2, 3 and 4. One map of the Archipelago (Figure 1) and one list of the characteristics of the collecting localities (Table 1) are shown as well.

From these data it is concluded that the carcinological fauna is relatively rich, although the stomatopods seem to be poorly represented. However, the Gonodactylidae appear to be more abundant than the other families of the latter group.

Most of the species inhabit the windward side of the islands. Probably the large formations of vermetid and melobesoid reefs are responsible for this windward side preference. These reefs and associated organisms provide favorable substrata and an abundant food supply for many wandering species. The existence of protected bays with a great amount of algae could also explain the high concentration of species.

The lack of estuarine or euryhaline forms in the area is due to the absence of rivers or other significant fresh water supplies. However, the distribution of the callianasid, Upogebia noronhensis, seems to be strictly related to the small amount of fresh water that runs off from a small reservoir and reaches Sueste Bay where this species lives.

The islands have an oceanic fauna with many stenohaline and cosmopolitan forms, such as most of the grapsids. The oceanic setting of the islands may explain why there are differences in the onset of changes in color and annual cycle of reproduction for certain species in the islands when compared with similar species from the continent. The climate of the islands is also responsible for the greater number of species collected during the dry season (August to January). During this time most of the species seem to be out of their hiding places and are easily collected. Sueste Bay has the greatest number and variety of species, followed by the beaches at Atalaia, Caierira, Leao, Rata, Pontinha, Sapata and Raza.

The location of the islands within the south equatorial current could be, in part, responsible for similarities that are found among the faunas of the eastern Atlantic, the Fernando de Noronha islands, the northeast coast of Brazil, and the Caribbean region. Probably most of the grapsids reach the islands and the northeast coast of Brazil by means of this current. The presence of calcareous algae around the islands and along the northeast coast of Brazil may be another factor that would explain the faunal similarities. There is also a good correlation between this kind of substratum and the vertical distribution of the species in the islands and along the northeast coast of Brazil. Therefore, many species on the northeast coast of Brazil form deep

water populations, while insular populations of the same species are generally collected in shallow water. This is due to the fact that the calcareous algae bottoms of the continental shelf of northeast Brazil are generally located far from the coast, in deep water. In the islands these substrata are closer to the coast because the shelf is relatively narrow and sometimes completely absent. We can conclude also that all subtidal species in the islands live exclusively on hard and calcareous algae bottoms.

Thus, the islands can be considered to be an insular province that is characterized by the presence of some endemic forms, no euryhaline species, and an insignificant sand-dwelling fauna. In this paper only the species Upogebia noronhensis and Munida spinifrons are considered endemic to the islands, and the forms Petrolisthes ? serratus, Panopeus harttii, Pachygrapsus transversus, Cyclograpsus interger, Geograpsus lividus, and Percnon ? gibbesi are reported from the Archipelago for the first time.

REFERENCES

- Bate, C. S.
1888 Report on the Crustacea Macrura dredged by H.M.S. Challenger during the years 1873-1876. Report on the Scientific Results of the Voyage of H.M.S. Challenger During the Years 1873-1876. Zoology. 24: 929 p., 150 pls., 76 figs., Johnson Reprint Corporation, 1965, New York.
- Brooks, W. K.
1886 The Stomatopoda of the "Challenger" collection. Johns Hopkins Univ. Cir., Baltimore, 5(49): 83-85.
- Castro, A. L.
1955 Contribuição ao conhecimento dos crustáceos da ordem Stomatopoda do litoral brasileiro: (Crustacea Hoplocarida). Bol. Mus. Nac., Rio de Janeiro, Zool., (128): 68 p., 18 pls., 31 figs.
1962 Sobre os crustáceos referidos por Marcgrave em sua "Historia Naturalis Brasiliae" (1648). Arq. Mus. Nac., Rio de Janeiro, 52: 37-51, 29 figs.
- Chace, A. F., Jr.
1937 The Templeton Crocker Expedition. VII. Caridean Decapoda Crustacea from the Gulf of California and the West Coast of Lower California. Zoologica, 21(8): 109-138, 9 figs.
1966 Decapod crustaceans from St. Helena Island, South Atlantic. Proc. U.S. Nat. Mus., Washington, 118(3536): 622-666, 15 figs.
- Chace, A. F., Jr., and Dumont, W. H.
1949 Spiny-lobsters -- Identification, world distribution and U.S. Trade. Comm. Fish. Rev., Washington, 11(5): 12 p., 7 figs.
- Coelho, P. A.
1964a Lista dos porcelanideos (Crustacea, Decapoda, Anomura) do litoral de Pernambuco e dos estados vizinhos. Trabs. Inst. Oceanogr. Univ. Fed. Pernambuco, Recife, 5/6: 51-68.

Coelho, P. A.

- 1964b Alguns crustáceos decápodos novos para Pernambuco e estados vizinhos na coleção carinológica da Universidade de Recife. *Ciência e Cultura*, São Paulo, 16(2): 255-256.
- 1966 Alguns crustáceos novos para Pernambuco e estados vizinhos na coleção carcinológica da Universidade de Pernambuco, segunda lista. *Ciência e Cultura*, São Paulo, 18(2): 139-140.
- 1967 Novas ocorrências de crustáceos em Pernambuco e estados vizinhos (Brasil). *Trabs. Inst. Oceanogr. Univ. Fed. Pernambuco*, Recife, 9/11: 239-248.
- 1969a Lista dos stenopodidea (Crustacea Decapoda Natantia) de Pernambuco e estados vizinhos. *Trabs. Inst. Oceanogr. Univ. Fed. Pernambuco*, Recife, 9/11: 249-254.
- 1969b A distribuição dos crustáceos decápodos reptantes do Norte do Brasil, *Trab. Inst. Oceanogr. Univ. Fed. Pernambuco*, Recife, 9/11: 223-238.

Corrêa, M. G.

- 1968 Sôbre as espécies de Upogebia Leach do litoral brasileiro, com descrição de uma espécie nova (Decapoda Callianassidae). *Rev. Brasil. Biol.*, Rio de Janeiro, 28(2): 97-109, 33 figs.

Costa, H. R.

- 1962 Notas sôbre os Hippidea da costa brasileira (Crustacea Anomura). Parte 2. *Cent. Est. Zool. Fac. Fil.*, Rio de Janeiro, Avulso, 14: 12 p., 3 pls.
- 1968 Crustacea Brachyura recoltee par les dragages de la "Calypso" sur les cotes bresilennes (1962). *Rec. Trav. Stat. Mar.*, Endoume, 59(43): 333-343.

Coutinho, P. N., and Morais, J. O.

- 1970 Distribucion de los sedimentos en la plataforma continental norte e nordeste del Brasil. *Arq. Ciên. Mar.*, Fortaleza, 10(1): 79-90, 3 figs.

Crosnier, A.

- 1965 (1). Crustacés décapodes. Grapsides. Grapsidae et Ocypodidae. *Faune Madagascar*. 18: 143 p., 11 pls.

- Crosnier, A. and Forest, J.
1966 Crustacés décapodes: Alpheidae. Resultats scientifiques des campagne de la "Calypso." Ann. Inst. Oceanogr., Paris, 7(19): 199-314, 33 figs.
- Darwin, C.
1897 Geological Observation on the Volcanic Islands and Parts of South America Visited During the Voyage of H.M.S. "Beagle." 3d ed., v-xiii, 648 p., illus. D. Appleton and Company, 1897, New York.
- Ekman, S.
1953 Zoogeography of the Sea. 1st. ed., xiv, 417 p., 121 figs. Sidgwick and Jackson, Limited, 1953, London.
- Faria, A. and Silva, D.
1937 Os Palinurideos do Brasil (Crustacea-Macrura. Excursão do Navio Pharoleiro Vital de Oliveira ao Atoll das Rocas). Rev. Dep. Nac. Prod. Anim., Rio de Janeiro, 4 (4/6): 45 p., 26 figs.
- Fausto-Filho, J.
1966 Primeira contribuição ao inventário dos crustáceos decápodos marinhos do nordeste brasileiro. Arq. Est. Biol. Mar. Univ. Fed. Ceará, Fortaleza, 6(1): 31-37.
- 1967a Sobre os calapideos do norte e nordeste do Brasil. Arq. Est. Biol. Mar. Univ. Fed. Ceará, Fortaleza, 7(1): 41-62, 4 pls., 7 figs.
- 1967b Segunda contribuição ao inventário dos crustáceos decápodos marinhos do nordeste brasileiro. Ar. Est. Biol. Mar. Univ. Fed. Ceará, Fortaleza, 7(1): 11-14.
- 1968a Terceira contribuição ao inventário dos crustáceos decápodos marinhos do nordeste brasileiro. Arq. Est. Biol. Mar. Univ. Fed. Ceará, Fortaleza, 8(1): 43-45.
- 1968b Crustáceos decápodos de valor comercial ou utilizados como alimento no nordeste brasileiro. Bol. Soc. Cear. Agron., Fortaleza, 9: 27-28.
- 1969 Upogebia noronhensis, nova especie de crustáceo do Brasil (Crustacea, Decapoda Callianassidae). Arq. Ciên. Mar., Fortaleza, 9(1): 1-7, 15 figs.

- Fausto-Filho, J.
 1970 Quarta contribuição ao inventário dos crustáceos decápodos marinhos do nordeste brasileiro. Arq. Ciên. Mar., Fortaleza, 10(1): 55-60.
- Fausto-Filho, J., and Costa, A. F.
 1969 Notas sobre a família Palinuridae no nordeste brasileiro (Crustacea, Decapoda, Macrura). Arq. Ciên. Mar., Fortaleza, 9(2): 103-110, 2 pls. 11 figs.
- Fausto-Filho, J., Matthews, H. R., and Lima, H. H.
 Nota preliminar sobre a fauna dos bancos de lagosta no Ceará. Arq. Est. Biol. Mar. Univ. Fed. Ceará, Fortaleza, 6(2): 127-130.
- Forest, J.
 1966 Crustacés décapodes: Paguridae. Campagne de la "Calypso" dans le Golf de Guinée et aux îles Principe, São Tomé et Annobon (1956). 17. Ann. Inst. Oceanogr., Paris, 44: 125-172, 25 figs.
- Forest, J. and Guinot-Dumortier, D.
 1966 Crustacés décapodes: Brachyures. Campagne de la "Calypso" dans le Golf de Guinée et aux îles Principe, São Tomé et Annobon (1956). 16. Ann. Inst. Oceanogr. Paris, 44: 23-124, 19 figs.
- Forest, J. and Saint-Laurent, M.
 1967 Campagne de la "Calypso" au large de cotes atlantiques de l'Amérique du Sud (1961-1962) (Première Partie). 6. Crustacés décapodes: Pagurides. Ann. Inst. Oceanogr., Paris, 45(2): 47-169, 1 pl., 150 figs.
- Gibbes, L. R.
 1850 On the carcinological collections of the United States. Proc. Amer. Assoc. Adv. Sci., Washington, 3: 167-201.
- Haig, J.
 1956 The Galatheidae (Crustacea Anomura) of the Allan Hancock Expedition with a review of the Procellanidae of the Western North Atlantic. Allan Hancock Expedition, Los Angeles, Report (8): 41 p., 1 pl.
- 1966 Campagne de la "Calypso" au large des cotes atlantiques de l'Amérique du Sud (1961-1962) (Première Partie). 2. Procellanid crabs (Crustacea Anomura). Ann. Inst. Oceanogr., Paris, 44: 351-358.

- Hartt, C. F.
1870 Geology and Physical Geography of Brazil, 1st ed., xxxiii, 617 p., illus. Fields. Osgood & Co., 1870, Boston.
- Henderson, J. B.
1888 Report on the Anomura collected by H.M.S. Challenger during the years 1873-1876. Report on the Scientific Results of the Voyage of H.M.S. Challenger During the Years 1873-1876. Zoology. 27: 209 p., 21 pls. Johnson Reprint Corporation, 1965, New York.
- 1920 A monograph of the east American scaphod mollusks. Bull. U.S. Nat. Mus., Washington, 3: 177 p., 12 pls.
- Holthuis, L. B.
1946 The Decapoda Macrura of Snellius Expedition. I. Temminckia, 7: 178 p., 11 figs.
- 1959 The Crustacea Decapoda of Suriname (Dutch Guiana). Zool. Verhandl., Leiden. (44): 296 p., 16 pls., 68 figs.
- 1961 The taxonomic status of Panulirus echinatus Smith, 1869 (Decapoda Macrura Palinuridae). Crustaceana, Leiden, 2 (3): 223-227, 1 fig.
- Kingsley, J. S.
1878a List of decapod Crustacea of the Atlantic coast, whose range embraces Fort Macon. Proc. Acad. Nat. Sci. Phil., Philadelphia, 30: 316-330.
- 1878b A synopsis of the North American species of the genus Alpheus. Bull. U.S. Geol. Geog. Surv., Washington, 4(1): 189-199.
- Laborel, J. L., and Kempf, M.
1967 Formações de Vermetus e algas calcáreas nas costas do Brasil. Trabs. Inst. Oceanogr. Univ. Fed. Pernambuco, Recife, 7/8: 33-50, 4 figs.
- Limbaugh, C., Pederson, H. and Chace, F. A., Jr.
1961 Shrimps that clean fishes. Bull. Mar. Sci. Gulf. Carib., Miami, 11(2): 237-257, 7 figs.
- Manning, R. B.
1961 Observations on Microprosthemata semilaeve (von Martens) (Decapoda, Stenopodidae) from Florida. Crustaceana, Leiden, 2(1): 81-52.

- Manning, R. B.
1966 Stomatopod Crustacea. 3. Campagne de la "Calypso" au large des cotes Atlantiques de l'Amerique du Sud (1961-1962). I. Ann. Inst. Oceanogr., Monaco, 44: 359-384, 8 figs.
- 1968 A revision of the family Squillidae (Crustacea, Stomatopoda), the description of eight new genera. Bull. Mar. Sci. Gulf. Carib., Miami, 18(1): 105-142, 10 figs.
- 1969 Stomatopoda Crustacea of the Western Atlantic. Stud. Trop. Oceanogr., Miami, 8:viii, 380 p., 91 figs.
- Matthews, H. R., and Kempf, M.
1970 Moluscos marinhos do norte e nordeste do Brasil. II - Moluscos do Arquipélago de Fernando de Noronha (com algumas referências ao Atol das Rocas). Arq. Ciên. Mar., Fortaleza, 10(1): 53 p., 1 fig.
- Miers, E. J.
1886 Report on the Brachyura collected by the H.M.S. Challenger during the years 1873-1876. Report on the Scientific Results of the Voyage of H.M.S. Challenger During the Years 1873-1876. Zoology. 17: 175 p., 25 pls., 2 figs. Johnson Reprint Corporation, 1965, New York.
- Moreira, C.
1901 Contribuições para o conhecimento da fauna brasileira. Crustáceos do Brasil. Arch. Mus. Nac., Rio de Janeiro, 11: iv, 151 p., 5 pls.
- Paiva, M. P.
1967 Fernando de Noronha, an Emerald in the Atlantic Ocean. Bol. Cear. Agron., Fortaleza, 8: 25-32, 12 figs.
- Pocock, R. J.
1890 Crustacea (in H. N. Ridley. Notes on the Zoology of Fernando de Noronha). Journ. Linn. Soc., London, 20: 506-526.
- Provenzano, A., Jr.
1959 The shallow-water hermit crabs of Florida. Bull. Mar. Sci. Gulf. Carib., Miami, 9(4): 349-420, 21 figs.

- Provenzano, A., Jr.
1961 Pagurid crabs (Decapoda Anomura) from St. John, Virgin Islands, with description of three new species. *Crustaceana*, Leiden, 3(2): 151-166, 3 figs.
- Rathbun, M. J.
1892 Catalogue of the crabs of the family periceridae in the U.S. National Museum. *Proc. U.S. Nat. Mus.*, Washington, 15(901): 231-277, 28-40 pls.
1893 Catalogue of the crabs of the family Majidae in the U.S. National Museum. *Proc. U.S. Nat. Mus.*, Washington, 16: 63-103, 3-8 pls.
1900 The decapod crustaceans of West Africa. *Proc.*, U.S. Nat. Mus., Washington, 22 (1199): 271-315.
1901 The Brachyura and Macrura of Puerto Rico. *Bull. U.S. Fish. Comm.*, Washington, (20): 3-127, 26 figs.
1918 The grapsoid crabs of America. *Bull. U.S. Nat. Mus.*, Washington, 97: 461 p., 161 pls., 172 figs.
1925 The spider crabs of America. *Bull. U.S. Nat. Mus.*, Washington, 129: 613 p., 283 pls., 153 figs.
1930 The cancrioid crabs of America of the families Euryalidae, Portunidae, Atelecyclidae, Cancridae and Xanthidae. *Bull. U.S. Nat. Mus.*, Washington, 152: 278 p., 230 pls., 85 figs.
1933 Brachyuran crabs of Puerto Rico and Virgin Islands. *Scientific Survey of Puerto Rico and the Virgin Islands*. New York Acad. Sci., New York, 15(1): 121 p., 107 figs.
1937 The oxystomatous and allied crabs of America. *Bull. U.S. Nat. Mus.*, Washington, 166: 278 p., 86 pls., 47 figs.
- Ricketts, E. F., and Calvin, Jr.
1968 Between Pacific Tides. 4th ed. xiv, 614 p., illus. Stanford University Press, 1968, California.
- Ridley, H. N.
1890 Notes on the Zoology of Fernando de Noronha. *Journ. Linn. Soc. Zoology*, London, 20: 473-570, pl. 30, 2 figs.

- Schmitt, W. L.
1926 The macruran, anomuran and stomatopod crustaceans collected by the American Museum Congo Expedition (1909-1915). Bull. Amer. Mus. Nat. Hist., New York, 20: 68 p., 9 pls., 75 figs.
- 1935 Crustacea Macrura and Anomura of Puerto Rico and the Virgin Islands. Scientific Survey of Puerto Rico and Virgin Islands, New York Acad. Sci., New York, 15(2): 123-227, 80 figs.
- 1939 Decapod and other Crustacea collected on the Presidential Cruise of 1938. Smithsonian Misc. Coll., Washington, 98(2): 29 p., 3 pls.
- Smith, S. I.
1869 Notice of the Crustacea collected by Prof. C. F. Hartt on the coasts of Brazil in 1867. Trans. Connecticut Acad. Art. Sci., New Haven, 2: 41 p.
- Verrill, A. E.
1908 Geographical distribution; origin of the Bermudan decapod fauna. Amer. Natural., Salem, 42(497): 289-296.
- 1922 Decapod Crustacea of Bermuda. Part II, Macrura. Trans. Connecticut Acad. Arts. Sci., New Haven, 26: 179 p., 12 figs.
- Williams, B. A.
1965 Marine Decapod crustaceans of the Carolinas. U.S. Fish. and Wildl. Serv., Washington, 65(1): 298 p., 252 figs.
- Work, R. C.
1969 Systematics, ecology and distribution of the mollusks of Los Roques, Venezuela. Bull. Mar. Sci. Gulf. Carib., Miami, 19(20): 614-711, 4 figs.