Numbers of Fish Recorded

The total fish count in 2001 at all 8 sites was 34,901, giving an average of 1,501 fish per 100 m^2. At the shallower sites the density was 1,431 fish per 100 m^2, and at the 20m depth sites 1,628 per 100 m^2 (Table 4).

Although the fish were counted into six total length categories (see Methodology) the data is summarised here into three categories: 1 to 10 cm, 11 to 20 cm, and >20 cm, by transect depth. At the shallow and deep transects, the largest percentage of fish was in the 1 to 10 cm category (82% and 70%, respectively), and the smallest percentage in the 11 - 20 cm category (4% and 5%, respectively). The abundance of fishes in the 1 to 10 cm category at both transect depths was primarily due to large numbers of fish from families with numerous small-sized species (Serranidae (fairybasslets), Apogonidae, and Pomacentridae), and secondarily because of the number of juvenile life-stages (e.g. Serranidae).

Table 4. Number of fish counted, by transect depths and fish size groups, during the Aldabra Marine Programme surveys in February 2001.

	10 m Transects (Site 7 - 5m)			**20 m Transects (Site 7 - 15m)**			
Total Survey Area - 2325 m^2	**Area Surveyed: 1500 m^2**			**Area Surveyed: 825 m^2**			
	Size (cm)	**Size (cm)**	**Size (cm)**	**Size (cm)**	**Size (cm)**	**Size (cm)**	
Family/Genus species	**1 to 10**	**11 to 20**	**>20**	**1 to 10**	**11 to 20**	**>20**	**Total**
MURAENIDAE							
Gymnothorax flavimarginatus			1				1
BELONIDAE							
Tylosurus crocodilus			1				1
HOLOCENTRIDAE							
Myripristis adusta		1	1		9	1	12
Myripristis berndti		40		17	226	14	297
Myripristis murdjan		22	14				36
Neoniphon sammara		6				1	7
Sargocentron caudimaculatum		31		3	58		92
Sargocentron diadema				13			13
Sargocentron spiniferum						2	2
SERRANIDAE							
Aethaloperca rogaa			2			550	552
Cephalopholis argus		1	11		5	4	21
Cephalopholis leoparda	2	1			1		4
Cephalopholis miniata		1	5		2	12	20
Cephalopholis spiloparaea	1	16	9		1		27
Cephalopholis urodeta	1	10			5		16
Dermatolepis striolatus						1	1
Epinephelus fasciatus	1	12	3		11		27
Epinephelus fuscoguttatus					1		1
Epinephelus polyphekadion			2			2	4
Epinephelus spilotoceps		1	2			1	4
Gracilia albomarginata		1	5			4	10
Plectropomus laevis						1	1

Table 4 (continued)

	10 m Transects (Site 7 - 5m)			20 m Transects (Site 7 - 15m)			
Total Survey Area - 2325 m^2	**Area Surveyed: 1500 m^2**			**Area Surveyed: 825 m^2**			
	Size (cm)	**Size (cm)**	**Size (cm)**	**Size (cm)**	**Size (cm)**	**Size (cm)**	
Family/Genus species	**1 to 10**	**11 to 20**	**>20**	**1 to 10**	**11 to 20**	**>20**	**Total**
Variola louti			1			2	3
Nemanthias carberryi				1			1
Pseudanthias cooperi	3			8	6		17
Pseudanthias evansi	281			100			381
Pseudanthias squamipinnis	928	1		1098			2027
Plectropomus areolatus		1	2			3	6
Cephalopholis nigripinnis	10	37	2		15		64
Pseudanthias ignitis					6		6
Anyperodon leucogrammicus	1						1
APOGONIDAE							
Apogon apogonoides	400	2		1835			2237
Cheilodipterus macrodon					1		1
HAEMULIDAE							
Plectorhinchus gaterinus						7	7
Plectorhinchus obscurus			4			3	7
Plectorhinchus orientalis						4	4
LUTJANIDAE							
Aphareus furca	1		11		1	4	17
Aprion virescens						3	3
Lutjanus bengalensis				1			1
Lutjanus bohar	1	6	18	1	2	15	43
Lutjanus gibbus			6				6
Lutjanus kasmira					4	711	715
Lutjanus monostigma			5		1	8	14
CAESIONIDAE							
Caesio xanthonota			69		15	10	94
Pterocaesio lativittata			60		15		75
Pterocaesio tile			2400		1	800	3201
MULLIDAE							
Parupeneus barbarensis			1			1	2
Parupeneus bifasciatus	1	10	4		3	2	20
Parupeneus cyclostomus		3	4			3	10
Parupeneus macronema	148	31	3	29	7	1	219
Parupeneus pleurostigma		1		1		2	4
Mulloidichthys vanicolensis						550	550
Parupeneus rubescens		1					1

Table 4 (continued)

	10 m Transects (Site 7 - 5m)			20 m Transects (Site 7 - 15m)			
Total Survey Area - 2325 m^2	**Area Surveyed: 1500 m^2**			**Area Surveyed: 825 m^2**			
	Size (cm)	**Size (cm)**	**Size (cm)**	**Size (cm)**	**Size (cm)**	**Size (cm)**	
Family/Genus species	**1 to 10**	**11 to 20**	**>20**	**1 to 10**	**11 to 20**	**>20**	**Total**
CHAETODONTIDAE							
Chaetodon auriga	4	11		9	6		30
Chaetodon bennetti	1			2	3		6
Chaetodon falcula		2		2	10		14
Chaetodon guttatissimus	19	3		14	3	1	40
Chaetodon kleinii				15	1	4	20
Chaetodon lineolatus						2	2
Chaetodon lunula		6		2	2		10
Chaetodon meyeri	3	1		2	1		7
Chaetodon trifasciatus	8	4					12
Chaetodon xanthocephalus	2	5	2				9
Chaetodon zanzibariensis					5		5
Forcipiger flavissimus	9	4	7	16	6		42
Hemitaurichthys zoster	12			7			19
Heniochus acuminatus		1					1
Heniochus monoceros					1		1
Chaetodon interruptus		1			1		2
Chaetodon madagaskariensis		3		3	2		8
Chaetodon vagabundus		2					2
Heniochus singularius			2				2
LETHRINIDAE							
Lethrinus nebulosus						3	3
Monotaxis grandoculis	5	21	5	8	18	2	59
EPHIPPIDAE							
Platax orbicularis			5			3	8
MALACANTHIDAE							
Malacanthus latovittatus				1			1
PINGUIPEDIDAE							
Parapercis hexophthalama	3	4		1			8
Parapercis millipunctata	5						5
Parapercis signata				6			6
POMACANTHIDAE							
Apolemichthys trimaculatus	1	7			4		12
Centropyge acanthops	17			28			45
Centropyge multispinis	59	4		37			100
Pygoplites diacanthus		1	2		2	2	7
Centropyge bispinosa	1			3			4
Centropyge debelius				6			6

Table 4 (continued)

	10 m Transects (Site 7 - 5m)			20 m Transects (Site 7 - 15m)			
Total Survey Area - 2325 m^2	**Area Surveyed: 1500 m^2**			**Area Surveyed: 825 m^2**			
	Size (cm)	**Size (cm)**	**Size (cm)**	**Size (cm)**	**Size (cm)**	**Size (cm)**	
Family/Genus species	**1 to 10**	**11 to 20**	**>20**	**1 to 10**	**11 to 20**	**>20**	**Total**
POMACENTRIDAE							
Amphiprion chrysogaster					2		2
Amphiprion clarkii				1			1
Chromis dimidiata	1005			705			1710
Chromis nigrura	267			36			303
Chromis ternatensis	565			164			729
Chromis weberi	374	21		36			431
Dascyllus aruanus	2			10			12
Dascyllus carneus				63			63
Dascyllus trimaculatus	1			14			15
Lepidozygus tapeinosoma	11695			4290			15985
Plectroglyphidodon dickii	14	5		5			24
Plectroglyphidodon johnstonianus	49			4			53
Plectroglyphidodon lacrymatus	91	8		5			104
Pomacentrus caeruleus	58			11			69
Pomacentrus sulfureus	1						1
Chromis xutha				107			107
Abudefduf sexfasciatus	2						2
Amphiprion allardi				2	3		5
Chromis atripectoralis	1						1
Pomacentrus chrysurus	1						1
Pomacentrus philippinus				1			1
LABRIDAE							
Anampses meleagrides	4	2		4	6		16
Bodianus axillaris	5	1	1	2	5		14
Bodianus bilunulatus			1		1	1	3
Bodianus diana		5	1	3	8	3	20
Cirrhilabrus exquisitus	604	12		138			754
Coris cuvieri		2					2
Coris frerei		4	1			2	7
Epibulus insidiator	1						1
Gomphosus caeruleus	25	16		8	5		54
Halichoeres cosmetus	134	9		49	6		198
Halichoeres hortulanus	2	8		1	8		19
Halichoeres vrolikii	3	3					6
Hemigymnus fasciatus		1	1				2
Hologymnosus doliatus		2		1			3
Labroides bicolor	9	3		5	1		18
Labroides dimidiatus	104			110			214
Labrobsis xanthonata	1			6	1		8
Macropharingodon bipartitus	11	2					13
Pseudocheilinus evanidus	61			94			155
Pseudocheilinus hexataenia	174			47			221

Table 4 (continued)

	10 m Transects (Site 7 - 5m)			20 m Transects (Site 7 - 15m)			
Total Survey Area - 2325 m^2	**Area Surveyed: 1500 m^2**			**Area Surveyed: 825 m^2**			
	Size (cm)	**Size (cm)**	**Size (cm)**	**Size (cm)**	**Size (cm)**	**Size (cm)**	
Family/Genus species	**1 to 10**	**11 to 20**	**>20**	**1 to 10**	**11 to 20**	**>20**	**Total**
Pseudocheilinus octotaenia	31	7		3	1		42
Pseudodax molucanus		2					2
Thalassoma amblycephalum	15	2	1	20	3		41
Thalassoma hardwicke		2		2			4
Thalassoma herbraicum	14	33	4	4	9	2	66
Thalassoma lunare	6	1		1	18		26
Anampses caeruleopunctatus			1				1
Bodianus anthioides			1		3		4
Bodianus mesothorax		1					1
Coris batuensis	9	9	1	16	2		37
Hologymnosus annulatus	1						1
Novaculichthys taeniourus	1	2	1		2		6
Pseudojuloides kaleidas				14			14
Stethojulis albovittata	8	1		1	1		11
CIRRHITIDAE							
Cirrhitichthys oxycephalus	10			11			21
Paracirrhites arcatus	28	1		10			39
Paracirrhites forsteri	7			10	1		18
SCARIDAE							
Scarus sordidus	10	63	23	4	14	3	117
Scarus rubroviolatus						1	1
Scarus frenatus			2			1	3
Scarus strongylocephalus		1	2			5	8
CARANGIDAE							
Caranx ignobilis			22			3	25
Caranx melampygus			32			18	50
Caranx sexfasciatus						515	515
Elagatis bipinnulata						2	2
BLENNIIDAE							
Aspidontus taeniatus	6	1		8			15
Ecsenius midas				4			4
Plagiotremus rhinorhynchos				1			1
Plagiotremus tapeinosoma	6			3			9
Cirripectes castaneus	16	1					17
GOBIIDAE							
Valenciennea helsdingeni	2						2
Valenciennea strigata	4						4

Table 4 (continued)

	10 m Transects (Site 7 - 5m)			20 m Transects (Site 7 - 15m)			
Total Survey Area - 2325 m2	**Area Surveyed: 1500 m^2**			**Area Surveyed: 825 m^2**			
	Size (cm)	**Size (cm)**	**Size (cm)**	**Size (cm)**	**Size (cm)**	**Size (cm)**	
Family/Genus species	**1 to 10**	**11 to 20**	**>20**	**1 to 10**	**11 to 20**	**>20**	**Total**
ACANTHURIDAE							
Acanthurus auranticavus			2				2
Acanthurus leucocheilus		6			9	6	21
Acanthurus leucosternon	11	76	1	1	4		93
Acanthurus thompsoni		5	5	11	67		88
Ctenochaetus striatus	75	30	7	11	3	2	128
Ctenochaetus strigosus	156	147		48	22		373
Naso brevirostris			55		2		57
Naso lituratus			3			1	4
Zebrasoma scopas	32	4		15	4		55
Acanthurus lineatus		4	1				5
Acanthusus nigricauda			4				4
Acanthurus tennenti		1					1
Naso vlamingii						14	14
Zebrasoma desjardinii		1			1		2
ZANCLIDAE							
Zanclus cornutus	1	6			4		11
BALISTIDAE							
Balistapus undulatus		2			3		5
Balistoides viridescens			1				1
Melichthys indicus		15	48		3	6	72
Odonus niger		3	7				10
Sufflamen bursa		3			1		4
Sufflamen chrysopterus	5	5		3	1		14
OSTRACIIDAE							
Ostracion meleagris	1			1			2
TETRAODONTIDAE							
Arothron meleagris	1					2	3
Arothron nigropunctatus		2	1		2	1	6
Canthigaster valentini	7						7
Canthigaster coronata	1						1
SCORPAENIDAE							
Scorpaenopsis diabola		1					1
SIGANIDAE							
Siganus stellatus			2				2

Table 4 (continued)

	10 m Transects (Site 7 - 5m)			20 m Transects (Site 7 - 15m)			
Total Survey Area - 2325 m^2	**Area Surveyed: 1500 m^2**			**Area Surveyed: 825 m^2**			
	Size (cm)	**Size (cm)**	**Size (cm)**	**Size (cm)**	**Size (cm)**	**Size (cm)**	
Family/Genus species	**1 to 10**	**11 to 20**	**>20**	**1 to 10**	**11 to 20**	**>20**	**Total**
MOBULIDAE							
Manta briostris						1	1
MICRODESMIDAE							
Nemateleotris magnifica	46			22			68
Ptereleotris evides.		2		3			5
MONACANTHIDAE							
Amanses scopas		2			2		4
Cantherinus pardalis		1					1
Total Fish Counted	**17702**	**863**	**2901**	**9418**	**689**	**3328**	**34901**
Number of Species	**86**	**92**	**62**	**84**	**74**	**57**	**191**
Fish/100m2	**12**	**0.6**	**2**	**11**	**0.8**	**4**	**1501**

Fish Species Distribution

The pattern of fish species distribution around the outer reef of the atoll in February 2001 (Figure 22), followed the same general pattern as in November 1999 (Figure 23). Sites 5, 3, 1, and 4 on the eastern portion of the atoll ranked 1st, 2nd, 3rd and 4th, respectively, for the least number of species in both years. Sites 2, 6, 7, and 8 (2001 only) on the western portion of the atoll accounted for the most number of species of fish on the transects in both years.

The difference in the species numbers from one end of the atoll to the other is striking. Thirty species were counted at Site 5 compared to a range of 62 to 115 species at the other sites. Furthermore, there were significant correlations between the number of species of fish surveyed on both the 10 m depth transects(R^2 = 0.41, $F_{.05}$,1 = 4.16, P = 0.087) and the 20 m depth transects (R^2 = 0.47, $F_{.05}$,1 = 5.23, P = 0.062) at Sites 1-8, and their relative positions from east to west along the shoreline of Aldabra Atoll (Figure 22).

Fish Numbers Distribution

In February 2001, the number of fish per 100 m^2, combining shallow and deep transects ranged from 299 fish (62 species) at Site 3, to 3,867 fish (89 species) at Site 6 (Figure 22). The 550 fish per 100 m^2 at Site 5 is unusually high for the low number of species at this site and was due to a school of 800 large fusilier, *Pterocaesio tile* (Caesionidae) crossing the transect line. The numbers of the fish counted in both shallow and deep transects combined, at Sites 1, 2, 3, 4, 6, and 7 were greatest in the 1 to 10 cm category. This ranged from 70% at Site 1 to 97% at Site 7. At site 8, 66% of the fish were in the >20 cm category. This was due to an extremely large school of >30 cm *Aethaloperca rogaa* (Serranidae) aggregated on a coral outcrop at 20 m depth.

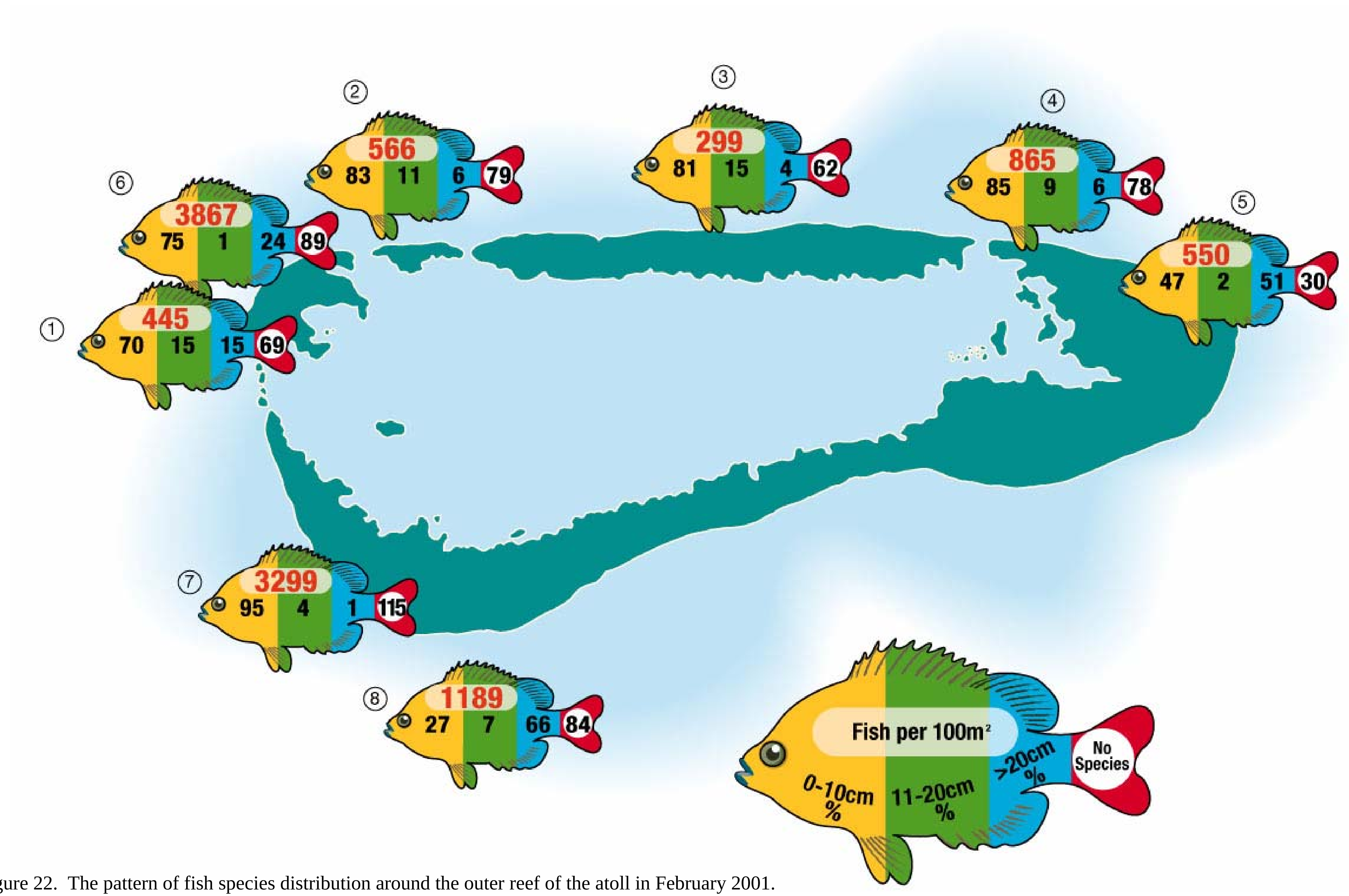


Figure 22. The pattern of fish species distribution around the outer reef of the atoll in February 2001.

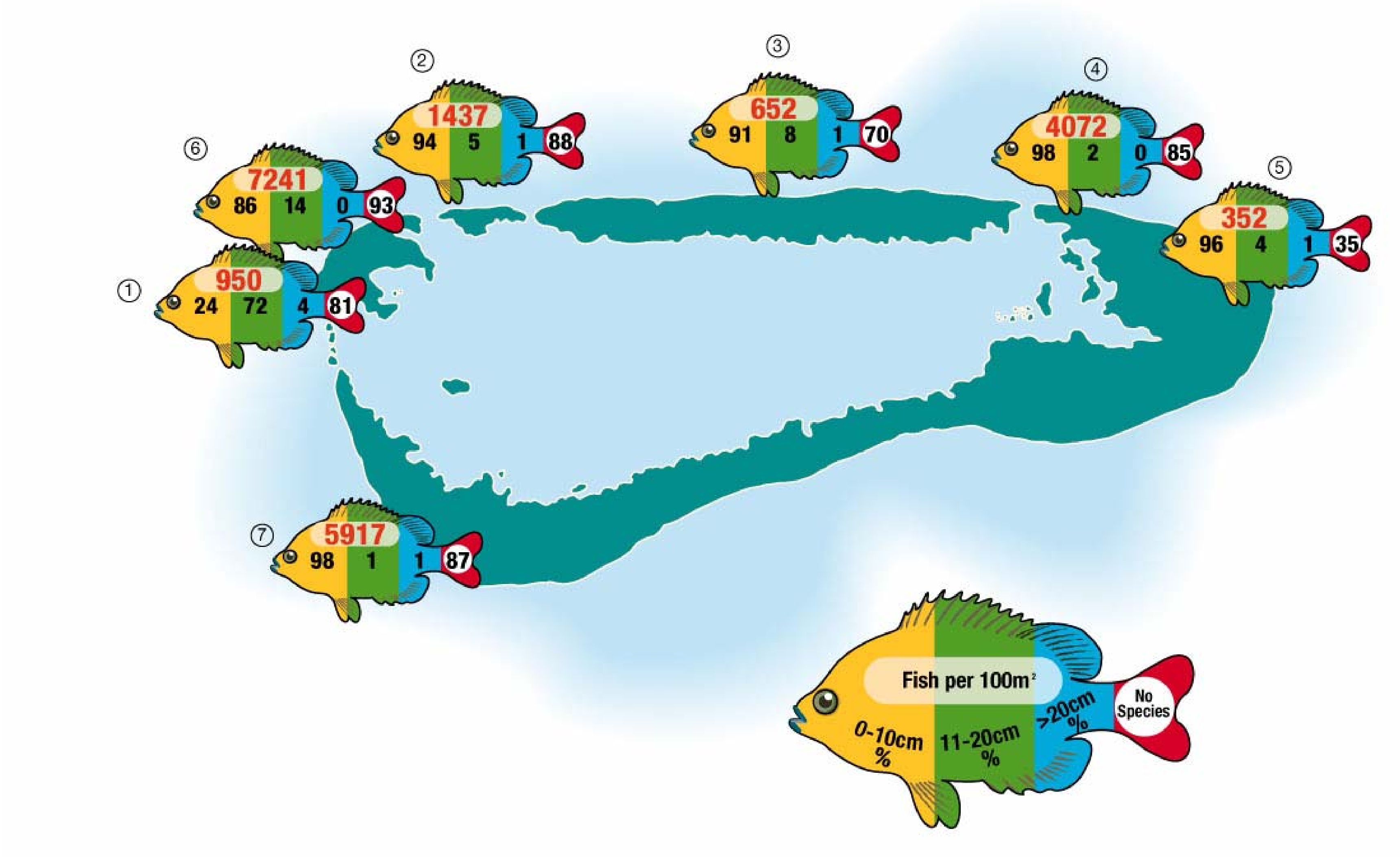


Figure 23. The pattern of fish species distribution around the outer reef of the atoll in November 1999.

There were no significant correlations between the densities of fishes at Sites 1-8, and the east to west positions along the outer reef.[3]

Relationship with Coral Habitat
There was no significant correlation between the number of species of fish, nor the density of fishes, surveyed at both depths at Sites 1-8, and the amounts of live coral habitat, and live coral and dead coral habitat combined, at each site.

The families Pomacentridae, Chaetodontidae, Labridae, and Serranidae each have several species that are commonly associated with live coral habitat, and habitat structure formed by erect dead corals. These selected fishes were examined for any associations with these measures of habitat structural complexity.

a) Fish Density
Only the density of Labrids at 10 m depth (R^2 = 0.78, $F_{.05}$,1 = 21.33, P = 0.004) and at 20 m depth (R^2 = 0.54, $F_{.05}$,1 = 7.02, P = 0.038), and the number of species of Pomacentrids at 20 m depth (R^2 = 0.67, $F_{.05}$,1 = 12.18, P = 0.013), were significantly correlated with the amount of **live coral habitat** at each site. In comparison, both the density of Chaetodontids at 10 m depth (R^2 = 0.50, $F_{.05}$,1 = 6.01, P = 0.050) and 20 m depth (R^2 = 0.60, $F_{.05}$,1 = 9.08, P = 0.024), and the density of Labrids at 10 m depth (R^2 = 0.70, $F_{.05}$,1 = 14.21, P = 0.009) and 20 m depth (R^2 = 0.52, $F_{.05}$,1 = 6.61, P = 0.042), were significantly correlated with the amount of **combined live and dead coral habitat** at each site.

b) Fish Species
For the number of species of fish, only the Chaetodontids (R^2 = 0.52, $F_{.05}$,1 = 6.53, P = 0.043) and Pomacentrids (R^2 = 0.64, $F_{.05}$,1 = 10.73, P = 0.017) were significantly correlated with the amount of **combined live and dead coral habitat** at each site.

Temperature Data Loggers

Since the February 2001 deployment of the 10 water temperature data loggers, three have been regularly monitored by Aldabra station staff, and appear to be functioning as anticipated. Although they are developing encrusting growths (Figure 24), it is unlikely that these would interfere with the operation and accuracy of the loggers[4].

The temperature data from Site 1 (19 February to 20 June 2001) at 10 m depth on the outer reef had a maximum of 29.7 ºC (April), a minimum of 21.4 ºC (February) and a mean of 27.4 ºC for this period (Table 5). There was a significantly decreasing trend in the temperatures at this outer reef site for this period (R^2 = 0.59, $F_{.05}$,1 = 9818.18, P = 0.0; Figure 25).

[3] The number of species of fish, and the fish per 100 m2, given in Figure 21 correct for errors in some of these numbers for Sites 1, 5, 6, and 7 in Figure 10 in Teleki et al. (1999).
[4] OnSet Computer Corp was consulted about the effect which the encrustations would have on the temperature. Given that the electronics, including the sensor, are enclosed in a waterproof plastic housing, their engineering staff do not believe that external growth would cause changes in the accuracy of the logger's sensor or electronics. The growths will add thermal mass to the housing, which could affect time response. However, the housing is thick, so the expectation is that a fairly substantial amount of growth would be required to affect the response time of the logger.

Figure 24. Encrustation on a temperature logger deployed in this survey.

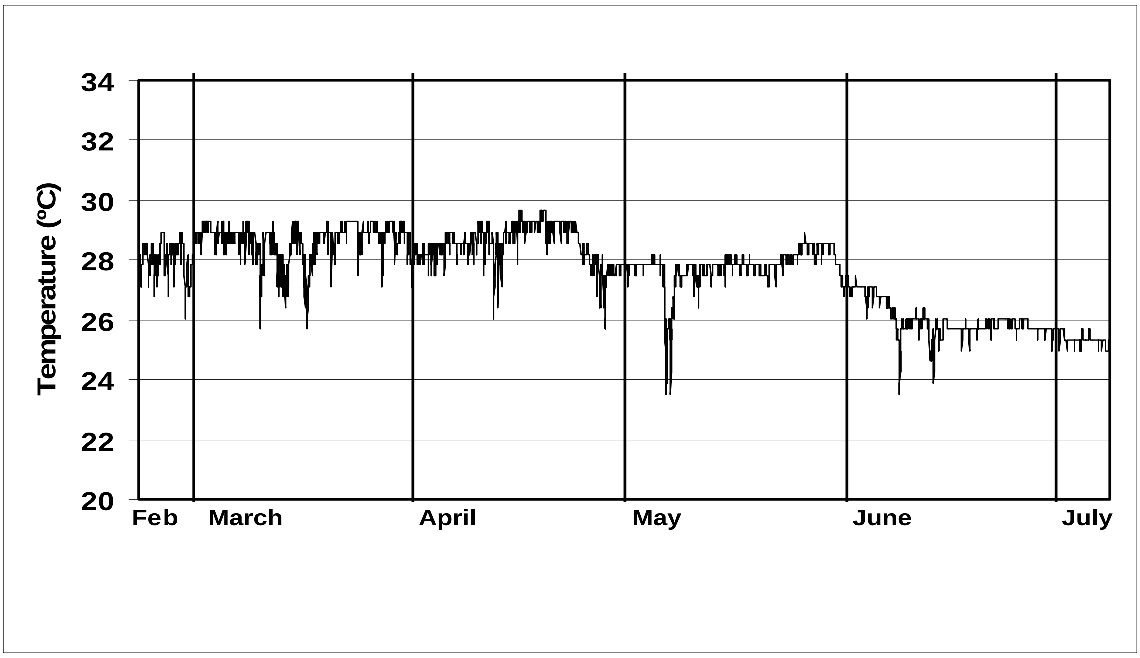


Figure 25. Temperatures recorded at 30 minute intervals at Aldabra Marine Programme survey Site 1 at 10 m depth, from 18 February to 8 July 2001.

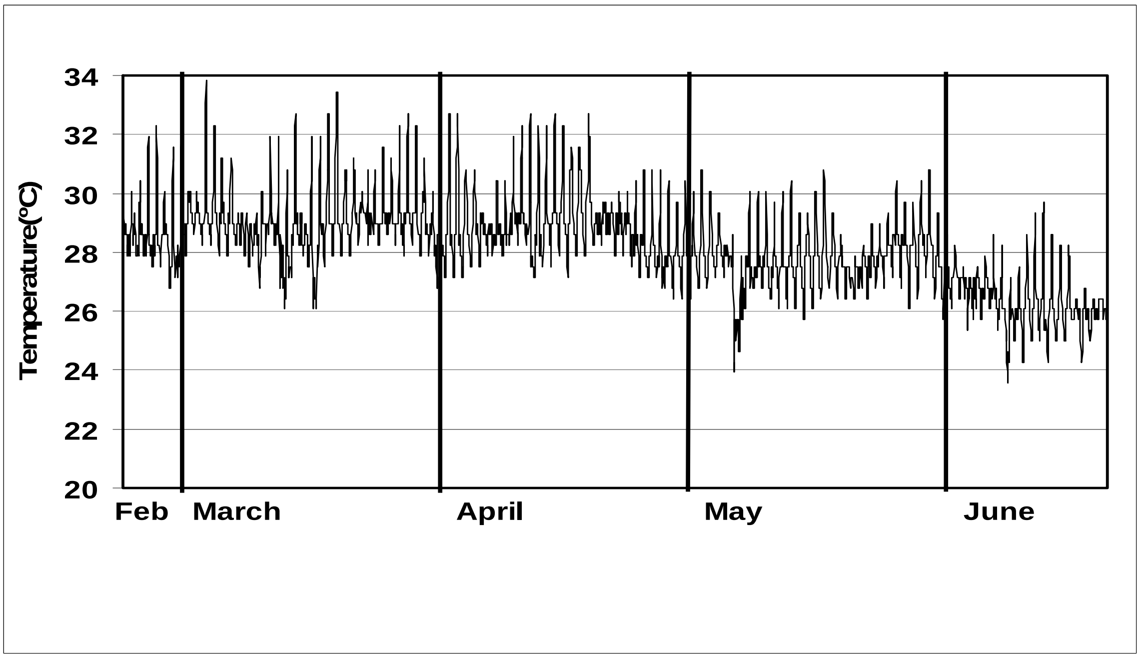


Figure 26. Temperatures recorded at 30 minute intervals at Aldabra Marine Programme temperature monitoring site Passe Dubois at 3 m depth, from 19 February to 19 June 2001.

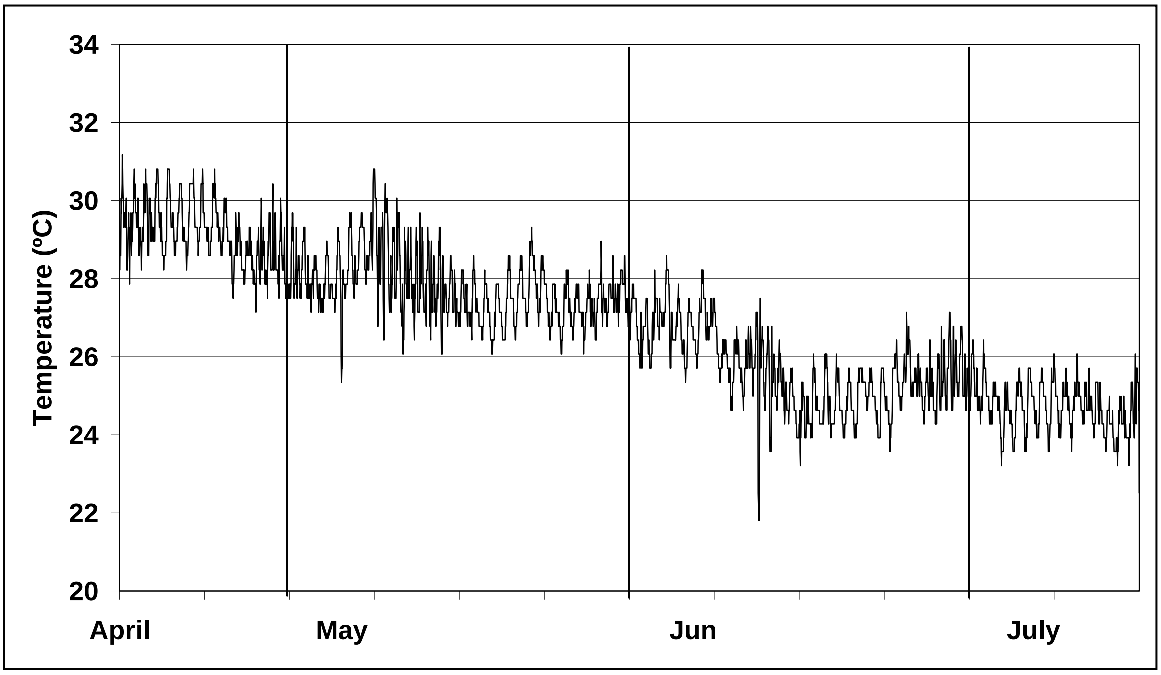


Figure 27. Temperatures recorded at 30 minute intervals at Aldabra Marine Programme temperature monitoring site North Ile Esprit at 3 m depth, from 11 April 2001 to 10 July 2001.

The temperature data for Passe Dubois (19 February to 20 June 2001) at 3 m depth had a maximum of 32.7 Cº (March and April), a minimum of 23.6 Cº (June) and a mean of 28.0 Cº for this period (Table 5). There was a steadily decreasing trend in maximum and minimum values towards June. Despite the wide fluctuations in temperature on most days, there was a significantly decreasing trend in the temperatures at 3 m in this passage to the lagoon for this period (R^2 = 0.33, $F_{.05},1$ = 2883.62, P = 0.0; Figure 26).

The temperature data for Ile Esprit (11 April to 10 July 200) at 3 m depth had a maximum of 31.2 Cº (April), a minimum of 21.8 Cº (June) and a mean of 26.8 Cº for this period (Table 5). There was a steadily decreasing trend in maximum and minimum values towards July. There was a significantly decreasing trend in the temperatures at 3 m in area of the lagoon for this period (R^2 = 0.80, $F_{.05},1$ = 17315.99, P = 0.0; Figure 27).[5]

Table 5. Temperatures (ºC) recorded, by monthly period, at Aldabra Atoll by the Optic StowAway temperature loggers deployed during the February 2001 AMP expedition (SD = standard deviation, n = number of 30 minute interval recordings). A. Site 1 at 10m depth, 18 February to 8 July; B. Passe Dubois at 3 m depth, 19 February to 20 June; and C. Île Esprit at 3 m depth 11 April – 10 June 2001.

A. Site 1 at 10m depth

Date	Mean	Max	Min	SD	n
Feb	28.3	29.3	26.0	0.6	507
March	28.6	29.3	25.7	0.6	1488
April	28.5	29.7	25.7	0.7	1440
May	27.8	28.9	23.5	0.6	1488
June	26.0	27.5	23.5	0.6	1439
July	25.3	25.7	21.4	0.4	364
Overall	**27.4**	**29.7**	**21.4**	**1.3**	**6725**

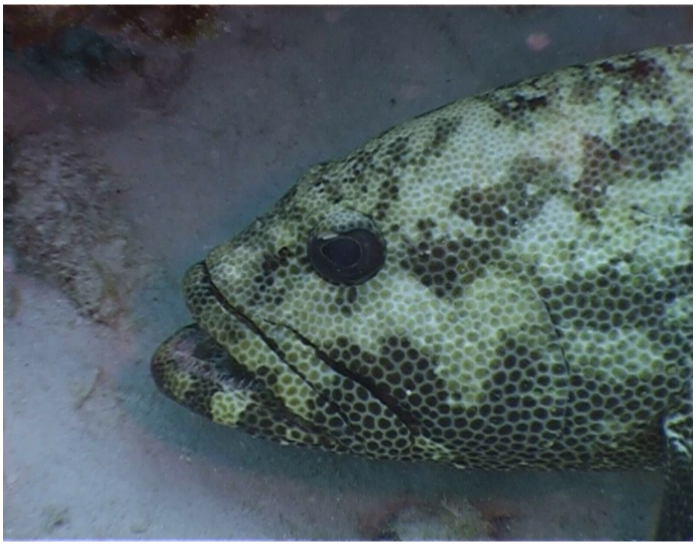
B. Passe Dubois at 3 m

Date	Mean	Max	Min	SD	n
Feb	28.7	32.3	26.8	0.9	462
March	29.1	32.7	26.8	1.0	1488
April	28.8	32.7	26.4	1.1	1440
May	27.8	30.8	23.9	1.0	1488
June	26.3	29.7	23.6	0.9	936
Overall	**28.0**	**32.7**	**23.6**	**1.4**	**5814**

C. Île Esprit at 3 m depth

Date	Mean	Max	Min	SD	n
April	28.9	31.2	25.4	0.9	940
May	27.6	30.8	25.4	0.9	1488
June	25.3	28.2	21.8	0.9	1440
July	24.6	26.1	22.5	0.6	450
April-July	**26.8**	**31.2**	**21.8**	**1.8**	**4318**

[5] The temperature logger data was provided by the following Seychelles Islands Foundation personnel at Aldabra Station: Anna Liljevik, Research Officer, Tina Dubel, Ranger, Conrad Savy, Volunteer, and Allen Cedras, Logistics Manager.



Fish of Aldabra – *Acanthurus lineatus* (top), *Epinephelus* sp. (middle), *Platax orbicularis* (bottom)

Discussion

Coral Community

The 1999 survey results showed that coral bleaching in 1998 had had a pronounced effect on the reefs around Aldabra Atoll, particularly in shallow water (Teleki *et al*. 1999). Between 1999 and 2001 there has been little change in the outer reefs, with some suggestion of coral recovery at both the depths studied. There is no evidence of high macro algal growth since 1999, with the exception of site 7 and, to a lesser extent, Site 6. These sites had high coral mortality in 1999 providing a new niche for algae, particularly at Site 7 which appears to have provided suitable conditions for abundant coralline algae growth.

By 2001 the dead corals still visible in 1999 had been mostly broken down to rubble and sand, or were covered by other organisms. The shapes of dead massive colonies were still visible in 2001, and some showed evidence of tissue regeneration from surviving areas around the side and base of the colonies. Many are now covered with coralline algae that are known to provide a good substrate for settlement of coral larvae.

The detected natural variation in live coral cover around Aldabra Atoll can be attributed to the prevailing weather and current patterns. The area encompassing Sites 1, 2 and 6 is the most sheltered and has the highest live coral cover. Live coral cover at depth was good around most of the atoll, with the exception of Site 5 that appears to be a rubble zone.

The new sites established in the lagoon have shown that coral cover is high in the vicinity of the drainage channels. Live coral cover at Sites 9 and 10 was estimated to be double that of most outer reef sites, though species diversity appears lower. There is also less evidence of old dead coral colonies in the lagoon, suggesting that the effect of the 1998 bleaching may not have been as great here, a theory supported by observations made by Teleki *et al.* (1998) just after the 1998 bleaching. Lagoon species may be acclimatised to extreme temperature changes, and new tides may bring in deep cooler water through the channels on every tide change reducing the time lagoon corals are exposed to extreme temperatures.

The temperature data recorded by the three loggers during April through June/July 2001 supports the suspected normally wider range in temperatures in the lagoon. During this period the temperature variation at the two lagoon sites was 9.1 and 9.4 ^{o}C respectively and at the outer reef site 6.1 ^{0}C.

Coral recruitment at Aldabra appears to be good, with most occurring at around 10 m. This would be expected as corals in shallower than 10 m depth have to cope with higher exposure to swell and a mobile substrate making settlement difficult, while corals in deeper water have less available light and reduced available settlement space due to the higher proportion of live coral. Levels of recruitment at Aldabra are in line with those found at other locations, though direct comparison is not always possible due to differing sampling methods (Miller *et al*. 2000). The diversity of coral families recruiting to Aldabra is high and to be expected in view of the high coral diversity on reefs around the atoll.

Size frequencies of recruits measured in 2001 suggests that there may have been several cohorts recruited since the coral bleaching of 1998. It appears that the fast colonisers such as *Acropora* and *Pocillopora* have had the best chance to produce several cohorts due to their high rate of growth and reproduction. The presence of so many recruits and evidence of several cohorts suggests that the atoll may be primarily self-seeding, though it is conceivable that the predominant southeasterly current may be carrying recruits from Assumption, Astove, Cosmoledo and potentially sites at much greater distances afar.

Fish Community

Unlike sessile coral colonies, fish populations are notoriously variable, even when surveyed at short time intervals. The following conclusions are therefore made within the limitations of two surveys having been undertaken some 16 months apart.

Comparing the 1999 and 2001 fish species lists there is generally good agreement between the two surveys even though the total numbers identified vary somewhat: in 1999, 35 families and 211 species and in 2001, 40 families and 205 species. Using a different survey method, Spalding identified 35 families and 287 species in 1998, prior to the bleaching episode.

Given the broadly similar diversity it is therefore of note that a comparison of the actual counts of fishes and species at each site in 1999 and 2001 appear to be very different (Figures 22 and 23). At this stage it is not known whether this difference is attributable to the different seasons in which the surveys were conducted, some structural change in the fish community, or a survey error. It is nevertheless concluded that surveys should, if possible, be conducted at similar times of the year, ideally in November and February.

If one compares the findings of the 1999 and 2001 surveys, the following conclusions emerge:

1. In 1999 the lowest fish density was at Site 5, and the highest at Site 6. In 2001 the highest count was still at Site 6, but the lowest at Site 3. This may be due to an anomaly at Site 5 where a large school of fusiliers crossed the survey area. If this number is excluded, Site 5 yields the lowest count in 2001.

2. In both years most of the fish counted were in the 0 – 10 cm length category. This was due to large numbers of fish from families with numerous small-sized species (Serranidae (fairybasslets), Apogonidae, and Pomacentridae), and because of juvenile

life stages (e.g. Serranidae). Exceptionally at Site 8 most fish were in the >20 cm category.

3. In both years there was no correlation between the **densities** of fishes counted and the relative positions of the survey sites east to west along the atoll.

4. In 1999 there was also no correlation between the **number of species** counted and the east/west position of the survey sites, but in 2001 a significant correlation did appear, both at the 10 m ($R^2 = 0.41$) and 20 m depths ($R^2 = 0.47$).

5. On coral reefs, fish diversity and habitat complexity are often linked (Ebeling and Hixon 1991; Sebens 1991; Turner *et al.* 1999; Williams 1991). In both 1999 and 2001 a distinction was made between benthic habitat whose structural integrity was still evident (live or dead coral), and habitat without such structural integrity (sand, rock and rubble). In 1999 no correlation was found between the **density** of fish, nor the **number of species**, and either the live or dead coral cover. In 2001 the analysis was slightly different, but a similar conclusion was drawn.

6. However, in 1999 an analysis of fish families that have species commonly associated with structurally complex habitat concluded that there were positive correlations amongst the Chaetodontidae, Labridae and Serranidae and live or dead coral. Although this association was not found amongst the Serranidae in 2001, it remained within the Chaetodontidae and Labridae, and was evident amongst the Pomacentridae at 20 m depth.

Although it is too early to establish any significant trends in Aldabra's fish populations, the nature of any long term study means that these will emerge in time. In particular, close attention should continue to be paid to the relationship between coral reef related species and reef structure. For example, the numbers of specific corallivorous Chaetodontids may prove to be an effective indicator of reef health (Crosby and Reese 1996).

Temperature

The temperature data for the marine environment at Aldabra being recorded by the loggers deployed during the February 2001 AMP expedition has a great potential to yield a valuable long-term data base for the atoll. This is based on the assessment of the temperature data provided by the Aldabra Station monitoring of three of the loggers, and by the seemingly flawless performance of these three loggers. The temperatures recorded at Site 1 at 10 m depth (Figure 25) show February through June 2001 monthly averages (Table 5) that track favourably with the monthly mean temperatures for these months for the period 1961-1996 (Figure 4). The potential for the encrusting growths developing on the loggers to affect the temperature readings, while suspected not to be a problem, will be tested on the next AMP expedition to Aldabra.

The Aldabra Marine Programme: Short Term and Long Term

The Aldabra Marine Programme has now established eleven permanent monitoring sites around Aldabra, seven of which have now been surveyed twice. These sites provide baseline data and will generate increasingly more important data as they are resurveyed on a yearly basis. Furthermore, as the information is gathered and analysed more questions about the atoll are generated, and therefore the scope to amplify the study.

After completing the 1999 survey, the AMP set out a list of five goals for the future. All of these goals have been achieved with the exception of the initiation of a study of mangrove ecosystem dynamics. AMP has therefore increased its research base in 2001 by:

- Continuing the fish and coral monitoring of permanent sites, and establishing one new long term site on the highly exposed southern shoreline;

- Establishing permanent monitoring sites in the lagoon and Passe Houareau channel;

- Initiating a coral recruitment study in the lagoon and outer reef slopes, and tagging corals to follow their survival and growth;

- Deploying temperature data loggers;

There was also the opportunity to train Aldabra staff in survey techniques for coral recruitment and echinoderm population assessment, and to discuss suitable monitoring programmes for the station staff. AMP remains committed to training Seychellois rangers in marine survey techniques and hopes to continue doing so in the future.

A long term marine science programme for Aldabra has now been established by AMP. Future surveys will continue to monitor the permanent sites and it is hoped that another site will be set up on the southern coastline along with further lagoon sites. The team also aims to improve the scope of the physical marine monitoring and expand the lagoon work, hopefully by appointing a PhD student.

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