STATUS AND BIODIVERSITY OF THE BUONA-VISTA CORAL REEF, RUMASSALA, GALLE.

1993-4 (UPDATED 1996)

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Nature Conservation Group

Natcog

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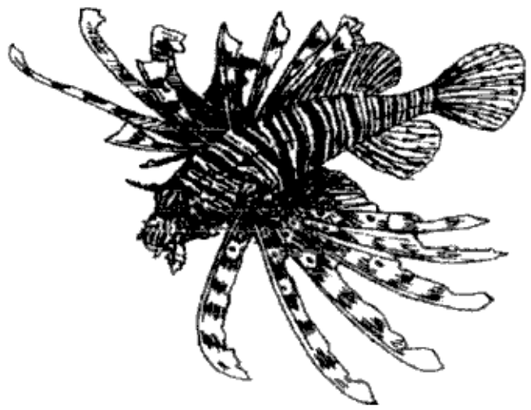

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Natcog

The Report on the Rumassala Coral reef published by Natcog initially in 1993 and updated in 1996 represented a significant contribution to the coral reefs in Sri Lanka at the time.

The research and the report initially published as photocopied documents contributed significantly to the campaign to save the Buona-vista reef from the proposed Galle Harbor development. Over a 1000 copies of the book-let was produced as photocopies mostly with the help of well wishes who would make a 50-100 copies at a time.

As the document has become out of print we are issuing the document as a E- publication for free distribution.

November 2010

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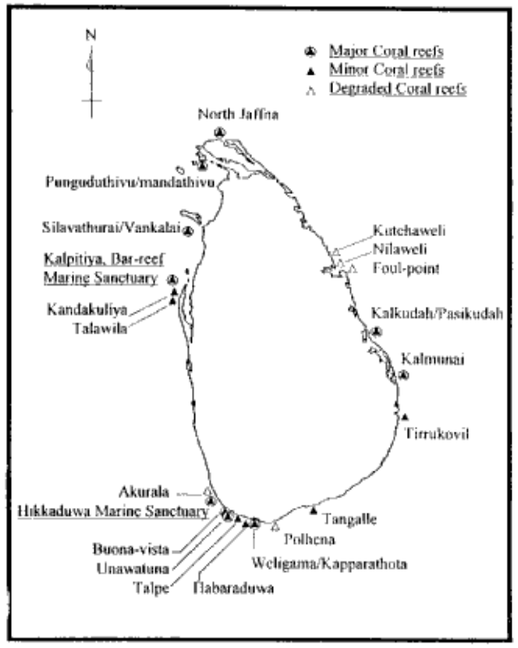
PREFACE

Development often takes a heavy toll on our environment, and the coral reefs of Sri Lanka have taken the brunt of it. Pollution, the growth of tourism and the extraction of reef material have all contributed to the steady degradation of most of our reefs. Buona-vista was amongst the last of the healthy coastal coral reefs' in Sri Lanka. With the coming of the proposed Galle harbour expansion project even this best of reefs seems doomed. The proposed plan aims to bury the whole reef under tons of concrete for a container yard.

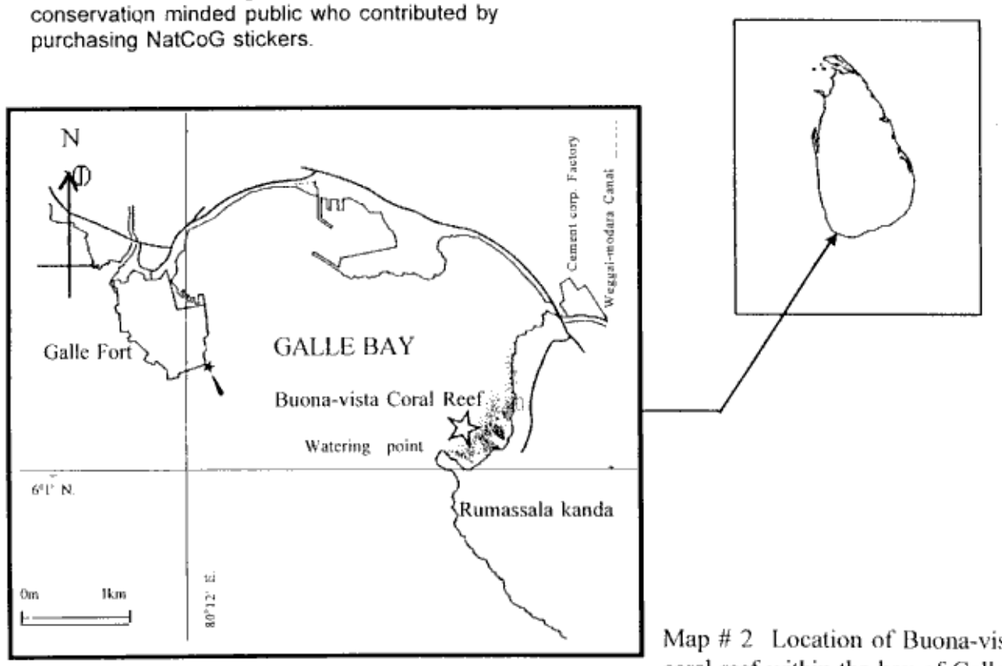
Coral reefs are a very rare heritage in Sri Lanka, rarer even than Rain forests. In importance and function the coral reefs are undoubtedly the rainforests of the Ocean. We Sri Lankans are beginning only now to explore the rich marine heritage we possess. But ironically if we do not alter our short-sighted ways, nothing worthwhile would be left for the coming generations.

Hence this survey is an attempt at enlightening Sri Lankans about the rich marine heritage we possess, hoping that it is not too late to alter our ways so that we do not jeopardise the needs of the future generations in our short term search for prosperity.

The project was funded by the Team members themselves and through the funds raised with a conservation minded public who contributed by purchasing NatCoG stickers.



Map #1 Distribution and status of Coral reefs in Sri Lanka.



Map # 2 Location of Buona-vista coral reef within the bay of Galle.

1. INTRODUCTION

Sri Lanka has 1760 Km. of coastline with a considerable length of reefs lining the shores at different depths. These consist of three main types. The majority fall within the categories of Sandstone/ Beach rock and Boulder/Granite reefs. Composed of compacted, cemented sand deposits and submerged granitic rocks, supporting only a scattered and superficial coral cover, these reefs contain less habitat and faunal diversity than true coral reefs. Yet they constitute very important marine habitats in deeper offshore areas where coral reefs do not grow. In Sri Lanka true coral reefs are very few, most of which are restricted to a narrow belt fringing the coast to a maximum depth of 10 meters. Two offshore coral reefs occur off the northwest coast on shallow banks isolated away from the shore.

1.1. CORAL REEFS OF SRI LANKA

Coral reefs occur dispersed along the coastline with the east coast supporting major reefs around Kalkudah/Pasikudah and at Kalmunai south of Batticaloa. Many minor coral reefs exist around Tirrukovil, Foul pt., Nilaweli and Kutchaweli and some which are now degraded such as at Pigeon island. Reportedly coral reefs occur off the northern shores and on some islands around Punkuduthivu and Mandativu off the Jaffna peninsula. Two large offshore reef systems are found on the north-west coast, off Silavatturai-Vankalai and Kalpitiya (Bar reef). Minor coral reefs are found in Kandakuliya and Talawila. No coral reefs occur on the western coastline from Talawila down to Akurala. As the coral reef at Akurala has been destroyed, good coral reefs are found only at Hikkaduwa, Buonavista, Unawatuna and at Kapparathota in the Weligama bay, while minor coral reefs are found at the base of the Galle fort, around Talpe-Habaraduwa, Polhena and Tangalle. The two offshore ridges of the Great and Little Basses are usually regarded as coral reefs. However after investigations we are of the opinion that the low live coral cover on these ridges does not warrant their classification as true coral reefs.

1.2. BUONA VISTA REEF

Located on the south-eastern corner of the Galle bay, (6°1'30"N/80°14'0"E, 6°1'30"N/80° 14'18"E, 6° 1"0"N/80°14'0"E, 6°1'0"N/80°14'18"E) at the base of the Rumassala cliff, the Buona-vista reef stretches from a point below the Harbour Inn up to the Watering Point. The reef covers an area 500m x 200m contained roughly within the 8m depth contour. The reef consists of coral patches extending seaward from the shore, interspersed with stretches of sand. The reef has a beach-rock base with individual reef patches recording up to 82% live coral cover. The north-eastern part of the area is surrounded by a steep granite rock face rising approximately 23m above sea level. The same rock face extends below water level creating a boulder reef towards the Weggal-modara canal. Except for three small sand coves the coastline consists of natural and man made rocky shores.

The live coral cover for the Buona-vista reef system total 70.94%. Of the total bottom cover 42.4% comprises *Acropora spp.* followed by 7.7% *Porites spp.* 7.7% *Echinopora spp.* and 6.4% *Montipora spp.* The non coralline areas were dominantly composed of coral rubble 13.1% with dead coral accounting for only 3.4% of the total reef area. The deeper zones of the reef were mostly of Beach-rock, interspersed with few large submarine boulders. Some areas on the north-eastern and southern coastline were composed of granite boulders. In some areas sea reclamation had been carried out by laying boulders. On these boulders some coral growth could be seen. (The extent of the destruction caused to the earlier reef however is hard to determine).

The survey recorded 484 species of fish divided between 186 genera in 68 families. (*see note pg. 20.*) This constitutes the highest number of species recorded from any Sri Lankan reef to date. It also provides the most comprehensive picture of the fish communities on any Sri Lankan reef. 63.2% of the species were found to be resident at the site with 34% migrant species also recorded. The designation for 2.5% of the population could not be determined. Of the recorded species 34.45% were important as food fishes and 24.16% were exploited for the ornamental fish trade.

The Family Chaetodontidae (Butterflyfishes) is considered an important indicator group in evaluating habitat diversity and reef health. During the survey 25 species in 3 genera were recorded within the Buona-vista reef. This number ranks among the highest for a Sri Lankan reef. There are 36 species of Chaetodontids in 5 genera recorded for Sri Lanka.

In comparison, the Islands of the Philippines in the heart of the central Indo-Pacific record more than 2000 species of inshore fishes. The area is considered as the centre of evolution for this zoogeographic region, recording the highest diversity of fish species anywhere in the world. Moving away from the centre, the reef complex of Great barrier reef supports 1300 species, with single reefs averaging 500 species of fish. The Islands of Guam list a total of 794 inshore species and the Hawaiian Islands at the eastern periphery report 442 species. The listed number of species for the single reef of Buona vista ranks close behind that of reefs in the Great barrier reef, the Authors are of the view that the total number of inshore species for Sri Lanka would also match with that reported for the Great Barrier reef. The total number of fish species recorded from the Atlantic Ocean amounts to less than 500.

1.3. MARITIME ARCHAEOLOGY

The Galle Bay area has a maritime heritage dating back at least to the period of the Portuguese occupation of Sri Lanka. Having served as a natural harbour for many merchant and Men 'o' war vessels and having seen a fair share of action the bay contain several important ship wrecks. At least 10 marine archaeological sites have been identified (Marine archaeological survey 1993), with one of the sites being located within the Buona vista area. This site is identified as site H. The site contains remains of copper plating, iron bolts and possibly a cargo of charcoal and is found in water around 7m deep.

2. METHODOLOGY

The survey was carried-out during two non-monsoonal seasons for the south-west coast of Sri Lanka, from 31st Dec. 1992 to 24th April 1993 and 23rd Dec 1993 to 24th April 1994. During the period the team worked for 60 days logging over 720 man-hours underwater.

Table #.1 Number of dives logged.

	Days	Daydives	Nightdives	Duskdives
Season #.1	27	27	6	0
Season #.2	33	33	4	2

2.1. GENERAL SURVEY

The qualitative list of fish and invertebrates was compiled on data collected by random visual sampling techniques using both snorkel and scuba diving gear. This included recording all species of fish observed with notes on approximate numbers of individuals per species, presence of juveniles, spawning, habitat and depth preference, feeding, migrations, population fluctuations and behaviour. Dives were carried out during day, dusk and at night to observe the diurnal and nocturnal fish communities and their interactions. The fish catches by both fishermen and ornamental fish collectors were also monitored and any interesting or new species for the site recorded. Most of the identification was carried out visually, a limited number of specimens being collected in situations where field identification was not possible. Due to technical difficulties in observing and identifying marine invertebrates, only a general list was compiled on their presence on the reef. A checklist for algae was formulated using a limited number of specimens collected in the field.

2.2. FISHERIES

Monitoring food fish catches, Two fibre glass catamarans operating in proximity to the reef were monitored in 1994. One boat was using bottom-set nets to collect spiny lobsters and the other used 38mm mesh size gill-nets laid vertically over a beach-rock substrate. Both these boats operated just out side the Rumassala cove and laid their nets in the night, collecting them early the next morning. The team recorded the Fish, crustaceans, and algae that they found entangled in the bottom-set nets.

A rod (kithul) and line fishery was practised mainly in the Watering Point area using brackish water shrimps as bait. This method was monitored, especially at dusk, when the lines brought up nocturnal fish species like Holocentrids, Pempherids and Apogons. The team also monitored the fish that were caught in cast nets and beach seines, which were restricted to Dewata and Waggal modara beach areas. The fish catches from these fisheries consisted of Mugills, Spratelloides, Leiognathids, Kuhlia and Stolephorus species. These species also occur on the reef and may represent one population.

Dynamiting large shoals of *Caranx, Rastrelliger* and *Sphyraena* was being illegally carried-out within the Buona-vista reef. Although we were not able to record any actual instances of dynamiting as collectors usually operate very early in the morning, several dead fish killed by explosives were observed during the survey.

Ornamental fish collectors operated mostly during the day time and used moxy nets, hand nets and rod and line to collect aquarium fishes. The team snorkelled with them to record the areas, species fished and to assess the damage caused to some reef sectors. The fish collectors carried-out night dives to collect *Zanclus, Chaetodon* and other species which had a high demand in the ornamental fish trade. The team often recorded for the site fishes that they had accidentally caught, such as *Paragobiodon, Gobiodon, Bryaniops* and *Tripterigion* species and crustaceans *Thor amboinensis, Trapezia, Alpheus* etc.

2.3. TRANSECT SURVEY

A transect survey was done to determine the bottom composition, live coral cover and the bottom/depth profiles of the reef. Six 100m line transects were laid on different sections of the reef, starting from a point shoreward and leading into the bay in an approximately north-westerly direction. All substrate types falling directly under the transect line were recorded down to a minimum section of 5cm with depths recorded at intervals of every 2m. Bottom cover was recorded under generalised headings (coral rubble, beach-rock etc.) and corals were categorised in to generic groups.

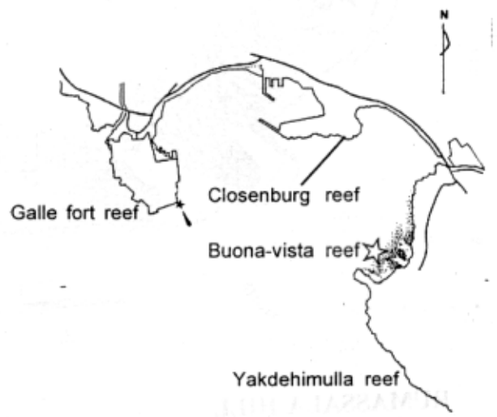
The data was analysed to calculate the bottom cover composition under different substrate types, total live coral cover and species dominance of corals for each transect and averages were calculated for the reef in general. The data was analysed by calculating the percentage of substrate types for each meter. The collective values totalled under the group/generic headings were then divided by 100 to give the percentages per transect. Bottom profiles of the transects were compiled by plotting the depth data on a graph using the sea level as point '0' on the Y axis, and depths were plotted as minus values to give a realistic representation of the reef relief. Substrate information from the transects was superimposed on to this and used in correlating bottom cover types with depth variation.

The Coral Reefs of Galle Bay

The Galle Bay contained at least three other Coastal coral reefs along its shores. The area below the Galle Fort on its Southern and South western coasts contains a somewhat degraded Coral reef. The reef is believed to have been much larger in extent previously, as the construction of the Galle Fort by the early Europeans used large quantities of Coral as Building material. Preliminary investigation of this reef revealed 138 species of fishes. This area is mainly composed of shallow reef crests.

The once famous Coral reef located within a small cove next to the present Closenburg Hotel was a place frequented by many early naturalists, among them J.W. Bennett, and the French artist Eugene Ransonnet (1880) who produced some of the worlds first underwater paintings. Earlier within this Century the reef was destroyed and the bay was reclaimed for the construction of a Flour mill on this site. The mill was never constructed though the cove was reclaimed destroying yet another irreplaceable Coral reef for short term progress.

Apart from the Coral reef at Buona-vista on the Eastern periphery of the Galle bay, Another Coral reef is known to exist on the rocky outer side of the Rumassala hill, stretching from the Watering point up to Yakdehimulla. This in effect connects the Buona-vista Coral reef with the Coral reefs at Unawatuna, which creates a complex of reefs surrounding the Rumassala hill. The area is difficult to survey as it is subjected to heavy surf. Insufficient data is available for this reef and further studies should be carried out to determine its' diversity and status. As the Reef at Unawatuna has been proposed as a Marine Sanctuary, it should be seriously considered in extending the Sanctuary boundaries up to Buona-vista, as this constitutes one reef system.



3. LOCATION GEOGRAPHY

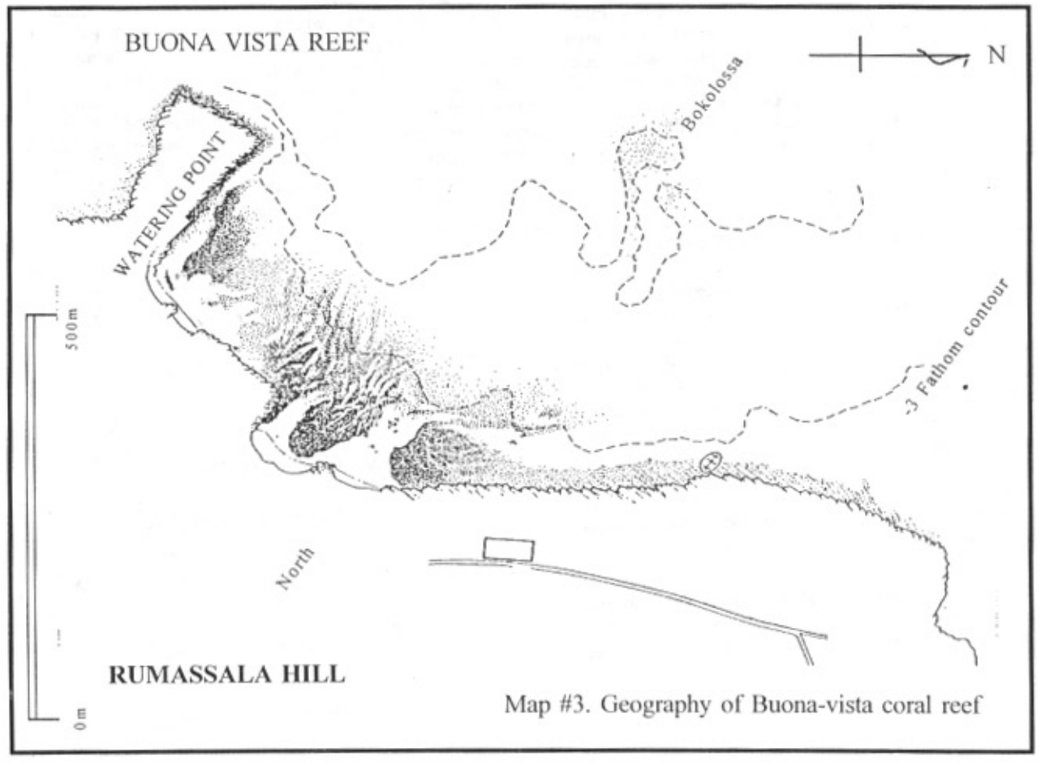
3.1. TERRESTRIAL GEOGRAPHY

The Buona-vista reef is located at the foot of the Rumassala hill flanking the south-eastern corner of the bay of Galle, beginning at a point opposite the Cement corporation premises and the outflow of the Weggal modara canal. The Rumassala hill rises 15m-23m above sea level in a steep rock face stretching out to sea initially in a south-westerly direction, followed by a southerly stretch for approximately 750m, at which point the hill gives way to a forested cliff following again a south-westerly bearing (450m). The coast here is broken by three small sandy beaches and nest the main areas of the reef. At the lower extreme a rocky projection cuts into the bay in a north-westerly direction (350m) effectively creating a sheltered cove within.

3.2. SUBMARINE GEOGRAPHY

The sea bottom on the outer side of the Watering Point [A] (refer Map #4.) consists of large granite boulders laid down in an unsuccessful attempt (in the 1970's) to build a breakwater at this site. The bottom slopes down to a sandy sea-bed 5m-10m deep. The inner sheltered side of the watering point is similar, though the depth of the sea-bed gradually decreases towards the shore [B]. The base substrate of the Rumassala bay area is composed of a mixed crystalline/coralline sand. The area also contains many naturally occurring submerged rocks and boulders (eg: Bokolossa) and a series of discontinuous sandstone ridges. The structures of coral are set in a pattern perpendicular to the shoreline, in contrast to the usual parallel-to-shore structure displayed by the fringing coral reefs in the south to west of Sri Lanka, neither is there the usual lagoon or enclosing barrier. This unique feature allows migrations of larger pelagic fish species rarely encountered in other fringing coral reef areas to take place within the Buona-vista reef.

Separated from the rocks of the watering point by a stretch of sand a large patch of low growing coral is found [C] at a depth of roughly 2m-4m. The coral cover thins out as one moves along in the direction of the Harbour-Inn, with alternating areas of sand, beach-rock [D] and low growing species of *Acropora*. Closer to the southern end of the middle beach, coral growth suddenly becomes prolific [E], the area is high in coral cover, with both species and habitat diversity and contains the areas highest in reef relief. Several large coral structures rise out of the sand in ridges standing 2m-4m high running in a north-



Map #3. Geography of Buona-vista coral reef

westerly direction. These give way to a large area of coral which extends into the bay to form an extensive system of deep water low relief reefs [H] stretching northwards up to the area off the Harbour Inn.

Moving in a shoreward direction the reef extends up to the beach and forms a subtidal reef crest. Separated by a long bar of sand, another elongate area of coral stretches away from the shore out to sea between the middle and north beaches, the coastal extreme of which forms a shallow reef crest often on which the surf breaks and which is exposed at low tide. The other extreme falls away gradually [G] to areas of sand and long band like structures of low growing coral at a depth of around 4m-5m. Separated by another sandbar, below the rock cliffs of the Harbour Inn is an area of naturally submerged rocks [I] extending up to the north end of the cliffs. The southerly end supports more coral growth and also forms a reef crest. At the periphery of the main reef a discontinuous system of sandstone/rock reefs extend in to the bay forming itself into important deep water habitats such as Bokolossa.

3.3. CURRENT PATTERNS

The main currents flow from the open sea approaching the reef from the south-west, but owing to the protection afforded by the Watering Point headland, the area is not subjected to the heavy surf encountered around Galle fort, Closenburg and at the Peella area. A back current is often encountered with the receding tide, approaching the reef from the north. This current at times brings in substantial sediment loads whenever the Weggal modara canal discharges muddy water and also whenever dredging operations are undertaken at Galle harbour.

3.4. TIDES ETC.

The coast at Galle is subjected to a mean high water spring tide level of 61cm, with mean low water spring tides at 6cm giving a tidal variation of 55cm. Tidal variation at neap tide is 13cm. The area is subjected to average velocity currents of 0.52m/sec and high velocity currents of 0.88m/sec. Average annual wind velocities are 3.8m/sec. (Swan,1983). The underwater visibility during the N.E. monsoon is 8m-16m, while during the S.W. monsoon visibility often drops below 1m.

3.5. PAST SEA LEVELS

Sri Lankan coasts show many indications of fluctuating past sea levels, Swan (1964) notes traces of buried coral deposits circumscribing the Rumassala hill, indicative of past sea levels.

4.HABITATS

The reef was divided in to sectors based on the different habitat types and labelled in sequence of occurrence inward from the watering point. Map # 4 illustrates the positions of the sectors

4.1 REEF SECTORS.

4.1.1. Sector [A]

This habitat is open to very strong wave action and is made up of huge boulders which have been dumped there two decades ago. The reef falls at a steep angle to the sea bottom with a depth ranging from 2m-10m. The boulders have a sparse coral cover (recently laid) which is mostly of genera *Porites, Favites, Favia, Acropora, Montipora* (encrusting) and *Platygyra*. Small areas on these boulders were covered in *Astreopora, Plesiastrea, Leptoria* and *Diploastrea*.

4.1.2. Sector [B]

This habitat is very similar to the above type but with more of the boulders covered with encrusting types of coral species, such as *Porites, Favites, Favia, Montipora* and *Platygyra*. On inshore sheltered boulders digitate species of *Acropora* are found with small colonies of *Leptoria* and *Diploastrea*. On the roofs of crevices and caves, cave coral *Tubastrea spp*. were recorded in association with oyster shells (*crassostrea sp*.) and zooanthids (*Palythoa sp*.). Some evidence of an older reef can still be found buried under a failed attempt at building a breakwater as some older colonies of coral survive in the interspaces. Sector recorded depths of 1-5M.

4.1.3. Sector [C]

This habitat is situated off the south beach on a low beach-rock base extending from a few meters offshore to a point half way through sector [B]. The sector is dominated by species such as *Acropora spp., Echinopora lamellosa, Pocillopora spp*. and *Porites spp*. Most of the *Acropora spp*. was of a low growing type and *Pocillopora verrucosa* dominated the deeper regions. Other genera of corals included *Platygyra, Favites, Hydnophora, Favia, Coscinaria, Pavona* (encrusting), *Leptoria* and encrusting and foliaceous *Montipora*. Small areas of beach-rock were covered by *Leptastrea spp., Leptoseris spp., Podabacia crustacea, Goniastrea spp., Oulophyllia spp., Turbinaria peltata* and *Goniopora* spp. The depth varies from 1.8m to over 4m, where the coral thins and gives way to a sandy or silty substrate. The coral areas are

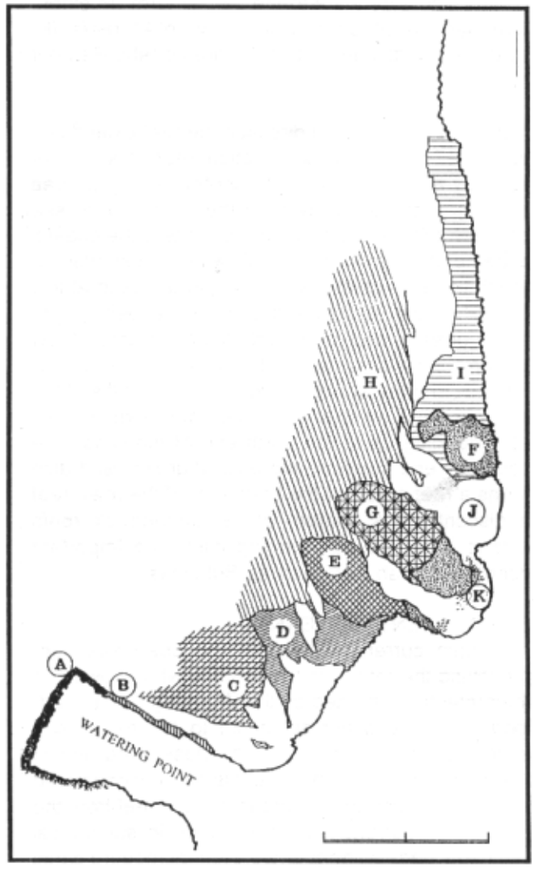
separated from sector [B] by a narrow sandy area scattered with small pieces of beach-rock.

4.1.4. Sector [D]
This lies close to the rocky shore and is in shallow water, ranging from 2m-2.5m in depth. There were several massive boulders of *Porites spp.*, almost reaching the surface. A few narrow ridges 30cm-60cm high, run perpendicular to the shore interspersed with sand. Sector [D] is separated from sector [C] by sandy areas dotted widely with very small dead coral heads covered in algae *Padina spp.* The area is dominated by low growing *Acropora spp., Porites spp.* and fairly big coral heads of *Goniopora spp.* on a sandy substratum. Small encrusting types such as *Favites spp., Leptastrea spp.* and minute patches of *Montipora spp.* were also observed.

4.1.5. Sector [E]
This sector consists of a variety of habitats from very shallow reef crest zones covered with *Acropora spp.*,some times forming into large beds, otherwise containing *Favites spp., Montipora spp., Favia spp. and Porites spp.* interspersed with *Goniastrea spp., Platygyra spp., Leptastrea spp.* and smaller patches of *Pavona spp* and *Galaxia spp.* It was observed that some areas in the shallows were covered by the algae Halimeda spp. with large areas carpeted with green Zooanthids (*Palythoa sp.*). The depth range was from 0.5m-3.3m. The higher sections were composed mostly of a beach-rock substrate with caves and eroded sections forming deep "holes" and crevices cutting into the reef, giving the section a very high reef relief. The deeper areas consisted mainly of *Pocillopora verrucosa* and *Echinopora lamellosa.* Several colonies of *Millipora* were recorded in the surf zone as well as in the sandy areas north of the sector.

In the middle section between the surf zone and the deeper sections *Acropora spp., Porites spp.* and *Favites spp.* were dominant. The beach-rock / massive granite rocks that come close to the surface were dotted with small heads of *Pocillopora damicornis* or *P. eydouxi.* while caves and overhanging areas were colonised by small clumps of *Distichopora violacea, Tubastrea spp.* and an assortment of Hydroids, sponges and algae.

As the sea floor within section [E] gradually slopes down deeper, the beach-rock substratum is progressively dominated by *Echinopora lamellosa, Pocillopora verrucosa, Montipora spp.* and *Porites spp.*. Small concentrations of *Favites spp., Favia spp., Hydnophora spp., Pachyseris spp. Leptastrea spp.* and *Platygyra spp.* also occur here. The sector



Map # 4 Location of Reef sectors

contained the highest concentrations of *porites* recorded during the transect survey.

4.1.6. Sector [F]
This habitat constitutes the reef crests of the three main coral patches of the Buona-vista reef. The reef crest is made of cemented compacted coral/beach-rock and is periodically exposed during low tide. The strong wave action combined with exposure to the elements has reduced the live coral cover and the species found were of the encrusting type with very small patches of foliaceous *Montipora spp.*. Dominant species recorded were *Porites spp., Pocillopora damicornis* and *P. eydouxi.* Species like *Goniastrea spp., Favites spp. and Favia spp.* were observed scattered and growing only to a very small size. Some areas were covered in *Halimeda spp.* and other algae. The zone is subtidal, exposing often at low tide. Even at high tide the depth does not exceed 30cm-50cm.

4.1.7. Sector [G]
This sector contains a very high species diversity with a healthy live coral cover. Transect #.2 set in this sector yielded the highest number of genera of corals recorded for the transect survey. The dominant genera were *Acropora, Montipora, Porites,* and *Hydnophora.* in the deeper areas. Other genera observed were *Pocillopora, Favia, Leptoseris, Millipora , Platygyra, and Favites.* It was noted that a significant amount (10.2%) of dead coral was observed in transect #.1 and was mostly *Acropora,* carpeted by a black coloured sponge. The depth ranged from 1m-5m.

4.1.8. Sector [H]
Beach rock forms the major part of this sector and links the deep areas of sectors [E]/[G]. The depths of the sea floor starts at 4m in the shallows, gradually going deeper. This habitat covers an extensive area. The coral cover was low consisting of colonies of *Acropora, Favites, Hydnophora, and Porites.* Small colonies of *Goniastrea, Montipora, Favia, Symphyllia.* and *Leptastrea.* were also recorded. In addition to true coral species fairly large areas of soft coral *Sarcophyton spp.* were observed.

4.1.9. Sector [I]
This habitat is located below the north-eastern cliffs and is made of a narrow belt of boulders lining the coast. Scattered colonies of *Porites spp.* dominate with small colonies of *Goniastrea spp., Platygyra spp.* and encrusting *Montipora spp.* were also observed. In shallow areas Zooanthids *Palythoa spp.* grow in association with small clumps of algae *Sargassum spp., Caulerpa spp.* and *Halimenia spp..* The maximum depth was 6 meters.

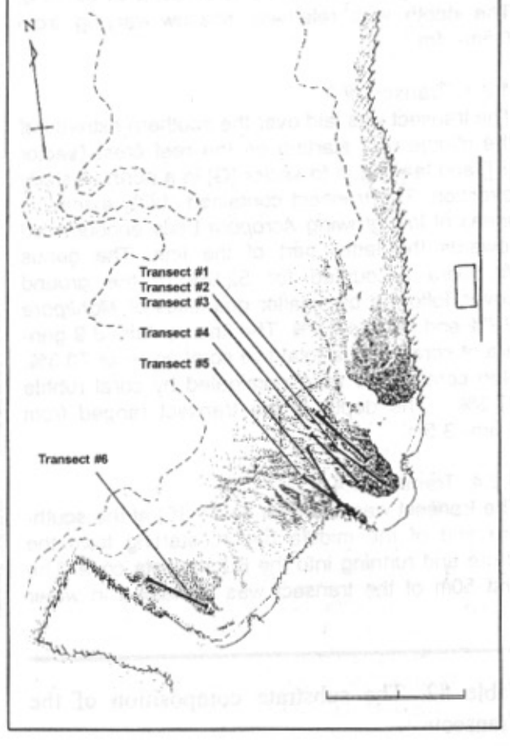
4.1.10. Sectors [J&K]
Sector [J] contained a sandy or silty substratum, sometimes littered with coral rubble with scattered algal species such as *Padina spp, Halimeda macroloba, Udotea sp.* and encrusting coralline species. The depth range from a few centimetres in beach areas to over 10m.

sector [K] consist of coarse coral rubble which is restricted to the very shallow areas close to the middle beach and with a maximum depth of about 45cm. A few clumps of Algae *Halimeda opuntia/ gracilis* were observed growing on the coral rubble. These two habitats are devoid of live coral.

4.2 TRANSECTS
A transect survey was under taken to assess the live coral cover and reef substrate composition. An analysis of the data is given for the reef, followed by a brief note on each of the transects carried out. Table #. 2 contain a breakdown of substrate types for the transects.

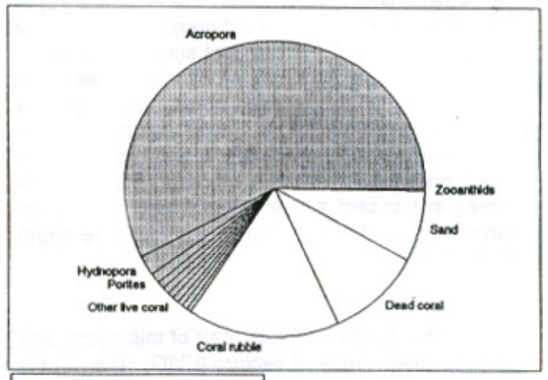
The middle reef was observed to contain the highest concentrations of *Acropora* 53.66%, *Montipora* 10.03%, *Leptoseris, Hydnopora and Favia* with all except the first showing a marked preference for the northern areas. The sector also indicated a high generic diversity. The occurrence of *Acropora* dropped by almost half on sector [E]. Instead *Porites* and *Echinopora* displayed a sudden increase, with *Porites* recording a marked peak in abundance of 14.8%. *Echinopora* and *Pocillopora* indicated a preference for the southern sections. *Echinopora* while remaining the third commonest genus was notably lacking in the transects of sector [G].
4.2.1. Transect #.1

Map #5. Location of Transects



4.2.1. Transect #.1

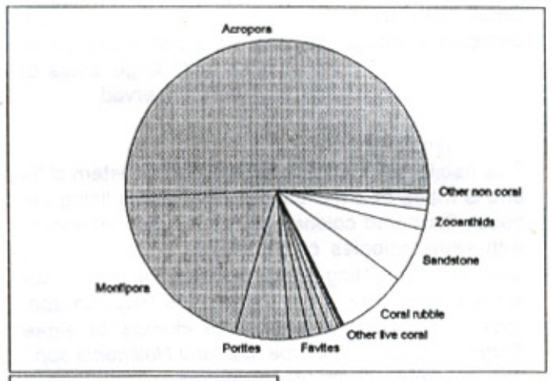
Positioned over the northern end of the middle reef (sector [G]) and running perpendicular to the beach, the first 60m of the transect contained an extensive bed of Stag-horn coral *Acropora,* stretching out almost continuously except for a single 5m gap of coral rubble and mixed coral species. A patch of dead coral found beyond the *Acropora* bed may be attributed to fish dynamiting. 57.6% of the transect consisted of *Acropora* followed by *Hydnopora* 2.1% and *Porites* 1.1%. 10 genera of corals were represented on this line with a total of 65.5% live coral cover. The unusually high percentage of dead coral recorded 10.2% was indicative of an external cause such as indicated above. The depth of the transect ran from 0.5m to 5m.



Transect #1

4.2.2. Transect #.2

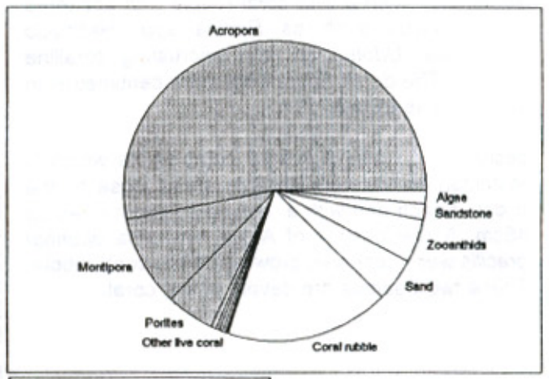
The transect was laid from the reef crest of the sector [G], running in towards the bay between Transects #.1 and #.3. The line displayed a mixed distribution of coral genera with a minor scattering of coral rubble and sandstone towards the latter part. *Acropora* were dominant among coral genera with a total bottom cover of 50.8%, followed by *Montipora* (encrusting, foliaceous) 19.6%, *porites* 5.8%, *Favites* 2% and *Pocillopora* 1.25%. The transect contained both the highest generic diversity of 11 genera and live coral cover of 82.15%. The depth was relatively shallow varying from 0.5m- 4m.



Transect # 2

4.2.3. Transect #.3

The transect was laid over the southern extreme of the middle reef starting on the reef crest (sector [F]) and leading in to sector [G] in a north westerly direction. The transect contained fairly extensive areas of low growing *Acropora* beds encountered towards the latter part of the line. The genus *Acropora* accounted for 52.6% of the ground cover, followed by smaller quantities of *Montipora* 9.7% and *Porites* 5.1%. The line contained 9 genera of corals and a total live coral cover of 70.3%. Non coral areas were dominated by coral rubble 17.3%. The depth of the transect ranged from 0.5m- 3.5m.

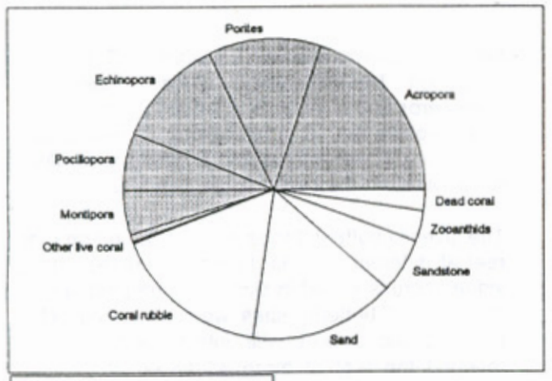


Transect # 3

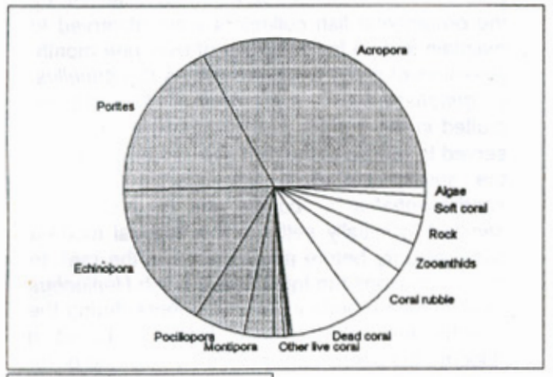
4.2.4. Transect #.4

The transect was laid over sector [E] at the southern end of the middle beach, starting from the shore and running into the Buona-vista cove. The first 50m of the transect was contained in water

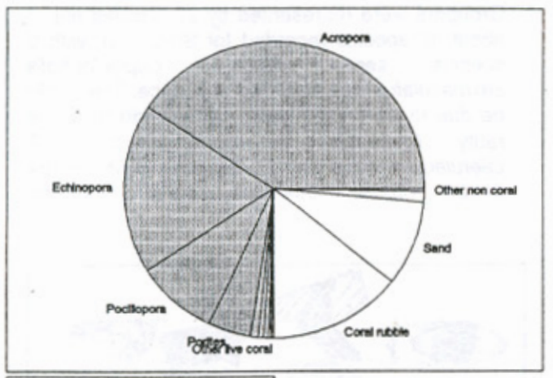
Table #2. The substrate composition of the Transects



Transect # 4



Transect # 5



Transect # 6

less than 2m deep, with relatively large areas of *Acropora spp.* and *Porites spp.*, after which the reef falls away gradually in to deeper water. Most of the coral growth was limited to the first 70m, when the substrate changed to coral rubble and sand, over which mixed coral species were scattered. The live coral cover for the transect dropped to 55.8%, with a similar reduction indicated in the genus *Acropora* (19.95%) which still remained dominant despite the reduction in abundance. The genera *Porites* (12.1%), *Echinopora* (11.8%) and *Pocillopora* (6.15%), were observed to show an increased presence. The line contained 9 genera of corals. The depth ranged from 1m to 5m.

4.2.5. Transect #.5

The transect began on the reef crest close to the shore on sectors [F/E], and running in to the bay crossing over the transect #. 4. It was interesting to note that, while this transect contained the second highest live coral cover of 76.9%, the genus *Acropora* occupied a mere 32.75%. In contrast an increase was seen in *Porites* 17.5%, *Echinopora* 16.1% and *Pocillopora* 5.55%. The line also contained a rather high incidence of dead coral 7.9%. The line consisted of 9 genera of corals. The depth ranged from 0.5m- 3.5m.

4.2.6. Transect #.6

Situated in the sector [C], the line was laid along the low relief coral patch located off the south beach. The line contained 75% live coral cover with *Acropora* accounting for 40.7%, followed by *Echinopora* 18.3%, *Pocillopora* 8.85% and *Porites* 17.5%. The depth range was from 2m-4m.

5. FAUNA

Coral reefs are considered among the richest living communities on earth, their biological diversity rivalling even the tropical rainforests and their productivity being second only to coastal wetlands. A coral reef fauna provides a major source of protein for coastal communities. Reef fauna is extracted in an organised manner to supply the export trade in seafood and for the Aquarium trade. The reef creatures are considered a major storehouse of medicinally important compounds.

The fish population of the reef comprised a total of 484 species divided among 186 genera and 68 families. (see note, page 20) 63.25% of the species were residents within the reef. This category included species found regularly during the survey or those which followed a benthic sedentary form of existence. The migrant fish comprising 34.03% included pelagic species and species observed only during certain periods. Of the total, no one family comprised a value amounting to 1% of the species.

The Wrasses (Labridae) constituted the highest number of 44 species for one family amounting to 0.92%, followed by 40 species for Gobiidae (0.84%) and 34 species for Pomacentridae (0.71%).

121 species of fish found within the reef were considered of major importance to the food fishery, with an additional 43 species being taken in subsistence fisheries. The ornamental fishery targeted 115 of the species listed for the site. Of the total fish species recorded for the reef, approximately 64 species had not been officially recorded from Sri Lanka previously.

Appendix #4.compares species representation of selected fish families within the reef.

5.1.1. RARE FISH SPECIES

The following species of fish considered to be rare in Sri Lankan waters were observed during the survey, including Squirrelfish *Sargocentron melanospilos,* Groupers *Epinephelus faveatus* and *E. flavocaeruleus,* Pipefish *Doryrhampus exisus,* Wrasse *Labroides bicolor,* Tang *Zebrasoma desjardini,* Sweetlip *Plectorhynchus gibbosus.* Filefish *Oxymonacanthus longirostris,* Butterflyfishes *Heniochus singularis, Chaetodon falcula, C. rafflesi, C. xanthocephalus, C. ornatissimus* and *C. triangulum.* The Goby *Callogobius mannarensis* described from Mannar was re-recorded during the survey. The Colombo Demoiselle *Pomacentrus proteus* so far recorded only in Sri Lanka and the Yellow-fin Pygmy Angelfish *Centropyge flavipectoralis* with a limited distribution within Sri Lanka and Maldives were also observed within the reef.

5.1.2. BUTTERFLYFISHES

Butterflyfishes were prominent among the reef fish populations on account of aesthetic as well as biomass and as an indicator group. The group was very well represented on the reef, with 25 species listed. This number is the highest recorded from any southern reef and is rivalled only by the Bar reef in Kalpitiya. About 12 species were found to be resident on the reef while the species *Chaetodon falcula, C. unimaculatus, C. plebeius, C. lunula, C. auriga, Hemitaurichthys zoster, Heniochus monoceros* and *H. singularis* tended to migrate in and out of the reef. *C. ornatissimus, C. rafflesi, C. triangulum, C. melanotus* and *C. xanthocephalus* were found on the reef only as juveniles.

The juvenile butterflyfishes were observed on the reef at different periods during the survey. Individual recruits varied in size as some post larval (tholichthys) butterflyfishes were observed with the cephalic shields still intact, while others reached the reef at more advanced stages of development. Once an individual had selected a site on the reef and settled down, the tendency was for it to remain within the selected coral patch. The individuals that escaped collection by the ornamental fish collectors were observed to maintain station for durations of over one month. Juveniles of some species such as *C. citrinellus, C. guttatissimus, C. melanotus, C. klinii* etc. recruited in the period Feb/March 1993 were observed to remain in the reef even at the closing of the survey period in late March 1994. *C. xanthocephalus, C. collare* and *H. acuminatus* seemed to initially settle in the Weggal modara canal estuary before migrating on to the reef. In certain seasons the Indian Bannerfish *Heniochus pleurotaenia* breeds in large numbers during the months August/September. Referred to as a "bloom", the phenomenon does not seem to occur in the same scale on any other reef in the south coast.

5.1.3. GROUPERS

Groupers were represented by 23 species out of about 40 species recorded for Sri Lanka, with 9 species seen regularly. *Cephalopholis sexmaculatus* was recorded only once. This could be due to it's cryptic habits rather than to actual rarity. *Epinephelus tauvina, E. longispinis, E. caeruleopunctatus* and *E. fasciatus* preferred the deeper waters, occasionally migrating into the

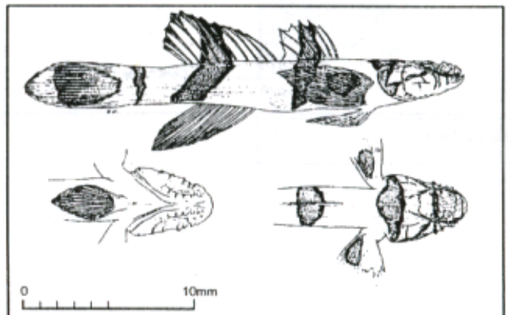


Illustration #1. *Calogobius mannarensis*

shallower reef areas while *E. malabaricus* and *E. polyhekadion* were recorded only from the deeper areas. In 1994 the full-moon of the month of February was followed by an influx of juvenile Groupers of many species settling on the reef. This included *Plectropoma maculatus, E. rivulatus, E. flavocaeruleus* and *C. hemistiktos* followed by *E. coioides* and *E. caeruleopunctatus.* The species *E. flavocaeruleus* and *P. maculatus* are both extremely rare on the south coast of Sri Lanka.

5.1.4. DAMSELFISHES

The family Pomacentridae recorded 34 species out of the 58 Sri Lankan species, with 27 species resident within the reef, including the rare Sergeantfish *Abudefduf notatus* and with two other rare fish *Pomacentrus pavo* and *Plectroglyphidodon jhonstonianus* coming in as migrants. Other migrant species included *Dascylus aruanus, Chromis lepidolepis, Plectroglyphidodon leucozonus* and *Neopomacentrus taeniurus.* The *N. taeniurus* resides in large numbers in the Weggal modara canal and in outer areas deeper than 8m, migrating occasionally in to the reef. The *Pomacentrus trilineatus* was identified from a juvenile specimen (1.5cm) as no adults were observed during the survey.

5.1.5. GOBIES

Gobies with 41 species listed were only second to the Wrasses in diversity, and as most gobies are cryptic in habit, the reef may contain many more unlisted species. The genera *Cryptocentrus* and *Amblyeleotris* were found in symbiotic relationships with shrimps of genera *Alpheus* and *Synalpheus.* It is believed that different gobies associate with different species of shrimps. Many species of Coral gobies of the genera *Gobiodon* and *Paragobiodon* were found living among the branches of corals of the genera *Acropora* and *Pocillopora.* Several other species of Gobies were observed and some specimens secured which could not be identified even to a generic level, and as such the species are listed in appendix #1 with a "?" for the genus.

5.1.6. WRASSES

46 Species of Wrasses out of 70 Sri Lankan species were recorded from the reef. Wrasses constituted the largest fish family composing 0.95% of the total fish species. Two juveniles and one adult of the rare and protected *Labroides bicolor* were observed during the second survey season. Depleated by the ornamental fish trade this species was making a come back. The *Thalassoma amblycephalum, T. purpureum* and *T. trilobatum* were generally observed over rocky substrates around the Watering point. The Genera *Coris, Hologymnosus* and *Novaculichthys* were recorded only as juveniles. Three individuals of *Chilio innermis* was recorded on one ocation early in the survey, the species was not observed on the reef subsequently though it is commonly found on adjecent areas. Within the family the genera *Halichoerus, Thalassoma* and *Stethojules* were found to be most abundant.

5.1.6. DOTTYBACKS

At least 7 species of Dottybacks (Pseudochromidae) were recorded and identified to the closest possible species. In some species the identification needed confirmation as source material was from the western Pacific, with no confirmed records from the Indian ocean.

5.1.7. MIGRATIONS

The reef is visited periodically by different groups of fishes for a variety of reasons. Subsequent to spells of rough weather the reef often contained many nonresident species including demersal species such as *Plectroglyphidodon jhonstonianus, Dascylus aruanus, Pomacentrus pavo, Hemitaurichthys zoster, Hippocampus kuda, Melichthys indicus* and *Suffleman frenatus.*

The presence of some species on the reef was more seasonal, often coinciding with the monsoon periods eg- *Heteropriacanthus cruentatus* and *Chaetodon rafflesi.* Shoaling pelagic species such as Sardines (Clupeidae) and Anchovies (Engraulidae) also visit the reef seasonally, in shoals of over a million individuals. and these migrations are often followed by schools of predatory fishes following them in to the reef. This group contained many species of Travellies *Caranx sexfasciatus, Carangoides spp. Atule mate, Scomberoides spp.*, Barracuda *Sphyraena putnamiae, S.jello* and *S.barracuda.*

The arrival and departure of some species was random in nature. This group included snappers *L.gibbus, L.monostigma,* Grunts *Pomadasys spp.*, Emperors *Lethrinus spp., Monotaxis grandoculis,* Goatfishes *Upeneus spp.* and Wrasses *Chelinus spp., Bodianus spp.* etc.

The reef was used by some species only as a nursery for the juveniles. Juvenile Black-tip reef sharks *Carcharhinus melanopterus* 60cm-90cm in length, are regularly observed on the surf areas (sector [F]) of the middle reef. These usually migrate out of the reef as they grow up. Some end up being caught with gillnets or with lines (Panne). Parrotfishes *Scarus frenatus, S.scaber, S.sordidus,* Wrasses *Coris frerei, Novaeculichthys taeniourus* and *Hologymnosus doliatus* were also observed only as juveniles.

Table #3. Fish species associated with the mixed feeding school.

The core group

Surgeonfishes	Parrotfishes
Acanthurus mata	*Scarus rubroviolaceus*
Acanthurus bariene	*Scarus gobban*
Acanthurus dussumieri	*Scarus oedima*
Goatfishes	Snapper
Parupeneus indicus	*Lutjanus rivulatus*
Parupeneus babarinus	
Mulloidichthys flavolineatus	

The reef group

Rabbitfish	Wrasses
Siganus javus	*Bodianus axillaris*
Siganuslineatus	*Halichoerus marginatus*
Siganus vermiculatus	
	Bristletooth
Butterflyfish	*Ctenochaetus spp.*
Chaetodon lineolatus	
	Surgeonfish
Angelfish	*Acanthurus nigricauda*
Pomacanthus semicirculatus	*Acanthurus tristis*
Parrotfish	Sweetlip
Calotomus sp.	*Plectorhynchus pictus*

Peripherial predators

Barracuda	Travellies
Sphyraena obtusata	*Carangoides spp.*
Sphyraena putnamiae	

5.1.8. MIXED FEEDING SCHOOLS

Certain species of fish were observed at times to congregate in a mixed feeding group at the reef edge. This group included many transitional species residing in the deeper regions beyond the reef, that would visit the reef regularly for food and cover. These included a mixed group of Surgeonfishes often accompanied by groups of Parrotfishes, Snappers and Goatfishes. When the group migrated closer to the reef they would be joined by the Angelfish, Spinefeet, Bristleteeth, Wrasses and the large Butterflyfish *Chaetodon lineolatus*, inhabiting the outer coral areas. This behaviour is important to reef fishes in two ways. Initially it offers an opportunity for reef species to migrate from reef patch to reef patch with the security of travelling in a school. Additionally it affords a way of utilizing a feeding area to the optimum by forming a feeding school resembling the mixed feeding flocks of birds encountered in rain forests. The assemblage contains fishes from different trophic groups feeding in a system whereby the feeding activities of one group would create opportunities for the others. The system is further extended by the regular presence of the schools of predatory species of Barracuda and Travellies, found in close proximity to the feeding school. A general listing of species that compose the feeding school is listed in table # 3.

5.1.9. PAST RECORDS

During earlier surveys at the site large Greasy Groupers (*E.tauvina*) were observed in abundance within the reef, but due possibly to increased human activity and hunting the species was noted for its rarity during this survey, with only a few medium sized individuals observed. The evidence seemed to indicate that individuals now prefer deeper water beyond the reach of the snorkel divers and they only occasionally visit the shallow areas. The population of Bi-coloured Cleaner Wrasse (*Labroides bicolor*) previously resident on the reef was collected for the ornamental fish trade to such an extent that the species was not observed on the reef for many years. During the 1994 season however at least two juveniles were observed. After much persuasion with the fish collectors they were allowed to complete the season within the reef. In addition one large super-male of the species was also reported in April 1994. The populations of *Zebrasoma desjardini, Rhinecanthus aculeatus* and *R.rectangulum* had decreased significantly as well. The other species of fish recorded by the authors on this reef during earlier surveys included: *Chaetodon madagascarensis, Alectis indicus, A.ciliaris* and *Bodianus diana.*

5.1.10. OTHER RECORDS

The ornamental fish collectors report having observed a Whale shark (*Rhynchodon typus*) of around 5m length close to the Watering Point. The area just outside is said to be visited occasionally by Manta rays (*Mobula sp.*). A large Reef shark had been reported off sectors [B,C] often attracted by the sound of the dynamite used for fishing.

A full list of species of fish recorded from the Buona-vista reef is included in appendix #1.

5.2. CORALS

Identification of corals to a specific level is a matter requiring specialized knowledge and detailed microscopic examination. Since this work fell outside the scope of this survey, identification of corals in the present work is limited to a generic level

The site ranks highest in the south coast in live coral cover with 70.94%. The total area of dead coral amounts to only 3.42% indicating a healthy reef. Species of *Acropora* dominated the bottom cover totalling 42.4% and in some sectors covering over half the surface area available (individual area maximum of 57.6%). Followed by *Porites* 7.71%, *Echinopora* 7.7%, *Montipora* 6.4% and *Pocillopora* 3.8%. The other species each represented values of less than 1%.

5.2.1. HABITAT PREFERENCE

The results of the transect lines carried out were used in assessing the species variation and habitat preference of corals. Some corals showed marked preferences for certain depth regimes and certain groups of corals also tended to be restricted in their distribution within the reef. The best example is *Echinopora*. Sparse or non existent in the northerly areas and in the shallows, the species seem to proliferate at depths over 2m deep in sectors [E] and [C]. The highest concentrations of *Montipora* occur in the southern part of sector [G]. The *Pocillopora verrucosa* is common in subtidal zones, *P. damicornis* occurs in shallow surf and rarely in the subtidal zones, while *P. eydouxi* prefers deeper zones. *Galaxia sp.* occurs in surf zones. Other species preferring deeper water are species of *Hydnopora* and *Symphyllia*, while Genera *Acropora, Porites, Montipora, Leptoseris, Favites* and *Favia* are generalists. The Mushroom coral *Fungia* was recorded from the periphery of the reef at Bokolossa (8m-9.5m) and at sector [H], a specimen of *Cycloseris* was recorded in deeper areas of sector [C]. (Refer to the graph annexed in appendix #5.)

5.2.2. ASSOCIATIONS

Digitate *Acropora* provides a habitat for a variety of organisms such as gobies *Paragobiodon spp., Gobiodon spp.*, shrimps *Alpheus spp., Synalpheus spp., Periclimenes spp.* and crabs *Trapezium spp.* and *Percnon spp.* forming symbiotic/commensal relationships. The damsel fishes of the genera *Dascyllus* and *Chromis* form aggregations close to and associated with coral colonies of *Acropora spp.* and *Pocillopora spp.*. Juveniles of many species of Butterflyfishes (Chaetodontidae) are found in association with different coral groups, preferring to stay within the same coral colony for extended periods if left undisturbed. Hermitcrabs *Paguritta* spp. were observed living embedded in *Porites* boulders and in *Pocillopora spp.*

5.2.3. EXPLOITATION & DEGRADATION

Several causes of coral degradation were observed during the survey. The illegal practice of using dynamite for fishing has caused severe damage to certain sections of the reef. The use of the Moxy net, a conical net used in collecting reef fish for the ornamental fish trade proved to be another main offender. In operation the net is used to enclose coral heads after the targeted fish is driven within its branches. This is followed by smashing the coral head with an iron bar to drive the fish out into the net. Additionally the Cave coral (*Tubastrea/Dendrophyllia sp.*) was collected for the aquarium trade from the Buonavista reef, the group is observed to be getting progressively rarer within the reef. Coral is also broken by people walking on the reefcrest and by careless swimmer/snorkellers standing on coral boulders and striking corals with their fins. Another threat is the collection of coral as souvenirs by tourists. The ever increasing sediment load discharged by the Weggal modara canal and stirred up by the periodic dredging of the Galle harbour channel often washes over the reef, The sediment loads are still believed to be within tolerable levels.

A list of corals is included in the Appendix # 2. The list is based on direct observations updated with the species recorded for the site by Arjan Rajasuriya and M.W.R.N.De Silva (1988)

5.3. OTHER INVERTEBRATES

5.3.1. HYDROZOA/ CNIDARIA

The reef building hydroid coral *Millipora* is found in fair amounts in the surf zone close to the reef crest. The colonies of Horny corals; Whip Coral (*Junceella sp.*) and Black coral (*Antipathes sp.*) observed in the deeper zones, several years prior to the survey were found to be absent, removed to cater for the tourist souvenir trade. *Palythoa sp.* were collected in large numbers for the aquarium trade, a small quantity of sea fans (Gorgonacea) and the Leather coral (*Sarcophyton sp.*) was recorded from the deeps of sectors [E,G,H] sometimes in association with fishes of the family Tripterigiidae.

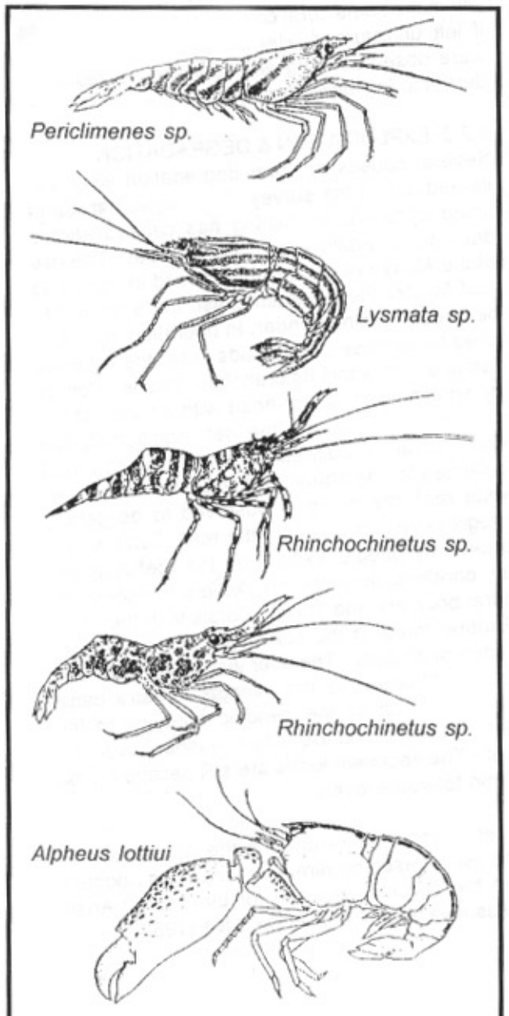


Illustration #2. Some reef shrimps recorded from Buona-vista reef

5.3.2. PORIFERA

The reef contained many unidentified species of encrusting and boring sponges. An uncommon red sponge with a prominent vein like tracery of spicules, belonging to the order *Poecilosclerida*, was found in waters deeper than 10m

5.3.3. CRUSTACEA

A great variety of Shrimps and Crabs were observed during both day and night diving. Most of which remain unidentified due to nonavailability of relevant literature. Limited collections were carried out on groups supported by references at hand and identified up to the highest level possible. This was supplemented by the specimens brought up as by-catch in bottom-set nets and by ornamental fish collectors.

The genera *Saron, Lysmata, Hippolysmata, Rhynchocinetes* and *Periclimenes* were common on the reefs at night, many species of *Periclimenes* associated with different species of corals. While the species *P. soror* could be observed on Pincushion seastars (*Culcita sp.*) and Black seaurchins (*Diadema sp.*), while *P. imperator* associated with Seacucumbers. Boxing Shrimps (*Stenopus sp.*) are found inside caves and under ledges, *S. hispidus* was commonly found while *S. cyanoscelis* was recorded from a single specimen in sector [E]. Genera *Alpheus* and *Synalpheus* were represented both by the sand burrowing goby-symbiotic varieties and cryptic species, often found among the branches of digitate corals.

The seastar feeder, Orchid Shrimp (*Hymnocera elegans*) was observed among the collections made by fish collectors operating in sector [I]. A specimen of the tiny coral Shrimp *Thor amboinensis* was collected from sector [C].

Several different varieties of coral crabs (*Trapezium sp.*) were observed among different species of corals (*Acropora sp., Pocillopora sp.* etc.). Xanthiid crabs were found commonly in all reef areas. In addition specimens of the large red-spotted crab (*Carpilius maculatus*) were commonly found in bottom set nets with an assortment of other smaller species of the genera *Atergatis, Actaea* and *Etisus*. The specimens were usually thrown away as they were not considered good eating. Unlike Xanthiids the Portunid crabs *Thalamita sp., Portunus sanguinolentus* and less commonly *P. pelagicus*, caught in Bottom-set and gillnets were taken readily as food. The Mud crabs (*Scylla cirrata*) collected with hand-spears in sector [I] were sought after for consumption.

Box crabs are also caught in nets regularly, and at least 4 species belonging to the genus *Calappa* were collected. Some specimens were observed in sand areas during night dives. The Swimming crabs of Genus *Matuta* occur in sandy areas often buried in and doing occasional feeding forays over sand.

Spider/Decorator crabs of assorted varieties and sizes were encountered on night dives in reef as well as rubble areas, with large individuals of *Schizophrys sp.* commonly getting entangled in Bottom nets

Several species of Ghost Crabs (*Ocypode sp.*) populate the sandy beaches. The rocky shoreline supports species of Swift footed crabs (*Grapsus spp./Varuna sp.*) and another group of grapsid crabs (*Percnon sp.*) were observed among the coral branches in sectors [E,F,G]

The commonest of the large hermit crabs on the reef the Blue-kneed Hermitcrab (*Dardanus guttatus*) is often found active during daytime. Sporadic instances of increased activity of the species was observed when considerable numbers of individuals would come out of the crevices and perch on high elevated sections of the reef. The Hairy Red hermitcrab (*Dardanus magistos*) numbers seem to be on the decrease due to pressure from the aquarium trade. The land hermit crabs (*Coenobita sp.*) were common on sandy beaches. A large hermitcrab was observed foraging on land 20m-25m high on the Rumassala hill side above the reef.

A large number of unidentified hermit crab species were observed in addition to the species listed in appendix #.2.

Five species of spiny lobsters (*Panulirus spp.*) were recorded during the survey, juvenile Painted spinylobsters (*P. versicolor*) are regularly seen during day with most of the catch consisting of *P.ornatus* and *P.homarus*. The collection rate does not seem sustainable and the population is on the decline.

5.3.4. MOLLUSCA

The Pharaoh cuttlefish (*Sepia pharaonis*) were commonly observed with few sightings of the Spineless cuttlefish (*Sepiella innermis*) and the Bottletail Squid (*Sepiadarium kochii*), Squids (*Sepioteuthis sp.*) were seen often travelling in small groups of about 5-15 individuals. *Sepia pharaonis* was observed on several occasions engaging in courtship displays indicating that the species breeds within the reef. At least two species of Octopus (*Octopus spp.*) were recorded. Though sightings were rare octopi were regularly hunted by fishermen from the reef crest areas. Most of the cephalopods were regarded as good eating.

The rocks that line the coast support several species of shells, *Neritta spp., Patella spp.* and *Acmaea sp.* which are found in the intertidal zone. The reef flat were populated by *Tectus spp., Tonna sp., Turbo sp., Cypraea moneta, C. annulatus, C. caputserpentis, Thais spp., Cymatium spp.* and *Drupa sp.* The genus *Chicoreus* was represented by four species, *C. adustus/brunneus, C. torrefactus*, and *C. ramosus* were recorded from deep beach-rock areas while *C. palmarosae* was rarely observed within the reef. Due to their cryptic habits only a few species of *Oliva sp.* were observed in sandy regions. *Tridacna maxima* was observed in sandy areas between sector [B] and [C], *T. crocea* occurred embedded in beach-rock of sector [F]. The poisonous cone shells *Conus spp.* were seen actively foraging in the night, hiding under coral rubble or pieces of beach-rock during day time. Spider shells *Lambis lambis* and *L.chiragra* were observed occasionally on reef zones.

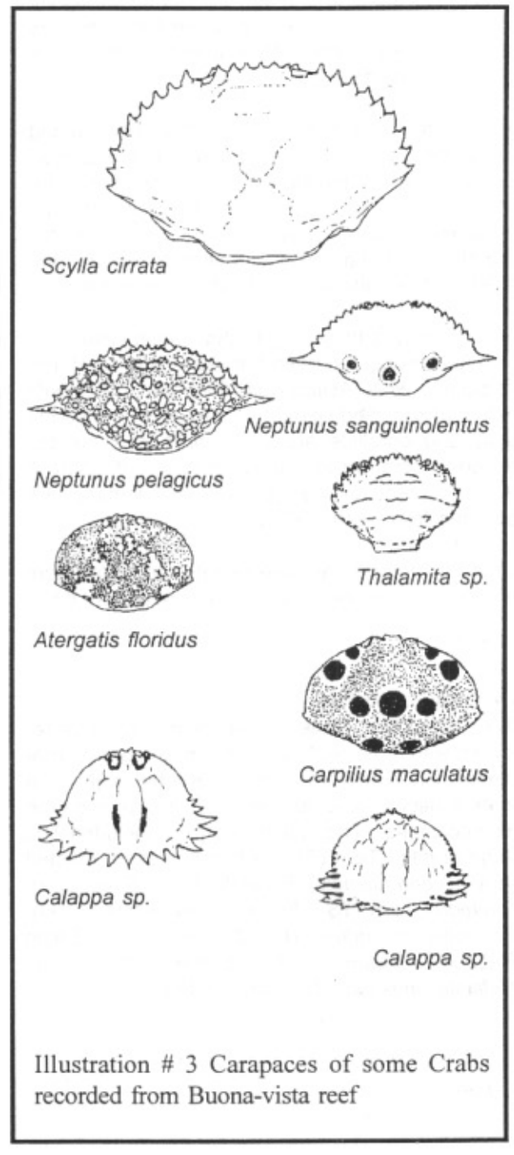


Illustration # 3 Carapaces of some Crabs recorded from Buona-vista reef

5.3.5. ECHINODERMATA

A marked reduction was observed in the abundance of the Green Seastar (*Nardoa sp.*). These and a species of small red Seastar (*Fromia sp.*) are usually collected for the aquarium trade, to which the population reduction may be attributed. The Horned seastar *Protoreaster linki* prefers the deeper beach-rock zones.

The notorious coral predator Crown of thorns Seastar (*Acanthaster planci*) was recorded from a 25cm diameter specimen in sector [F]. Although evidence of feeding was observed on a few colonies of *Acropora* sp., the damage did not seem significant. The team could not verify the fish collectors report on the presence of *A. planci* on the rocks north of the harbour inn.

Feather stars and Brittlestars (orders Crinozoa and ophiuroidea) were found in abundance with a large number of yet unidentified species unaccounted for in the appendix #2. Seaurchins *Toxopneustes sp., Tripneustes sp.,* and *Heterocentrotus mammiliatus* also showed a marked decrease in numbers compared to observations carried-out prior to this survey.

Sea cucumbers belonging to the Genus *Holothuria* were commonly recorded from sand and coral rubble sectors while *Actinopyga, Stichopus, Thelanota* and an unidentified spined holothurian inhabited the rocky and coralline areas. *Synapta sp.* was observed in coral areas during night and at dawn. A few specimens of the genus *Labidodemas* were recorded from sector [K]

A full list of coral and Invertebrates recorded from the Buona-vista reef is included in Appendix #2.

5.4. OTHER FAUNA

The Green Sea Turtle (*Chelonia mydas*) was recorded within the reef by the team, while the ornamental fish collectors reliably reported sighting a Leather-back Sea turtle (*Dermochelys coriacea*) on two occasions. The coastal avifauna included The Large crested Tern (*Sterna bergii*), Lesser crested Tern (*S. bengalensis*), Roseate Tern (*S. dougalii*), Common Tern (*S. hirundo*), Whiskered Tern (*Chlidonias hybridus*), The White bellied Sea Eagle (*Haliaeetus leucogaster*) and The Brahmini Kite (*Heliastur indicus*) (N.B. See Note.)

6. FLORA/ALGAE

Several species of algae were collected and identified to species level where ever possible. The present survey revealed 22 species in 16 genera. The commonest were *Halimeda opuntia, Padina spp.* and *Udotea sp.*, which were mostly found on reef crest and on rocks. Durairathnam (1978) had recorded 41 species of algae belonging to 8 orders and 17 genera from Galle. *Halimenia sp.* was the only algae collected for the aquarium trade. A large variety of filamentous and coralline algae were observed but were not collected for identification due to the lack of reference material and literature . Algae were an important food source for a number of marine organisms. They included fishes such as Acanthurids, Siganids, Balistids and Scarids with some invertebrate groups like Molluscs, Echinoderms, Crustaceans etc.

Note: During four 'post-survey' dives in 1995-6 several additions were made to the faunal lists annexed; In late 1995 a rare Black-cap Purple Kingfisher was observed on several occations taking up residence on the trees lining the shore and in association with the reef.

A list of additional 9 fish species were recorded at the closing of the 96 season giving a **total count of 493 species**. the list is annexed to the Appendix #1.

7. HUMAN INTERACTIONS

The reef and the surrounding area provide rich fishing grounds for many traditional fisheries. Four outrigger canoes operate from the sand beaches of Rumassala and in addition about 15-20 outriggers from Devata and Ma-galle area visit the reef for fishing. The main mode of fishing involves bottom-set nets targeting the spiny lobsters, Gillnets, line(panna) and reef trolling. Many locals engage in subsistence fishing with line for demersal fishes or with hand-spears for Octopus on the reef crest. The edible mussel (*Perna sp.*) is also collected for consumption on a very limited scale.

About 30 divers operate within the reef area, diving both for ornamental fish and for spiny lobsters depending on the availability of each group. A diver collecting lobsters may have a monthly income of Rs.4,000/00 to Rs.6,000/00, ornamental fisheries bring in an income of Rs.4,000/00 to Rs.20,000/00.

The tourist boat operators in Unawatuna frequently bring in special tours to the Buona-vista beach. The area is referred to as the "jungle beach" due to the relative isolation of the site. This special attraction tour is organised for a cost of Rs. 1800/00 per trip. A minimum of two boats from Unawatuna visit Buona-vista per day, bringing in an average income of Rs. 108,000/00 per month. The actual income could be much higher as the tourist might also hire out diving gear as well.

Instances of explosive fishing using dynamite easily obtained from the many rock quarries on Rumassala kanda were often recorded. The operations carried out usually in the early mornings, targeted shoaling species as the Travellies (Carangidae), Barracuda (Sphyraenidae) and Mackerels (Scombridae).

School children/University students visit the area frequently on educational expeditions and the beach is popular as a recreational site among Sri Lankans as well.

8. SIGNIFICANCE

Coral reefs are a very limited resource in Sri Lanka, with most of them occurring in very shallow water easily accessible to anyone equipped with the most basic of equipment. Reefs contain many commercially important resources, including ornamental and food fishes and invertebrates, lime for construction and souvenirs for the tourist industry. Exploitation at present is not maintained at sustainable levels and the reefs are subject to severe stress on most fronts. Coastal areas in Sri Lanka contain the highest population concentrations and industrial activity in the country (Natural resources of S.L.) resulting in high levels of pollution, which is conveniently diverted to the sea posing a major threat to coastal coral communities (eg. Polhena coconut husk retting/ Kokgala FTZ)

Most of the major coral reefs on the east coast are reportedly being destroyed through lime collection, dynamite fishing, ornamental fisheries and by plagues of the coral eating seastar *Acanthaster planci.* The conditions of the northern reefs remain unknown although it is expected that the ongoing war in the region would also have an impact on the reefs.

The Silavatturai-Vankalai reefs are believed to be the best preserved coral reefs in the country due to their inaccessible location. Similarly offshore reefs of the Bar-reef complex are still in near pristine condition despite the ornamental fish collecting and bottom set netting being carried out.

Coral reefs occur on the south coast of Sri Lanka from Akurala down to roughly around Tangalle. This coastal belt is among the most densely populated coastal regions in the country. It is also the most economically important, supporting almost all coastline based tourism, providing the major portion of fish and marine organisms for the ornamental aquarium fish export trade and the lobster fishery. A considerable number of youth in the area is employed in activities centering on these reefs. With population pressure and ever increasing development activities, the survival of the southern reefs is becoming a matter of concern. Some development projects seem to totally overlook the sustainable values involved when assessing the projected benefits of their activities.

Already the reef at Akurala has been exterminated through lime collection. The once popular resort reef at Polhena has become a relict with the coral dead and slowly crumbling away as a result of the pollution carried in by the Nilwala ganga and from the coconut husk retting activities carried out within the lagoon. The fate of the coral reef at Kokgala is in doubt as the sewage outfall of the Kokgala Free Trade Zone opens out in the near vicinity of the reef. The Weligama/Kapparathota reef is degrading at an alarming rate at the hands of the ornamental fish collectors. Even the oldest marine sanctuary in the country at Hikkaduwa has fared no better as the effects of unmanaged and excessive tourist activity are seen widespread on the reef.

The site of the present reef studied under the survey is earmarked to be reclaimed under the proposed Galle Harbour expansion project. This will include the termination of the Buona-vista reef, during the construction process to make way for the proposed container pier. With the expected increase in shipping traffic and the consequent increase in pollution, the long term effects on the adjacent proposed marine sanctuary at Unawatuna is also uncertain.

The present reef remains one of the last healthy coastal coral reefs in Sri Lanka. The reef coral structures remain mostly intact with a very high percentage and diversity of living coral. The site supports the highest fish diversity recorded for any Sri Lankan reef, with over 484 species of fish utilising it as a home, a nursery and feeding grounds. This includes 39 species of marine fish out of the 72 species listed under appendix #.2 as threatened species in Sri Lanka, in the IUCN

National Status Report on Biological Conservation in Sri Lanka, and 1 species of fish and 39 species of invertebrates listed as protected (schedules IV & IV.a) under the revised Fauna and Flora Protection Act (no.49 of 1993). The survey recorded about 300 species of invertebrate species. The present invertebrate survey remains incomplete due to difficulties in observation, collection and identification encountered within the group. The published list represents only a fraction of the actual diversity of the invertebrate fauna found on the reef.

The reefs Buona-vista and Unawatuna remain the best remaining coastal coral areas in the southwest or possibly the whole of Sri Lanka and need to be treated as a national resource and as the heritage of the generations to come. A coral reef constitutes a structure and a community thousands of years in the making. Easily predating the arrival of King Vijaya 2500 years ago (Sri Lankan reefs are estimated to be in the region of 5000-8000 years old). Reefs therefore cannot be replaced within the scale of human lifetimes. Any activity that results in changing or degrading such resources should take this fact into consideration. Needs and priorities change from generation to generation. and if coral reefs should become a priority and a desired resource tomorrow, should we be the ones who denied the future generations this right.

RECOMMENDATIONS

The findings of the survey clearly show that the Buona-vista is possibly the most diverse and best preserved coastal coral reef in the country and as such should be considered a national heritage and steps should be taken in declaring Buona-vista as a Marine sanctuary. This would be in line with the steps taken in declaring the Rumassala Kanda as a sanctuary. As the buffer zone of the Proposed Unawatuna Marine sanctuary extends up to the Watering point, the two reefs could easily be joined and managed as one sanctuary.

The site of the Buona-vista coral reef has been earmarked to be reclaimed under the proposed expansion of the Galle Harbour. The project seemed to have over looked the value of this very important reef in its planning process. which would be totally destroyed by the harbour, in addition the pollution hazards to the reef posed by the harbour and accompanying maritime trafic on the adjacent Unawatuna Proposed marine sanctuary should also be taken into account .The Authorities should seriously reconsider the present plans and relocate the Harbour in a different part of the coast line in a more suitable location both on a bio-diversity and physio-economic standpoint.

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APPENDIX # 1 LIST OF FISH SPECIES REPORTED FROM THE BUONA-VISTA REEF 1993-4

CHONDRICHTHYS		
Family: Hemiscyllidae		
Chiloscyllium griseum	Gray Bambooshark	3
Family: Carcharhinidae		
Carcharhinus melanopterus	Blacktip Reef shark	4
Family: Torpedinidae		
Torpedo sinuspersici	Torpedo Ray	2
Family: Dasyatidae		
Dasyatis kuhlii	Ring tailed Stingray	2
Himantura walga		2
OSTEICHTHYS		
Family: Albulidae		
Albula sp.	Round jaw Bonefish	2
Family: Muraenidae		
Gymnothorax javanicus	Giant Moray eel	4
Gymnothorax flavimarginatus	Yellow margin Moray eel	3
Gymnothorax favagineus	Black-spotted Moray eel	3
Gymnothorax zonipectus	Barred fin Moray eel	2
Gymnothorax buroensis	Latticetail Moray eel	2
Gymnothorax meleagrides	White-spotted Moray eel	#
Echidna zebra	Zebra Moray eel	4
Echidna nebulosa	Starry Moray eel	4
Sideria grisea	Gray Moray eel	4
Sideria thyrsoidea	Grayface Moray eel	4
Family: Ophichthydae		
Myrichthys maculosus	Spotted Snake eel	3
Leiuranus semicinctus	Culverin	2
Family: Clupeidae		
Dussumeria acuta	Rainbow sardine	3
Illisha sp.		3
Family: Engraulidae		
Stolephorus indicus	Indian Anchovy	4
Stolephorus waitei	Spot-faced Anchovy	4

Abundance key
1= Very rare
2= Rare
3= Uncommon
4= Common
5= Very common

#= Additional species recorded subsequent to the survey.

Family: Synodontidae		
Saurida gracilis	Slender Lizardfish	4
Synodus variegatus	Reef Lizardfish	3
Family: Ariidae		
Arius sp.	Sea catfish	2
Family: Plotosidae		
Plotosus lineatus	Striped Eel-catfish	4
Plotosus sp. (brown with yellow fins)		2
Family: Hemiramphidae		
Hemiramphus limbatus	Congaturi Halfbeak	4
Hemiramphus far	Black-barred Halfbeak	3
Hemiramphus sp.		3
Family: Belonidae		
Tylosus crocodilia	Crocodile Longtom	4
Tylosus sp.		3
Strongylurus strongylurus	Spot-tail Needlefish	#
Family: Holocentridae		
Neoniphon sammara	Bloodspot Squirrelfish	4
Neoniphon opercularis	Blackfin Squirrelfish	2
Sargocentron spiniferum	Sabre Squirrelfish	5
Sargocentron caudimaculatum	Tailspot Squirrelfish	4
Sargocentron diadema	Crowned Squirrelfish	4
Sargocentron cornutum	Three-spot Squirrelfish	3
Sargocentron violaceum	Violet Squirrelfish	3
Sargocentron rubrum	Redcoat Squirrelfish	3
Sargocentron tiere	Tahitian Squirrelfish	2
Sargocentron microstomus	Smallmouth Squirrelfish	2
Sargocentron melanospilos	Blackspot Squirrelfish	1
Myripristis adustus	Shadowfin Soldierfish	4
Myripristis kuntee	Shoulder bar Soldierfish	4
Myripristis violacea	Latticed Soldierfish	4
Myripristis murdjan	Bloch eye Soldierfish	4
Myripristis vittata	Whitetip Soldierfish	4
Myripristis hexagona	Doubletooth Soldierfish	4
Family: Pegasidae		
Pegasus draconis	Short Seamoth	1
Family: Fistularidae		
Fistularia commersoni	Blue spotted Flutemouth	4
Fistularia petimba	Red Flutemouth	2

Family: Aulostomidae		
Aulostoma chinensis	Trumpetfish	#
Family: Syngnathidae		
Corythoichthys intestinalis	Banded Pipefish	3
Doryrhampus exisus	Blue-striped Pipefish	1
Hippocampus kuda	Spotted Seahorse	1
Family: Scorpaenidae		
Pterois miles	Red Firefish	5
Pterois antennatus	Raggedfin Firefish	3
Pterois mombasae	Frill-fin Firefish	1
Inimicus filamentosus	Two-stick Stingfish	2
Sebastapistes cyanostigma	Yellow-spotted Scorpionfish	3
Scorpaenoides parvipinnis	Blochfin Scorpionfish	4
Scorpaenoides varipinnis	Shortfin Scorpionfish	3
Scorpaenoides sp.		2
Scorpaenopsis oxycephala	Tassled Scorpionfish	4
Scorpaenopsis venosa	Raggy Scorpionfish	2
Scorpaenopsis diabolus	Devil Scorpionfish	2
Scorpaenopsis rosea	Rosy Scorpionfish	2
Scorpaenopsis fasciatus		2
Parascorpaena picta	Painted Scorpionfish	2
Family: Platycephalidae		
Onigocea sp.	Flathead	2
Family: Serranidae		
Aethaloperca rogaa	Redmouth Grouper	3
Plectropomus maculatus	Spotted Coraltrout	2
Cephalopholis argus	Peacock Hind	5
Cephalopholis formosa	Blue-lined Hind	5
Cephalopholis leopardus	Leopard Hind	5
Cephalopholis sexmaculatus	Six-blotch Hind	2
Cephalopholis microprion	Dothead Hind	1
Epinephelus merra	Honeycomb Grouper	5
Epinephelus spilotoceps	Foursaddle Grouper	4
Epinephelus fasciatus	Red banded Grouper	3
Epinephelus malabaricus	Malabar Grouper	3
Epinephelus hexagonatus	Whitespecked Grouper	3
Epinephelus longispinis	Streakyspot Grouper	3
Epinephelus quoyanus	Barred-chest Grouper	3
Epinephelus rivulatus	Halfmoon Grouper	2
Epinephelus faveatus	Bigspot Grouper	2
Epinephelus tauvina	Greasy Grouper	2

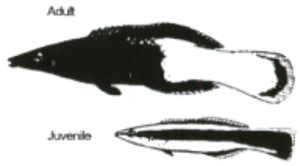
Epinephelus caeruleopunctatus	White spotted Grouper	2
Epinephelus coioides	Estuary Grouper	2
Epinephelus macrospilos	Snubnosed Grouper	2
Epinephelus polyphekadion	Camoflage Grouper	2
Epinephelus flavocaeruleus	Blue & yellow Grouper	1
Grammistes sexlineatus	Six-lined Soapfish	4
Family: Pseudochromidae		
Pseudochromis wilsoni	Yellowfin Dottyback	4
Pseudochromis cyanotaenia	Blue-barred Dottyback	4
Pseudochromis fuscus	Brown Dottyback	2
Pseudochromis tapeinosoma	Blackmargin Dottyback	2
Pseudochromis marshalensis	Yellowspeckled Dottyback	2
Pseudochromis diadema	Diadem Dottyback	2
Pseudochromis sp.		2
Family: Pleisiopidae		
Pleisiops caeruleopunctatus	Redtip Longfin	2
Family: Kuhliidae		
Kuhlia mugil	Barred Flagtail	3
Kuhlia rupestris	Rock Flagtail	3
Family: Priacanthidae		
Priacanthus humrur	Dusky-finned Bullseye	4
Heteropriacanthus cruentatus	Glasseye	3
Family: Apogonidae		
Apogon kalopterus	Spinycheeked Cardinalfish	4
Apogon cyanosoma	Yellowstriped Cardinalfish	4
Apogon cookii	Blackbanded Cardinalfish	4
Apogon apogonides	Goldbelly Cardinalfish	3
Apogon frenatus	Spurcheek Cardinalfish	3
Apogon aureus	Ringtail Cardinalfish	3
Apogon taeniatus	Twobelt Cardinalfish	3
Apogon nigrofasciatus	Broadstriped Cardinalfish	3
Apogon multitaeniatus	Menystriped Cardinalfish	2
Apogon fuscus	Gray Cardinalfish	2
Apogon thermalis		2
Apogon coccineus ?	Cryptic Cardinalfish	2
Apogon sp.2 (black with white tail)		2
Cheilodipterus artus	Wolf Cardinalfish	4
Cheilodipterus macrodon	Bigtooth Cardinalfish	4
Cheilodipterus quinquelineata	Fivelined Cardinalfish	3
Cheilodipterus sp.		#
Archamia furcata	Orangeline Cardinalfish	4
Archamia sp.		2

Family: Pinguipididae		
Parapercis millipunctata	Brownspotted Sandperch	4
Parapercis clathrata	Latticed Sandperch	3
Family: Sillaginidae		
Sillago sihama	Silver Whiting	4
Family: Carangidae		
Caranx Melampygus	Bluefin Travelly	5
Caranx sexfasciatus	Bigeye Travelly	3
Caranx sem	Blacktip Travelly	3
Caranx lugubris	Black Travelly	2
Caranx ignobilis	Giant Travelly	2
Carangoides ferdue	Blue Travelly	2
Carangoides fulvoguttatus	Yellowspotted Travelly	2
Carangoides praeustus	Brownback Travelly	2
Carangoides hippos		1
Gnathanodon speciosus	Golden Travelly	3
Atule mate	Yellow tail Scad	2
Trachinotus blochii	Bloch's Dart	3
Scomberoides lysan	Doublespotted Queenfish	2
Scomberoides commersonianus	Talang Queenfish	2
Scomberoides tol	Needleskin Queenfish	2
Family: Leiognathidae		
Leiognathus daura	Glodstripe Ponyfish	4
Leiognathus bindus	Orangefin Ponyfish	3
Leiognathus fasciatus	Striped Ponyfish	2
Secutor insidiator	Pugnose Ponyfish	2
Family: Lutjanidae		
Lutjanus argentimaculatus	Mangrove Snapper	5
Lutjanus decussatus	Checkered Snapper	4
Lutjanus fulviflamma	Blackspot Snapper	4
Lutjanus fulvus	Blacktail Snapper	4
Lutjanus lunulatus	Lunartail Snapper	4
Lutjanus vitta	Brown stripe Snapper	4
Lutjanus ehrenbergi	Blackspot Snapper	4
Lutjanus kasmira	Bluestripe Snapper	3
Lutjanus bohar	Twospot Snapper	3
Lutjanus madras	Indian Snapper	3
Lutjanus rivulatus	Blubberlip Snapper	2
Lutjanus lutjanus	Bigeye Snapper	2
Lutjanus lemniscatus	Yellowstreaked Snapper	2
Lutjanus gibbus	Humpback red Snapper	2
Lutjanus russelli	Moses Snapper	2
Lutjanus monostigma	Onespot Snapper	2
Lutjanus rangus		2

Etelis carbunculus	Ruby Snapper	2
Family: Caesionidae		
Pterecaesio chrysozona	Goldband Fussilier	5
Caesio xanthonotus	Yellowfin Fussilier	5
Caesio caeruleus	Blue & Gold Fussilier	5
Caesio pisang	Bannana Fussilier	4
Caesio tassellata	Tassellate Fussilier	#
Gymnocaesio gymnopterus	Slender Fussilier	3
Family: Gerridae		
Gerres sp.	Silver biddies	3
Family: Haemulidae		
Plectorhynchus orientalis	Oriental Sweetlips	5
Plectorhynchus griseus	Gray Sweetlips	4
Plectorhynchus schotaf	Minstral Sweetlips	3
Plectorhynchus pictus	Trout Sweetlips	3
Plectorhynchus lineatus	Yellow banded Sweetlips	2
Plectorhynchus gibbosus	Harry Hotlips	1
Diagramma pictum	Painted Sweetlips	3
Pomadasys furcatus	Banded Grunter	2
Pomadasys commersoni	Small spotterd Grunter	2
Pomadasys argenteus	Silver Grunter	2
Pomadasys (c.f.) guoraka	(*Lutjanus fulvus* mimic)	3
Family: Lethrinidae		
Lethrinus harak	Thumb-print Emperor	4
Lethrinus nebulosus	Spangled Emperor	4
Lethrinus ornatus	Ornate Emperor	3
Lethrinus obsoletus	Yellow banded Emperor	2
Lethrinus mahsena	Mahsena Emperor	2
Monotaxis grandoculis	Humpnosed Bigeye bream	2
Family: Nemipteridae		
Scolopsis vosmeri	White cheeked Monocle bream	4
Scolopsis bimaculatus	Thumb print Monocle bream	4
Scolopsis frenatus	Seychells Monocle bream	3
Scolopsis ghanam	Arabian Monocle bream	2
Scolopsis xenochrous	Odd Monocle bream	2
Family: Sciaenidae		
Paranibea sp.	Croaker	2
Family: Mullidae		
Parupeneus indicus	Indian Goatfish	5
Parupeneus macronema	Long barbel Goatfish	5
Parupeneus barberinus	Dash & dot Goatfish	4
Parupeneus bifasciatus	Double bar Goatfish	3
Parupeneus cyclostomus	Goldsaddle Goatfish	3
Upeneus sulphureus	Sulphur Goatfish	2
Upeneus vittatus	Striped Goatfish	2
Upeneus taeniopterus	Finstripe Goatfish	2
Upeneus tragula	Freckled Goatfish	2
Mulloidichthys flavolineatus	Yellowstripe Goatfish	5
Mulloidichthys vanicolensis	Yellowfin Goatfish	3
Mulloidichthys mimicus	Mimic Goatfish	3
Family: Monodactylidae		
Monodactylus argenteus	Malayan angel	5
Family: Pempheridae		
Pempheris oualensis	Copper Sweeper	5
Pempheris vanicolensis	Vanicoro Sweeper	4
Pempheris schwenki	Schwenk's Sweeper	3
Parapriacanthus ransonneti	Golden Sweeper	4
Family: Kyphosidae		
Kyphosus cinerascens	Blue Seachub	4
Kyphosus vaigiensis	Brassy Seachub	3
Family: Ephippidae		
Platax teira	Longfin Batfish	4
Platax orbicularis	Orbicular Batfish	2
Family: Chaetodontidae		
Chaetodon decussatus	Indian vagabond butterflyfish	5
Chaetodon meyeri	Meyer's butterflyfish	5
Chaetodon trifasciatus	Rainbow butterflyfish	5
Chaetodon trifascialis	Chevroned butterflyfish	4
Chaetodon vagabundus	Vagabond butterflyfish	4
Chaetodon lineolatus	Lined butterflyfish	4
Chaetodon collare	Brown butterflyfish	4
Chaetodon auriga	Golden butterflyfish	4
Chaetodon cittrinellus	Cittron butterflyfish	4
Chaetodon guttatissimus	Spotted butterflyfish	4
Chaetodon klinii	Sunburst butterflyfish	4
Chaetodon lunula	Racoon butterflyfish	3
Chaetodon plebeius	Bluespot butterflyfish	3
Chaetodon unimaculatus	Teardrop butterflyfish	3
Chaetodon melanotus	Blackbacked butterflyfish	2
Chaetodon falcula	Saddle backed butterflyfish	2
Chaetodon xanthocephalus	Yellowheaded butterflyfish	2
Chaetodon ornatissimus	Ornate butterflyfish	1
Chaetodon rafflesi	Latticed butterflyfish	1
Chaetodon triangulum	Triangular butterflyfish	1
Hemitaurichthys zoster	Black pyramid butterflyfish	1

Heniochus pleurotaenia	Indian Bannerfish	4
Heniochus acuminatus	Longfin Bannerfish	4
Heniochus monoceros	Masked Bannerfish	2
Heniochus singularis	Singular Bannerfish	1
Family: Pomacanthidae		
Pomacanthus annularis	Blue-ringed Angelfish	4
Pomacanthus semicirculatus	Halfmoon Angelfish	4
Pomacanthus imperator	Emperor Angelfish	1
Centropyge multispinis	Meny-spined Pygmy-angelfish	5
Centropyge flavipectoralis	Yellowfin Pygmy-angelfish	2
Apolemichthys xanthurus	Cream Angelfish	2
Family: Pomacentridae		
Abudefduf vaigiensis	Indo-pacific Sergeant	5
Abudefduf septemfasciatus	Banded Sergeant	4
Abudefduf sordidus	Blackspot Sergeant	4
Abudefduf notatus	Yellowtail Sergeant	3
Chrysiptera leucopoma	Surge Demoiselle	4
Chrysiptera unimaculata	Onespot Demoiselle	4
Chrysiptera biocellata	Twospot Demoiselle	4
Chrysiptera glauca	Gray Demoiselle	4
Chromis viridis	Bluegreen Puller	5
Chromis dimidiatus	Twotone Puller	4
Chromis ternatensis	Ternate Puller	4
Chromis nigrura	Blacktail Puller	3
Chromis lepidolepis	Scally Puller	2
Dascyllus carneus	IndianHumbug	4
Dascyllus trimaculatus	Three spot Humbug	4
Dascyllus aruanus	Whitetail Humbug	2
Neoglyphidodon bonang	Ocellated Damselle	4
Neopomacentrus azysron	Yellowtail Damselle	5
Neopomacentrus taeniurus	Scissortail Damselle	2
Pomacentrus philliphinus	Philippine Demoiselle	5
Pomacentrus chrysurus	Whitespot Demoiselle	5
Pomacentrus similis	Similar Demoiselle	5
Pomacentrus tripunctatus	Threespot Demoiselle	4
Pomacentrus proteus	Colombo Demoiselle	4
Pomacentrus trilineata	Threeline Demoiselle	3
Pomacentrus pavo	Sapphire Demoiselle	2
Pomacentrus coelestis	Neon Demoiselle	2
Plectroglyphidodon dickii	Blackbar Devil	5
Plectroglyphidodon lacrymatus	Jewelspotted Devil	5
Plectroglyphidodon leucozonus	Whitebanded Devil	2
Plectroglyphidodon jhonstonianus	Jhonston Devil	1
Stegastes nigricans	Dusky Farmerfish	4
Stegastes fasciolatus	Pacific Gregory	4
Stegastes lividus	Bluntsnout Gregory	2
Family: Cirrhitidae		
Paracirrhitus forsteri	Blackside Hawkfish	5
Paracirrhitus arcuatus	Archeye Hawkfish	2
Cirrhitichthys aprinus	Threadfin Hawkfish	4
Cirrhitichthys oxycephalus	Pixy Hawkfish	2
Cirrhitichthys sp.		1
Cyprinocirrhitus polyactis	Swallowtail Hawkfish	3
Family: Mugilidae		
Liza subviridis	Greenback Mullet	4
Liza vaigiensis	Squaretail Mullet	4
Oedalechelius labiosus	Hornlip Mullet	4
Family: Sphyraenidae		
Sphyraena barracuda	Great Barracuda	4
Sphyraena obtusata	Obtuse Barracuda	4
Sphyraena putnamiae	Chevroned Barracuda	4
Sphyraena jello	Pickhandle Barracuda	2
Sphyraena forsteri	Bigeye Barracuda	2
Family: Polynemidae		
Polynemus indicus	Indian Threadfin	3
Polynemus sextarius	Blackspot Threadfin	3
Family: Labridae		
Anampses caeruleus	Spotted Chistletooth Wrasse	1
Bodianus neilli	Bay of Bengal Hogfish	4
Bodianus axillaris	Coral Hogfish	2
Bodianus macrourus	Blackbanded Hogfish	2
Bodianus bilunulatus	Tarry Hogfish	2
Chelinus chlorurus	Floral Wrasse	4
Chelinus undulatus	Humphead Wrasse	3
Chelinus trilobatus	Tripletail Wrasse	2
Chelio innermis	Cigar Wrasse	1
Coris frerei	Queen Coris	3
Coris gaimardi	Yellow-tail Coris	#
Epibulus insidiator	Sling jaw Wrasse	3
Gomphosus caeruleus	Indian Ocean Birdwrasse	5
Halichoerus marginatus	Ribboned Wrasse	5
Halichoerus hortulanus	Checkerboard Wrasse	5
Halichoerus nebulosus	Clouded Wrasse	5
Halichoerus timorensis	Timor Wrasse	5

Halichoerus biocellatus	Bi-ocellated Wrasse	3
Halichoerus scapularis	Brownbanded Wrasse	3
Halichoerus margaritaceus	Pinkbelly Wrasse	3
Halichoerus notopsis		3
Halichoerus hytleri		3
Hologymnosus doliatus	Pastel wrasse	1
Hologymnosus annulatus	Ring Wrasse	1
Hemigymnus fasciatus	Banded Clown Wrasse	4
Hemigymnus melapterus	Blackeye Clown Wrasse	3
Labroides dimidiatus	Blue Cleaner Wrasse	5
Labroides bicolor	Bi-coloured Cleaner Wrasse	2
Labrichthys unilineata	Tubelip Wrasse	4
Leptojuloides cyanopleura	Shoulder spot Wrasse	2
Macropharyngodon meleagris	Blackspotted Wrasse	3
Macropharyngodon ornatus	Ornate Wrasse	3
Novaeculichthys taeniourus	Dragon Wrasse	2
Pseudochelinus hexataenia	Sixstriped Wrasse	3
Pseudochelinus octotaenia	Eightstriped Wrasse	3
Pseudojuloides erythrops	Redeye Wrasse	2
Stethojules interrupta	Cut-ribbon Rainbow-wrasse	4
Stethojules albovittata	Bluelined Rainbow-wrasse	3
Stethojules trilineata	Threelined Rainbow-wrasse	3
Stethojules strigiventer	Silverstreaked Rainbow-wrasse	3
Thalassoma lunare	Moon Wrasse	5
Thalassoma hardwickii	Sixbarred Wrasse	5
Thalassoma janseni	Jansen's Wrasse	5
Thalassoma quinquevittatum	Fivestriped Wrasse	5
Thalassoma amblycephalum	Blunthead Wrasse	3
Thalassoma purpureum	Surge Wrasse	2
Thalassoma trilobatum	Green bloched Wrasse	2



Labroides bicolor
Protected species

Family: Scaridae

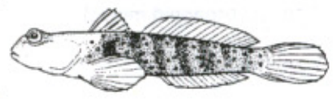
Scarus rubroviolaceus	Amber Parrotfish	4
Scarus gobban	Yellowscaled Parrotfish	4
Scarus oedima (?)	Knothead Parrotfish	4
Scarus sordidus	Bullethead Parrotfish	4
Scarus niger	Swarthy Parrotfish	3
Scarus scaber	Yellowbar Parrotfish	3
Scarus frenatus	Bridled Parrotfish	3
Scarus russelli		3
Scarus gibbus	Heavybeak Parrotfish	2
Calotomus carolinus	Stareyed Parrotfish	3
Leptoscarus vaigiensis	Marbled Parrotfish	3

Family: Tripterigidae

Helcogramma striata	Neon Tripplefin	4
Tripterigion sp.1 (green)		4
Tripterigion sp.2 (red with black beard)		3
Tripterigion sp.3 (white with 3 black bloches)		2

Family: Blennidae

Aspidonotus taeniatus	False cleaner Fangblenny	5
Aspidonotus dussumieri	Lance Fangblenny	2
Plagiotremus rhynorhinchos	Bluestriped Fangblenny	4
Plagiotremus tapeinosoma	Piano Fangblenny	3
Plagiotremus phenax	Imposter Fangblenny	2
Meiacanthus mossambicus	Mozambique Fangblenny	2
Petroscirtes (c.f.) mitratus	Floral Fangblenny	#
Salarias fasciatus	Jewelled Blenny	4
Salarias sp.		3
Ecsenias bicolor	Bicolour Blenny	4
Ecsenias oculus	Ocular Blenny	4
Ecsenias nalolo	Nalolo Blenny	3
Ecsenias lineatus	Linear Blenny	2
Exalias brevis	Shortbodied Blenny	3
Cirripectus stigmaticus	Reticulated Blenny	4
Cirripectus castaneus	Chestnut Blenny	4
Istiblennius lineatus	Lined Rockskipper	4
Istiblennius edentulus	Rippled Rockskipper	3
Istiblennius sp.		3
Enneapterigius sp.		2
Perulixia sp.		2



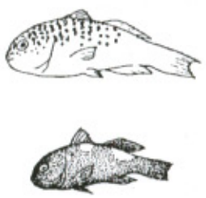
Cryptocentrus sp.2

Family: Gobiidae

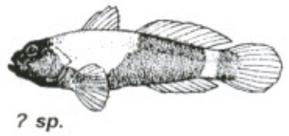
Cryptocentrus sp.1 (white forehead)		4
Cryptocentrus cryptocentrus	Ninebar Shrimpgoby	3
Cryptocentrus caeruleomaculatus	Bluespekled Shrimpgoby	3
Cryptocentrus strigiliceps	Target Shrimpgoby	3
Cryptocentrus cinctus	Yellow Shrimpgoby	2
Cryptocentrus sp.2 (yellow/ black)		1
Amblyeleotris periophthalmus	Blotchy Shrimpgoby	3
Amblyeleotris fasciata	Redbarred Shrimpgoby	2
Amblyeleotris wheeleri	Gorgeous Shrimpgoby	2
Amblyeleotris diagonalis		2
Ctenogobius aurocingulus	Goldstreaked Shrimpgoby	3
Amblygobius hectori	Hector's Goby	2
Amblygobius nocturnus	Nocturna Goby	2

Valencienna sexguttata	Sixspot Goby	4
Valencienna puellaris	Orange dashed Goby	3
Valencienna longispinis	Longfinned Goby	3
Valencienna strigata	Bluebanded Goby	2
Valencienna sp.		2
Asterropterix semipunctatus	Starry Goby	3
Eviota nigriventris	Blackbelly Goby	3
Eviota sebreei		2
Bryaniops sp.		2
Istigobius decoratus	Decorated Goby	4
Istigobius diadema		2
Bathygobius sp.		2
Gnatholepis sp.		3
Callogobius mannarensis	Mannar Goby	2
Callogobius hasselti	Van Hasselt's Goby	2
Paragobiodon echinocephalus	Redheaded Coralgoby	3
Paragobiodon lacunicolus	Blackfin Coralgoby	2
Gobiodon cittrinus	Four-bar Coralgoby	4
Gobiodon quinquestrigata	Five-lined Coralgoby	4
Gobiodon atrangulatus	Coralgoby	2
Gobiodon sp.1	Coralgoby	2
Gobiodon sp.2	Coralgoby	2
Gobiodon sp.3	Coralgoby	2
Gobiodon sp.4	Coralgoby	2
Scatelaos sp.? (cirri on mouth)		2
? sp. "parva goby"		2
? sp. (scorpaenid mimic)		2
? sp. (sail fin)		1

Gobiodon quinquestrigata



Gobiodon spp. 1-4



? sp.

***4 (Scorpaenodes parvipinnis.* mimic)**

Family: Microdesmidae

Ptereleotris evidas	Twotoned Dartfish	4
Ptereleotris microlepis	Pale Dartfish	3
Ptereleotris heteroptera	Spot-tail Dartfish	3
Ptereleotris monoptera	Monofin Dartfish	2

Family: Acanthuridae

Acanthurus lineolatus	Lined Surgeonfish	5
Acanthurus leucosternon	Powder-blue Surgeonfish	4
Acanthurus triostegus	Convict Surgeonfish	4
Acanthurus mata	Elongate Surgeonfish	4
Acanthurus nigricauda	Blackstreak Surgeonfish	3
Acanthurus nigrofuscus	Brown Surgeonfish	3
Acanthurus tristis/pyroferus?	Indian Ocean Mimic Surgeonfish	3
Acanthurus bariene	Roundspot Surgeonfish	3

Acanthurus dussumieri	Eyestripe Surgeonfish	3
Acanthurus blochii	Ringtail Surgeonfish	2
Ctenochaetus striatus	Striated Bristletooth	5
Ctenochaetus strigosus	Goldring Bristletooth	3
Ctenochaetus binotatus	Twospot Bristletooth	3
Prionurus maculatus ?	Yellow spotted	1
Zebrasoma scopas	Brown SailfinTang	3
Zebrasoma desjardini	Indian Sailfin Tang	1
Naso lituratus	Orangespine Unicornfish	3
Naso annulatus	Ringtail Unicornfish	3
Naso vlamingi	Bignose Unicornfish	3
Naso brevirostris	Spotted Unicornfish	2

Family: Zanclidae

Zanclus cornutus	Moorish idol	5

Family: Siganidae

Siganus lineatus	Goldlined Rabbitfish	4
Siganus canaliculatus	Whitespotted Rabbitfish	4
Siganus vermiculatus	Vermiculate Rabbitfish	3
Siganus argenteus	Forktail Rabbitfish	3
Siganus javus	Streaked Rabbitfish	3
Siganus spinus	Little Rabbitfish	2
Siganus virgatus	Virgate Rabbitfish	#

Family: Scombridae

Rastrelliger kanagurta	Indian Makeral	4
Scomberomorus sp.	Seer	2

Family: Psettodidae

Psettodes erumei	Indian Halibut	2

Family: Bothidae

Bothus pantherinus	Panther Flounder	3
Bothus mancus	Peacock Flounder	2

Family: Cyanoglossidae

Cyanoglossus puncticeps	Tonguesole	2
Cyanoglossus feldmanni	Tonguesole	2

Family: Soleidae

Pardachirus sp. ?	Sole	2

Family: Balistidae

Balistapus undulatus	Yellowstriped Triggerfish	4

Balistoides viridescens	Spotted Triggerfish	4
Suffleman frenatus	Masked Triggerfish	3
Suffleman chrysopterus	Goldfinned Triggerfish	3
Melichthys indicus	Indian Ocean Triggerfish	3
Rhinecanthus aculeatus	Picasso Triggerfish	2
Rhinecanthus rectangulum	Wedgetail Triggerfish	2
Family: Monacanthidae		
Pervagor janthinosoma	Darkblotched Leatherjacket	5
Amanses scopas	Brushsided Leatherjacket	4
Alutera scripta	Scribbled Leatherjacket	3
Cantherhinus pardalis	Honeycomb Leatherjacket	3
Cantherhinus dumerili	Yelloweye Leatherjacket	2
Oxymonacanthus longirostris	Longnosed Filefish	1
Anacanthus barbatus	Large scaled Leatherjacket	2
Acreichthys sp.	Filefish	#
Family: Ostracionidae		
Ostrcion cubicum	Cube Boxfish	4
Ostrcion meleagris	Whitespotted Boxfish	3
Ostrcion cyanurus	Bluetail Boxfish	3
Family: Tetraodontidae		
Canthigaster solandri	Jewelspotted Toby	4
Canthigaster valentini	Blacksaddled Toby	4
Canthigaster amboinensis	Ambon Toby	3
Canthigaster janthinoptera	Greenspotted Toby	3
Canthigaster natalensis		3
Canthigaster bennetti	Bennett's Toby	2
Canthigaster epilamprus	Lantern Toby	2
Arothon nigropunctatus	Blackspotted Pufferfish	4
Arothron immaculatus	Immaculate Pufferfish	3
Arothron hispidus	Whitespotted Pufferfish	2
Torquigener oblongus		1
Family: Diodontidae		
Diodon hystrix	Spotted Porcupinefish	3
Diodon litturosus	Blackblotched Porcupinefish	2

Number of records during 93/94 survey.

No of Families..... 67
No of Genera..... 185
No of species.....483

Adjested total count with additional species from 4 supplimentary dives in 95/96

No of Families.....68
No of Genera.....189
No of Species.....492

APPENDIX # 2. LIST OF MARINE INVERTEBRATES RECORDED FROM BUONA-VISTA 1993-4

Status key
species protected by the fauna & flora protection ordinence ..... P
species listed as threatened by the IUCN status report(1993) ..... T

PHYLLUM: PORIFERA

Clathrina coriacea		
Clathria sp.	White vained Red sponge	
Siphonochalina sp.	Vase sponge	
Phakelia sp.	Thick yellow Fansponge	
Ianthella sp.	Thin yellow Fansponge	
Suberites sp.	Brown Encrusting sponge	
?. sp.	Cup sponge	

PHYLLUM: COELENTERATA

CLASS: HYDROZOA

Order: Athecata

Millipora platyphyllia	Fire Coral	P
Distichopora violacea	Hydroid Coral	P

Order: Thecata

Lytocarpus sp.	Feather Hydroid	

CLASS: CERIANTIPATHERIA

Cerianthus sp.	Tube animone	P

CLASS: ALCYONARIA

Order: Alcyonacea

Sarcophyton trocheliophorum	Leather coral	P
Lobophyton sp.	Leather coral	
Sinularia sp.	Encrusting Soft coral	
Anthellia/ Xenia sp.	Pumping coral	P

Order: Gorgonacea

Acabaria sp.	Gorgonian	P

CLASS: ZOANTHARIA

Order: Actinaria

Heteractis aurora	Beaded Animone
Caliactis sp.	Hermit crab Animone
?. sp.	Sand animone

Order: Zoantharia

Palythoa sp.	Pavement coral

Order: Scleractinia		
Family: Pocilloporidae		
Pocillopora damicornis	Cauliflower Coral	P
Pocillopora eydouxi		P
Pocillopora verrucosa		P
Family: Acroporidae		
Acropora spp.	Staghorn Coral	P
Astreopora sp.		P
Montipora spp.		P
Family: Agariciidae		
Gardineroseris spp.		P
Pavona spp.		P
Leptoseris sp.		P
Pachyseris rugosa	Serpent Coral	P
Family: Fungiidae		
Fungia spp.	Mushroom Coral	P
Podabacea crustacea	Bracket Coral	P
Cycloseris spp.		P
Family: Poritidae		
Porites spp.	Pore Coral	P
Goniopora spp.	Animone/ Ball Coral	P
Family: Faviidae		
Favia sp.	Knob Coral	P
Favites sp.	Large Star coral	P
Goniastrea sp.	Lesser Star coral	P
Echinopora lamellosa	Hedgehog Coral	P
Diploastrea heliopora	Double star Coral	P
Hydnophora exesa	SpinyCoral	P
Leptastrea sp.		P
Leptoria sp.	Brain Coral	P
Platygyra sp.	Brain / Valley Coral	P
Cyphastrea sp.		P
Montastrea valenciennesi		P
Oulophyllia sp.		P
Family: Oculinidae		
Galaxia fascicularis		P
Galaxia sp.		P
Family: Mussidae		
Symphyllia sp.	Brain Coral	P
Family: Pectinidae		
Echinophyllia sp.		P
Family: Dendrophyllidae		
Tubastrea sp.	Cave Coral	P
Dendrophyllia sp.		P
Turbinaria peltata	Disk Coral	P
Family: Siderasteridae		
Coscinaria sp.		P

Family: Thamanasteridae		
Psammocora sp.		P
Family: Caryophyllidae		
Paracyathus sp.		P
PHYLLUM: CTENOPHORA		
CLASS: TENTACULATA		
Order: Lobata		
(c.f.) Bolinopsis sp.	Comb Jellyfish	
PHYLLUM: PLATYHELMINTHES		
Order: Polycladida		
Pseudoceros hancockanus	Polyclad Flatworm	
Pseudoceros corallophilus	Polyclad Flatworm	
Pseudoceros zebra	Polyclad Flatworm	
PHYLLUM: ANNELIDA		
CLASS: POLYCHAETA		
Order: Phyllodocida		
(c.f.) Nereis spp.	Ragworm	
Order: Sabellida		
Sabellastarte spp.	Fanworm	P
Spirobranchus giganteus	Feather-duster worm	P
Serpula sp.	Calcareus Tubeworm	
Order: Terebellida		
(c.f.) Terebellides sp.	Sand-burrowing Worm	
PHYLLUM: CRUSTACEA		
CLASS: CIRRIPEDIA		
Tetraclita sp.	Acorn Barnacle	
Chthalmus sp.	Star Barnacle	
Lepas sp.	Goose Barnacle	
CLASS: MALACOSTRACA		
Order: Stromatopoda		
Odontodactylus scyllarus	Peacock Mantis-shrimp	
Gonodactylus sp.	Green Mantis-shrimp	
Order: Decapoda		
Suborder: Natantia		
Family: Panaeidae		
Parapaeniopsis sp.	Prawn	

Family: Palaemonidae		
Periclimenes imperator	Emperor Shrimp	
Periclimenes soror	Starfish Shrimp	
Periclimenes magnificus	Animone Shrimp	
Periclimenes sp.1 (spotted)	Coral Shrimp	
Periclimenes sp.2 (white banded)	Coral Shrimp	
Coralliocaris sp.	Green Coralshrimp	
Family: Rhynchocinetidae		
Rhynchocinetus hiatti	Hingebeak Shrimp	
Rhynchocinetus spp.		
Family: Gnathophyllidae		
Hymnocera elegans	Orchid Shrimp	T/P
Family: Alpheidae		
Alpheus lottiui	Coral Shrimp	
Alpheus spp.	Goby symbiotic Shrimps	
Synalpheus sp.	Coral Shrimp	
Family: Hippolytidae		
Saron marmoratus	Marbled Shrimp	
Saron neglectus	Marbled Shrimp	
Saron spp.		
Hippolysmata spp.	Cleaner Shrimps	
Thor amboinensis	Coral Shrimp	
Family: Stenopodidae		
Stenopus hispidus	Banded Boxing-shrimp	T
Stenopus cyanoscelis	Bluelegged Boxing-shrimp	

Hymnocera elegans

Suborder: Reptantia

Family: Palinuridae		
Panulirus versicolor	Painted Spinylobster	T
Panulirus homarus	Scalloped Spinylobster	T
Panulirus ornatus	Ornate Spinylobster	T
Panulirus longipes	Longlegged Spinylobster	T
Panulirus peniciliatus	Pronghorn Spinylobster	T
Family: Scyllaridae		
Parribacus antarcticus	Sculptured Slipper-lobster	
Family: Coenobitidae		
Coenobita sp.	Shore Hermitcrab	
Family: Diogenidae		
Dardanus magistos	Hairy red Hermitcrab	P
Dardanus guttatus	Blueknee Hermitcrab	
Dardanus logopodes	Hermitcrab	
Dardanus tinctor	Animone Hermitcrab	
Dardanus spp.		
Diogenes sp.		
Family: Paguridae		
Aniculus sp.	Streaked red Hermitcrab	
Paguritta sp.	Coral Hermitcrab	

Family: Porcellanidae	
Neopetrolisthes sp.	Porcelain crab
Family: Hippidae	
Emerita sp.	Mole crab
Family: Calappidae	
Calappa lophos	Box crab
Calappa calappa ?	Box crab
Calappa sp.1 (grannulate)	Box crab
Calappa sp.2 (spiked)	Box crab
Matuta planipes	Mooncrab
Matuta lunaris	Monncrab
Family:Leucosidae	
Leucosia sp.	Pea crab
Family: Majidae	
Schizophrys sp.	Spider crab
Lambrus sp.	Spider crab
Camposcia spp.	Decorator crab
Family: Portunidae	
Scylla cirrata	Mud crab
Portunus pelagicus	Blue Swimming crab
Portunus sanguinolentus	Redspot Swimming crab
Charybdis ferriata	Coral crab
Charybdis sp.	
Thalamita crenata	Swimmer crab
Thalamita spp.	
Family: Xanthidae	
Carpilius maculatus	Spotted crab
Carpilius convexus	Reef crab
Etisus splendidus	Red reef crab
Atergatis integerrimus	Red egg crab
Atergatis floridus	Floral egg crab
Ozius sp.	
Trapezius sp.	Acropora crab
Tetralia sp.	Poecillopora crab
Pseudoliomera speciosa	Reef crab
Zosimus anaeus	Reef crab
Family: Ocypodidae	
Ocypode ceratophthalma	Ghost crab
Ocypode sp.1 (no eye tentacle)	Ghost crab
Ocypode sp.2 (white with banded legs)	Ghost crab
Scopimera sp.	Sand bubbler crab
Family: Grapsidae	
Grapsus sp.	Swift-foot crab
Varuna litterata	Swift-foot crab
Percnon sp.	Greenline reef crab
Familly: Menippidae	
Eriphia sp.	Red eye crab

PHYLLUM: MOLLUSCA		
CLASS: POLYPLACOPHORA		
Family: Chitonidae		
(c.f.) Acanthopleura sp.	Chiton	
CLASS: GASTROPODA		
SUBCLASS: PROSOBRANCHIA		
Family: Haliotidae		
Haliotis sp.	Abalon	
Family: Patellidae		
Patella sp.	Limpet	
Family: Acmaeidae		
Acmaea sp.	Limpet	
Family: Trochidae		
Trochus radiatus	Topshell	
Trochus maculatus	Topshell	
Trochus pyramis	Topshell	
Trochus calicoceus	Topshell	
Family: Turbinidae		
Turbo (c.f.) intercostalis	Turbanshell	
Family: Neritidae		
Neritopsis radula	Nerite	
Nerita polite	Nerite	
Nerita albicella	Nerite	
Ritena maura	Nerite	
Family: Littorinidae		
Littorina sp.	Periwinkle	
Family: Turritellidae		
Turitella duplicata	Turretshell	
Turitella sp.	Turretshell	
Family: Vermatidae		
Vermetus sp.	Wormshell	
Family: Cerithidae		
Cerithium obeliscus	Hornshell	
Family: Strombidae		
Strombus marginatus	Conchshell	
Strombus variabilis	Conchshell	
Lambis chiragra	Spidershell	T/P
Lambis lambis	Spidershell	T/P
Lambis crocata	Spidershell	T
Family: Cypraeidae		
Cypraea asellus	Banded Cowry	
Cypraea tigris	Tiger Cowry	T/P
Cypraea moneta	Money Cowry	
Cypraea caputserpentis	Snakehead Cowry	
Cypraea arabica	Arabian Cowry	
Cypraea ocellatus	Eyed Cowry	
Cypraea nucleus	Cowry	
Cypraea erosa	Cowry	
Cypraea isabella	Cowry	
Cypraea staphylea	Cowry	
Cypraea felina	Cowry	
Cypraea annulata	Ringed Cowry	
Cypraea muritiana	Muritius Cowry	
Family: Cassidae		
Cassis sp.	Helmutshell	
Phalium glaucum	Helmutshell	
Family: Tonnidae		
Tonna perdix	Tunshell	
Tonna sp.	Tunshell	
Family Cymatidae		
Cymatium lotoreum	Trumpetshell	
Cymatium rubecula	Trumpetshell	
Cymatium (c.f.) aquatilis	Trumpetshell	
Cymatium clandestinum	Trumpetshell	
Colubrellina grannularis	Trumpetshell	
Family: Bursidae		
Bursa crumenoides	Frogshell	
Family: Muricidae		
Chicoreus brunneus / adustus	Murex	
Chicoreus palmarosae	Palmarosa Murex	T/P
Chicoreus torrefactus	Short-frond Murex	
Chicoreus ramosa	Giant Murex	T
Family: Thaididae		
Thais rudolphi	Whelk	
Mancinella bufo	Whelk	
Drupa grannulata	Drupeshell	
Drupa musiva	Drupeshell	
Drupa margariticola	Drupeshell	
Family: Nassaridae		
Nassarius arcularius	Dogwhelk	
Family: Buccinidae		
Babylonia spirata	Babylonshell	
Family: Fasciolaridae		
Pleuroploca filamentosa	Spindleshell	
Pleuroploca trapezium	Tulip shell	
Family: Olividae		
Oliva sericea	Oliveshell	
Oliva ispidula	Oliveshell	
Oliva textilina	Oliveshell	
Oliva reticulata	Oliveshell	
Oliva spp.	Oliveshell	
Family: Vasidae		
Vasum turbinellum	Vaseshell	

Family: Turbinellidae		
Turbinella pyrum	Sacred chank	
Family: Harpidae		
Harpa spp.	Harpshell	
Family: Mitridae		
Mitra sp.	Mitreshell	
Tiara morchi	Mitreshell	
Family: Conidae		
Conus literatus	Coneshell	T
Conus textile	Textile Coneshell	T
Conus distans	Coneshell	
Conus ebraeus	Coneshell	
Conus miles	Coneshell	
Conus chaldeus	Coneshell	
Conus vaxillium	Coneshell	
Conus nonile	Coneshell	
Conus spp.	Coneshell	
Family: Terebridae		
Terebra crenulata	Augershell	
Terebra sp.	Augershell	

SUBCLASS: OPISTHOBRANCHIA

Order: Bullomorpha		
Family: Bullidae		
Bulla ampulla	Bubbleshell	
Bulla sp.	Bubbleshell	
Order: Aplysiomorpha		
Family: Aplysiidae		
Aplysia spp.	Sea hares	
Order: Nudibranchia		
suborder: Doridacea		
Family:Phyllididae		
Phyllidia bourguini	Seaslug	
Phyllidia elegans	Seaslug	
Phyllidia ocellata	Seaslug	
Phyllidia spp.	Seaslug	
Family: Polyceridae		
Tambja affinis	Seaslug	
Tambja sp.	Seaslug	
Family: chromodoridae		
Chromodoris quadricolor	Seaslug	
Chromodoris coi	Seaslug	
Chromodoris elisabethina	Seaslug	
Chromodoris geometrica	Seaslug	
Chromodoris spp.	Seaslug	
Casella spp.	Seaslug	

Family: Archaeodoridae		
(c.f.) Archaeodoris sp.	Seaslug	
suborder: Aeolidacea		
Family: Elysiidae		
(c.f.) Thurdilla spp	Aeolic Nudibranchs	
Family: Glaucidae		
Phylodesmium spp.	Aeolic Nudibranchs	
Pteraeolidia spp.	Aeolic Nudibranchs	

CLASS: BIVALVIA

Family: Mytilidae		
Lithophaga sp.	Boring Mussel	
Septifer bilocularis	Mussel	
Septifer variegatus	Mussel	
Perna perna	Edible Mussel	
Family: Pteriidae		
Pteria sp.	Wingshell	
Pinctada sp.	Pearl Oyster	
Family: Ostreidae		
Crassostrea sp.	Oyster	
Saccostrea sp.	Rock Oyster	
Lopha sp.	Cocks'comb Oyster	
Family: Pinnidae		
Pinna sp.	Ear shell	
Family: Tridacnidae		
Tridacna maxima	Giant clam	
Tridacna squamosa	Giant clam	T
Tridacna crocea	Burrowing clam	
Family: Tellinidae		
Latona cuneata	Tellin shell	
Tellina sp.	Tellin shell	
Family: Carditidae		
Cardita spp.	Cockles	

CLASS: CEPHALOPODA

Family: Sepiidae		
Sepia pharaonis	Pharao Cuttlefish	
Sepiella innermis	Spineless Cuttlefish	
Sepiadarium kochii	Bottletail Squid	
Family: Loliginidae		
Sepioteuthis sp.	Reef Squid	
Family: Octopodidae		
Octopus cyaneus	Big blue Octopus	
Octopus sp.(c.f. O.valgaris)	Red Octopus	

PHYLLUM: BRYOZOA		
Family: Membraniporidae		
Membranipora sp.	Bryozoan	
PHYLLUM: ECHINODERMATA		
CLASS: CRINOIDEA		
Family: Comasteridae		
Comanthina spp.	Featherstar	
Family: Himerometridae		
Himerometra spp.	Featherstar	
CLASS: STELLAROIDEA		
SUBCLASS: ASTERIDEA		
Family: Oreasteridae		
Culcita schimideliana	Pincushon Seastar	
Culcita novaeguineae	Pincushon Seastar	
Culcita sp.	Pincushon Seastar	
Protoreaster linki	Horned Seastar	T
Family: Ophidiasteridae		
Fromia elegans	Red seastar	T
Nardoa spp.	Green seastar	
Tamaria sp.	Batik seastar	
Family: Acanthasteridae		
Acanthaster planci	Crown-of-thorn Seastar	
SUBCLASS: OPHIUROIDEA		
Family: Ophiuridae		
Ophiolepis sp.	Brittlestars	
Family: Ophiocomidae		
Ophiocoma sp.	Brittlestars	
Ophiomastix		
Family: Ophiotrichidae		
Ophiothrix sp.	Brittlestars	
CLASS: ECHINOIDEA		
Family: Echinothuriidae		
Asthenosoma varium		T
Family: Diadematidae		
Diadema setosum	Black Seaurchin	
Diadema savigneae	Bluelined Seaurchin	
Astropyga sp.		
Echinothrix diadema		
Echinothrix calamaris		
Family: Toxopneustidae		
Toxopneustes pileolus	Poison Seaurchin	T
Tripneustes sp.	Decorator Seaurchin	
Family: Echinometridae		
Echinometra mathaei		
Heterocentrotus mamilliatus	Slate pencil Urchin	T
Family: Clypeasteridae		
Clypeaster sp.	Sand Dollar	
CLASS: HOLOTHURIOIDEA		
Family: Holothuridae		
Holothuria atra	Beche' de mer	
Holothuria edulis	Pinkbelly Seacucumber	
Actinopyga muritiana	Red Seacucumber	
Labidodemas sp.		
Family: Stichopodidae		
Stichopus sp.		
Thelanota anax	Yellow Seacucumber	
Thelanota ananas	Prikly Redfish	
Bodaschia ? sp.		
Family Synaptidae		
Synapta sp.		

No of phyla..... 9
No of genera..... 199
No of species..... 299

APPENDIX # 3. LIST OF ALGAE REPORTED FROM BUONA-VISTA REEF 1993-4

DIVISION: CHLOROPHYTA
CLASS: CHLOROPHYCEAE
Order: Ulvales
Family: Ulvaceae
Ulva lactuca — Sea Lettuce
Ulva fenestrata
Ulva sp.

Enteromorpha ? sp.

Order: Siphonales
Family: Codiaceae
Halimeda opuntia — Corraline algae
Halimeda macroloba
Halimeda sp.

Codium adherens

Udotea sp.

Family: Caulerpaceae
Caulerpa taxifolia — Sea grapes
Caulerpa spp.

Order: Siphonocladales
Family: Valoniaceae
Dictyospheria ? sp. — Button weed

Order: ?.....
Chlorodesmis sp. — Turtle weed

DIVISION: PHAEOPYTA
CLASS: PHAEOPHYCEAE
Order: Dictyotales
Family: Dictyotaceae
Dictyota ? sp.

Padina tetrastromatica — Funnelweed
Padina sp.

Order: Fucales
Family: Sargassaceae
Turbinaria sp.

Sargassum spp.

DIVISION: RHODOPHYTA
CLASS: RHODOPHYCEAE

Order: Bangiales
Family: Bangiaceae
Porphyra suborbiculata

Order: Cryptonemiales
Family: Grateloupiaceae
Halimenia ? ceylonica

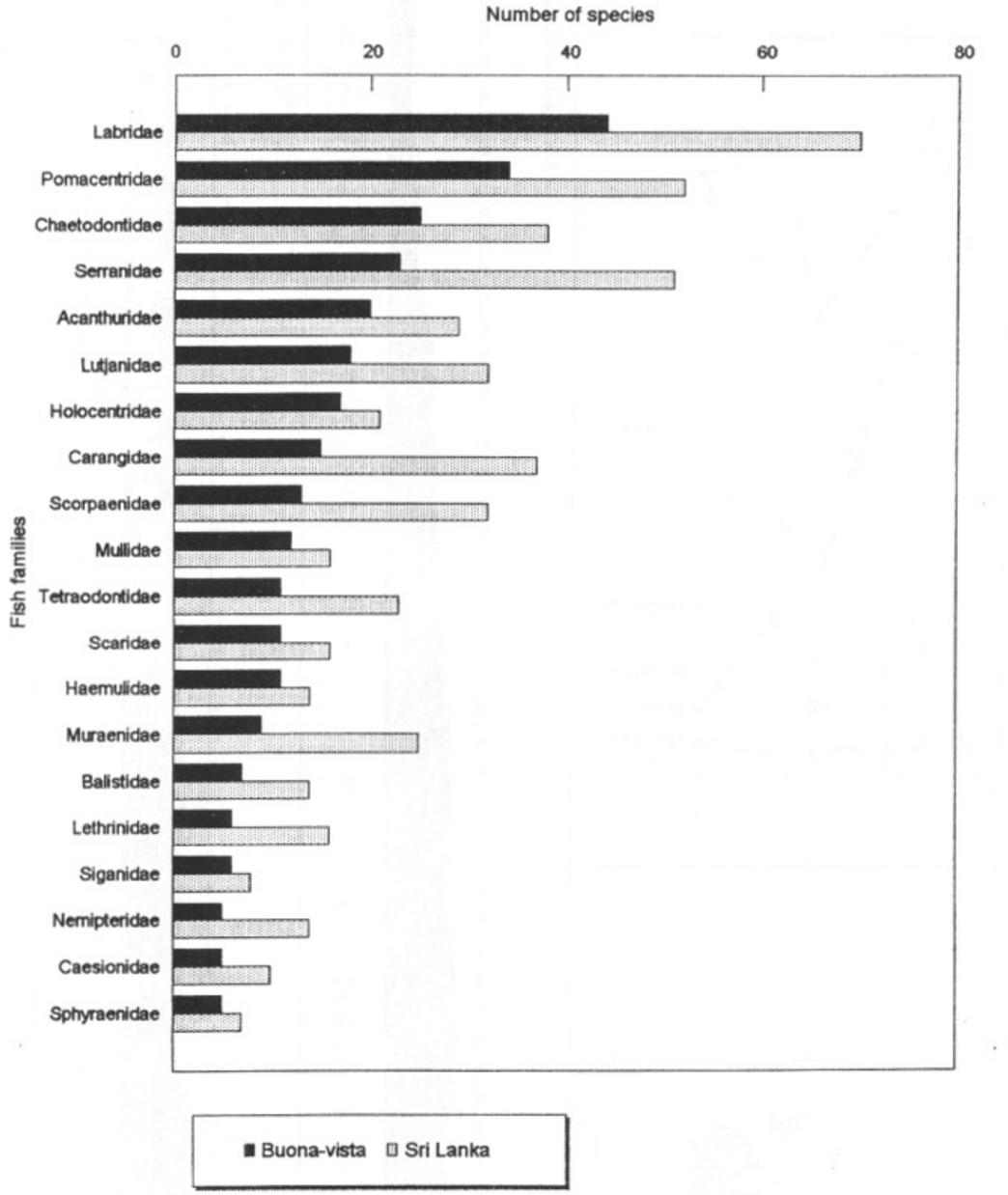
Order: ?.....

Titanophora ? sp. — Jelly weed

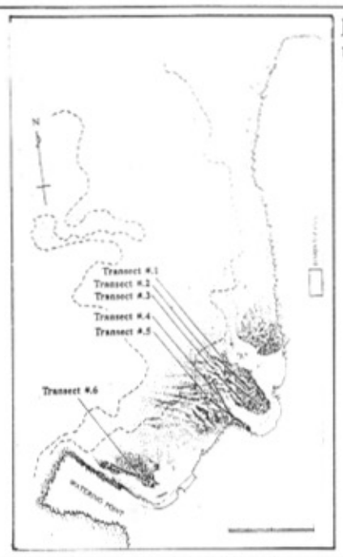
Neogonolithon ? sp. — Corraline Red algae

8+ Families
16 Genera
22 Species

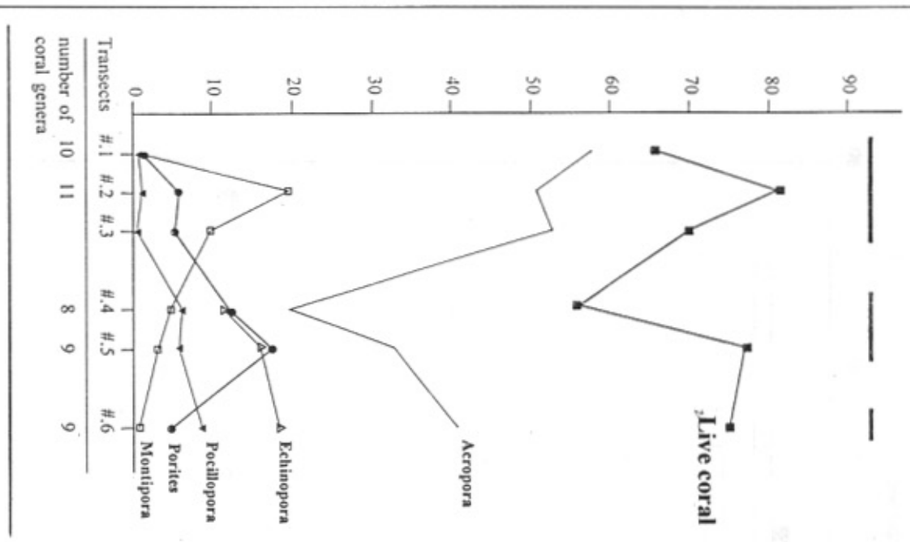
APPENDIX #4. SPECIES REPRESENTATION IN BUONA-VISTA OF SOME SELECTED FISH FAMILIES



APPENDIX # 5. SEA BOTTOM PROFILES OF TRANSECTS

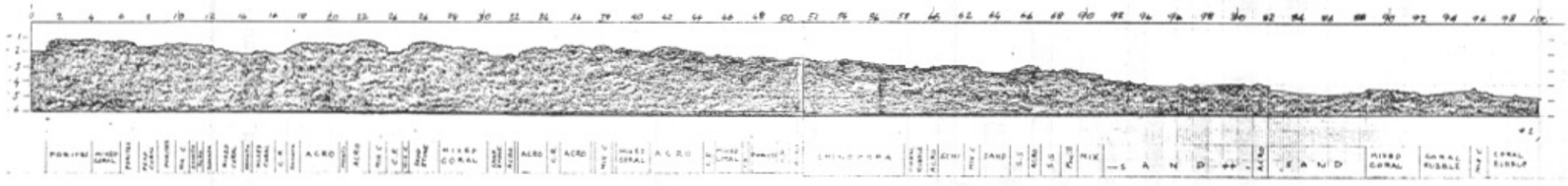


Locations of the transects. ▽



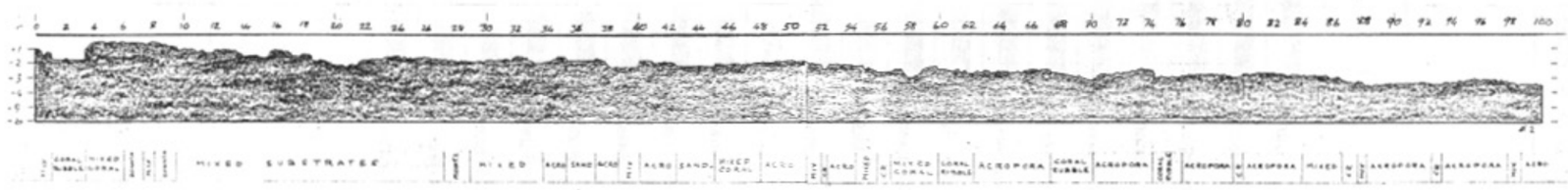
#1

65.5% live coral(10 genera)



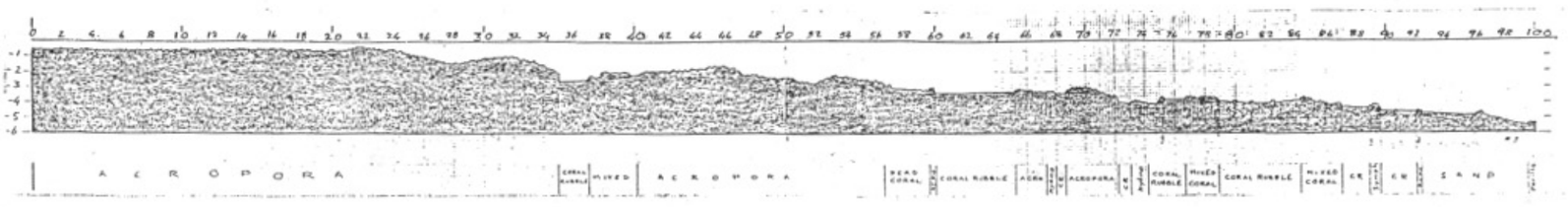
Transect #.2

82.15% live coral(11 genera)



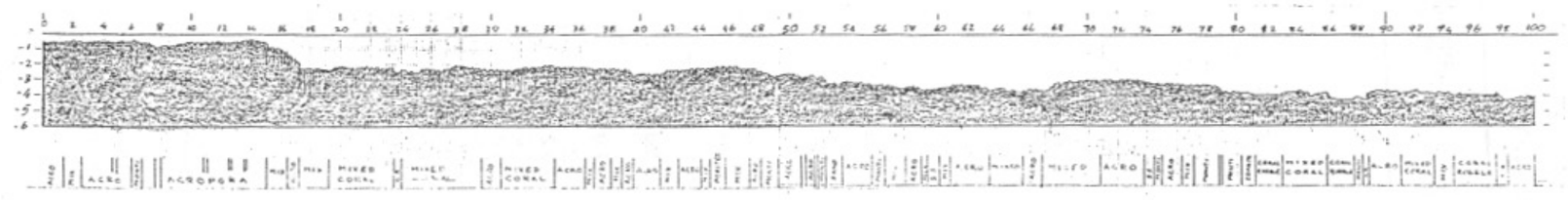
#3

70.3% live coral(9 genera)



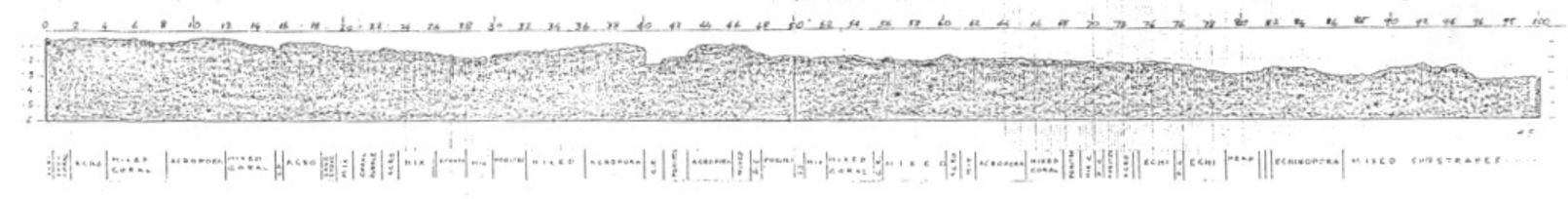
#4

55.8% live coral(8 genera)



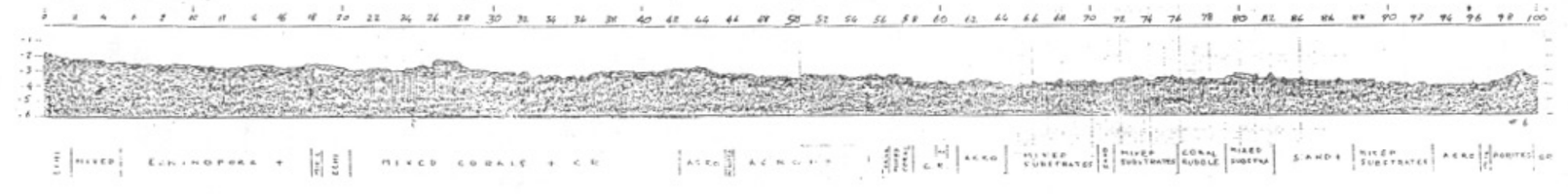
#5

76.9% live coral(9 genera)



Transect #.6

75.0% live coral(9 genera)



APPENDIX # 6. SUBSTRATE COMPOSITION OF TRANSECTS, PERCENTAGES PER LINE AND TYPE (GENERA IN LIVE CORAL) AND THE NUMBER OF CORAL GENERA PER TRANSECT.

TRANSECT NUMBER	1	2	3	4	5	6	Total%
Acropora	57.6	50.8	52.6	19.95	32.75	40.7	**42.4**
Porites	1.1	5.8	5.1	12.1	17.5	4.7	**7.71**
Echinopora	–	–	–	11.8	16.1	18.3	**7.7**
Montipora	0.8	19.6	9.7	4.8	3.1	0.55	**6.42**
Pocillopora	0.7	1.25	0.4	6.15	5.55	8.65	**3.81**
Hydnopora	2.1	0.1	1.5	0.1	–	0.6	**0.73**
Favites	0.8	2.0	–	0.2	1.1	0.2	**0.71**
Platygyra	0.7	0.2	–	0.7	–	0.8	**0.4**
Leptoseris	0.5	1.1	0.4	–	–	–	**0.33**
Favia	0.6	0.3	0.1	–	0.2	0.3	**0.25**
Millipora	–	0.9	0.3	–	–	–	**0.2**
Symphyllia	0.6	–	–	–	–	–	**0.1**
Galaxia	–	0.1	–	–	0.4	–	**0.08**
Leptastrea	–	–	0.2	–	–	–	**0.03**
Pachyseris	–	–	–	–	0.2	–	**0.03**
TOTAL LIVE CORAL %	**65.5**	**82.15**	**70.3**	**55.8**	**76.9**	**75.0**	**70.94**
Coral rubble	16.4	7.5	17.3	16.95	5.8	14.5	**13.07**
Sand	7.7	0.9	4.65	15.6	–	9.0	**6.3**
Dead coral	10.2	0.2	–	2.25	7.9	–	**3.42**
Sandstone	–	6.0	1.7	6.0	–	1.2	**2.48**
Zooanthids	0.2	2.2	4.65	3.3	3.2	0.3	**2.3**
Algae	–	1.05	1.4	0.1	1.0	–	**0.59**
Rock	–	–	–	–	3.0	–	**0.5**
Soft coral	–	–	–	–	2.2	–	**0.37**
TOTAL NON LIVE CORAL %	**34.5**	**17.85**	**29.7**	**44.2**	**23.1**	**25.0**	**29.05**
Number of coral genera per transect	10	11	9	8	9	9	15
Depth range of transect metres.	0.5-5.0m	0.5-4.0m	0.5-3.5m	1.0-5.0m	0.5-3.5m	2.0-4.0m	