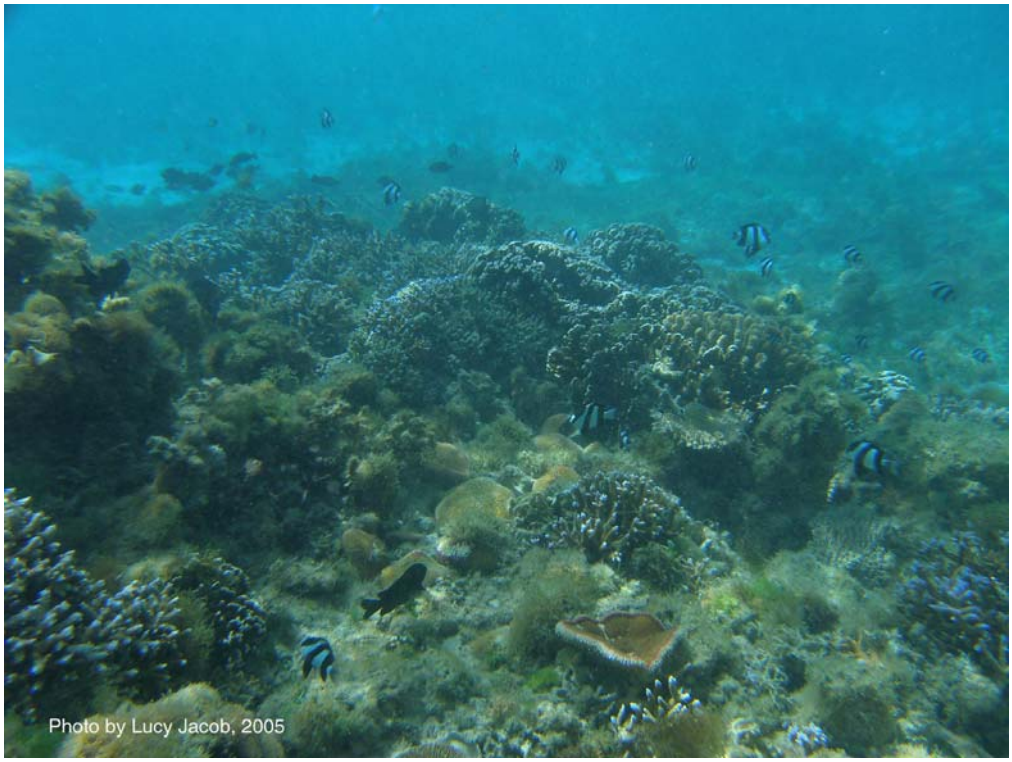


Annual Report of Benthos, Reef Fish and Invertebrate Surveys for Lagoon Areas in Rodrigues 2005

E.R. Hardman, F.E.I. Blais, J.S.J Raffin, S. Perrine, R. Raffaut and M. Chinien-Chetty

Shoals Rodrigues, Pointe Monier, Rodrigues

January 2006

SHOALS RODRIGUES

DARWIN INITIATIVE

Annual Report of Benthos, Reef Fish and Invertebrate Surveys for Lagoon Areas in Rodrigues 2005

E.R. Hardman, F.E.I. Blais, J.S.J Raffin, S. Perrine, R. Raffaut and M. Chinien Chetty

Shoals Rodrigues, Pointe Monier, Rodrigues

Summary

This report forms part of the continuing assessment of the lagoon habitats in Rodrigues, which was started in 2003. Surveys were undertaken in four different habitat types: Lagoon Coral (2 sites), Coral Blocks (2 sites), Algae/Seagrass (3 sites) and Mud (2 sites). At each site three 500m transects were surveyed and benthos, invertebrate and fish populations were assessed using a semi-quantitative scale. The results were similar to those found in the previous two years' surveys, highlighting healthy coral colonies in the southern lagoon with >50% hard coral cover. In contrast, coral cover was low at the northern Coral Block site. Cluster Analysis clearly separates the southern sites from the northern survey sites, with the southern sites being dominated by hard coral and the northern sites being dominated by sand, rubble and vegetation. The lack of hard coral in the northern lagoon may be as a result of the high turbidity, which tends to affect this region. Invertebrate populations were echinoderm dominated, with holothurians being particularly abundant. Molluscs were only found in very low densities, indicating over-harvesting of these organisms. Damselfish, Parrotfish and Surgeonfish dominated the coral habitats. Algae/Seagrass areas had a much lower abundance of fish however tended to show more diversity in fish populations with Groupers, Wrasse and Damselfish common. The species diversity amongst carnivorous fish was low and Trevally, Snappers and Triggerfish were either rare or entirely absent, suggesting that overfishing is occurring within the lagoon. The Mud habitats supported very limited invertebrate and fish life, indicating that any increases in sedimentation are likely to be detrimental to the lagoon ecosystem. The results suggest a decrease in fish abundance at all sites between 2004 and 2005, a further indication that overfishing is occurring within the lagoon.

Contents

List of Figures

List of Tables

Acknowledgements

This work was funded by the U.K. Department for Environment, Food and Rural Affairs (DEFRA) Darwin Initiative, North of England Zoological Society and the New England Biolabs Foundation. Thank you to Dr Alasdair Edwards of the University of Newcastle upon Tyne, UK for advice on survey methodology. *Shoals Rodrigues* would also like to acknowledge the co-operation of the Rodrigues Regional Assembly and the Mauritius Oceanography Institute in the undertaking of this work.

1 Introduction

Shoals Rodrigues has been monitoring reef slope and reef flat areas around Rodrigues since 1999. Equally important, however, are the lagoon habitats. Rodrigues is surrounded by a shallow lagoon of over 240km^2, extending up to 13km width in the south. Lagoon habitats, such as coral patch reefs and seagrass beds are however under threat from a number of natural and anthropogenic impacts. Due to weather conditions, the majority of fishing effort is concentrated within the lagoon resulting in overfishing (Lynch *et al*., 2004a) and physical damage from trampling and anchors (Clark, 2001); the lagoon is also affected by sedimentation (Lynch *et al*., 2003) and increased water temperatures resulting in coral bleaching (Hardman *et al*., 2004; Lynch *et al*. 2004b)

The Rodrigues lagoon is a little studied ecosystem and the fisheries that occur within it are of major importance to the island's population. A monitoring programme has therefore been established to provide a better understanding of the composition of the lagoon habitats and the animal populations they support, and how these change in response to human and natural impacts. The results of the first two years of study conducted in 2003 and 2004, indicate that there are still relatively vigorous coral communities within the lagoon, particularly in the south around Passe l'Ancre and Couzoupa (Lynch *et al*., 2004c; Lynch *et al*., 2005), however coral cover was much reduced in the north-western lagoon. The plant communities found within the Rodrigues lagoon tended to be dominated by algae, although seagrass was abundant at the fine sediment sites near Baie Malgache and Baie Topaze in winter. Invertebrate populations were echinoderm dominated, with holothurians being particularly abundant, and urchins also common. Damselfish, Parrotfish and Surgeonfish dominated the coral habitats and the species diversity amongst carnivorous fish was low, with Trevally, Snappers and Triggerfish being either rare or entirely absent. The fine sediment habitats supported very limited animal life.

This report forms part of the continuing assessment of the lagoon habitats in Rodrigues and presents the results obtained during the 2005 surveys.

2 Materials and Methods

Four different habitat types were selected for monitoring. These were areas of lagoon coral on a consolidated limestone platform (2 sites), isolated coral blocks within a generally sandy area (2 sites), beds of algae and/or seagrass (3 sites) and areas with a fine sediment substrate (2 sites). Three stations were surveyed within each site. The location of the stations is shown in Figure 1, with the habitat type and GPS position of each station given in Table 1.

Table 1. The habitat type and area code for each site, with the GPS position of individual stations.

Lagoon Coral				**Fine Sediment**			
Area	**Station number**	**Latitude**	**Longitude**	**Area**	**Station number**	**Latitude**	**Longitude**
A	1	19º 45.270	63º 28.058	**H**	1	19º 45.076	63º 20.736
	2	19º 45.446	63º 28 129		2	19º 44.885	63º 20.912
	3	19º 45.270	63º 28 380		3	19º 45.111	63º 20.769
D	1	19º 48.772	63º 25.634	**K**	1	19º 41.864	63º 23.168
	2	19º 48.772	63º 25.624		2	19º 41.852	63º 22.997
	3	19º 49.031	63º 25.674		3	19º 41.685	63º 23.249
Coral Blocks on Sand				**Algae / Seagrass**			
Area	**Station number**	**Latitude**	**Longitude**	**Area**	**Station number**	**Latitude**	**Longitude**
E	1	19º 48.785	63º 24.972	**I**	1	19º 43.436	63º 19.269
	2	19º 48.633	63º 24.920		2	19º 43.565	63º 19.157
	3	19º 48.806	63º 25.138		3	19º 43.278	63º 19.319
J	1	19º 40.456	63º 20.232	**L**	1	19º 39.849	63º 23.061
	2	19º 40.493	63º 20.234		2	19º 39.896	63º 22.960
	3	19º 40.561	63º 20.222		3	19º 39.966	63º 22.816
				M	1	19º 40.248	63° 28 129
					2	19º 40.271	63º 28.079
					3	19º 40.100	63º 27.569

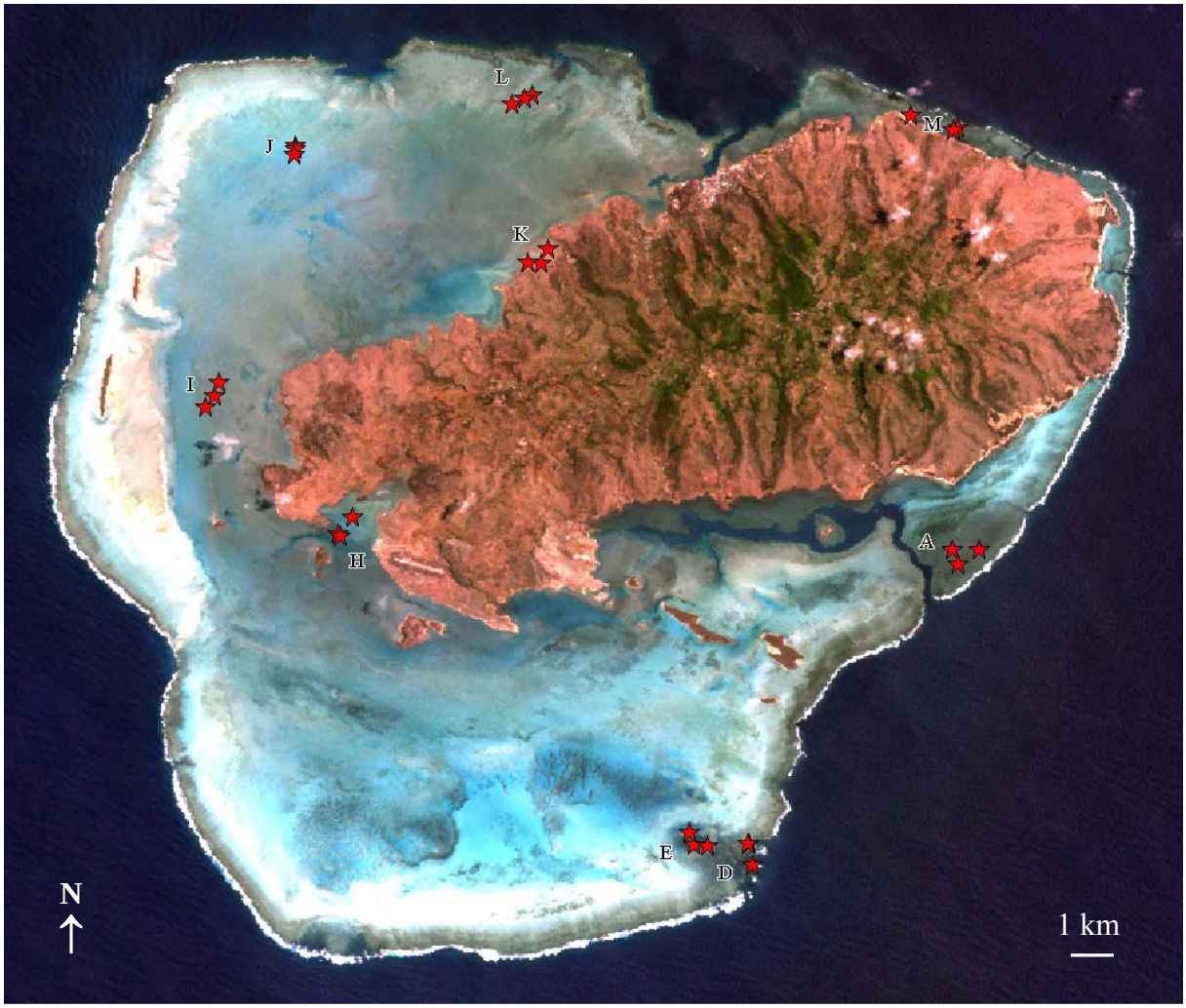


Figure 1. The location of the areas in which the survey stations were located.

A 500m transect was surveyed at each station, with the length of the transect being determined using a GPS. Fish and invertebrates in a 2m wide belt were counted continuously along the transect by separate observers. The benthos was assessed by evaluating a 5m x 5m area at one minute intervals along the transect. The surveys were semi-quantitative, to reflect the lack of absolute precision in the dimensions of the transects. The abundance scales used are given in Table 2. Monitoring took place during winter in May/June.

Table 2. The abundance scales used to categorise the prevalence of benthic features and organisms and the size of fish and invertebrate populations.

Benthos		Fish & Invertebrate Populations	
Category	**Percentage cover**	**Category**	**Abundance**
1	<1	1	1
2	1 – 10	2	2 – 5
3	11 – 30	3	6 – 15
4	31 – 50	4	16 – 50
5	51 – 75	5	51 – 250
6	76 – 100	6	250 – 1000
		7	>1000

3 Results

3.1 Benthos

At the Lagoon Coral sites the mean percentage cover of hard coral at both Couzoupa (Site A) and Passe l'Ancre (Site D) was high, being in the 51-75% range at Site A and in the 76-100% range at Site D (Figure 2). At Site A, coral cover consisted of 31-50% *Acropora* spp. colonies, especially branching *Acropora* spp.; Digitate *Acropora* spp. and sub-massive coral colonies were also common (11-30%). At Site D, coral cover consisted of 51-75% *Acropora* spp. colonies, especially branching and tabular species; Foliose coral colonies (*Montipora* sp.) and fungiids were also common (11-30%). No dead coral was observed at either of the sites and mean percentage cover of rubble at both sites was 1-10%. Mean soft coral cover was 11-30% at Site A and 1-10% at Site D. Mean turf algal cover was 11-30% at Site A, however no turf algae was recorded at Site D.

At the Coral Block sites, the mean percentage of hard coral was 76-100% at the southern site E, but was only 1-10% at the northern site J. At Site E, coral cover consisted of 51-76% *Acropora* spp. colonies, especially tabular and branching *Acropora* spp., as well as 11-30% foliose corals (*Montipora* sp.). At Site J, coral cover consisted of 31-50% *Acropora* spp, especially digitate species; Massive and sub-massive corals were also common (11-30%). No dead coral was observed at either of the sites and mean percentage cover of rubble at both sites was 1-10%. No soft corals were observed at either of the sites. No macro-algae or seagrass was observed at Site E, however at Site J mean percentage cover of macro-algae was 31-50% and seagrass was 1-10%. Sand consisted of a mean of 1-10% cover at Site E but was dominant at Site J (51-75%).

At the Algae/Seagrass sites, the mean percentage of hard coral was <1% at Site I, 1-10% at Site M and 11-30% at Site L. At Site I only 1 massive and 1 sub-massive coral colony were observed. At Site M, coral cover consisted of 51-75% massive coral species with 11-30% encrusting species. At Site L, coral cover consisted of 31-50% sub-massive species, with 11-30% massive corals and 11-30% *Millepora* sp. No dead coral was observed at the sites and mean percentage cover of rubble was 1-10% at Sites L and M, but was 11-30% at Site I. Mean percentage cover of macro-algae was 11-30% at Sites I and L, but was 31-50% at Site M and mean cover of seagrass was 1-10% at Sites I and M and 31-50% at Site L. Mean percentage cover of sand was 31-50% at Site I and 1-10% at Site L; no sand was recorded at Site M.

The mud sites, H and K, were dominated by fine sediment (51-75%), with a mean percentage cover of 1-10% macro-algae and rubble and 11-30% seagrass. One branching *Acropora* sp. colony was observed at Site H.

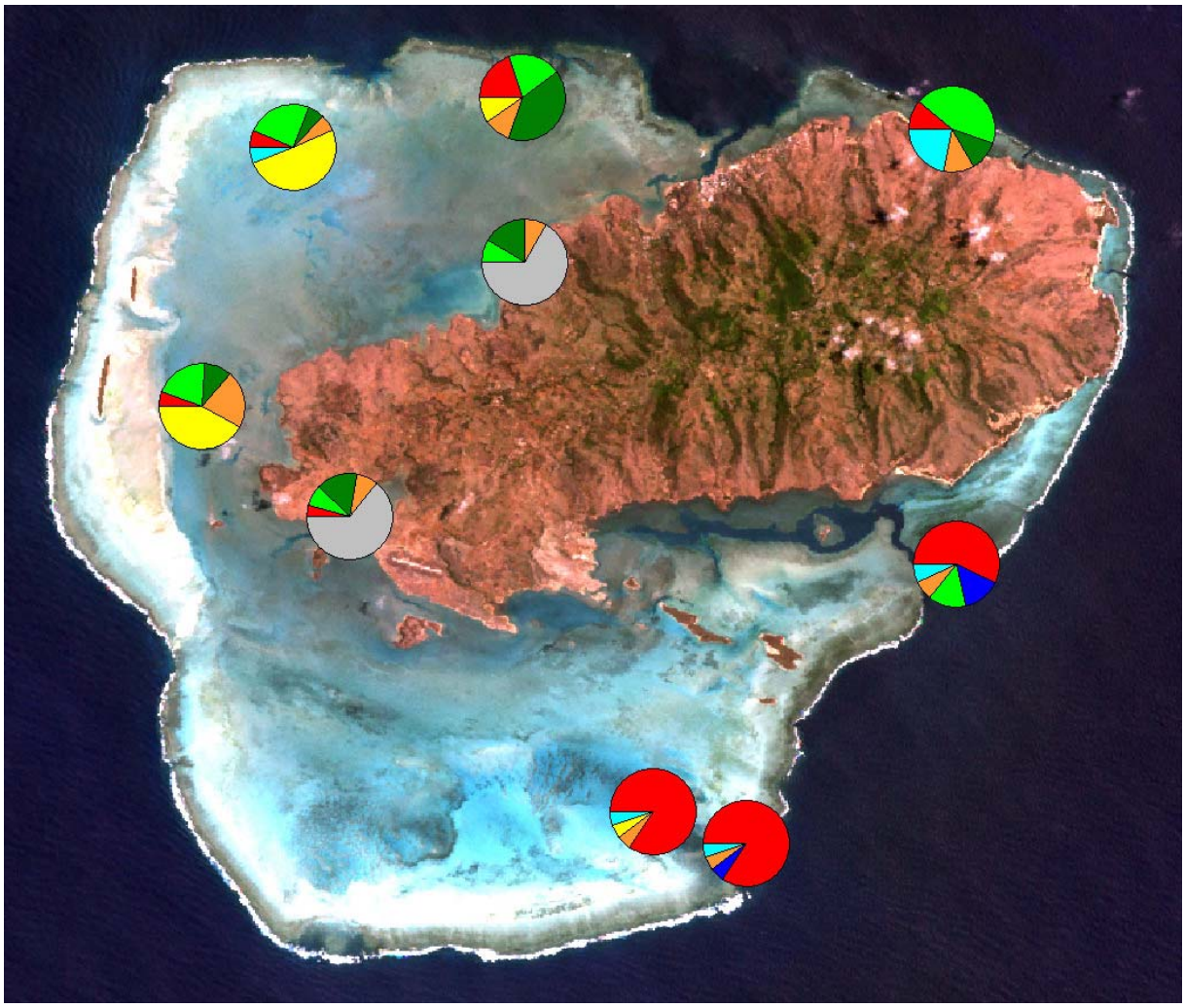


Figure 2. The mean percentage cover of each benthic category at the 9 sites.

Cluster Analysis groups the 2 Mud sites together at 93% similarity and the 2 Coral sites together with the Southern Coral Block site (Site E) at 83% similarity (Figure 3). The northern Coral Block site (Site J) is grouped with the Algae/Seagrass sites at 65% similarity.

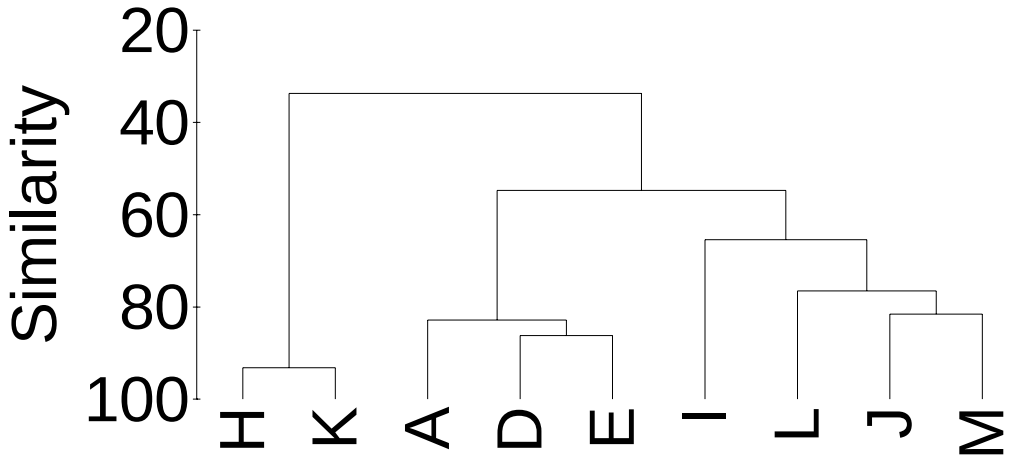


Figure 3. Cluster Analysis (√-transformed) of the benthic habitats at each site.

3.2 Invertebrates

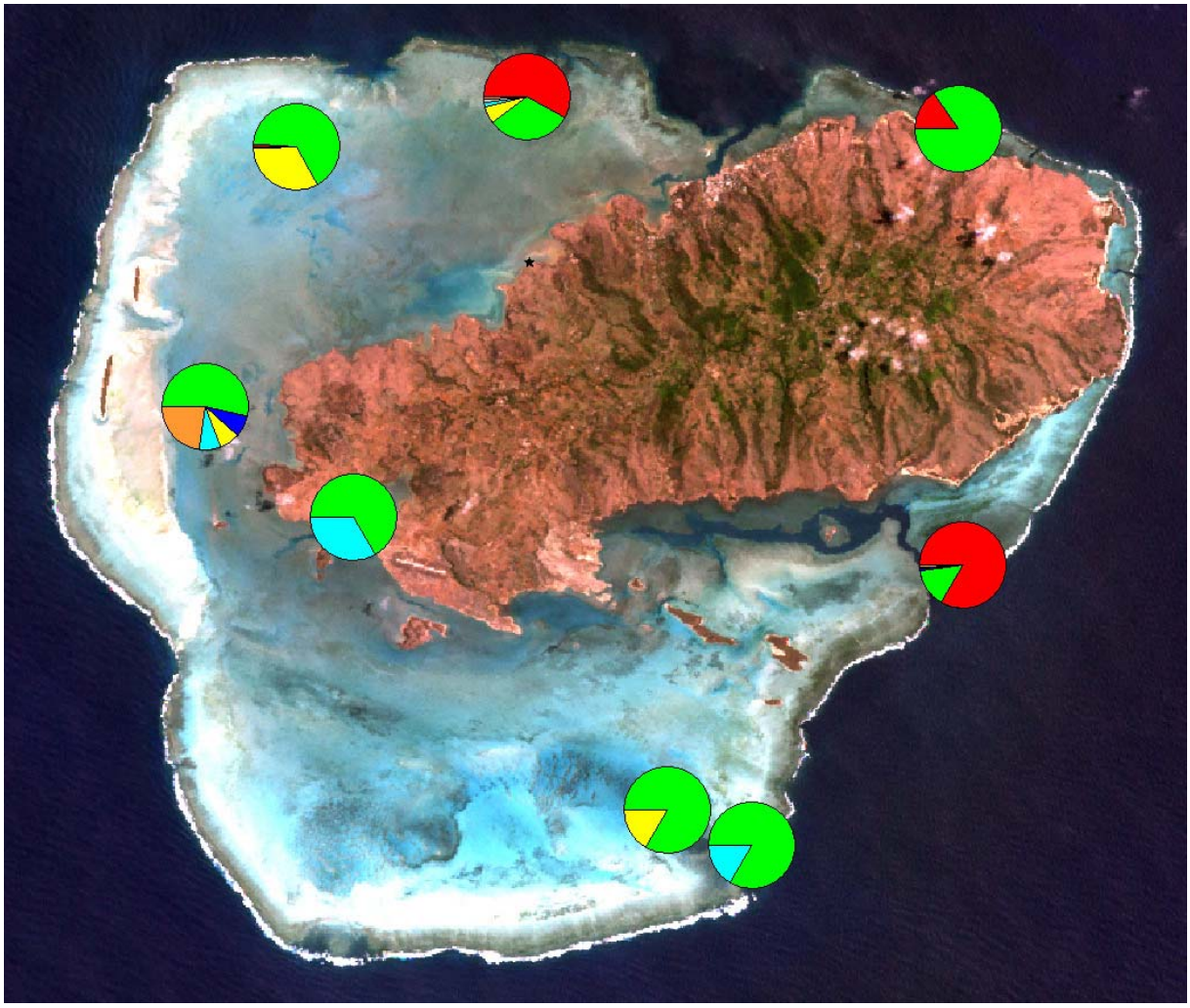
All sites were dominated by urchins and/or holothurians and other invertebrate groups were very rare.

At the Lagoon Coral sites, the sea urchin, *Echinometra mathaei* was very abundant at Couzoupa (Site A) with a mean of 250-1000 individuals; holothurians (*Holothuria atra, H. leucospilata* and *Synapta maculata*) were also common at this site (Figure 4). There were very few invertebrates at Passe l'Ancre (Site D) with a mean of only 2-5 *H. atra* and *H. leucospilata* and 1 gastropod (*Cypraea tigris*).

Very few invertebrates were observed at the southern Coral Block Site E with a mean of 2-5 *Holothuria atra* and *H. leucospilata* and 1 bivalve (*Pinna muricata*). At the northern Coral Block Site J invertebrates were more abundant and a mean of 16-50 *H. atra, H. leucospilata* and the bivalve, *Pinna muricata* observed.

At the Algae/Seagrass sites invertebrate numbers were very low at the western site (Site I) with a mean of 2-5 *Holothuria atra* and *H. leucospilata,* 1 gastropod (*Pleuroploca trapezium*) and 1 bivalve (*Pinna muricata*) observed. Site L, in the north was dominated by sea urchins with a mean of 16-50 *Echinometra mathaei* as well as 6-15 *H. atra* and *H. leucospilata* and 1 *Octopus cyanea.* In contrast, the north-eastern site (Site M) was dominated by holothurians with a mean of 51-250 *H. leucospilata* and 16-50 *H. atra*, *Stichopus chloronatus* and *Synapta maculata* as well as 16-50 *E. mathaei*.

At the Mud sites, no invertebrates were observed at Baie Malgache (Site K) and only 2-10 *Holothuria atra* and 1 gastropod (*Pleuroploca trapezium*) were observed at Baie Topaze (Site H).



Key

Urchins	Other Bivalves
Holothurians	Large Gastropods
Other Echinoderms	Octopus
Tridacna maxima	Other

Figure 4. The distribution of invertebrate species at the 9 survey sites.

The greatest number of invertebrate species were observed at the Coral site A and the Algae/Seagrass site L (13 species) and the greatest number of individuals at the Lagoon Coral site A due to the presence of large numbers of *Echinometra mathaei* (Table 3). The least number of invertebrate species were observed at the Mud sites H (2 species) and K (0 species) and the least number of individuals at the Mud site K and the Lagoon Coral site D. In terms of invertebrate species, Cluster Analysis groups the Lagoon Coral site D with the southern Coral Block site E at 74%; the Lagoon Coral site A is grouped with the Algae/Seagrass sites M and L at 48% (Figure 5).

Table 3. The number of invertebrate individuals, species and genera at each site.

Site	No. individuals	No. species	No. genera
A	250-1000	13	12
D	2-5	3	2
E	6-15	3	2
J	51-250	5	4
I	6-15	7	6
L	51-250	13	12
M	51-250	9	8
H	2-5	2	2
K	0	0	0

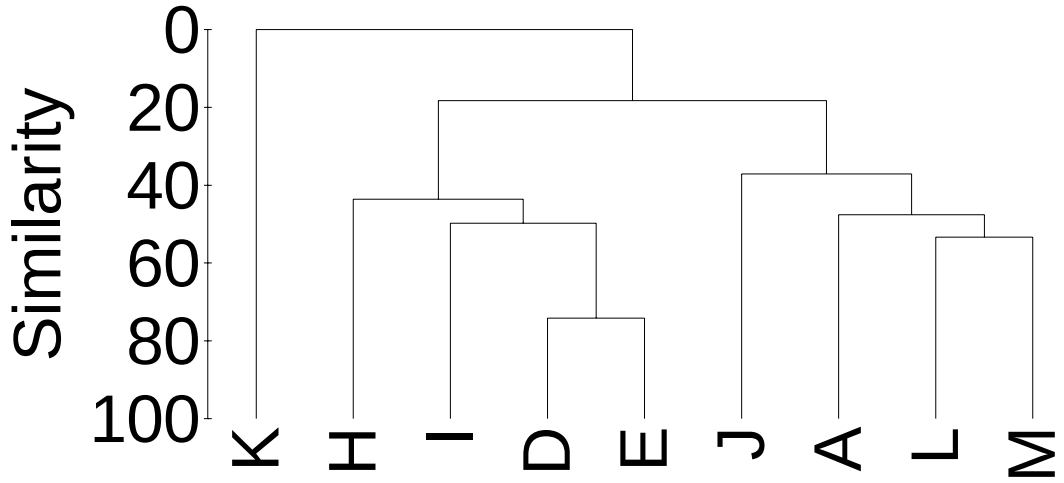


Figure 5. Cluster Analysis (√-transformed) of the invertebrate species recorded at each site.

3.3 Fish

The fish populations at both Lagoon Coral sites were dominated by Damselfish (Pomacentridae), particularly *Dascyllus aruanus, Stegastes limbatus, S. nigricans S. lividus* and *Chromis vividis*, as well as small immature Parrotfish and small brown Surgeonfish (Figure 6). Snappers (Lutjanidae) and Trevally (Carangidae) were absent from both sites.

At the Coral Block sites the abundance of fish and species richness was much lower at Site J than at Site E. Both sites were however dominated by damselfish (Pomacentridae), especially *Chromis viridis* and *Dascyllus aruanus*. The Surgeonfish, *Acanthurus triostegus,* was very abundant at Site E and the Parrotfish, *Scarus sordidus* was also common. Only 1 individual of the family Chaetodontidae was observed at Site J. The Emperors (Lethrinidae), were common at Site E but were absent from Site J. Trevally (Carangidae) and Triggerfish (Balistidae) were absent from both sites.

In the Algae/Seagrass habitat very few fish were observed at any site, particularly at Sites I and M. Site I was dominated by gobies (Gobiidae) and the Grouper, *Epinephelus spilotoceps*. Site L was dominated by Damselfish (Pomacentridae), particularly *Dascyllus aruanus* and the Grouper *E. spilotoceps* was also common. Site M was dominated by Wrasse (Labridae). No Trevally (Carangidae), Emperors (Lethrinidae) or Snappers (Lutjanidae) were observed at any site and Parrotfish (Scaridae) and Butterflyfish (Chaetodontidae) were either rare or absent.

No fish were observed at either of the Mud sites.

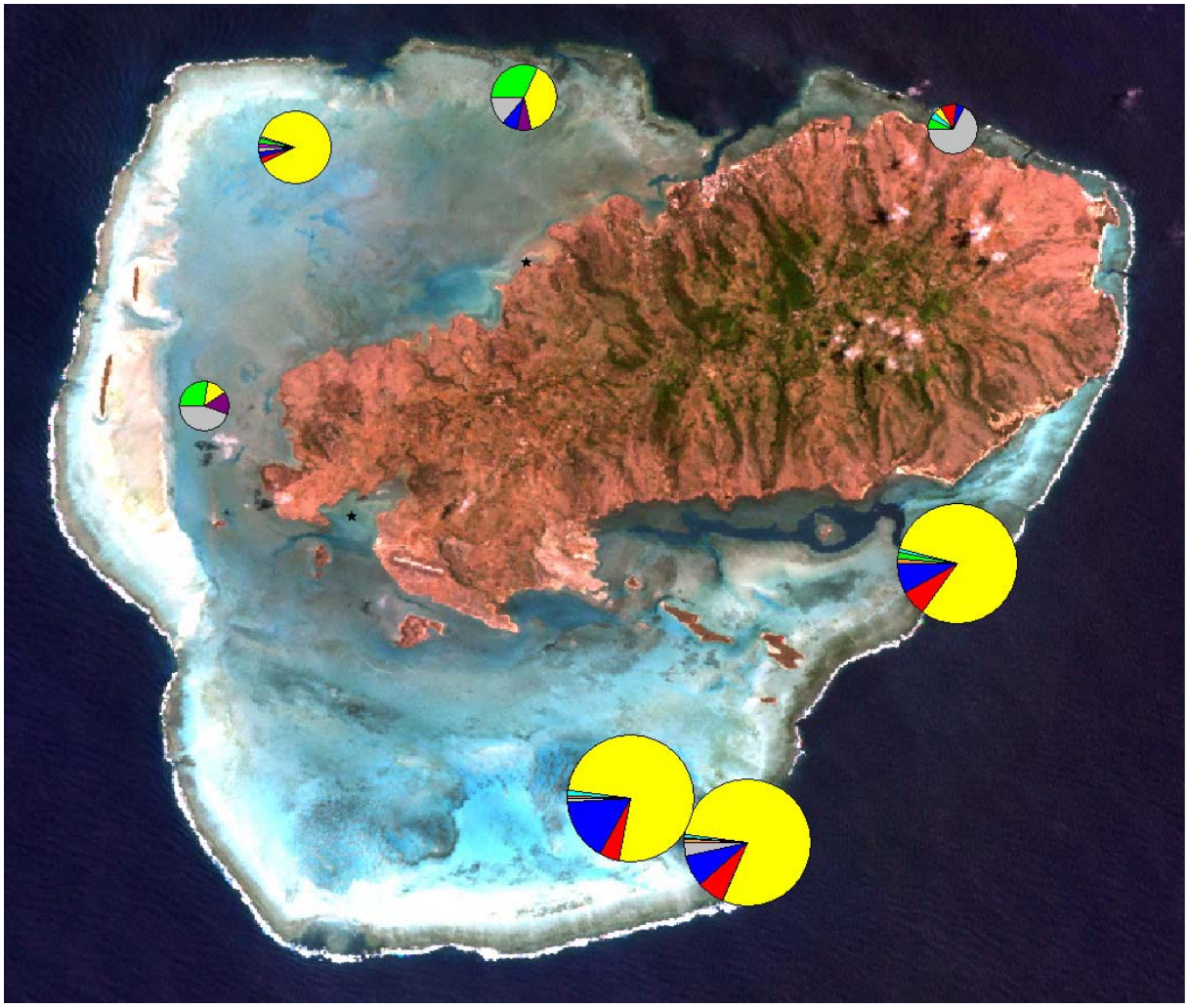


Figure 6. The distribution of fish families at the 9 survey sites.

Lagoon Coral Site D and Coral Block Sites E and G had the greatest species richness in terms of number of fish species and number of genera and the greatest number of individuals was also observed at these sites (Table 4). The Algae/Seagrass site, I had the lowest number of individuals and the lowest species richness in terms of both fish species and fish genera. Based on fish genera, cluster analysis groups Lagoon Coral Sites A and D with Coral Block Site E together at 69% similarity. Coral Block Site J is grouped with the Algae/Seagrass Sites L and M at 37% (Figure 7).

Table 4. The number of fish individuals, species and genera at each site.

Site	No. individuals	No. species	No. genera
A	>1000	22	12
D	>1000	37	21
E	>1000	34	19
J	51-250	12	11
I	16-50	6	6
L	16-50	12	11
M	16-50	10	9
H	0	0	0
K	0	0	0

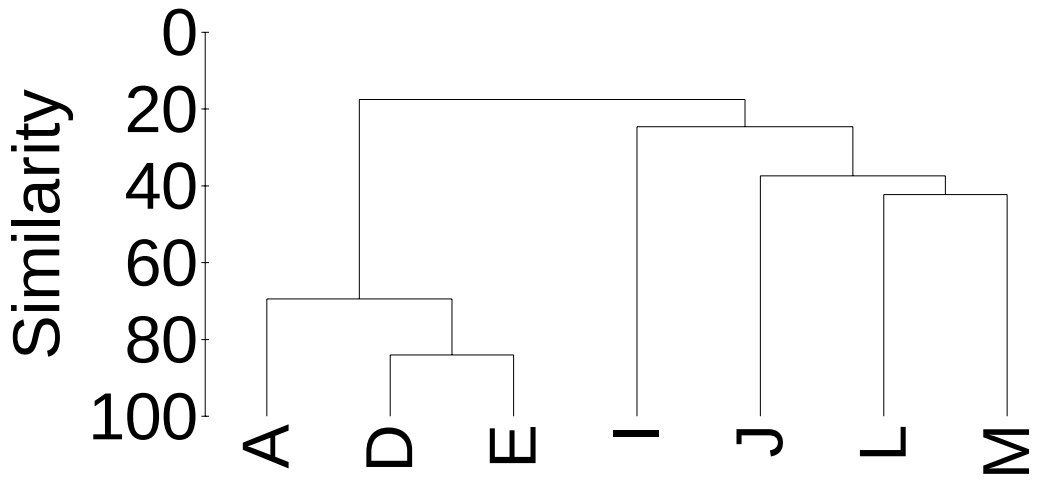


Figure 7. Cluster Analysis (√-transformed) of the fish genera recorded at each site.

3.4 Comparisons with 2004

At both Coral sites (Sites A and D), there was an increase in hard coral cover and a decrease in rubble between 2004 and 2005, however this is most likely as a result of the semi-quantitative nature of the surveys (Figure 8). There were declines in seagrass at all 3 Algae/Seagrass sites and at the 2 Mud sites. At Site I, seagrass decreased from 31-50% in 2004 to 1-10% in 2005. At the Mud sites, H and K, there was a decline in seagrass from 51-75% in 2004 to 11-30% in 2005; there was also a decline in macro-algae at Site H.

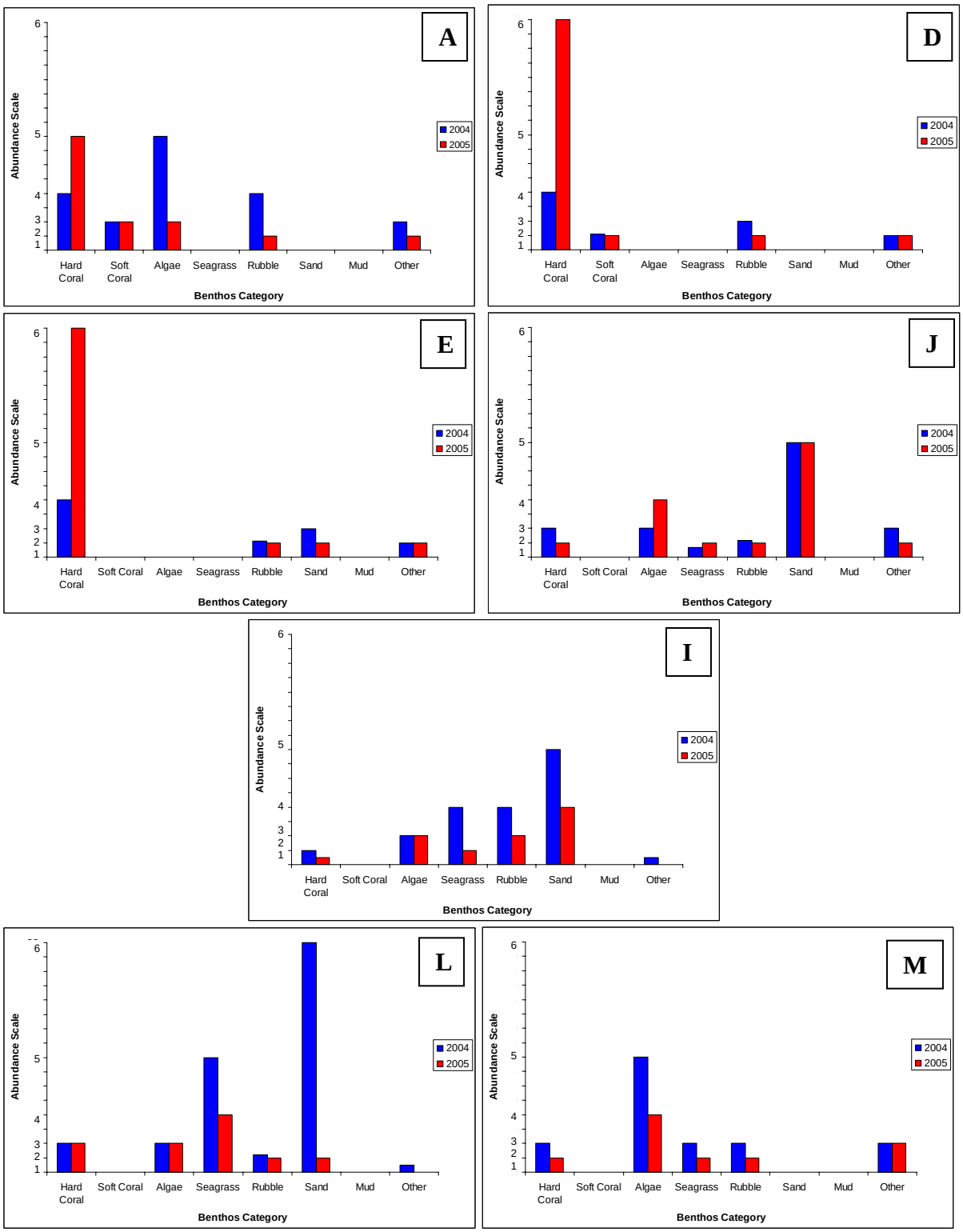


Figure 8. The abundance of each benthos category at the 9 survey sites in 2004 and 2005, based on an abundance scale where 0 = 0%, 1 = <1%, 2 = 1-10%, 3 = 11-30%, 4 = 31-50%, 5 = 51-75% and 6 = 76-100%.

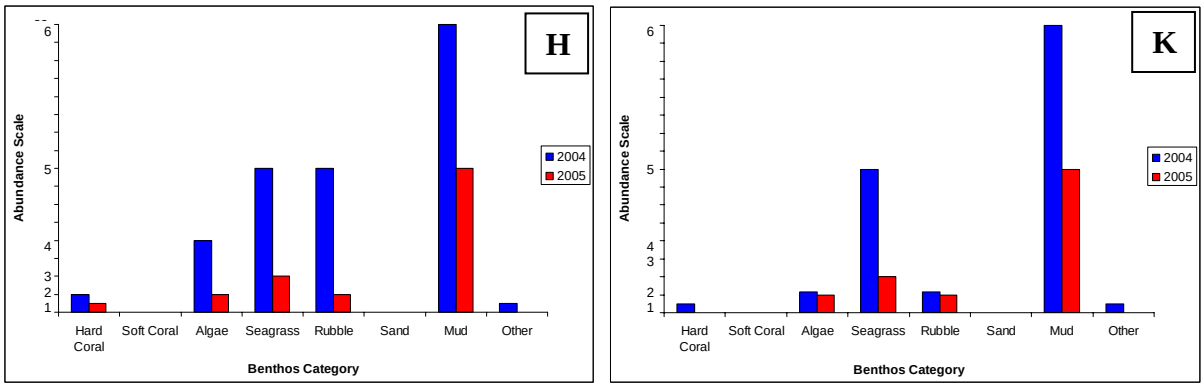


Figure 8 (cont.). The abundance of each benthos category at the 9 survey sites in 2004 and 2005, based on an abundance scale where 0 = 0%, 1 = <1%, 2 = 1-10%, 3 = 11-30%, 4 = 31-50%, 5 = 51-75% and 6 = 76-100%.

At the Coral sites urchins (*Echinometra mathaei*) remained very high at Site A between 2004 and 2005, whereas invertebrate numbers remained low at Site D in both years (Figure 9). Similarly, there were no changes in invertebrate abundance at the 3 Coral Block sites. At the Algae/Seagrass sites there was a decline in urchins (51-250 individuals in 2004 compared to 16-50 in 2005) and holothurians (250-1000 individuals in 2004 compared to 51-250 in 2005) at Site M. Furthermore, no other invertebrates were observed at this site in 2005, whereas molluscs had been present in 2004. At the Mud sites, holothurians declined at site H from 16-50 individuals in 2004 to just 2-5 in 2005.

In general, there was a decrease in the total number of fish encountered between 2004 and 2005 at all sites and there was also a decline in the number of genera of fish observed. At the Coral sites the numbers of Wrasse (Labridae) decreased from 16-50 individuals in 2004 to 0 in 2005 at Site A and Parrotfish (Scaridae) decreased from 250-1000 individuals in 2004 to 51-250 in 2005 (Figure 10). At Coral Block Site E, there was a decrease in Emperors (Lethrinidae) and at Site J there was a decline in the numbers of Surgeonfish (Acanthuridae), Emperors (Lethrinidae) and Parrotfish. At the Algae/Seagrass sites there was no change in fish abundance at Site I. At Site L there was a decline in Damselfish (Pomacentridae) from 51-250 individuals in 2004 to 16-50 in 2005 and no Butterflyfish (Chaetodontidae) or Parrotfish were observed in 2005. At Site M there were declines in Surgeonfish (6-15 individuals in 2004 compared to 1 in 2005), Wrasse (16-50 individuals in 2004 compared to 6-15 in 2005) and Damselfish (16-50 individuals in 2004 compared to 1 in 2005). No fish were observed in 2004 or 2005 at either of the Mud sites.

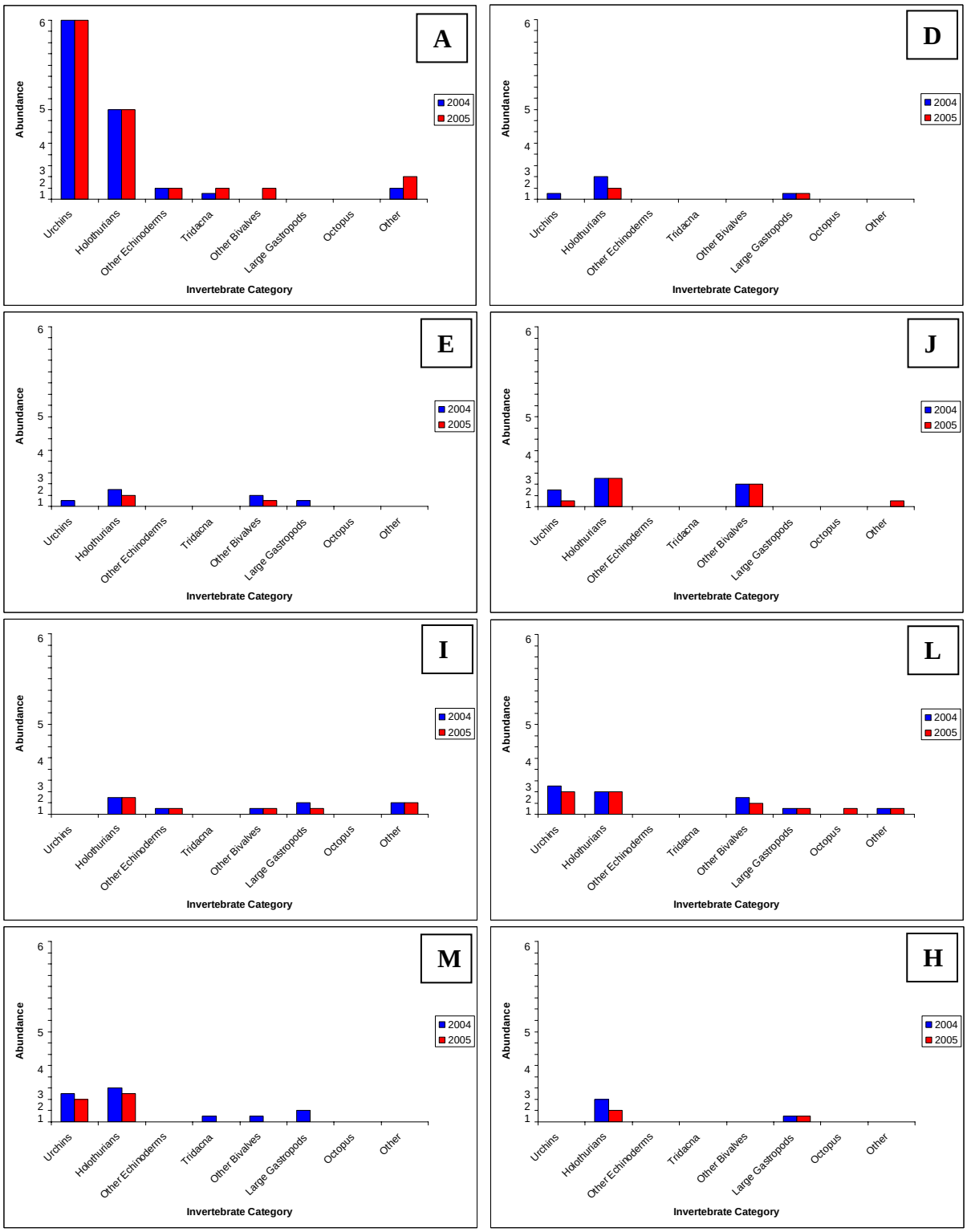


Figure 9. The abundance of invertebrates at the 8 survey sites in 2004 and 2005, based on an abundance scale where 1 = 1 individual, 2 = 2-5 individuals, 3 = 6-15 individuals, 4 = 16-50 individuals, 5 = 51-250 individuals and 6 = 250-1000 individuals.

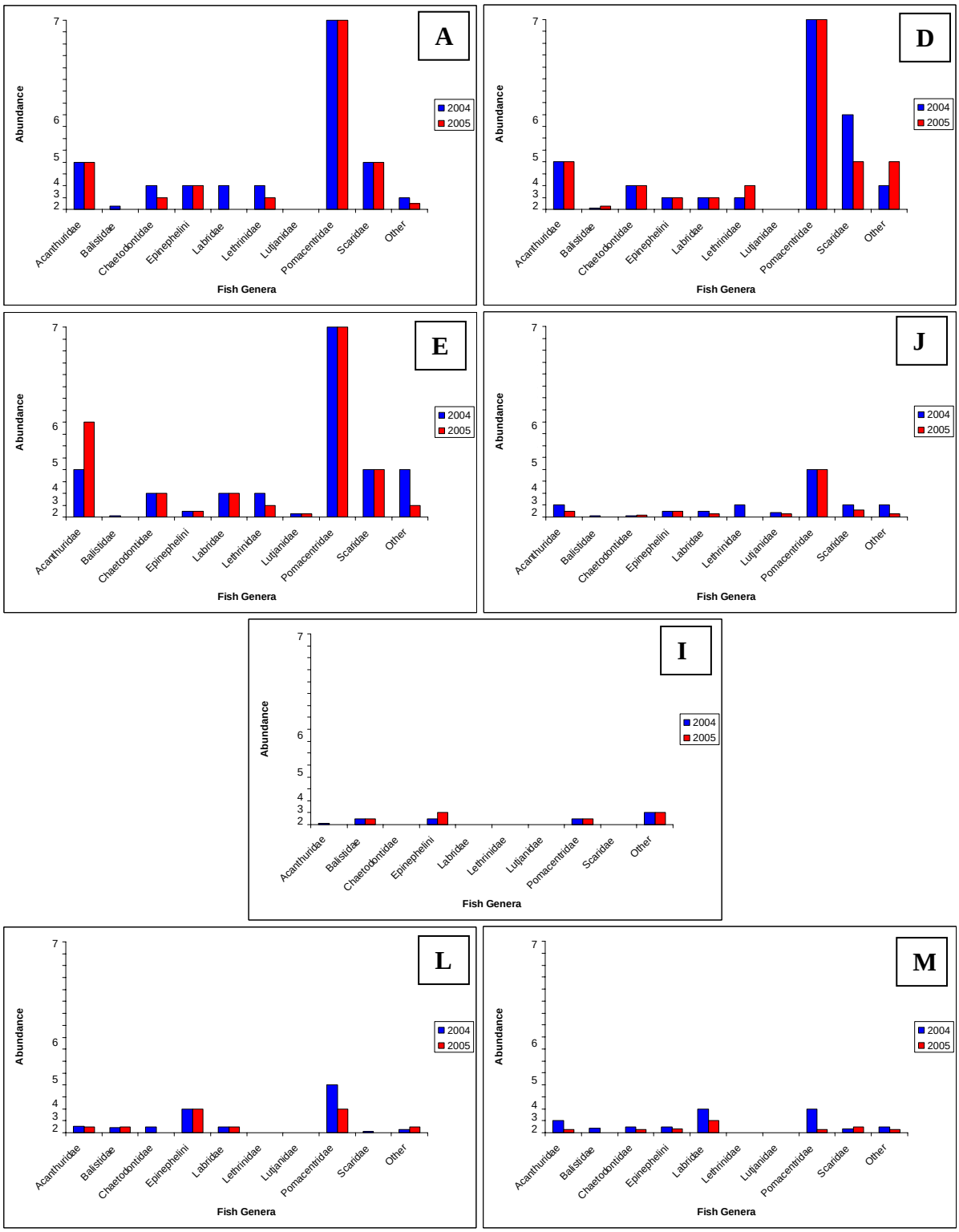


Figure 10. The abundance of fish genera at the 7 survey sites in 2004 and 2005, based on an abundance scale where 1 = 1 individual, 2 = 2-5 individuals, 3 = 6-15 individuals, 4 = 16-50 individuals, 5 = 51-250 individuals, 6 = 250-1000 individuals and 7 = >1000 individuals.

4 Discussion

The results are similar to those observed in the 2003 and 2004 surveys (Lynch *et al.*, 2004c; Lynch *et al*., 2005) highlighting fairly healthy coral colonies in the southern lagoon, around Couzoupa (Site A) and Passe l'Ancre (Sites D and E). Coral cover was >50% and was dominated by branching and tabular *Acropora* spp colonies. In contrast, coral cover was low at the northern Coral Block site J. The plant communities tended to be dominated by macro-algae, however seagrass was abundant at Sites L, H and K.

As in previous years, invertebrate populations were echinoderm dominated, with holothurians being particularly abundant, dominating the invertebrate populations of 7 of the sites. The bio-eroding sea urchin *Echinometra mathaei* was also present in large numbers at Lagoon Coral Site A. Molluscs were found in both coral and plant-dominated habitats, but in very low densities. Shellfish are popular food items locally, with octopus and other fishers regularly collecting gastropods and bivalves and therefore the low numbers of these organisms may indicate over-harvesting.

Damselfish dominated the coral habitats, presumably as a result of their territorial behaviour. Parrotfish and Surgeonfish were also common in regions with coral substrates. Algae/Seagrass areas had a much lower abundance of fish and tended to show more diversity in fish populations with Groupers, Wrasse, Gobies and Damselfish common. At all sites the species diversity amongst carnivorous fish was low. Emperors and Groupers tended to be more numerous, but the populations were composed of almost entirely two species – *Gnathodentex aurolineatus* and *Ephinephelus spilotoceps*. Trevally, Snappers and Triggerfish were either rare or entirely absent, suggesting that overfishing is occurring within the lagoon.

As in the pervious years surveys, Cluster Analysis clearly separates the southern sites from the northern survey sites, with the southern sites being dominated by hard coral and the northern sites being dominated by sand, rubble and vegetation. The lack of hard coral in the northern lagoon may be as a result of the high turbidity, which tends to affect this region. In terms of fish populations the southern sites also cluster together, with the northern lagoon sites having more distinct fish communities. Invertebrate populations show a less obvious distribution pattern.

Comparisons with surveys in 2004 suggest that there has been a decline in seagrass at the lagoon sites, particularly at Sites I, H and K. These areas are fairly close to shore in sheltered locations and this decline may be as a result of increased sedimentation associated with land run-off. There has also been a general decline in fish abundance at all sites (except at Site I where there was a slight increase) and in particular, Damselfish, Parrotfish, Surgeonfish, Emperors and Wrasse decreased in numbers between 2004 and 2005. The decrease was most marked at the Algae/Seagrass sites L and M. This decline in fish abundance is a further indication that overfishing is occurring within the lagoon.

5 References

Clark, T. H. (2001). The Status of the Coral Reefs in Rodrigues. Shoals of Capricorn Programme report.

Hardman, E. R., Meunier, M. S., Turner, J. R., Lynch, T. L., Taylor, M. and Klaus, R. (2004). The extent of coral bleaching in Rodrigues, 2002. *Journal of Natural History* **38**: 3077-3089.

Lynch, T. L., Uncles, R. J., Bale, A. J., Stephens, J. A., Harris, C., Raffin, J. S. J., Perrine, S., Begue, T., Meunier, M. S., Blais, F. E. I. and Raffaut, R. (2003). Accumulation and behaviour of suspended sediment in the Rodrigues lagoon. Shoals Rodrigues report, 135pp.
Lynch, T. L., Hooper, T. E. J., Meunier, M. S., Blais, F. E. I., Raffin, J. S. J., Perrine, S. and Raffaut, R. (2004a). Annual report on the status of the artisanal seine net fishery of Rodrigues 2003. Shoals Rodrigues report, 79pp.
Lynch, T. L., Meunier, M. S., Hooper, T. E. J., Blais, F. E. I., Raffin, J. S. J., Perrine, S. and Raffaut, R. (2004b). Annual report of benthos, reef fish and invertebrate surveys for reef slope and reef flat areas in Rodrigues 2003. Shoals Rodrigues report, 52pp.
Lynch, T. L., Meunier, M. S., Hooper, T. E. J., Blais, F. E. I., Raffin, J. S. J., Perrine, S. and Raffaut, R. (2004c). Annual report of benthos, reef fish and invertebrate surveys for lagoon areas in Rodrigues 2003. Shoals Rodrigues report, 44pp.
Lynch, T. L., Desiré, M. S., Hooper, T. E. J., Blais, F. E. I., Raffin, J. S. J., Perrine, S., Raffaut, R. and Hardman, E. R. (2005). Annual report of benthos, reef fish and invertebrate surveys for lagoon areas in Rodrigues 2004. Shoals Rodrigues report, 31pp.

6 Appendices

Table A1. Benthic cover for the Lagoon Coral and Coral Block sites

	A1	A2	A3	D1	D2	D3	E1	E2	E3	J1	J2	J3
Mud	0	0	0	0	0	0	0	0	0	0	0	0
Branching Acropora	3	3	3	3	3	3	3	3	4	2	0	0
Tabular Acropora	3	3	2	3	3	3	3	2	3	1	1	0
Digitate Acropora	3	2	2	2	2	2	2	2	2	2	0	0
Solitary Coral	0	2	3	3	2	3	2	2	2	0	0	0
Massive Coral	3	2	1	2	2	2	1	2	1	2	2	0
Sub-massive Coral	3	2	3	2	2	2	1	2	0	1	1	1
Foliose Coral	2	2	3	3	3	3	2	2	2	0	0	0
Encrusting Coral	2	2	2	2	2	2	2	2	2	1	1	0
Bleached Coral	0	0	0	0	0	0	0	0	0	0	0	0
Algae	5	5	5	0	0	0	0	0	0	4	3	3
Rock	5	4	3	2	2	3	2	3	0	2	0	0
Rubble	4	3	4	2	2	3	2	2	2	3	0	2
Sand	0	0	0	0	0	0	3	3	0	5	5	6
Seagrass	0	0	0	0	0	0	0	0	0	0	0	1
Soft Coral	3	3	2	2	2	2	0	0	0	0	0	0
Millepora	2	2	2	0	0	0	0	0	0	0	0	0
Others	0	0	3	0	0	0	0	2	0	0	0	0

Table A2. Benthic cover for the Algae/Seagrass and Mud sites.

	I1	I2	I3	L1	L2	L3	M1	M2	M3	H1	H2	H3	K1	K2	K3
Mud	0	0	0	0	0	0	0	0	0	6	6	6	6	6	6
Branching Acropora	0	0	0	2	2	0	0	0	0	0	1	0	0	0	0
Tabular Acropora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Digitate Acropora	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0
Solitary Coral	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Massive Coral	1	0	0	2	1	1	2	1	3	0	0	0	0	0	0
Sub-massive Coral	0	0	1	2	2	2	0	1	0	0	0	0	0	0	0
Foliose Coral	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Encrusting Coral	0	0	0	2	2	2	2	0	0	0	0	0	0	0	0

	I1	I2	I3	L1	L2	L3	M1	M2	M3	H1	H2	H3	K1	K2	K3
Bleached Coral	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Algae	3	3	3	3	3	3	5	5	6	3	4	3	0	2	0
Rock	0	0	0	0	0	0	6	5	3	0	0	0	0	0	0
Rubble	3	6	3	3	2	2	0	4	2	5	5	0	2	2	3
Sand	6	4	5	0	6	0	0	0	0	0	0	0	0	0	0
Seagrass	2	0	4	5	5	6	0	3	3	0	0	5	6	6	2
Soft Coral	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Millepora	0	0	0	2	1	1	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A3. Numbers of invertebrates recorded at the Lagoon Coral and Coral Block sites.

	A1	A2	A3	D1	D2	D3	E1	E2	E3	J1	J2	J3
Echinothrix diadema	0	0	0	0	0	0	0	0	0	0	0	0
Diadema sp	0	0	0	0	0	0	0	0	0	0	0	0
Echinometra mathaei	773	851	187	0	0	0	0	0	0	1	0	0
Toxopneustes pileolus	0	0	0	0	0	0	0	0	0	0	0	0
Heterocentrus mammilatus	1	0	0	0	0	0	0	0	0	0	0	0
Holothuria atra	16	19	55	2	5	1	3	5	0	121	36	21
H. leucospilota	36	35	15	1	4	0	1	1	3	66	22	22
Stichopus chloronotus	0	0	9	0	0	0	0	0	0	0	0	0
Synapta maculata	20	31	79	0	0	0	0	0	0	0	0	0
Euapta godeffroyi	0	0	0	0	0	0	0	0	0	0	0	0
Actinopyga sp	0	0	0	0	0	0	0	0	0	0	0	0
Bohadschia sp	1	2	2	0	0	0	0	0	0	0	0	0
Other holothurians	0	0	0	0	0	0	0	0	0	0	0	0
Linkia sp	0	0	0	0	0	0	0	0	0	0	0	0
Nardoa variolota	8	0	3	0	0	0	0	0	0	0	0	0
Ophiocoma erinaceus	11	12	1	0	0	0	0	0	0	0	0	0
Tridacna maxima	3	1	1	0	0	0	0	0	0	0	0	0
Pinna muricata	0	2	0	0	0	0	0	1	0	76	46	20
Coral Oyster	0	0	2	0	0	0	0	0	0	0	0	0
Anadara antiquate	0	0	0	0	0	0	0	0	0	0	0	0
Big oyster	0	0	0	0	0	0	0	0	0	0	0	0
Conus sp	0	0	0	0	0	0	0	0	0	0	0	0

	A1	A2	A3	D1	D2	D3	E1	E2	E3	J1	J2	J3
Cypraea tigris	0	0	0	0	2	0	0	0	0	0	0	0
Pleuroploca trapezium	0	0	0	0	0	0	0	0	0	0	0	0
Strombus sp	0	0	0	0	0	0	0	0	0	0	0	0
Harpa sp	0	0	0	0	0	0	0	0	0	0	0	0
Phyllidia sp	1	0	0	0	0	0	0	0	0	0	0	0
Aplysia sp	0	0	0	0	0	0	0	0	0	0	0	0
Black nudibranch	0	0	0	0	0	0	0	0	0	1	0	0
Octopus cynaea	0	0	0	0	0	0	0	0	0	0	0	0

Table A4. Numbers of invertebrates recorded at the Algae/Seagrass and Mud sites.

	I1	I2	I3	L1	L2	L3	M1	M2	M3	H1	H2	H3	K1	K2	K3
Echinothrix diadema	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diadema sp	0	0	0	0	2	0	2	0	0	0	0	0	0	0	0
Echinometra mathaei	0	0	0	48	45	35	50	6	25	0	0	0	0	0	0
Toxopneustes pileolus	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
Heterocentrus mammilatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Holothuria atra	0	5	0	11	7	17	67	43	15	5	0	0	0	0	0
H. leucospilota	3	6	2	10	5	6	90	81	48	0	0	0	0	0	0
Stichopus chloronotus	0	0	0	0	0	0	16	36	7	0	0	0	0	0	0
Synapta maculata	0	0	0	1	1	3	2	11	35	0	0	0	0	0	0
Euapta godeffroyi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Actinopyga sp	0	0	0	0	4	3	1	1	0	0	0	0	0	0	0
Bohadschia sp	0	1	0	0	1	3	2	11	0	0	0	0	0	0	0
Other holothurians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Linkia sp	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nardoa variolota	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tridacna maxima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pinna muricata	0	2	0	7	1	1	0	0	0	0	0	0	0	0	0
Coral Oyster	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Conus sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cypraea tigris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pleuroploca trapezium	0	2	0	0	1	0	0	0	0	1	0	0	0	0	0
Strombus sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ophiocoma erinaceus	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0

Phyllidia sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harpa sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aplysia sp	4	1	5	0	0	0	0	0	0	0	0	0	0	0	0
Black nudibranch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Octopus cynaea	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Anadara antiquate	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Big oyster	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0

Table A5. Numbers of fish recorded at the Lagoon Coral and Coral Block sites.

	A1	A2	A3	D1	D2	D3	E1	E2	E3	J1	J2	J3
Brown surgeonfish <20cm	16	54	90	170	90	205	38	47	18	0	0	0
Brown surgeonfish >20cm	0	9	0	0	0	0	0	0	0	2	0	0
Acanthurus triostegus	5	88	55	55	3	0	4	8	842	0	1	0
Acanthurus blochii	0	0	0	0	0	0	0	0	0	0	0	0
Zebrasoma scopas	0	0	0	1	0	0	1	0	0	0	0	0
Zebrasoma desjardinii	0	0	0	4	0	0	7	2	4	0	0	0
Naso unicornis	0	0	5	0	0	0	8	4	14	0	0	0
Chaetodon trifasciatus	6	0	1	4	12	25	28	18	4	0	0	0
Chaetodon melannotus	5	0	17	0	1	0	5	8	1	0	0	0
Chaetodon lunula	0	0	0	0	0	1	2	0	0	0	0	0
Chaetodon auriga	0	0	0	0	1	0	0	0	0	2	0	0
Chaetodon trifascialis	0	0	0	4	0	0	1	4	4	0	0	0
Chaetodon guttatisimus	0	0	0	0	0	0	0	0	0	0	0	0
Chaetodon kleinii	0	0	0	0	0	0	0	0	0	0	0	0
Chaetodon xanthocephalus	0	0	0	2	0	1	0	2	2	0	0	0
Chaetodon vagabundus	0	0	0	0	0	0	0	0	0	0	0	0
Chaetodon zanzibariensis	0	0	0	0	0	0	0	0	0	0	0	0
Chaetodon unimaculatus	0	0	0	0	1	2	0	0	0	0	0	0
Forcipiger flavissimus	0	0	0	0	0	0	0	0	0	0	0	0
Heniochus monoceros	0	0	0	0	0	0	0	0	0	0	0	0
Epinephelus spilotoceps	25	11	44	10	9	1	2	6	3	3	2	1
Halichoeres nebulosus	0	0	0	0	0	0	0	0	0	0	0	0
Thalassoma genivittatum	0	0	0	2	3	0	1	1	0	0	0	0
Anampses caeruleopunctatus	0	0	0	0	0	0	0	0	0	0	0	0
Cheilinus trilobatus	0	0	0	0	2	1	2	2	1	0	0	0

	A1	A2	A3	D1	D2	D3	E1	E2	E3	J1	J2	J3
Cheilinus chlorourus	0	0	0	2	0	1	1	1	0	1	0	0
Cheilinus fasciatus	0	0	0	0	0	0	0	0	0	0	0	0
Cheilinus trilobatus	0	0	0	0	0	0	0	0	0	0	0	0
Gomphosus caeruleus	0	0	0	2	0	1	9	4	10	0	0	0
Halichoeres scapularis	0	0	0	1	1	0	1	1	0	0	0	0
Thalassoma hardwicke	0	0	0	4	2	1	15	3	7	0	0	0
Thalassoma pupureum	0	0	0	0	0	0	0	0	0	0	0	0
Thalassoma quinquevittatum	0	0	0	0	0	0	0	0	0	0	0	0
Stethojulis albovittata	0	0	0	0	0	0	0	0	0	0	0	0
Stethojulis strigiventer	0	0	0	0	0	0	0	0	0	0	0	0
Hologymnus annulatus	0	0	0	0	0	0	0	0	0	0	0	0
Cheilio inermis	0	0	0	0	0	0	0	0	0	0	0	0
Epibulus insidiator	0	0	0	0	0	0	0	0	0	0	0	0
Halichoeres marginatus (juv)	0	0	0	0	0	0	0	0	0	0	0	0
Hemigymnus fasciatus	0	0	0	0	0	0	0	0	0	0	0	0
Labroides diminata	0	0	0	0	0	0	0	0	0	0	0	0
Labroides bicolour	0	0	0	0	0	0	0	0	0	0	0	0
Gnathodentex aurolineatus	0	3	39	0	0	1	13	7	7	0	0	0
Lethrinus nebulosus	0	0	0	20	0	23	0	0	0	0	0	0
Lethrinus harak	0	0	0	1	0	0	0	0	0	0	0	0
Lutjanus fulvus	0	0	0	0	0	0	1	0	0	1	0	0
Lutjanus kasmira	0	0	0	0	0	0	0	0	0	0	0	0
Mulloidichthys vanicolensis	0	0	0	0	0	0	0	0	0	0	0	0
Mulloidichthys flavolineatus	0	0	0	0	0	0	0	0	0	0	0	0
Parupeneus barberinus	3	0	0	1	1	0	0	0	1	0	0	0
Parupeneus macronema	0	1	0	0	0	0	0	0	3	0	0	0
Parupeneus ciliatus	0	0	0	0	0	0	0	0	0	0	0	0
Parupeneus cyclostomus	0	0	0	0	0	0	0	0	0	0	0	0
Parupeneus bifasciatus	2	0	0	0	0	0	1	0	0	0	0	0
Chromis viridis	0	0	176	320	160	890	600	450	500	60	0	0
Chrysiptera glauca	19	25	74	0	0	10	0	0	0	1	0	0
Dascyllus aruanus	115	320	300	650	560	660	700	530	700	83	48	3
Stegastes limbatus	320	500	190	280	180	205	145	205	5	2	3	0
Stegastes lividus	120	380	80	200	280	350	310	140	270	0	0	0

	A1	A2	A3	D1	D2	D3	E1	E2	E3	J1	J2	J3
Stegastes nigricans	250	232	150	125	100	190	100	60	10	0	0	0
Stegates pelicieri	0	0	0	0	0	0	0	0	0	0	0	0
Abudefduf sexfasciatus	0	0	0	4	1	5	0	0	1	0	0	0
Chromis nigrura	0	0	0	0	0	0	0	0	0	0	0	0
Dascyllus trimaculatus	0	0	0	0	0	0	0	0	0	0	0	0
Plectroglyphidodon johnstonianus	0	0	0	0	0	0	0	0	0	0	0	0
Pomacentrus dickii	0	0	0	0	0	0	0	0	0	0	0	0
Pomacentrus semicirculatus	0	0	0	0	0	0	0	0	0	0	0	0
Abudefduf sparoides	0	0	0	0	0	0	0	0	0	0	0	0
Small immature parrotfish	100	32	132	165	65	160	5	33	18	7	0	0
Scarus sordidus	3	1	0	11	19	10	53	26	80	0	0	0
Scarus ghobban	4	0	0	1	1	1	25	1	14	0	0	0
Scarus scaber	1	0	0	1	1	0	11	12	15	0	0	0
Hipposcarus harrid	0	0	0	4	2	5	3	1	5	0	0	0
Scarus strongylocephalus	0	0	0	0	0	0	0	0	0	0	0	0
Siganus sutor	0	0	0	0	0	0	0	0	0	0	0	0
Siganus argenteus	0	0	0	0	0	0	0	0	0	0	0	0
Rhinecanthus aculeatus	0	0	0	0	1	0	0	0	0	0	0	0
Bothus mancus	0	0	0	0	0	0	0	0	0	0	0	0
Pterocaesio tile	0	0	0	0	0	0	0	0	0	0	0	0
Trachinotus blochii	0	0	0	0	0	0	0	0	0	0	0	0
Fistularia commersonii	0	0	0	0	0	0	0	0	0	0	0	0
Goby	0	0	0	0	0	0	0	0	0	1	0	0
Myripristis violacea	0	0	0	0	0	0	0	0	0	0	0	0
Siderea grisea	0	0	0	0	0	0	0	0	0	0	0	0
Snake Eel	0	0	0	0	0	0	0	0	0	0	0	0
Ostracion meleagris	0	0	0	0	0	0	0	0	0	0	0	0
Rhabdosargus sarba	0	0	0	200	0	0	0	0	0	0	0	0
Sea horse	0	0	0	0	0	0	0	0	0	0	0	0
Arothron stellatus	0	0	0	0	0	0	0	0	0	0	0	0
Zanclus cornutus	2	0	0	2	1	3	1	2	6	0	0	0

Table A6. Numbers of fish recorded at the Algae/Seagrass and Mud sites.

	I1	I2	I3	L1	L2	L3	M1	M2	M3	H1	H2	H3	K1	K2	K3
Brown surgeonfish <20cm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brown surgeonfish >20cm	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0
Acanthurus triostegus	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
Acanthurus blochii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zebrasoma scopas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zebrasoma desjardinii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Naso unicornis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetodon trifasciatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetodon melannotus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetodon lunula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetodon auriga	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetodon trifascialis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetodon guttatisimus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetodon kleinii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetodon xanthocephalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetodon vagabundus	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Chaetodon zanzibariensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetodon unimaculatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Forcipiger flavissimus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heniochus monoceros	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Epinephelus spilotoceps	4	5	8	20	15	12	3	0	1	0	0	0	0	0	0
Halichoeres nebulosus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thalassoma genivittatum	0	0	0	4	5	0	18	9	0	0	0	0	0	0	0
Anampses caeruleopunctatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheilinus trilobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheilinus chlorourus	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
Cheilinus fasciatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheilinus trilobatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gomphosus caeruleus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Halichoeres scapularis	0	0	0	1	2	0	0	2	2	0	0	0	0	0	0
Thalassoma hardwicke	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0
Thalassoma pupureum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thalassoma quinquevittatum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	I1	I2	I3	L1	L2	L3	M1	M2	M3	H1	H2	H3	K1	K2	K3
Stethojulis albovittata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stethojulis strigiventer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hologymnus annulatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cheilio inermis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Epibulus insidiator	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Halichoeres marginatus (juv)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hemigymnus fasciatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Labroides diminata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Labroides bicolor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gnathodentex aurolineatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lethrinus nebulosus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lethrinus harak	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lutjanus fulvus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lutjanus kasmira	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mulloidichthys vanicolensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mulloidichthys flavolineatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parupeneus barberinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parupeneus macronema	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parupeneus ciliatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parupeneus cyclostomus	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Parupeneus bifasciatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromis viridis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chrysiptera glauca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dascyllus aruanus	0	0	8	15	7	20	0	0	0	0	0	0	0	0	0
Stegastes limbatus	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
Stegastes lividus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stegastes nigricans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stegates pelicieri	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Abudefduf sexfasciatus	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0
Chromis nigrura	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dascyllus trimaculatus	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Plectroglyphidodon johnstonianus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pomacentrus dickii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pomacentrus semicirculatus	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0

	I1	I2	I3	L1	L2	L3	M1	M2	M3	H1	H2	H3	K1	K2	K3
Abudefduf sparoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small immature parrotfish	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0
Scarus sordidus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scarus ghobban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scarus scaber	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hipposcarus harrid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scarus strongylocephalus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Siganus sutor	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Siganus argenteus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhinecanthus aculeatus	1	5	4	10	0	0	0	0	0	0	0	0	0	0	0
Bothus mancus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pterocaesio tile	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trachinotus blochii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fistularia commersonii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goby	4	8	10	0	0	0	0	0	0	0	0	0	0	0	0
Myripristis violacea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Siderea grisea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Snake Eel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ostracion meleagris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhabdosargus sarba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sea horse	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Arothron stellatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zanclus cornutus	0	0	0	2	0	0	1	2	0	0	0	0	0	0	0