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REEF ASSOCIATED MOLLUSCAN FAUNA OF THE SANTA MARTA AREA, CARIBBEAN COAST OF COLOMBIA

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RESUMEN

Se registra un total de 263 especies de moluscos (201 encontradas vivas) colectadas entre 1982 y 1989 en siete localidades arrecifales de la región de Santa Marta, Colombia. Los moluscos fueron ordenados de acuerdo a las zonas de arrecife en que fueron encontradas, a sus hábitos alimentarios y a su modo de vida. El dendrograma resultante del análisis de similaridad faunística entre las zonas muestra que existen tres tipos básicos de comunidades en el arrecife (asentadas respectivamente en zonas someras, zona de declive arrecifal y zona con coral muerto y arena), más una comunidad pobre en especies y restringida a la zona dominada por el coral *Agaricia tenuifolia*. Existen algunas diferencias entre las zonas arrecifales en cuanto a la distribución porcentual de especies con ciertos hábitos alimentarios. Los gastrópodos errantes y carnívoros constituyen el grupo más abundante en especies, aunque en ciertas zonas los bivalvos filtradores y los gastrópodos herbívoros alcanzan proporciones significativas. Algunas especies no eran conocidas anteriormente del Caribe colombiano.

ABSTRACT

A total of 263 molluscan species (201 of them found alive), collected from 1982 to 1989, is reported from seven coral reef localities of the Santa Marta area, Colombia. Species were arranged according to the reef zones in which they were found, their feeding habits and mode of life. Cluster analysis of faunal similarity between reef zones revealed the ocurrence of three molluscan assemblages (settled respectively in shallow environments, reef-slope zones, and sand-coral rubble zones), plus one containing few species and limited to a small zone dominated by lettuce coral (*Agaricia tenuifolia*). There are some differences between reef zones in the distribution of species with respect to feeding habits. Vagrant, carnivore gastropods constitute the most diverse group, but filter-feeding bivalves and herbivore gastropods reach high numbers in some zones. Some species were not recorded previously from the Caribbean coast of Colombia.

INTRODUCTION

Gastropod and bivalve molluscs are particularly diverse on coral reefs. Some molluscs are obligate parasites or predators feeding on coral tissue

(Robertson, 1970; Hadfield, 1976). Facultative associates do not require live coral but utilize the physical space of the reef framework, either living as endolithic, epilithic, sessile forms, cavity or sand dwellers, or as symbionts of other invertebrate hosts. Burrowing and epilithic filter feeding molluscs are not restricted to living coral but utilize a variety of hard substrata. Vagrant forms that occur, but are not restricted to coral habitats, constitute high diversity communities as cavity-dwellers in the interstices of coral rubble (Choi and Ginsburg, 1983).

Molluscan assemblages on coral reefs have been studied more intensively in the Indo-West Pacific region (e.g. Salvat, 1967; Taylor, 1968, 1971; Sheppard, 1984) and the Red Sea (Mastaller, 1978, 1979; Taylor and Reid, 1984) than in the Caribbean. In the Western Atlantic and the Caribbean most malacological surveys usually have been conducted on reef flats and shallow areas less than 10 m deep, despite the fact that the latter are areas of reduced diversity for many groups (Stoddart, 1969). Also, most molluscan studies in reef areas have focussed on single taxa (e.g. Miller, 1972; Logan, 1974; Brawley and Adley, 1982; Kleemann, 1986) or particular reef microhabitats (Choi and Ginsburg, 1983; Kobluk and Lysenko, 1986; Young, 1986; Reed and Mikkelsen, 1987). Studies of molluscan distribution that fully encompasse all broad reef habitats to a depth of 40 m and more have been conducted in the western Atlantic only in the southern Gulf of Mexico (Rice and Kornicker, 1962; Tunnell, 1974) and Cuba (Martínez, 1984). Such surveys are hitherto lacking in the Southern Caribbean.

The coral reefs of the Santa Marta area, as well as those along the entire continental coast of northeastern Colombia and Venezuela, are particularly poorly developed in comparison with other areas of the Southern Caribbean like the Netherlands Antilles, the Venezuelan offshore islands and the Islas del Rosario in northwestern Colombia (Antonius, 1972, 1980; Geister, 1983). Nevertheless, from a zoogeographical proint of view, these reefs lodge a singular fauna, as has been shown for fishes (Acero and Garzón, 1987) and sponges (Zea, 1987).

This study provides a detailed inventory of mollusks found since 1982 in the coral reefs of the Santa Marta area, with remarks on their microhabitat preferences and feeding habits, as a basis for further studies on the structure and composition of reef communities in the area, and on the niche arrangement of selected species or functional groups.

MATERIALS AND METHODS

Study Sites

The fringing and patch reefs along the rocky shore and in the bays of the Santa Marta area, Colombian Caribbean, consist of unusual, possibly unique,

spongedominated coral reefs located often on metamorphic rocks, rather than on carbonate sediments. Coral growth in the area is restricted mostly to a narrow fringe along rocky cliffs to a depth of about 30 m (Antonius, 1972). Seteepness of the bottom and the alternating periodic ocurrence of cold-water upwelling (dry season) and turbid water (rainy season) are undoubtedly responsible for the limited development of these reefs.

Since 1982, coral reefs of the Santa Marta area have been surveyed almost constantly with regard to their molluscan fauna. However, collections and pilot observations have been concentrated only on seven localities that, selected according to their accessibility, orientation to wave action, bottom relief, substrata, and coral zonation, together make a representative sample of the whole reef environment in the area (Fig. 1).

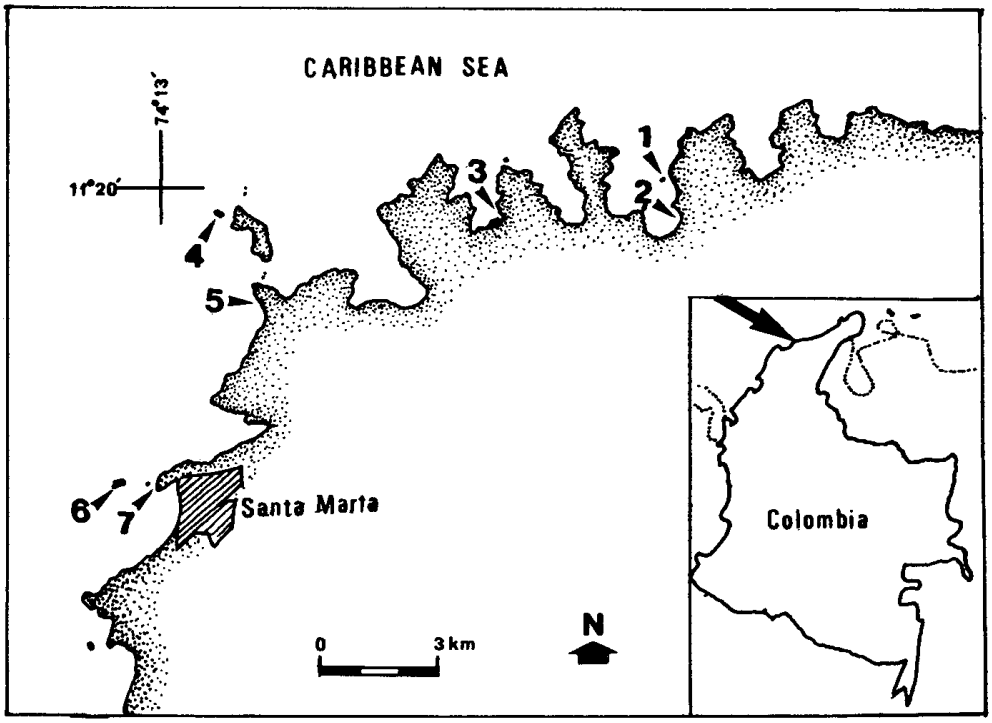

Figura 1. The Santa Marta area, Caribbean coast of Colombia. Numbers refer to study sites.

Sites 1, 4 and 6 are moderately exposed to wave action, whereas sites 2, 3, 5 and 7 are sheltered. Sites 2 and 3 are patch reefs showing a shallow back-reef lagoon followed by a wide crest and a shallow slope ending at a depth of 14 to 18 m; sites 1, 4, 5, 6 and 7 are fringing reefs with a steeper slope extending to depths greater than 20 m. At each locality, reef structure and zonation patterns of corals and substrata were roughly determined along a representative transect traced perpendicular to the coast line. Figure 2 shows the depth profiles and zonation pattern of all sites studied.

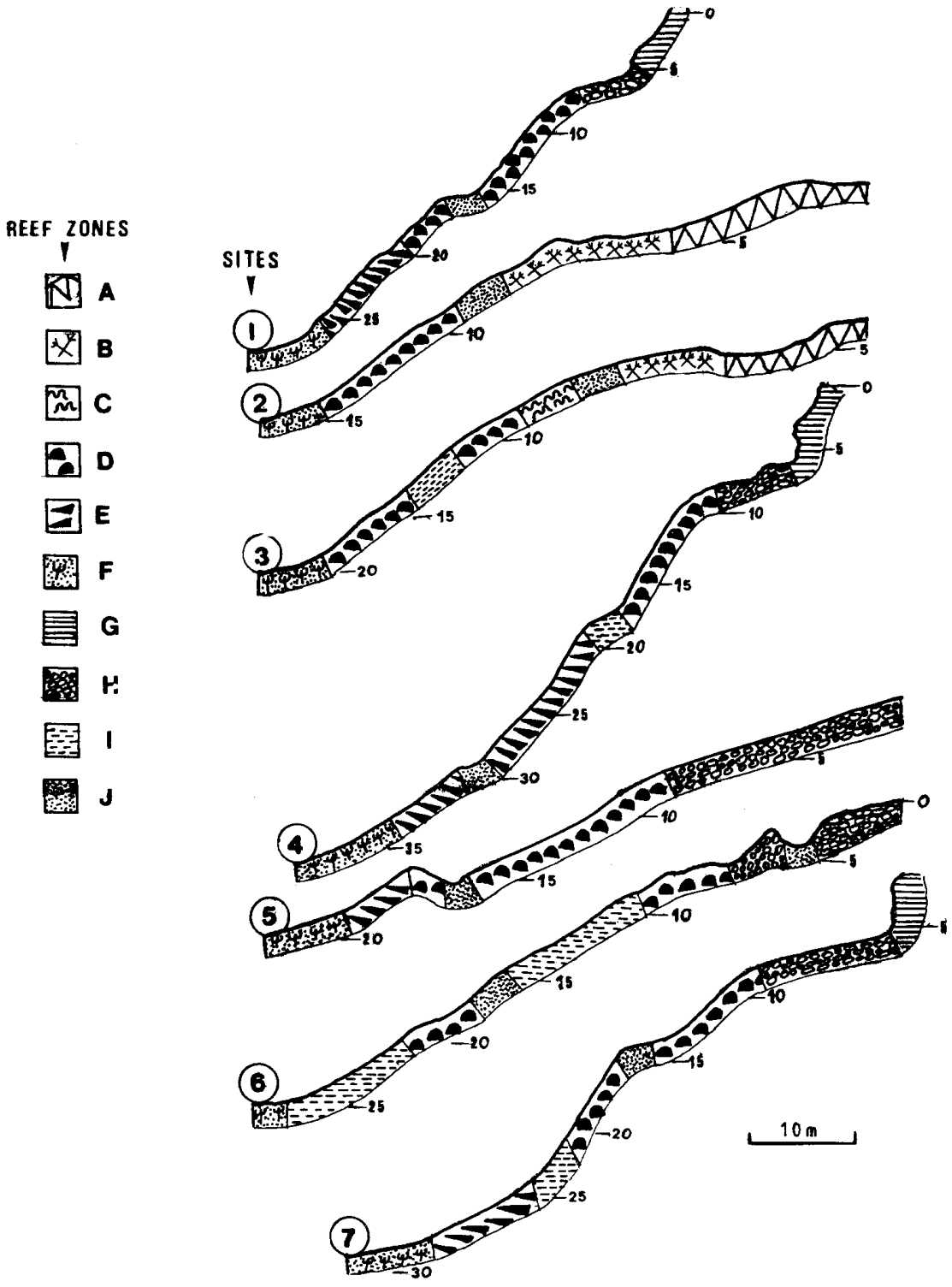

Figure 2. Profiles of studied sites showing bottom relief and reef zones; for characterization of zones see text; depth scales in meters.

Reef Zonation

A total of ten representative reef zones were recognized; they can be charecterized as follow:

— A. Reef-lagoon with isolated coral horsts (*Millepora* sp., *Porites astreoides*), coral slabs, and sandy patches. This zone is present in the reef localities 2 and 3. We do not consider here the sea-grass beds with scattered corals, which generaly extend from this zone to the beach, because they themselves represent a different community with a particular molluscan fauna.

— B. Reef-crest with elkhorn coral (*Acropora palmata*), fire coral (*Millepora squarrosa*), coral slabs, debris, and sand patches. This zone is present in sites 2 and 3.

— C. Upper reef-margin with lettuce coral (*Agaricia tenuifolia*) forming a narrow belt of conspicuosly upright, leafy structures. This zone occurs only in reef locality 3.

— D. Upper reef-slope with large coral heads (*e.g. Diploria clivosa, Montastrea carvernosa, Dichocoenia stokesi*) forming caves and an intrincate system of cryptic microhabitats. Species of sea fans (*Gorgonia ventalina*), sea whips (*Plexaurella* sp. *Plexaura* sp.), and sea plumes (*Pseudopterogorgia* sp.) are also common. This zone is present in all reef sites.

— E. Lower reef-slope with dominating foliose and crust forming corals (*Agaricia lamarcki, Mycetophyllia* sp.) and some coral heads. Antipatharians, wire corals and encrusting sponges are common in this zone, which occurs in sites 1, 4, 5 and 6 below 18 m depth.

— F. Reef-base of coarse sand and coral debris. Sponges and antipatharians are common. This environment occurs in all reef localities.

— G. Sublittoral rocky cliff (metamorphic) with large boulders and overhanging walls. Fire corals, scattered encrusting brain coral forms, gorgonians and sponges dominate this zone, which occurs in exposed localities (1, 4, 6).

— H. Rocky boulders and pebble partly covered by filamentous algae, crusting zoanthids (*Palythoa caribbaeorum*), and fire corals. This zone is present in calm environments (sites 5 and 7) in shallow water.

— I. Conglomerates of coral rubble partly bound together by sponges; dead coral heads and scattered debris patches may also be present. This zone occurs in sites 3,4,6 and 7

— J. Large patches of coarse sand on the upper reef slope and across sandy channels on the lower reef-slope. This habitat occurs in all localities.

Mollusk Samplings

Although samplings of molluks took place mainly in these localities along transects, 1 to 2 m wide, from shallow to deep water, many specimens were found by chance whilst the authors dived errantly moving away from the transects. Habitat and other collecting data of specimens found in such a way

were noted and assigned respectively to one of the ten reef zones recognized above.

Mollusks were collected mainly by hand with the aid of snorkeling and SCUBA diving. Cemented of firmly attached specimens were removed from substrata by hammer and chisel. Small coral heads, rocks and coral rubble were sampled in mesh nets or buckets and carried to the laboratory; all mollusks found, including those living within boreholes and hidden in crevices, were collected after breaking the coral heads and rubble into small pieces. Sediments were sampled with a shovel, carried to the laboratory in nytex bags 0.5 mm in mesh size and spread on a shallow tray, from where the molluscs were picked out. A few diver-guided bottom trawls were also included. Because *post-mortem* transport of shells can constitute a significant source of error in data concerning habitat preferences, species that were collected dead or as empty shells are included in Table 1 but are not considered further in this study.

Faunal similarity between reef zones was calculated with Sorensen's index of affinity; clustering of zones (molluscan assemblages of diferent reef zones) was then determined by weighted averages of affinities.

Voucher specimens of most collected species have been deposited in the collection of the Instituto de Investigaciones Marinas de Punta de Betín —"INVEMAR"—, Santa Marta, Colombia.

RESULTS

General Overview

A total of 201 species of mollusks belonging to 64 families and 134 genera were collected alive in all sites studied (Table 1). They consisted of 6 polyplacophorans (4 genera), 64 bivalves (46 genera), and 131 gastropods (84 genera). Turridae was the most species-rich gastropod family (17 spp.), followed by Muricidae (9 spp.), Marginellidae (7 spp.), Pyramidellidae, Fasciolariidae, and Fissurellidae (6 taxa each). Arcidae and Mytilidae were the most species-rich bivalve families with 6 species each. Another 62 species were collected dead (46 gastropods, 14 bivalves, 2 scaphopods, and one polyplacophoran).

Reef locality 3 yielded by far the greatest number of species-level taxa (S = 128), followed by sites 1 (S = 87), 7 (S = 76), and 6 (S = 68). On the other hand, site 5 yielded only 55 species. However, since collecting intensity was not always the same in all localities, such comparisons do not wholly reflect a real condition.

Similarity Between Reef Zones

Reef zones H (boulders and pebble covered by zoanthids and fire corals, calm water) and I (conglomerates of coral rubble and debris) had the greastest

number of unique taxa (those found on a single environment), with 23 and 21 species respectively, followed distantly by zones J, F, A, D, and G (13, 10, 6, 5 and 2 species respectively). Zone C has no unique species, whereas zones B and E yielded only one each. The percent faunal similarity zone pairs was higher for zones with greater substratum-resemblance (e.g. zones D-E (50%), both with a high share of living coral cover giving an irregular bottom topography; zones F-J (44.9%), dominated by sediment and shell debris; Fig. 3).

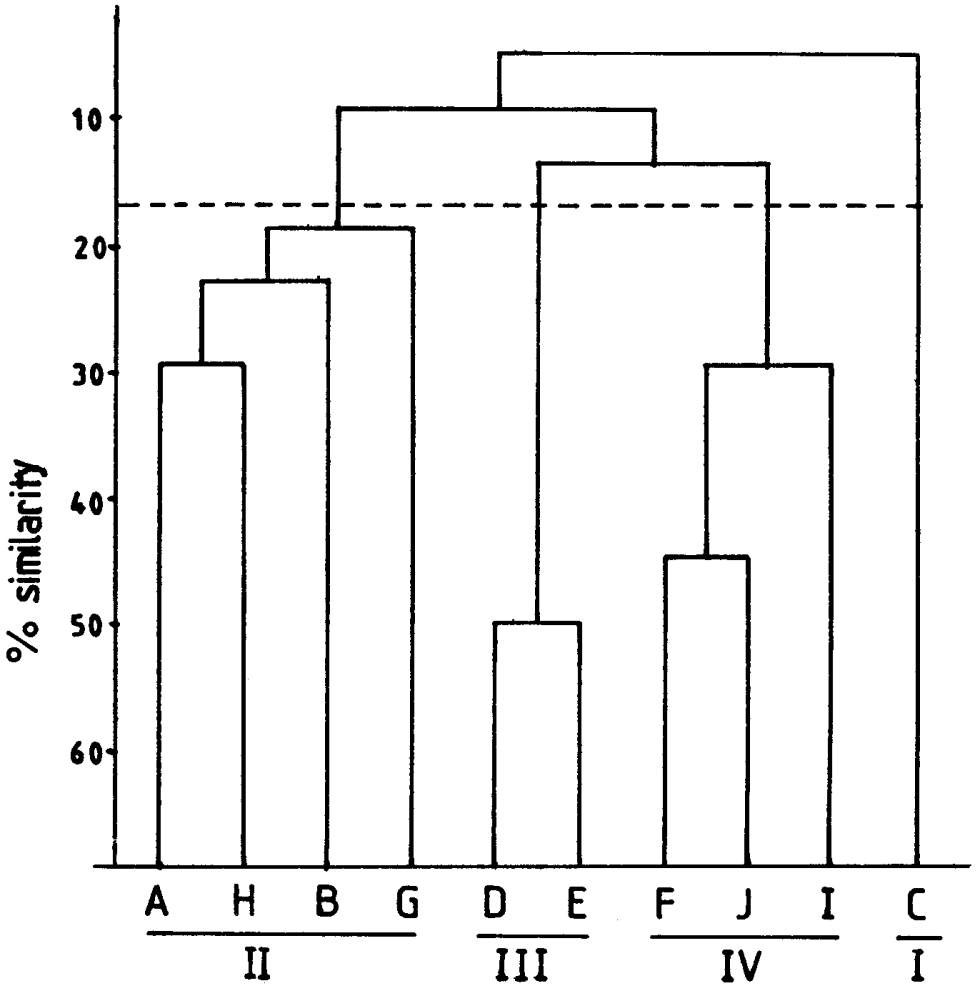

Figura 3. Dendrogram from similarity analysis of 10 zones for 201 species collected alive. Four clusters (I-IV) originate at 18% arbitrarily choosen similarity level.

Cluster analysis produced four groups of zones (Arbitrarily chosen at 18% similarity level) according to their molluscan composition (Fig. 3). Group I consists of a unique zone (C), with a low level of similarity to other zones, though it has no unique species and shares all its members with at least one other zone. Zonce C lodges the lowest number of species (S = 6), a fact dealing probably with the scarcity of non-living substratum available in this environment, since the upright, leafy structures of the lettuce coral (*Agaricia tenui-*

folia) occupy almost the entire benthic space. Group II includes those zones occurring in sheltered areas shallower than 8 m. Group III represents the reef slope assemblages, where massive and encrusting corals have a great percentage of cover. Group IV includes sandy and coral rubble-rich environments, lodging a high diversity assemblage composed mainly of sand-dwelling and coelobitic (cavity-dwelling) mollusks.

Trophic Structure

Molluscan species were categorized by feeding type based on available literature (Table 1). Carnivores (including scaverngers) were dominant (41.0% of all species), followed by filter feeders (33.5%), parasitic carnivores (parasitic on invertebrates including corals, 13,7%), herbivores (9.9%), and deposit feeders (1.9%).

Nevertheless, the percentage distribution of species according to feeding habits is very different between reef zones (Fig. 4). Whereas carnivores are dominant in zones C,D,E,H,I, and J, filter feeders make up the main group in zones A,B,F, and G. Herbivores are well represented in shallow water zones (A,B,G, and H), where algal growth is more evident. Zone J had the highest percentage of parasitic forms (22.7%).

Two gastropod genera containing species that feed on scleractinian coral tissue were collected in this study (*Coralliophila* and posibly *Calliostoma* (Hadfield, 1976; Reed and Mikkelsen, 1987)). Two other genera prey on species of gorgonians and sea plumes (*Cyphoma* and *Simnia*). Some species of *Cerithiopsis* and *Triphora*, as well as *Cypraea* spp., feed on sponges (Bandel and Wedler, 1987). It seems likely that single species of these gastropos feed only on specific species of sponges. *Seila adamsi* and *Trivia* spp. prey mainly on tunicates, whereas members of the family Melanellidae live attached to sea cucumbers and other echinoderms feeding on their epidermis. Most members of the family Muricidae prey on other mollusks (e.g. *Chicoreus brevifrons* on the spiny oyster *Spondylus* spp.); species of Conidae and Turridae are mainly worm-eaters.

Life Habits

The molluscan species were divided into several life habit groups on the basis of the relation of organisms to the substratum (Table 1): vagrant forms, loosely attached benthic forms (e.g. by byssal threads), comented or encrusting forms, endoliths (burrowers), sand-dwellers, and symbiotic (parasitic or commensal). Vagrant species dominated in percentage of total number of species (51.6%), followed by loosely attached forms (15.7%), symbiotic (14.3%), sand-dwellers (8.1%), cemented (6.3%), and endolithic (4.0%). Vagrant species yielded the highest percentages in all reef zones, but sand-dwellers were also well represented in zones F and J, where sediments are the

predominating substratum. All endolithic bivalves occur together only in zone D, where coral diversity is also greater, but highest numbers of individuals of *Lithophaga* spp. and *Gastrochaena hians* were found in zone B embeded in coral slabs (mainly *Acropora palmata*).

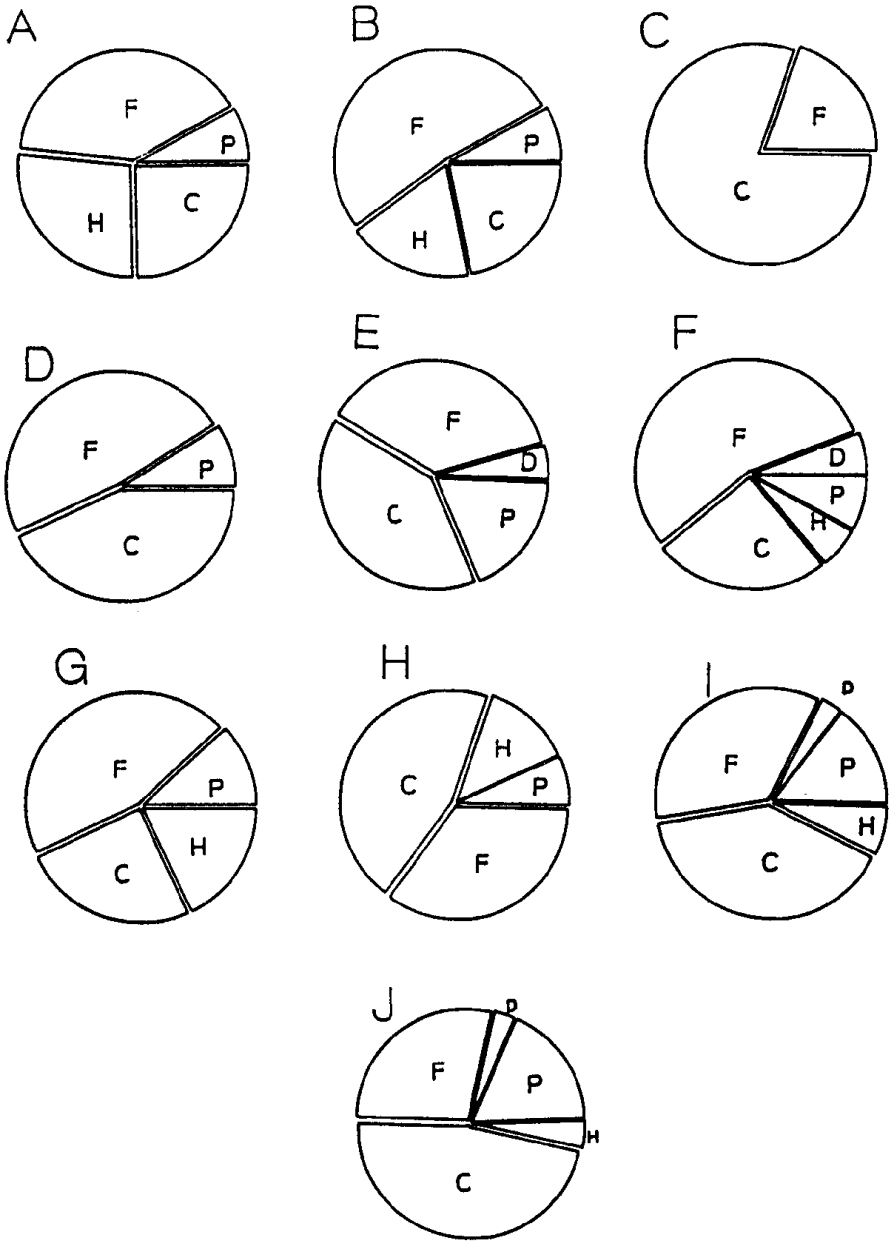

Figura 4. Percent composition of numbers of species by feeding habits in each reef zone (C = carnivores, H = herbivores, F = filter feeders/suspension feeders; D = deposit feeders, P = parasites).

DISCUSSION

Molluscan Fauna

In spite of their limited development, the coral reefs of the Santa Marta area support a molluscan fauna that is at least as rich as that in other reef areas of the western Atlantic reported in literature. A total of 263 species recorded on this study (62 of which were collected dead) is indeed a greater number than most of those reported for reef areas in the western Atlantic and Caribbean: Lobos and Enmedios reefs, SW Gulf of Mexico, 290 (112 of which were found dead) and 210 (73 dead) species, respectively (Tunnel, 1974); Florida Middle Grounds, NE Gulf of Mexico, 251 (186 dead) species (Turgeon and Lyons, 1977); Alacran Reef, Gulf of Mexico, 130 species (Rice and Kornicker, 1962). Of course, collecting methods in these studies differed greatly thus results are not directly comparable. The low number of molluscan species reported in other works dealing with the reef associated fauna in the western Atlantic is surely due to the little attention paid to mollusks smaller than 10 mm. For example, only 114 species are reported for Cuban reefs (Martínez, 1984), 74 for three reef areas at Bonaire, Netherlands Antilles (Kobluk and Lysenko, 1986), and 31 for a Brazilian reef area (Young, 1986). The high species number of our study reflects, in part, the thoroughness in sampling of micro-mollusks.

The majority of mollusks found in the coral reefs of the Santa Marta area have a wide distribution range in the western Atlantic region and particularly in the Caribbean. However, a portion of this fauna reveals a much limited zoogeographical range, namely restricted to the northernmost South American coasts. For example, there are several gastropod species that were hitherto only known from the Netherlands Antilles and the Santa Marta area (e.g. *Hapocochlias moolenbeki, Risomurex withrowi,* and *Pusiolina veldhoveni*). Some others are apparently restricted to the coasts of northern Colombia and Venezuela (e.g. *Nucula venezuelana, Calotrophon velero, Ancilla glabrata, Conus mappa granarius,* and *Bellaspira margaritensis*). In any case, it is certain that, besides wide ranging species, the reefs of the Santa Marta area lodge a significant share of forms restricted zoogeographically to northernmost South America. One species (*Pachybathron tayrona*) seems to be endemic from the Santa Marta area (Díaz and Velásquez, 1987).

The occurrence of several species in the Santa Marta area that hitherto were only known from remote localities was quite unexpected and cannot be zoogeographically well explained (e.g. *Gari* sp., a paciphile genus whose occurrence in the Caribbean has not been reported to date; *Pusia venusta,* previously known only from Cuba, *Chantarus karinae* and *Murex consuelae,* from the Lesser Antilles; various Turridae from Florida, etc.; see also Díaz and Götting, 1988). These apparently surprising records just reflect how little is still known about the composition of the marine molluscan fauna of northernmost South America and its zoogeographical relationships.

Molluscan Assemblages

Variations in the structure of the coral biotope among reef zones affect molluscan communties. The degree of abundance of cryptic habitats, such as interstices and small caves, seems to be the main factor affecting the abundance of molluscan species in the reef; in other words, three-dimensional shaped bottoms have the tendency to lodge species-richer communities than uniformly shaped ones. Of course, other factors as flushing, illumination, depth, and substratal qualities also play a significant role. Zones H and I yielded the highest numbers of species; both are rich in interstices and small cavities formed by accumulation of boulders and coral rubble, favouring the establishment of coelobites (cavity-dwellers); additionally, both zones have a high percentage coverage by hard substrata although low in living corals, thus more area is available for colonization by epilithic and endolithic forms.

Zones D and E both have a similar percentage of cover of living coral, but three-dimensional structures are frequent in zone D (pinnacles, hollow brain corals), lodging twice as many species as zone E, where flat encrusting corals are the rule. Although zone B (reef-crest) is characterized by conspicuous pillar structures and cavities, the number of molluscan species living there is rather reduced. Wave action and substratal instability could be the main limiting factors in this zone, which represents an environment of reduced diversity for many groups (Stoddart, 1969).

There are no significant differences in species richness between areas with great coral diversity and reefs where coral has been partially damaged (sites 6 and 7). However, reef areas with high coverage of dead coral and sediments have a lower number of symbiotic and carnivorous species but a high proportion of sediment-dwellers and herbivores. Dead coral surfaces in shallow zones are mostly overgrown by filamentous algae, whereas in deeper ones coral debris is covered by sediments, the interstices of coral rubble also becoming filled by them.

The clusters from the similarity analysis indicate strongly, from the viewpoint of molluscan distribution, that there are just three broad types of environment, plus an extreme one with a small area and few species. Only the shallow water zones cluster themselves on the basis of depth. The other two are grouped together principally on substratum type. The coral rubble and shell debris environment is more closely linked to the soft bottom zones than to the hard substrata.

Asmuch as 60 of the 201 species (29.8%) considered in the analysis had a range which spanned more than one of the clusters, the validity of the analysis becomes somewhat reduced. This reflects that though substratal quality and depth are important factors, a complex and partly unresolved mixture of environmental variables including wave energy, illumination, siltation, flushing, patterns of predation, and other biological pressures participate on molluscan distribution. It also emphasizes that future works on molluscan dis-

tribution patterns in coral reefs should include all reef zones and consider additional environmental variables.

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Table 1. Molluscan species found in 10 reef zones (1 to 40 m depth) of 7 studied sites in the Santa Marta area, Colombia. Species characterizations (LH, FH) were taken in part from the literature (sources listed below) and applied only to taxa collected alive (+ preceding species name = dead). Life habit (LH): V = vagrant; Sd = Sediment dweller; C = cemented; E = endolithic; L = loosely attached; S = symbiont. Feeding Habit (FH): C = carnivore; H = herbivore; D = deposit feeder; F = filter feeder/suspension feeder; P = parasite.
(References used for species categorization: Graham, 1955; Abbott, 1974; Bandel, 1976. 1984; Hadfield, 1976; Bandel and Wedler, 1987; Reed and Mikkelsen, 1987: Shweimanns, 1988).

	Reef Site	Reef Zone	LH	FH
POLYPLACOPHORA				
Ischnochitonidae				
Ischnochiton purpurascens (C.B. Adams)	1,6,7	A,H	V	H
I. papillosus (C. B. Adams)	2,6	A,G,H	V	H
I. pseudovirgatus Kaas	2,4,7	A,H	V	H
Chaethopleura apiculata (Say)	1,7	F,I	V	H
Acanthochitonidae				
Acanthochitona spiculosa (Reeve)	4	H	V	C
Choneplax lata (Guilding)	7	H	V	C?
BIVALVIA				
Nuculidae				
Nucula venezuelana Weisbord	1,3,7	J,F	Sd	D
Arcidae				
Arca zebra (Swainson)	1,3,7	A,D,I	L	F
Arca imbricata Bruguiere	1,2,3,4,5,6,7	D,E,F,I,	L	F
Barbatia candida (Helbling)	1,2,3,7	A,B,H,I,	L	F
B. domingensis (Lamarck)	1,2,3,4,6,7	A,B,D,I,	L	F
B. tenera (C.B. Adams)	1,2,3,4,5	A,D,I	L	F
Arcopsis adamsi (Smith)	1,2,3,4,5,6,7	D,F,H,I,	L	F
Mytilidae				
Lithophaga antillarum (d'Orbigny)	1,2,3,5,6,7	D	E	F
L. aristata (Dillwyn)	1,2,3,5,6,7	A,B,D,E,	E	F
L. bisulcata (d'Orbigny)	1,2,3,4,5,6,7	A,B,D,H	E	F
Botula fusca (Gmelin)	1,2,3,5,7	D,I	E	F
Modiolus americanus (Leach)	2	A	L	F

	Reef site	Reef zone	LH	FH
Gregariella coralliophaga (Gmelin)	3,4	I	E	F
Pinnidae				
Pinna carnea (Gmelin)	2,4,5,6,7	A,B,J	L	F
Atrina seminuda (Lamarck)	6,7	J,F	Sd	F
Pteriidae				
Pteria colymbus (Röding)	1,3,4,5,6,7	G,H	L	F
Pinctada imbricata Röding	1,3,5	A,G,H	L	F
Isognomonidae				
Isognomon radiatus (Anton)	1,4,5,6,7	A,H,I	L	F
Malleidae				
Malleus candeanus (d'Orbigny)	1,3,4,5,6,7	D,E	E/L	F
Ostreidae				
Lopha frons (Linné)	1,3,4,5,6,7	G,H	C	F
Ostrea equestris Say	3	G,H	C	F
Ostrea sp.	1	F	S/C	F
Plicatulidae				
Plicatula gibbosa Lamarck	1,3	G,I	C	F
Pectinidae				
Pecten ziczac (Linné)	6	I	L	F
Lyropecten nodosus (Linné)	1,3	D,I	L	F
L. antillarum (Recluz)	3,4,6,7	D,H,I	L	F
Chlamys sentis (Reeve)	2,3,7	D,H,I	L	F
C. benedicti Verrill & Bush	3	D	L	F
+ *Argopecten nucleus* (Born)	-	-	-	-
Spondylidae				
Spondylus americanum Herrmann	1,2,3,4,6	D,E	C	F
S. ictericus Reeve	1,3,6,3	D,E,H	C	F
Limidae				
Lima scabra (Born)	1,2,3,4,5,6,7	B,D,E,I	L	F
L. lima (Linné)	1,5	H	L	F
L. pellucida C.B. Adams	1	H	L	F
L. albicoma Dall	3,4,7	I	L	F

	Reef site	Reef zone	LH	FH
Crassatellidae				
Crassinella martinicensis (d'Orbigny)	2,3,4,5,6,7	F,I,J	Sd	F
Anomiidae				
Anomia simplex d'Orbigny	2	A	C	F
Pododesmus rudis (Broderip)	3	A	C	F
Trapeziidae				
Coralliophaga coralliophaga (Gmelin)	3	D,I	L	F
Lucinidae				
Parvilucina multilineata (Tuomey & Holmes)	4,5	F,J	Sd/L	F
Erycinidae				
+ *Erycina periscopiana* Dall	-	-	-	-
Chamidae				
Chama congregata Conrad	1,3,5,6,7	G,H	C	F
C. macerophylla Gmelin	1,2,3,6	G,H.I	C	F
C. sarda Reeve	1,3	A,H	C	F
C. sinuosa Broderip	1,2	B,H	C	F
Pseudochama radians (Lamarck)	1,4,5,6,7	B,G,H	C	F
Cardiidae				
+ *Americardia media* (Linné)	-	-	-	-
Trachycardium isocardia (Linné)	2,3	F,J	Sd	F
T. magnum (Linné)	1	F	Sd	F
Papyridea semisulcata (Gray)	1,3,4	F,I	Sd/L	F
P. soleniformis (Bruguiere)	2,3	J	Sd	F
+ *Laevicardium pictum* (Ravenel)	-	-	-	-
Condylocardiidae				
Carditopsis smithii (Dall)	3,6	F	Sd/L	F
Veneridae				
Gouldia cerina (C.B. Adams)	3,7	F,J	Sd	F
Chione cancellata mazycki Dall	1,2,3,4,5,6,7	F,I,J	Sd	F
Ventricolaria rigida (Dillwyn)	1,4	F	Sd	F
V. listeroides Fischer-Piette & Testud	4	F,J	Sd	F

	Reef site	Reef zone	LH	FH
Pitar fulminatus (Menke)	1,4,6,7	F,J	Sd	F
+ *Transenella stimpsoni* Dall	-	-	-	-
+ *Callista eucymata* (Dall)	-	-	-	-
+ *Macrocallista maculata* (Linné)	-	-	-	
Petricolidae				
Petricola lapicida (Gmelin)	1,4,7	D,I	E	F
Rupellaria typica (Jonas)	2	A	E	F
Tellinidae				
Tellina listeri Röding	2,3	J	Sd/I	F
+ *T. laevigata* Linné	-	-	-	-
+ *T. fausta* Pulteney	-	-	-	-
Psamobiidae				
+ *Gari* sp.	–	–	–	–
Semelidae				
Semele bellastriata (Conrad)	3,5	I,J	Sd/L	F
+ *S. proficcua* (Pulteney)	-	-	-	-
+ *S. purpurascens* (Gmelin)	-	-	-	-
Cumingia coarctata Sowerby	4,5,6,7	F,I,J	Sd/L	F
Myidae				
Sphenia antillensis Dall & Simpson	3	I	L	F
Mesodesmatidae				
+ *Ervilia nitens* (Montagu)	-	-	-	-
Corbulidae				
Corbula dietziana C. B. Adams	3, 4, 5, 6	F, I, J	Sd	F
+ *C. caribaea* d'Orbigny	-	-	-	-
Gastrochaenidae				
Gastrochaena hians (Gmelin)	2,3,5,7	B,D,E,I	E	F
Spengleria rostrata Spengler	3,5,7	D	E	F
Lyonsiidae				
Lyonsia beana d'Orbigny	1,3	I	L	F
SCAPHOPODA				
Dentaliidae				
+ *Antalis antillarum* (d'Orbigny)	-	-	-	-

	Reef site	Reef zone	LH	FH
Cadulidae				
+ *Polyschides tetraschistus* (Watson)				
GASTROPODA				
Fissurellidae				
Rimula pycnonema Pilsbry	2,3,5,6	I,J	V	C?
Emarginula pumila (A. Adams)	3	D	V	C
+ *E. phrixodes* Dall	-	-	-	-
Diodora dysoni (Reeve)	1,3	I	V	H
D. cayenensis (Lamarck)	3,7	I	V	H
D. sayi (Dall)	3	I	V	H
+ *D. listeri* (d'Orbigny)	-	-	-	-
+ *D. meta* (von Ihering)	-	-	-	-
Lucapina suffusa (Reeve)	3,5,6	A,H	V	H
+ *L. sowerbyi* (Soerby)	-	-	-	-
+ *Lucapinella limatula* (Reeve)	-	-	-	-
+ *Hemitoma octoradiata* (Gmelin)	-	-	-	-
Trochidae				
Calliostoma jujubinum (Gmelin)	1	E	V	P/D?
C. euglyptum (A. Adams)	3	I	V	P/D?
Tegula fasciata (Born)	1,3,6,7	H	V	H
Cyclostrematidae				
Arene tricarinata (Stearns)	3	I	V	H
Turbinidae				
Astraea caelata (Gmelin)	1,3	A,B,G	V	H
A. tecta (Lightfoot)	3	B	V	H
A. phoebia (Röding)	1	H	V	H
Liotiidae				
+ *Haplocochlias moolenbeki* Jong & Coomans	-	-	-	-
Phasianellidae				
+ *Tricolia bella* (Smith)	-	-	-	-
Rissoinidae				
+ *Rissoina bryerea* (Montagu)	-	-	-	-

	Reef site	Reef zone	LH	FH
+ *Zebina browniana* (d'Orbigny)	-	-	-	-
Vitrinellidae				
Conchliolepis parasitica Stimpson	-	-	-	-
+ *Solariorbis infracarinata* Gabb	-	-	-	-
Tornidae				
Macromphalina palmalitoris *pilsb. & McGin.	3,4	H,I	V	?
Architectonicidae				
Heliacus bisulcatus d'Orbigny	-	-	-	-
Caecidae				
Caecum regulare Carpenter	2	J	V	H
C. cornucopiae Carpenter	3	I	V	H
+ *C. pulchellum* Stimpson	-	-	-	-
C. floridanum Stimpson	1	F	V	H
C. imbricatum Carpenter	1,3	F,J	V	H
Modulidae				
Modulus modulus (Linné)	2,3,4,6	A,H	V	H
Turritellidae				
Vermicularia spirata (Philippi)	1,3	F,I	L	F
Vermetidae				
Serpulorbis decussatus (Gmelin)	1	H	C	F
Petaloconchus erectus (Dall)	7	H	C	F
Cerithiidae				
Cerithium eburneum Bruguiere	1,3,4,5,6,7	A,B,H	V	H
C. litteratum (Born)	3,4,5,6,7	A,G,H	V	H
Diastoma varium (Pfeiffer)	2,3	A	V	H
Cerithiopsidae				
Cerithiopsis emersoni (C.B. Adams)	3,7	I	V/S	C/P
C. greeni (C.B. Adams)	3,7	I,J	V/S	C/P
+ *C. latum* (C.B. Adams)	-	-	-	-
+ *C. rugulosum* (C.B. Adams)	-	-	-	-
+ *Alaba incerta* (d'Orbigny)	-	-	-	-
Seila adamsi (Lea)	2,3,7	D,I,J	V/S	C/P

	Reef site	Reef zone	LH	FH
Triphoridae				
Triphora decorata (C.B. Adams)	2,3,6	H,I	V/S	C/P
T. melanura (C.B. Adams)	3,4,5	I,J	V/S	C/P
T. turristhomae (Holten)	1,3,4	I	V/S	C/P
T. nigrocincta (C.B. Adams)	3	A,I	V/S	C/P
T. pulchella (C.B. Adams)	3	I	V/S	C/P
+ *T. ornata* (Deshayes)	-	-	-	-
Epitoniidae				
Epitonium lamellosum (Lamarck)	2	A	V/S	C/P?
Opalia burryi Clench & Turner	4	J	V/S?	C/P?
Melanellidae				
Melanella intermedia (Cantraine)	1,2,3	J	S	P
M. conoidea (Kurz & Stimpson)	2,3	J	S	P
+ *M. arcuata* (C.B. Adams)	-	-	-	-
+ *M. gracilis* (C.B. Adams)	-	-	-	-
Strombiformis bifasciatus (d'Orbigny)	6	J	S	P
+ *S. auricinctus* (Abbott)	-	-	-	-
+ *Oceanida graduata* Folin	-	-	-	-
Hipponicidae				
Hipponix antiquatus (Linné)	2,4,5,6	D,F,H	L	F
Cheilea equestris (Linné)	2,3	A,B,F	L	F
Crepidulidae				
Crucibulum auricula (Gmelin)	5	H	L/S	F
C. striatum (Say)	3,6	F,I	L/S	F
Crepidula convexa Say	2	A	L/S	F
C. plana Say	3,7	H	L/S	F
Eratoidae				
+ *Erato maugeriae* Gray	-	-	-	-
Trivia nix (Schilder)	1	D	V	C
T. guadripunctata (Gray)	1,3,6	D,E,J	V	C
T. suffusa (Gray)	1	D	V	C
T. pediculus (linné)	1,3	D,E	V	C
T. antillarum Schilder	3	J	V	C

	Reef site	Reef zone	LH	FH
Cypraeidae				
Cypraea zebra Linné	1,3,6	B,D,H,I	V	C/H?
C. cinerea Gmelin	1,3,6	D,I	V	C
C. spurca acicularis Gmelin	1,2,3,7	D,E,I	V	C
Ovulidae				
Cyphoma gibbosum (Linné)	1,3,4,5,6,7	E,F,G,H	S/V	P
C. signatum Pilsbry & McGinty	4	E	S/V	P
Simnia acicularis (Lamarck)	1,3	H,B	S/V	P
S. uniplicata (Sowerby)	3	F	S/V	P
Tonnidae				
+ *Tonna maculosa* (Dillwyn)	-	-	-	-
Cassidae				
Morum oniscus (Linné)	3,4	A,H	V	C
Cymatiidae				
Cymatium pileare (Linné)	1	H	V	C
C. nicobaricum (Röding)	1,4,5	H	V	C
Charonia variegata (Lamarck)	4	H	V	C
Bursidae				
Bursa cubaniana (d'Orbigny)	1,2,3,4,6,7	D,H,I	V	C
B. thomae (D'Orbigny)	2,3,6	C,D,I	V	C
B. corrugata (Perry)	3	F	V	C
Colubrariidae				
Colubraria lanceolata (Menke)	1,3,6,7	D,I	V	C
C. obscura (Reeve)	2,5	J	V	C
C. swifti (Tryon)	1,3	D,I	V	C
Muricidae				
Murex consuelae Verrill	4	J	V	C
Chicoreus brevifrons (Lamarck)	1,3,6,7	D,E	V	C
Calotrophon velero (Vokes)	6,7	F	V	C
Risomurex withrowi Vokes & Houart	1,3,4,6,7	D,E,H	V	C
Muricopsis muricoides (C.B. Adams)	1,3	H	V	C
Trachypollia nodulosa (C.B. Adams)	1,3,5,6	G,H	V	C

	Reef site	Reef zone	LH	FH
+ *T. didyma* (Schwengel)	-	-	-	-
Dermomurex pauperculus (C.B. Adams)	3	H	V	C
Favartia alveata (Kiener)	3	H	V	C
F. cellulosa (Conrad)	3,7	H,I	V	C
Thais deltoidea (Lamarck)	-	-	-	-
Coralliophilidae				
Coralliophila abreviata (lamarck)	1,2,3,4,5,6,7	B,D,E,H	S	P
C. scalariformis Lamarck	1,3	D	S	P
C. mansfieldi McGinty	3	D	S	P
C. caribaea Abbot	1,3,4,5,6,7	D,E,G,H	S	P
Buccinidae				
Pisania pusio (Linné)	2	B	V	C
Cantharus karinae Usticke	1, 3, 4, 7	D,E,J,F	V	C
+ *C. auritulus* (Link)	-	-	-	-
Engina turbinella (Kiener)	5,6	H	V	C
Columbellidae				
+ *Columbella mercatoria* (Linné)	-		-	-
Anachis sparsa (Reeve)	7	H,I	V	C
+ *A. hotessieriana* (d'Orbigny)	-	-	-	-
Mitrella nycteis (Duclos)	5	I	V	C
+ *M. lunata* (Say)	-	-	-	-
+ *M. dichroa* (Sowerby)	-	-	-	-
Nassarina minor (C.B. Adams)	2	I	V	C
Nassaridae				
Nassarius cf. *consensus* (Ravenel)	4,5,6,7	F,J	V	C/D
Fasciolariidae				
Fasciolaria tulipa (Linné)	2,6	B,E	V	C
Latirus infundibulum (Gmelin)	1,2,4,5,7	F,I,J	V	C
L. mcgintyi Pilsbry	2,3,4,6	B,C,D	V	C
L. angulatus (Röding)	4	G	V	C
Dolicholatirus cayohuesonicus (Sowerby)	3,4,5,6	A,H	V	C
Leucozonia nassa (Gmelin)	1,4,5	D,G	V	C

	Reef site	Reef zone	LH	FH
Volutidae				
+ *Voluta musica* Linné	-	-	-	-
Turbinellidae				
+ *Turbinella angulata* (Lightfoot)	-	-	-	-
Vasidae				
Vasum muricatum (Born)	2,3,4,5,7	A,D,F,J	V	C
Mitridae				
Mitra nodulosa (Gmelin)	1,3,4,5,6	D,E,I	V	C
Pusia exigua (C.B. Adams)	2,3,4	C,I	V	C
P. monilifera (C.B. Adams)	1,4	H	V	C
+ *P. puella* (Reeve)	-	-	-	-
+ *P. laterculata* (Sowerby)	-	-	-	-
+ *P. venusta* Sarasua	-	-	-	-
+ *Pusiolina veldhoveni* Johg & Coomans	-	-	-	-
Olividae				
+ *Ancilla glabrata* (Linné)	-	-	-	-
Marginellidae				
Pachybathron tayrona Díaz & Velásquez	2,6	A,J	V	C?
Gibberula lavaellana (d'Orbigny)	3,5,6,7	J	V	C?
Persicula fluctuata (C.B. Adams)	2,3,7	F,J	V	C
Volvarina avena (Kiener)	1,3,4,6,7	H,I,J	V	C
V. lactea (Kiener)	7	H	V	C
V. pallida (Linné)	4	H	V	C
Dentimargo reducta (Bavay)	1,6,7	F	V	C?
+ *Granulina ovuliformis* (d'Orbigny)	-	-	-	-
Conidae				
Conus mus Hwass	1,6,7	G	V	C
C. ermineus Born	1	A,F	V	C
C. daucus Hwass	1,3	D,E,F	V	C
C. regius Hwas	3,4	H	V	C
C. mappa granarius Kiener	2,7	F	V	C

	Reef site	Reef zone	LH	FH
Turridae		-		
Monilispira albomaculata (d'Orbigny)	2,3,4,6,7	A,C,H	V	C
Crassispira apicata (Reeve)	1,4,5,6	D,I,J	V	C
C. leucocyma Dall	4,6,7	H,I	V	C
Pilsbryspira hardfordiana (Reeve)	6	H	V	C
Buchema hadromeres Melvill	6,7	I	V	C
Pyrgospira cf. *ostrearum* (Stearns)	3,4,5,7	D,H,I	V	C
+ *Clathrodrillia minor* (Dautzenberg)	-	-	-	-
Fenimorea halidorema Schwengel	5	H	V	C
Cerodrillia perryae Bartsch & Rehder	2,3,5,7	I,J	V	C
Neodrillia cydia Bartsch	5,6,7	I,J	V	C
Bellaspira margaritensis McLean & Poorman	1,2,3,4,5,6	F,H,I,J	V	C
Glyphoturris diminuta (C.B. Adams)	1,2,3,6,7	I,J	V	C
Pyrgocythara filosa Rehder	3,5	J	V	C
Pyrgocythara sp.	3,7	J	V	C
+ *Vitricythara lavalleana* (d'Orbigny)	-	-	-	-
Agathotoma candidissima (C.B. Adams)	1,3	C,J	V	C
Cryoturris quadrilineatus (C.B.Ad.)	7	I,J	V	C
Brachycythara biconica (C.B. Adams)	5,7	F,I,J	V	C
Ithycythara parkeri Abbott	5,7	I	V	C
+ *I. lanceolata* (C.B. Adams)	-	-	-	-
+ *Mitrolumna biplicata* (Dall)	-	-	-	-
+ *Daphnella margaretae* Lyons	-	-	-	-
+ *D. lymneiformis* (Kiener)	-	-	-	-