

CAIRNS/XYZ

THE CROWN-OF-THORNS STUDY

1985

An assessment of the distribution and effects  
of the starfish Acanthaster planci (L.) on  
the Great Barrier Reef:

6. CAIRNS SECTOR

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**The Crown-of-Thorns Study**

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**6. Cairns Sector**

COT-CCEP TEAM

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## Executive Summary

- 20 reefs were surveyed in the Cairns Sector.
- Only one (1) Acanthaster planci was found during this survey (on Michaelmas Reef).
- Six reefs (Norman, Hastings, Arlington, Evening, Pickersgill and Green) showed evidence that might be attributed to past A. planci predation.

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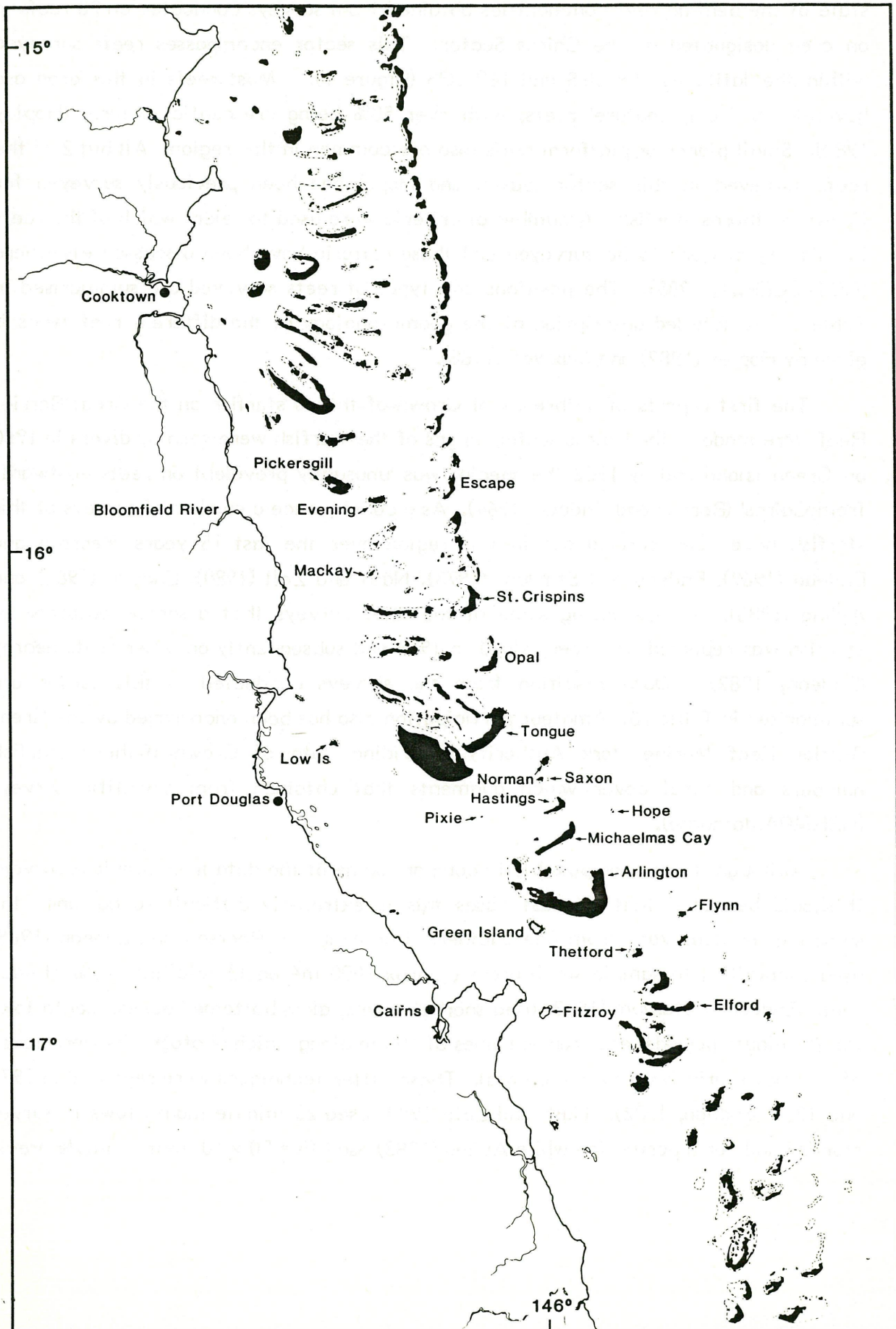
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Figure 1. Cairns sector map.





## INTRODUCTION

This report presents data on the abundance and distribution of A. planci and the state of the benthic reef communities obtained from surveys conducted on 20 reefs in an area designated as the Cairns Sector. This sector encompasses reefs surveyed within the latitudes 15° 50'S and 16° 60'S (Figure 1). Most reefs in this area are 'juvenile' or 'early mature' reefs, with over 50% being crescentic in form (Hopley 1982). Small planar or platform reefs also are common in this region. All but 2 of the reefs surveyed in this sector (Saxon and Hope) had been previously surveyed for Crown-of-thorns starfish. A number of criteria were used to select which of the reefs in this region were to be surveyed and these criteria have been discussed elsewhere (COT-CCEP.:1, 1985). The positions and types of reefs surveyed are summarised in Table 1. A detailed description of the geomorphology of the different reef types is given by Hopley (1982) and Maxwell (1968).

The first reports of outbreaks of Crown-of-thorns starfish on the Great Barrier Reef were made in the Cairns sector. Signs of the starfish were seen by divers in 1960 on Green Island and by 1962 the species was 'unusually prevalent on reefs eastwards from Cairns' (Barnes and Endean, 1964). As a consequence a number of surveys of this starfish have been carried out in this region over the last 15 years (Pearson and Endean (1969), Endean and Stablum (1973), Nash and Zell (1980), Endean (1982) and Ayling (1983). It was during some of the later surveys that a second outbreak of starfish was reported on Green Island in 1979 and subsequently on other reefs nearby (Endean, 1982). Data resulting from the surveys conducted in this sector are summarised in Table 10. Amateur participation also has been encouraged by the Great Barrier Reef Marine Park Authority, providing data of Crown-of-thorn starfish numbers and coral cover which augments that obtained from scientific surveys (GBRMPA database).

Although it has been possible to compare some of the data from previous surveys it should be noted that in most cases this is extremely difficult to do since the sampling methods vary from one another. For example, Pearson and Endean (1969) used snorkelling to sample small areas (approx 1000 m<sup>2</sup> each) totalling 2-3% of each reef. Endean & Stablum (1973) used snorkel swims, glass bottomed boxes, manta tows for 20 minute periods, and transect lines of 100 m along which photographs were taken of a 1 metre grid lying over the coral. These latter techniques were repeated in 1979 and 1981 (Endean, 1982). Nash and Zell (1980) used 20 minute manta tows to survey starfish and coral population while Ayling (1983) used five 50 x 10 metre sample areas.

For details of the methods used in this survey reference should be made to volume I of this series (COT-CCEP.:1,1985). The perimeters of all 20 reefs were surveyed using the manta tow method. In addition the 8 reefs designated as Priority I (Table I) were surveyed using benthic line transect techniques. The surveys were undertaken in November and December 1985 and January 1986 by scientists operating from the M.V. HERO.

Table 1. Classification, location and priority of reefs surveyed in the Cairns sector.

Name	Code No.*	Position	Priority	Reef Type*	Survey date
Escape	15094	15°53'S 145°51'E	2	Ribbon	2/1/86
Pickersgill	15093	15°53'S 145°35'E	2	Lagoonal	25/11/85
Evening	15095	15°54'S 145°40'E	2	Planar	26/11/85
Mackay	16015	16°3'S 145°39'E	2	Planar; sand cay	26/11/85
St. Crispin	16019	16°7'S 145°51'E	1	Crescentic	3/1/86
Opal	16025	16°13'S 145°54'E	1	Crescentic	4/1/86
Tongue	16026	16°2'S 145°44'E	2	Crescentic	5/1/86
Low Isles	16028	16°23'S 145°34'E	1	Planar; low wooded isl.	27/11/85
Norman	16030	16°25'S 146°0'E	2	Planar	8/1/86
Saxon	16032	16°28'S 146°0'E	2	Planar	8/1/86
Hope	16058	16°31'S 146°8'E	2	Submerged	11/1/86
Hastings	16057	16°31'S 146°1'E	1	Crescentic	7/1/86
Pixie	16040	16°52'S 145°57'E	2	Planar	6/1/86
Michaelmas	16060	16°35'S 146°1'E	1	Crescentic; veg. sand cay	8-9/1/86
Arlington	16064	16°43'S 146°3'E	1	Crescentic	9-10-11/1/86
Flynn	16065	16°44'S 146°16'E	2	Planar	20/12/85
Green Is.	16049	16°46'S 145°58'E	1	Planar; veg. sand cay	12-13/1/86
Thetford	16068	16°48'S 146°11'E	2	Crescentic	19/12/85
Elford	16073	16°55'S 146°17'E	2	Crescentic	20/12/85
Fitzroy	16054	16°56'S 146°0'E	1	Fringing; high cont.	28/11/85

\* Drawn from the Great Barrier Reef Gazetteer

## RESULTS

PRIORITY 1 REEFSST. CRISPIN

St. Crispin is a crescentic outer barrier reef comprising one large reef (Section A) and two smaller reefs (Sections B & C)(Figure 2a). Its exposed seaward side rises steeply from a sand base at 15 m to the reef crest, becoming more gradual midway along the front. No A. planci were found during this survey and no recent areas of dead coral were recorded. The results of the manta tow survey of this reef are presented in Figure 2a.

Coral cover along the reef fronts of all sections consistently ranged from 30 to 75 percent. Tabulate and branching Acropora and some Porites species appeared to be the most visually dominant corals. Soft corals were abundant on the south-eastern slopes while dead standing corals were few (1-10 percent).

The backs of the 3 reefs consisted of extensive sand areas with patches of staghorn Acropora and massive corals. Live coral cover in these areas ranged from 0-30 percent. Increased amounts of dead standing coral also were recorded (10-30 percent) consisting mainly of staghorn Acropora. The median live and dead coral cover values for this reef were categories 2 and 1 respectively (Table 10a).

A transect site was selected on the south-eastern front of Section A (Figure 2a), where the reef slope was gradual. Coral cover remained moderate (22-27 percent) throughout and comprised mainly branching forms of both Acropora and non-Acropora.

The benthic community at 3 m was dominated by soft corals followed by algal covered dead coral. The presence of this latter group (14.7 - 19.1 percent) suggests the possibility of recent starfish predation in the area. The major component of the community at 6 m was algal assemblage. Sand and rubble were the main benthic component at 12 m depth.

The back reef site comprised large amounts of algal assemblage (22.8 - 39.2 percent) and sand and rubble (13.6 - 35.7 percent). The latter group increased in importance over the former with increasing depth. Algal covered dead coral was common at 3 m and 12 m (16.8 - 11.8 percent respectively) but not at 6 m (1 percent). This corresponded with a rise in live coral cover (7.59 percent at 3 m) at this depth (29.4 percent). Non-Acropora were moderately abundant along the 12 m transect while branching Acropora were low in abundance (0.6 percent). Fewer soft corals were present on the back of the reef.

Ayling (1983) reported 3 A. planci and coral cover of 5-40 percent during surveys of this reef in 1983. Prior to this 14 individuals were reported in 1982 (GBRMPA database) while no A. planci were found in 1970 (GBRMPA database).

### OPAL REEF

Opal Reef is a crescentic reef comprising 3 sections. The front slopes of each section were generally steep with periodic spur and groove systems. The results of the manta tow surveys of this reef are presented in Figure 3a. No A. planci were reported and there was no evidence of recent feeding scars.

Live coral cover was moderate to high across the exposed slopes of each reef (30-50 percent). The most common corals in these areas were branching and encrusting Acropora and Montipora and Pocillopora spp. Most coral colonies were small, being less than 1 m in diameter. Crustose coralline algae was present on the reef slopes and reef crest.

A reduction in live coral cover was recorded along the backslopes of Sections A and B (1-10 percent). Pockets of higher dead coral cover (10-30 percent) were recorded in these areas and they mainly consisted of staghorn Acropora covered with algae. The back reef slopes of sections A and B were characteristically more shallow than the front slopes and had large areas of sand and rubble.

The third section had good live coral cover around almost its entire perimeter, with highest values (30-50 percent) being recorded on the south-western corner and lowest values being observed along the south-eastern front. This latter area was mainly composed of massives (10-30 percent) less than 3 m in diameter. Dead standing coral remained low (1-10 percent) on this section of reef. The median live and dead coral cover values were categories 2 and 1 respectively (Table 10a).

A front reef transect site was located on the southern slopes of Section B. The main benthic life forms at this site were coralline algae, algal assemblages, and algal covered corals. Live coral cover remained between 16-19 percent at all depths. Small branching Acropora were common at 3 m while non-Acropora, particularly numerous small encrusting forms, dominated the hard corals at 12 m depth. Small soft corals occurred repeatedly at 3 m and their abundance was reduced only slightly with depth. The presence of water as a significant abiotic component reflects the presence of spur and groove systems as noted on the manta survey. This was not the case at the back reef transect site on section B. Here the shallows (3 m) comprised mainly sand slopes which were littered with dead algal covered corals (25.7 percent). The few Acropora

that were present at this site were mainly branching in form. In general, the coral community at this site was restricted to small massive and encrusting non-Acropora. Of the 3 dominant life forms, coralline algae was replaced by algal assemblages as the dominant life form with increased depth, while soft corals and sponges remained poor. Since the sand slopes levelled off at around 10 m a 12 m transect was not possible.

No outbreaks of A. plani have been observed on Opal reef despite being surveyed on several occasions over the last 20 years. In 1966 only 9 starfish were found (Pearson & Edean, 1969). None were found in 1970 (GBRMPA database) and high coral cover was reported (80 percent). In 1983 only 1 starfish was found (Ayling, 1983) with coral cover remaining high (10-70 percent).

### LOW ISLES

The Low Isles is a low wooded island with patch reef. The results of the manta tow survey of this reef are given in Figure 4a.

Live coral cover was high (30-75 percent) along the eastern front of the reef (tows 7-17), decreasing westwards to 10-30 percent. The gentle back reef slopes had little live coral (1-10 percent) which occurred only as small outcrops on the sandy slopes. Massive corals less than 1 metre in diameter were common on the southern slopes, particularly the south-eastern corner. Dead coral cover remained low on the front slopes (1-10 percent) and was absent or in patches of 1-10 percent on the back of the reef.

No Crown-of-thorns or recently dead coral were sighted during the survey. The median values for live and dead coral cover were categories 2 and 1 respectively (Table 10a).

Live coral cover along the 3 m transect at the reef front site was good (40.1 percent) consisting of both branching and submassive Acropora, and massive and submassive non-Acropora. Dead algal covered coral was low in abundance at this site. Soft corals were common, along with algal assemblages.

At 6m depth there was a marked decrease in the cover of Acropora and an increase in the cover of non-Acropora, particularly submassives (12.2 percent). Similarly there was a decrease in the cover of soft corals and an increase in the cover of algal assemblages (47.4 percent). However, at 12 m the community was dominated by sand and rubble (55.4 percent) and the cover of hard corals and soft corals was greatly reduced.

Hard coral cover at 3 m depth on the back reef site was almost restricted to non-Acropora, particularly massive and submassive forms (25.2 percent). Apart from non-Acropora, algal assemblages and soft corals also were common life forms (22-25 percent) at this depth. Patches of sand and rubble were found in moderate amounts (20 percent) along this transect. Beyond this depth the slope was comprised completely of sand and rubble.

This reef was first surveyed in 1966 by Pearson and Endeane (1969). At that time they reported between 10 and 20 A. planci on the front of the reef. Ayling (1983) reported only 1 A. planci in 1983 and estimated coral cover to be very poor with extensive beds of soft corals.

### HASTINGS REEF

Hastings Reef is a crescentic reef with gently grading slopes around most of its perimeter. The results of the manta tow survey of this reef are presented in Figure 5a.

For most of the reef front live coral cover was generally moderate (10-30 percent) and composed of small colonies. On the north-eastern front (tows 1-6) higher coral cover was found (30-50 percent). Patches of sand and rubble appeared regularly, as did soft corals. Dead standing coral cover was low (1-10 percent).

The back reef slopes showed greater benthic variation along their length. Northward from the south-western corner (tows 31-39) numerous small colonies of branching and tabulate Acropora were recorded (30-50 percent). Soft corals were well established while dead standing coral remained low at 1-10 percent. However, further to the north (tows 40-58) large areas of dead standing coral, mainly staghorn Acropora, were present (30-50 percent) and live coral cover was reduced to 1-10 percent. Large areas of sand occurred between tows 59 and 70 along with numerous massive corals of all sizes. The median values for live and dead coral cover were categories 2 and 1 respectively (Table 10a).

The front transect site was located on the north-eastern corner of the reef (Figure 5a). The substitute at 3 m depth was well covered by hard corals (62 percent), particularly branching and tabulate Acropora. This figure declined greatly at 6 m where the major life forms were soft corals. Algal assemblages dominated the community at 12 m. There was a small increase with depth in the cover of non-Acropora, especially encrusting forms.

Dead coral cover at this site was relatively constant over all depths (7-10 percent), while the scalloped nature of the slope was reflected by the low values for sand and rubble and the high values for water.

A 12 m transect was not undertaken at the back reef site (tow 50), as the slope levelled off before this depth was reached. Coral cover was much reduced at this site, comprising mainly massive and encrusting non-Acropora (10-14 percent). The main lifeforms at 3 m and 6 m were algal assemblages and dead algal covered corals (20-26 percent). Sand and rubble was relatively common (15-24 percent), as were soft corals (8-10 percent). The low coral cover and high dead standing coral cover suggest that this reef may have experienced a recent outbreak of A. planci. This is likely since during 1984 a total of 140 A. planci were counted on the back reef (GBRMPA Database). Previous surveys in 1981 counted 3 individuals (GBRMPA database) and in 1983 good coral cover (60 percent) was reported (Ayling (1983).

### MICHAELMAS REEF

Michaelmas Reef is a crescentic reef with a vegetated sand cay on its south-western corner. The results of the manta tow survey of this reef are given in Figure 6a.

Live coral cover was low (10-30 percent) for most of the front, increasing to 30-50 percent in patches towards both the south-western and north-eastern corners where small colonies of branching and tabulate Acropora were recorded (30-50 percent). Dead standing coral cover was low (1-10 percent) over the whole front. The cover of soft corals increased towards the middle of the front.

The back of the reef comprised an extensive sand area with isolated outcrops of coralline substrate. Live coral cover was low (1-30 percent) and was patchily distributed. Large patch reefs were scattered along the gentle slopes of the south-western corner along with isolated coral colonies of tabulate and branching Acropora. A single A. planci was found on a patch reef (tow 91) feeding on top of a small branching Acropora. There was little evidence of more extensive damage or other A. planci. Dead coral cover was very low (1-10 percent) on the back of the reef. The median values for live and dead coral were categories 2 and 1 respectively (Table 10a).

The front transect site was located midway along the windward side of the reef. Live coral cover at 3 m was about 36 percent with dead coral cover comprising just over 12% of the substrate. Overall, the cover of branching Acropora decreased as



the depth increased, while the cover of non-Acropora increased with depth. Coralline algae decreased in cover with depth and was replaced by Halimeda and algal assemblage. Dead algal covered coral was relatively common at all depths.

The back reef transect site was located on one of the isolated patch reefs along the leeward side of the reef. Live coral cover at 3 m was also about 36% and comprised mainly tabulate Acropora. This level of cover, mostly non-Acropora, diminished with increasing depth to be only 13 percent at 12 m. Soft corals were quite common at all depths (25-33 percent) while algal assemblages were most prominent at 6 m (17 percent). The cover of sand and rubble was recorded as increasing with depth to a figure of 28 percent at 12 m.

Previous A. planci sightings on this reef date from 1966 (Pearson and Endean, 1969). Live coral cover was reported as 'slight' and dead standing coral as 'high' on a subsequent survey on the back of the reef in 1970 (GBRMPA database). The reverse of this was reported for the front slopes (Endean and Stablum, 1973). More recently, low live and dead coral cover were reported during surveys in 1983 (Ayling 1983) (GBRMPA database).

### ARLINGTON REEF

Arlington Reef is a crescentic reef and is the largest reef surveyed in this sector. The results of the manta tow survey are presented in Figure 7a.

Live coral cover on the steep east and south-eastern windward slopes was generally 10-30 percent increasing to 50 percent in patches to the north. Soft corals were common and dead standing coral cover remained low (at 1-10 percent) in this area. A notable increase in dead coral cover (75-100 percent) was recorded along the western end of the reef front (comprising patches of tabulate Acropora) while live coral cover was much reduced (1-10 percent).

Sand slopes were found in the south-western corner, as were patches of live coral (in the range 10-50 percent) (tows 117, 118). Overall, live coral cover was in the range 1-10 percent in this area.

The back reef consisted of isolated patch reefs of dead staghorn coral, and sand and rubble slopes. Live coral cover was low to moderate in this area (1-30 percent). Similar values were recorded for dead coral cover.

The transect site on the front of Arlington Reef was located on the southern slopes where the reef descends steeply onto a sand slope, merging as broken coral outcrops. Hard coral cover was low at this site, comprising mainly small encrusting

Acropora. Dead coral cover was moderate (14-25 percent) while the main benthic components at each depth were generally algae, and sand and rubble. Soft corals and sponges were present but restricted to small patches. As depth increased the hard substrate gave way to a community dominated by sand and rubble.

The back reef site (Figure 7a) consisted of gradual sand slopes levelling off above 12 m depth. Again, live coral cover was very low and comprised mainly small, massive non-Acropora colonies. Dead coral cover was relatively common, although algal cover was much reduced. The major life form components at 3 m and 6 m depths were soft corals, colonising most of the consolidated substrate (approximately 50 percent cover at 6 m). Sand and rubble increased greatly with depth. No 12 m transect was surveyed because the site was too shallow.

This reef has a history of outbreaks of A. planci similar to Green Island (Pearson and Endean, 1969; Endean, 1982). Recently 3 starfish were sighted by Ayling (1983) and live coral cover was recorded at 10-40 percent.

### GREEN ISLAND

Green Island is a small vegetated cay surrounded by a broad reef flat which extends towards the south east and remains submerged at all tides. The reef flat is composed of sand and coralline rubble and outcrops of solid substrate. The perimeter of the reef slopes gradually except in the north-west where it is much steeper. The results of the manta tow survey of this reef are given in Figure 8a.

Small colonies of branching and tabulate Acropora (10-30 percent) were noticeable along the north-western and south-western slopes. However, live coral cover over the entire reef was low (1-10 percent). Dead coral cover, comprising mainly dense patches of branching and massive Porites, was moderate to high (10-50 percent) rising to 50-75 percent in the south-western part of the reef.

No A. planci were found during the survey but the effects of the previous outbreak were obvious. The median values for live and dead coral cover were categories 1 and 2 respectively (Table 10a).

The front transect site (tow 35) was located in a relatively broken and undulating area, consisting of patch reefs rising from a gently shelving substrate. A 12 m transect was not surveyed as the site was not deep enough.

Hard coral cover was low (approximately 12-14 percent) along the 3 m transect at this site. It comprised mainly remnant massive corals (Porites) and foliose corals. Most massive corals were algal covered and dead coral cover was moderate (15-19 percent).

Apart from sand and rubble, sponges occupied most of the substrate at 3 m (33.6 percent) and 6 m (21 percent). Algal assemblages covered between 11 and 19 percent of the total substrate.

The more steeply sloping back reef site (tow 15) had an increased cover of dead coral (20-25 percent) at all depths. Live coral cover was very low (less than 5.2 percent) while algae and soft corals were the dominant organisms at each depth. Another important component at this site was sand and rubble.

A. planci were reported on Green Island as early as 1962 (Barnes and Endean, 1964) with large numbers causing extensive damage in 1966-67 (Pearson and Endean, 1969) and 1979-81 (Endean, 1982). Minimal live coral cover (< 5%) was reported in 1983 (Ayling, 1983).

### FITZROY ISLAND

Fitzroy Island is a high continental island which is surrounded by a fringing reef. The results of the manta tow survey are presented in Figure 9a.

Live coral cover was moderate on the front of the reef (10-30 percent) and poor on the back of the reef (1-10 percent). Dead coral cover also was low on the reef (1-10%) while small soft corals were noted in abundance on the windward slopes. The median values for live and dead coral were categories 2 and 1 respectively (Table 10a). The position of the front reef transect site is given in Figure 9a.

Live coral cover was most common at 6 m (56.9 percent) where branching Acropora occupied 34.2 percent of the benthic substrate. Although hard coral cover was reduced (28.2 percent), on the lower slopes (12 m) it comprised a variety of forms of non-Acropora.

Dead coral cover was low at this site while the cover of algae was relatively high comprising a mixture of types (turf, coralline and algal assemblage). The cover of this latter category declined with depth. Small colonies of soft corals were well established at 3 m but they also decreased in cover with depth. Sand and rubble became the major benthic component at 12 m depth.

The more gentle slopes of the back reef allowed transects at only 3 and 6 m to be undertaken. Hard coral colonies were well established at both depths (58 percent and 64 percent). Generally, these were small, and comprised numerous branching Acropora and submassive non-Acropora. Non-Acropora were found extensively at 6 m (46.9 percent) while dead algal covered coral and algal assemblage contributed little to the overall benthic cover. Small colonies of soft corals were well established at



## PRIORITY 2 REEFS

### ESCAPE REEF

Escape Reef is a ribbon reef comprised of three separate sections. It has a well defined front which rises from a sand base at 15 m and alternates between spur and groove systems and steep dropoffs, with more gentle slopes to the south. The back reef area slopes more gradually throughout.

No A. planci were found on this survey nor were any recent feeding scars. The results of the survey are given in Figure 10a.

The reef fronts of both sections had a live coral cover of 30-50 percent, predominantly of branching and tabulate Acropora. Hard coral cover increased to the north (50-70 percent) and decreased to the south (10-30 percent). Fifteen A. planci were reported on the south of the reef in 1982. A coral cover of 70 percent was noted (GBRMPA database) at that time.

Dead standing coral remained at 1-10 percent along the front of the B sections.

Hard coral colonies were fewer and more scattered along the back of the reefs (10-30 percent), with increased dead standing corals on section B (30-50 percent). Massive coral colonies were more numerous on section A which had more extensive areas of high coral cover (30-70 percent). The median values for live and dead coral cover over the whole reef were categories 3 and 1 respectively (Table 10a).

### PICKERSGILL REEF

Pickersgill reef is a lagoonal reef which has a well defined front with steep slopes.

Live coral cover along the front was consistently low (<10 percent), rising occasionally to 10-30 percent near the crest, where small colonies of tabulate Acropora, scattered patches of branching Acropora and small massives were found. The highest live coral cover (30-50 percent) was recorded towards the north-western end of the reef where dense patches of Acropora were recorded.

Dead coral cover was consistently high around the reef (30-50 percent), composed mainly of broken staghorn Acropora. Extensive (30-50 percent) areas of dead coral (mostly Acropora staghorn) were recorded on the back of the reef although this decreased towards the north-western corner. The median values for live and dead coral cover for the reef were categories 1 and 2 respectively (Table 10a).

A. planci have been reported on Pickersgill since 1966 (Pearson & Endean, 1969). The highest numbers were reported during 1981-82 on the back of the reef (GBRMPA database) along with reduced live coral cover and high dead coral cover.

### EVENING REEF

Evening Reef is a mid shelf planar reef. The continuous front of this reef has a gentle gradient which slopes from the south-east to the north-east. The back of the reef is broken up and includes a number of bays and bommies. The results of the survey of this reef are presented in Figure 12a.

Coral cover was good along the reef front, ranging from 30 to 75 percent (tow 1), with less than 10 percent dead coral cover. Higher amounts of dead coral cover were recorded along the back of the reef, ranging from 10-30 percent. This consisted almost exclusively of staghorn Acropora.

Live coral cover on the back of the reef declined to 10-30 percent as this region comprised mostly small colonies of massives scattered over the sand slopes. Soft corals were well established on both front and back reefs.

No Crown-of-thorns were observed during this survey although the extent of coral mortality, particularly on the back of the reef, suggests previous heavy predation. No A. planci were found on this reef in 1966 (Pearson and Endean, 1969), but numerous A. planci were reported on the back slopes in 1979 (GBRMPA database). The median values for live and dead coral cover for this reef were categories 2 and 1 respectively (Table 10a).

### MACKAY REEF

Mackay Reef also is a planar reef with a sand cay. No A. planci were found during the manta tow surveys of this reef. The results are given in Figure 13a.

Live coral cover along the eastern front reef was low to moderate (1-30 percent) and many small massives were observed on the sand slopes. Dead coral cover was low (1-10 percent) in this area. Although live coral cover on the back reef slopes was similar to that along the front of the reef, slightly higher values for dead coral cover (10-30 percent) were recorded. Few massives were reported in this area.

Large numbers of A. planci were reported on this reef in 1966 (Pearson and Endean, 1969) while much lower figures were recorded during the following year (Pearson and Endean, 1969). Reports in 1982 suggested that the back of this reef was

"devastated" while the front was "healthy", though only a few A. planci were found (GBRMPA database).

### TONGUE REEF

Tongue Reef is a patch reef composed of three sections. The largest section (C) lies in a north/south aspect while the smaller sections (A and B) extend to the west. The reef slopes on the front of sections A and B were steep with spur and groove systems present while this area on Section C was more gentle. The back reef areas of all sections remained broad and flat.

No Crown-of-thorns were sighted during this survey, the results of which are presented in Figure 14a.

Live coral cover was moderate to low (10-30 percent to 1-10 percent) over the majority of the front and back slopes. However increases were noted along the eastern slopes of each section, particularly sections A and C (10-50 percent). Here tabulate and branching corals, along with soft corals, were common.

Dead standing coral cover increased to 10-30 percent in small patches on the slopes of all sections. High levels of dead coral cover were recorded along the southern slopes of section C where extensive areas of dead staghorn coral were observed.

The backs of each section had large areas of sand with live and dead coral cover, each comprising only 1-10 percent of the total benthic cover. Since the back of section C consisted solely of isolated patch reefs surrounded by sand, spot checks were carried out in preference to towing.

Crown-of-thorns were first sighted in 1966 on the back of this reef (Pearson & Endean, 1969). Few A. planci (and good coral cover) have been reported since 1980 (GBRMPA database) (Ayling, 1983). The median live and dead coral cover values for this reef were categories 2 and 1 respectively (Table 10a).

### NORMAN REEF

Norman Reef is a planar shaped reef located on the outer shelf. The reef front comprised a typical spur and groove system which supported low profile branching and tabulate Acropora.

No A. planci were recorded during this survey, the results of which are given in Figure 15a.

Live coral cover ranged from 30-75 percent throughout the reef, although dense patches of tabulate Acropora increased this figure to 75-100 percent (tows 8,9,12) on the steeper south-west slopes. Massive corals, particularly Porites, were common throughout as were soft corals.

Dead coral cover was low (1-10 percent) over much of the reef, increasing only slightly in patches. Dense patches of dead staghorn Acropora with live tips occurred on the back of the reef, suggesting that this part of the reef may have been recovering from a relatively recent outbreak of A. planci.

This reef has been surveyed only once before, in 1966 (Pearson & Edean, 1969). During that time only 1 A. planci was reported on the back of the reef. The median values for live and dead coral cover for this reef were categories 3 and 1 respectively (Table 10a).

### SAXON REEF

Saxon Reef is a small planar reef which has not been recorded as having been surveyed in the past.

No Crown-of-thorns were observed during the present survey of this reef. The survey results are presented in Figure 16a.

Live coral cover was generally high around the reef perimeter, ranging from 30-75 percent with highest values being recorded along the front of the reef (50-75 percent).

Dead coral cover was consistently low (1-10 percent) over the entire reef and there was no evidence of recent Crown-of-thorns predation. The median live and dead coral cover values for this reef were categories 4 and 1 respectively (Table 10a).

### PIXIE REEF

Pixie Reef is a planar reef.

Live coral cover was generally low to moderate (10-30 percent) on this reef, comprising mainly branching Acropora which were particularly common around the front of the reef. Moderate levels of dead coral cover were recorded along both the front and back slopes (10-30 percent). This consisted of mainly staghorn Acropora as



well as patches of dead tabulates and some massive corals. Live coral cover was 1-30 percent on the back of the reef.

Although no Crown-of-thorns were sighted during this survey, the presence of extensive areas of algal covered dead standing corals on the south-eastern slopes suggests that the reef had experienced a recent outbreak. This would seem to be the case since 100 Crown-of-thorns were sighted on the back of this reef in 1980 (GBRMPA database). At that time coral cover was described as very good with little dead coral. The median live and dead coral cover values for this reef were categories 2 and 2 respectively (Table 10a).

### HOPE REEF

Hope Reef is a small submerged reef. Its front and back slopes drop steeply to a sand floor at 15 m depth.

No A. planci were observed during this survey, the results of which are presented in Figure 18a.

The front slopes had high levels of live coral cover (50-100 percent) which comprised mainly large tabulates and smaller colonies of branching Acropora. Conversely, there was little dead coral cover (1-10 percent) and few massives in this area.

The back of the reef had lower levels of live coral cover (30-50 percent) which decreased on the north-western corner. Most coral colonies were relatively small (<1 m) except for some tabulate Acropora (>1 m).

Dead coral cover was low (1-10 percent) over the whole reef and mainly consisted of isolated patches of dead Acropora. Soft corals were noted to be fairly common throughout the reef.

Four A. planci were reported on the eastern side of this reef during the survey by Pearson in 1970 (GBRMPA database). Live coral cover for the area at that time was estimated to be 90 percent. The median live and dead coral cover values were categories 3 and 1 respectively (Table 10a).

## FLYNN REEF

Flynn Reef is a planar reef which lies on the edge of the continental shelf.

No Crown-of-thorns were sighted on this survey, the results of which are given in Figure 19a.

Moderate live coral cover (10-50 percent) was recorded along both the front and back slopes of this reef. Numerous small massives were observed during the survey of these areas.

Dead coral cover was low (1-10 percent) over the entire reef and several small patches of dead staghorn corals were observed along the front of the reef (10-30 percent).

More than 40 A. planci were reported on the reef front and a further 15 individuals were sighted on the back of the reef in 1970 (GBRMPA database). Coral cover was recorded as being high in both areas at that time (Endean and Stablum, 1973). High levels of coral cover (30-70 percent) were reported for this reef in 1983 (Ayling 1983).

The median live and dead coral cover values for this reef were categories 2 and 1 respectively (Table 10a).

## THETFORD REEF

The results of the manta tow survey of this crescentic reef are given in Figure 20a.

High live coral cover (30-50 percent) was recorded along the front slopes of this reef with patches of 50-75 percent occurring on the steeper south-eastern slopes. Soft corals were well established over much of the reef while massive corals (mainly Porites) were more numerous towards the north-western corner. Although, feeding scars were observed on the south-eastern front, no A. planci were recorded over the entire reef.

The back of the reef was more irregular than the front and was broken into several small patch reefs and isolated coral outcrops. Live coral cover declined as the survey moved northwards along the back reef to the north-eastern slopes (1-30 percent). Dead coral cover was low over much of the reef (1-10 percent).

Only 1 A. planci was observed during surveys in 1966 (Pearson & Endean, 1969). Starfish numbers remained low and coral cover remained high throughout subsequent surveys (Endean and Stablum, 1973) (GBRMPA database). In April 1985, 135 A. planci

were reported on the back of this reef (GBRMPA database). Coral cover was estimated at 90 percent at that time. The median values for live and dead coral cover were categories 3 and 1 respectively (Table 10a).

### ELFORD REEF

The results of the manta tow of this crescentic reef are given in Figure 21a.

Live coral cover was moderate to high (10-50 percent) over most of the reef. On the steeper south-eastern slopes it ranged from 30-50 percent. Soft corals were well established in this area. Dead coral cover was consistently low (1-10 percent) on the reef with occasional dense patches of dead staghorn Acropora (10-30 percent). Further to the west, live coral cover was 10-30 percent, being augmented by large numbers of small massives (mainly of the genus Porites). The back reef slope had a similar cover of live coral (10-30 percent) with areas of numerous small massives.

Pearson and Endean (1969) reported 21 A. planci on the back of this reef in 1966. A similar number were reported in 1981 (GBRMPA database). The median live and dead coral cover values for this reef were categories 2 and 1 respectively (Table 10a).

## DISCUSSIONS

For comparative purposes, the 20 reefs surveyed in the Cairns sector have been divided into Inner, Mid and Outer Shelf categories.

### OUTER SHELF REEFS

Escape, Hope, Flynn, Saxon, Norman, Opal and St. Crispin Reefs occur near the edge of the continental shelf. Few surveys have been made of these reefs and only one reef, St. Crispin, was reported as having large numbers of A. planci (Pearson & Eudean, 1969). Generally, the median for live coral cover was 30-50 percent for all slopes, with patches of higher cover (75-100 percent) on Norman and Hope Reefs. Median dead standing coral cover was low (1-10 percent), with patches of dead Acropora staghorn (10-30%) observed on Flynn Reef. On Norman Reef similar patches of dead standing coral were found with live tips. Small colonies of soft coral were common on most reef slopes while massive corals, mainly porites, were irregularly distributed.

The composition of the benthic cover differed noticeably between the two Priority I reefs, St. Crispin and Opal. Coralline algae dominated the seaward slope of Opal Reef, perhaps due to the steep gradient. The front slopes of St. Crispin support a more varied community with a greater overall cover of live and dead coral.

The back reef communities of Opal and St. Crispin Reefs differ less. Both have a moderate cover of dead coral and few Acropora, perhaps indicating previous A. planci predation. A band of branching Acropora on St. Crispin Reef separating areas of dead coral may indicate an area completely missed by A. planci. Both reefs have very small coral colonies and appear to be undergoing localised regrowth and recolonisation by remnant Acropora and massives.

### MID SHELF REEFS

The mid shelf reefs surveyed were Pickersgill, Evening, Mackay, Tongue, Pixie, Hastings, Michaelmas, Arlington, Green Island, Thetford and Elford. Since 1966 seven of these reefs have had reported outbreaks of A. planci. Successive outbreaks have occurred on three reefs: Green Island, Arlington and Pickersgill.

The median live coral cover for the majority of these midshelf reefs was 10-30 percent on both front and back slopes. Patches of dense live coral, mainly staghorn, were found on Tongue (30-50 percent), and on Evening and Thetford Reefs (75-100 percent). Dead standing coral was low on the front slopes (1-10 percent), with patches of 10-30 percent cover. On back reefs, cover of dead standing coral was generally higher (10-30 percent). Pixie Reef returned 30-50 percent, whilst Arlington and Tongue Reefs had patches of 75-100 percent.

Both Arlington and Green Island have shared the same frequency of A. planci outbreaks since 1962, with limited periods between for regrowth. The most recent outbreak occurred in 1979-80 (Endean, 1982) and few A. planci have been reported in the last five years. Coral cover on both Arlington and Green Island remains very low with small patches of surviving massives (mainly Porites), encrusting and foliose corals. Acropora are virtually absent. The major live components of both reefs are the algal assemblages and soft corals.

Michaelmas and Hastings Reefs, particularly towards the crest, show evidence of coral regrowth and recolonisation. Recent A. planci activity is suggested by the minimal Acropora cover and increased dead coral and algal component on the Hastings back reef. By contrast, Michaelmas Reef showed a more balanced community at both front and back sites with Acropora well established and algae and soft corals not particularly predominant. Michaelmas and Hasting Reefs represent post-outbreak recovery communities (Endean & Stablum, 1973), (Pearson, 1981).

## INNER SHELF REEFS

The two inner shelf reefs, Fitzroy and Low Isles, are both Priority I reefs.

On the seaward slopes Low Isles has higher coral cover than Fitzroy Island, with patches of 75 and 50 percent respectively. Both are similar on the back reefs where less live coral (1-10 percent) and few dead standing corals were recorded. Although there are few dead scleractinians both reefs have had reports of previous A. planci activity, particularly Fitzroy Island in 1966-68 (Pearson and Endean, 1969).

On the Fitzroy Island survey coral regrowth and recolonisation appeared extensive, particularly bands of branching Acropora and a range of non-Acropora. The same has occurred along the seaward Low Isles transect, and to a lesser extent on the back reef. This appears to support recovery estimates of 10-15 years (Pearson and Endean, 1969).

NOTES ON INTERPRETING DATA REPRESENTATIONS

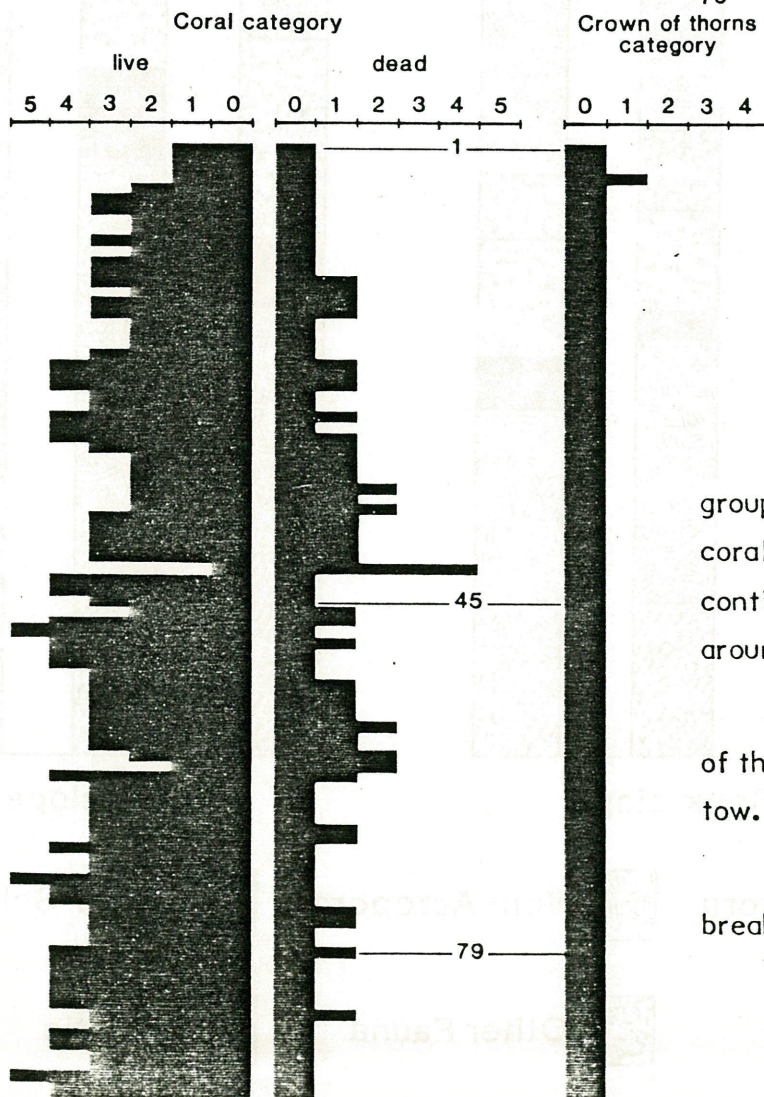
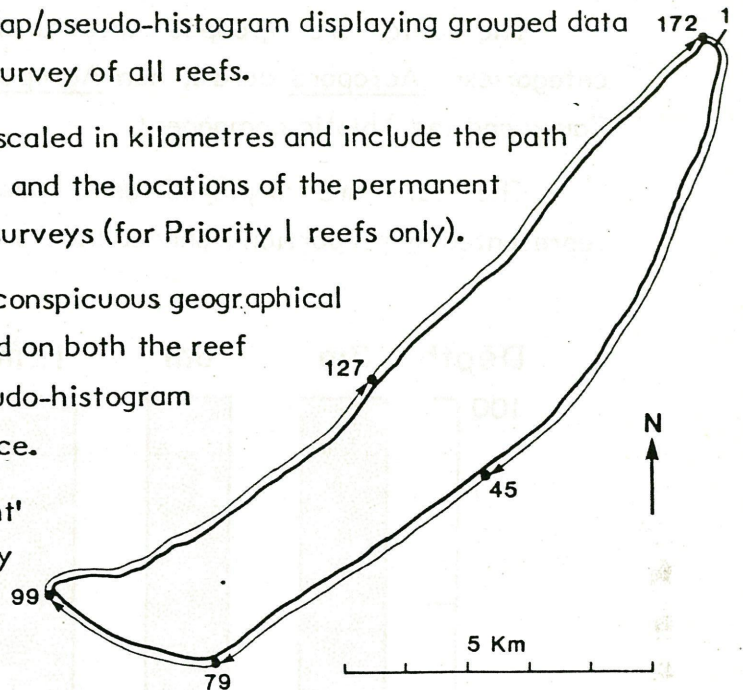
The graphic and tabular data representations designed for this report series are of 3 types.

1. The first is a combination map/pseudo-histogram displaying grouped data collected from the manta tow survey of all reefs.

Maps are oriented north, scaled in kilometres and include the path taken by the manta tow survey, and the locations of the permanent sites for the benthic life form surveys (for Priority I reefs only).

Tow numbers relating to conspicuous geographical and or data features are marked on both the reef map and the corresponding pseudo-histogram to facilitate easy cross reference.

The terms 'back' and 'front' are used on the maps of Priority I reefs to locate the benthic survey sites.



The pseudo-histograms display grouped data on live coral cover, dead coral cover and *A. planci* occurrences contiguously for every tow conducted around the perimeter of each reef.

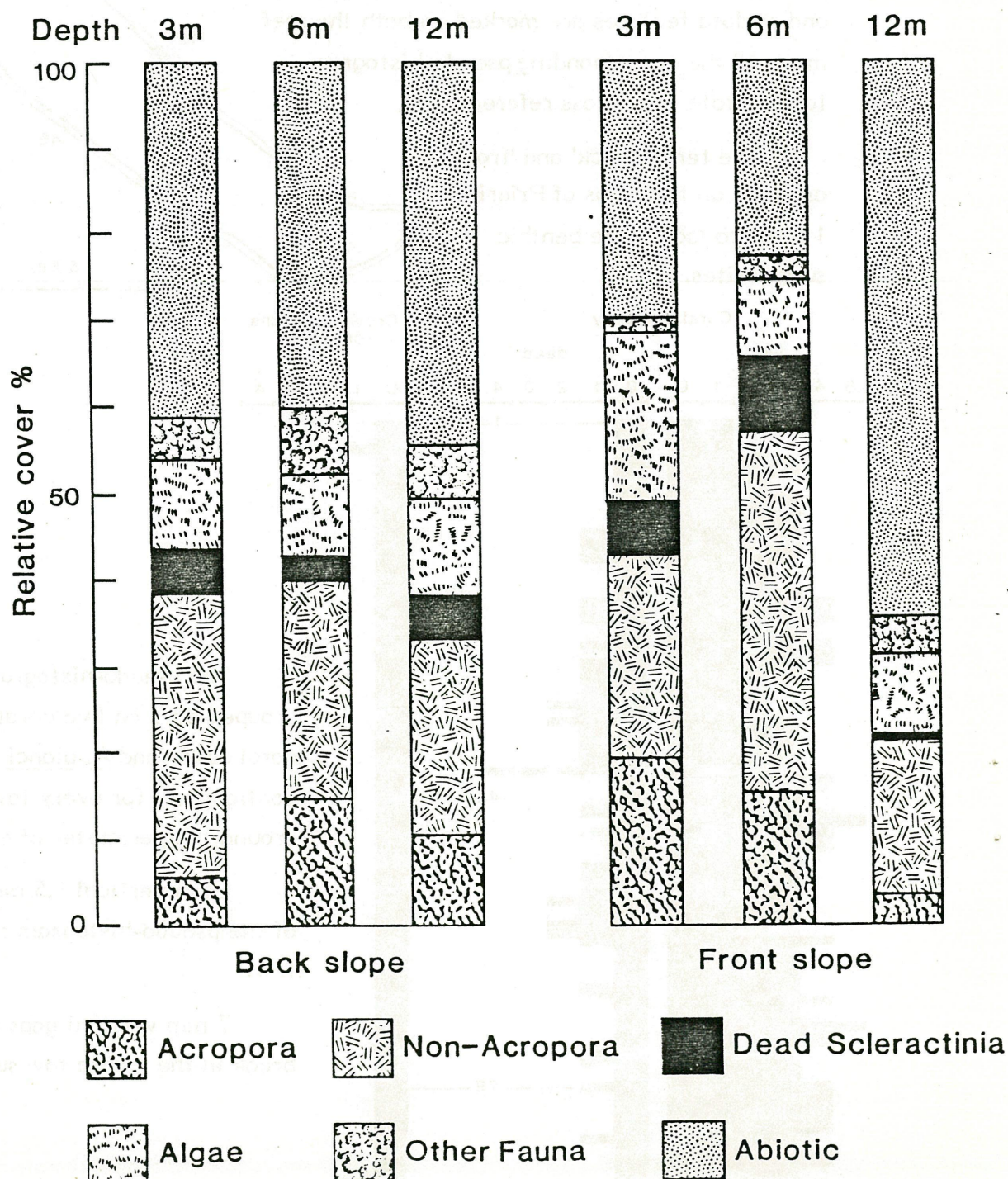
Each vertical 1.5 mm increment of the pseudo-histogram represents 1 tow.

7 mm vertical gaps represent a break in the manta tow survey.

2. Benthic transect survey data are initially displayed in the form of compound histograms (1 per reef) containing the data from each of the individual depth sites (up to 3 - at 3, 6 and 12 m) at each of the transect sites (back and front slope; with some noted variations).

The data are grouped into 6 broad structural-physiognomic life form categories: Acropora corals, non-Acropora corals, dead Scleractinia, Algae, Other Fauna and the Abiotic component.

The data are displayed as a percentage of the total substrate, and are represented by proportional shaded blocks.



3. The third form of data presentation is tabular. The benthic life form data are presented as relative cover and abundance tables for each Priority I reef.

The breakdown of data follows that used in the life form histograms, but also contains the full 21 sub-categories used to record the data in the field.

Also included are the category codes, actual occurrence numbers, and broad category totals (as a percentage of the total cover).

Date Sampled : 05/22/85		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	41	16.72		
Tabulate	ACT	3	1.88		
Encrusting	ACE	1	0.48		
Submassive	ACS	1	0.12		
				19.20	
<b>Non-Acropora</b>					
Branching	CB	11	2.34		
Massive	CM	45	13.61		
Encrusting	CE	16	3.84		
Submassive	CS	6	1.27		
Foliose	CF	5	2.41		
				23.47	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	10	5.95		
				5.95	
<b>Algae</b>					
Macro	MA	0	0.00		
Turf	TA	1	0.10		
Coralline	CA	5	1.47		
Halimeda	HA	0	0.00		
Algal assemblage	AA	47	17.82		
				19.39	
<b>Other Fauna</b>					
Soft Corals	SC	6	1.42		
Sponge	SP	2	0.45		
Other	OT	0	0.00		
				1.87	
<b>Abiotic</b>					
Sand & Rubble	SR	45	29.86		
Water	WA	1	0.26		
				30.12	



Figure 2a). Tow path, hard coral cover and *A. planici* numbers for: St. Crispin Reef.

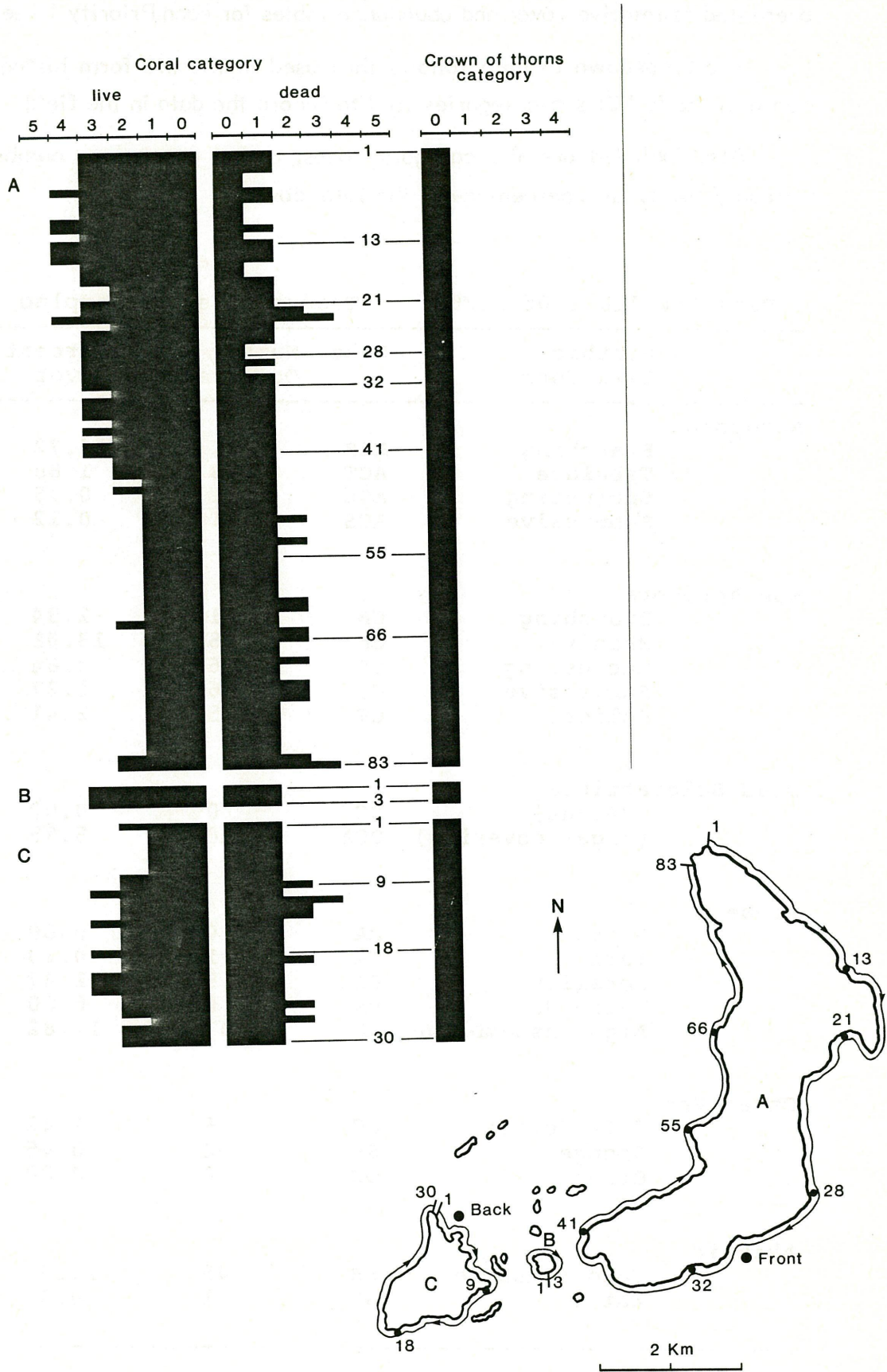


Figure 2b). Relative cover and abundance of life form categories on: St. Crispin Reef.

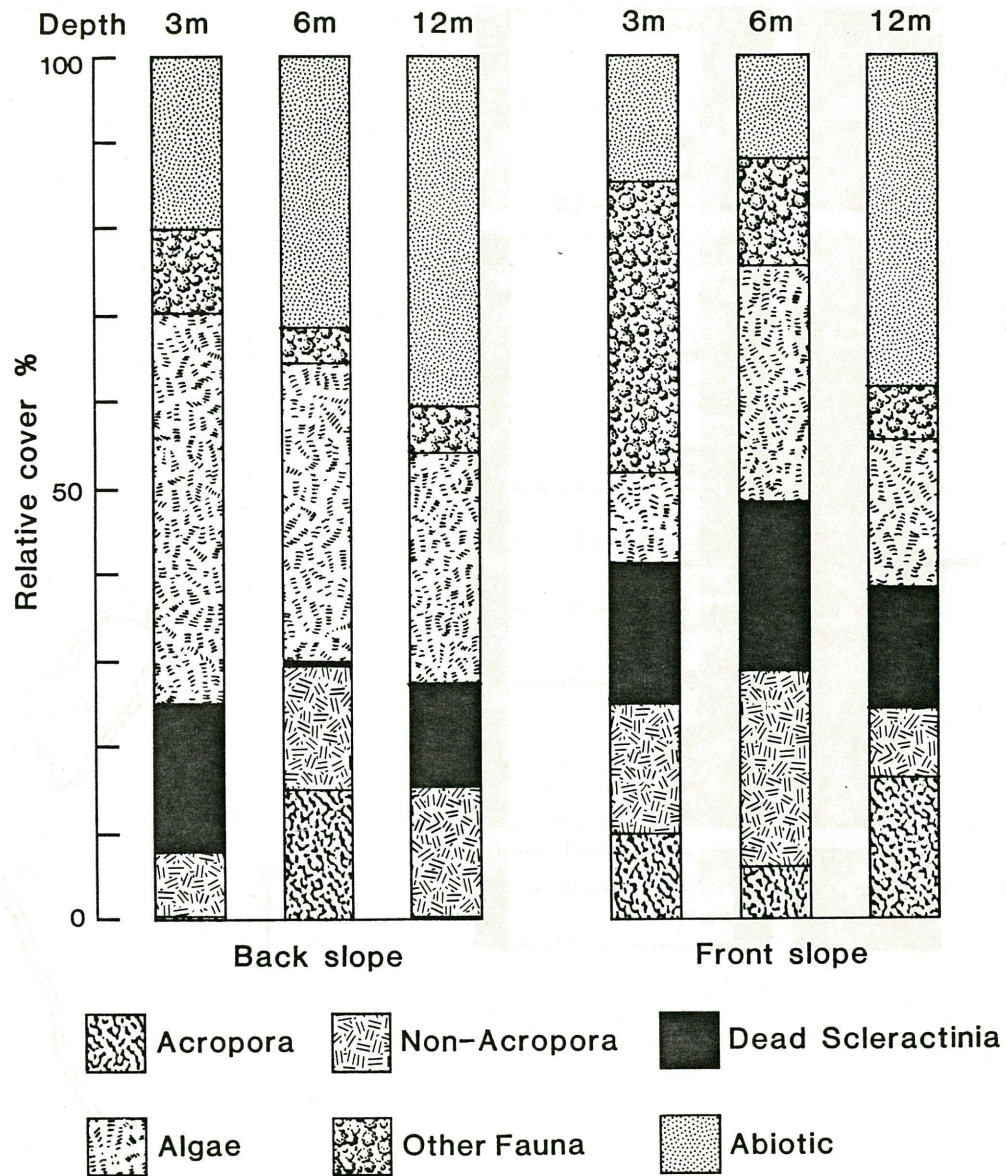


Figure 3a). Tow path, hard coral cover and *A. planci* numbers for: Opal Reef.

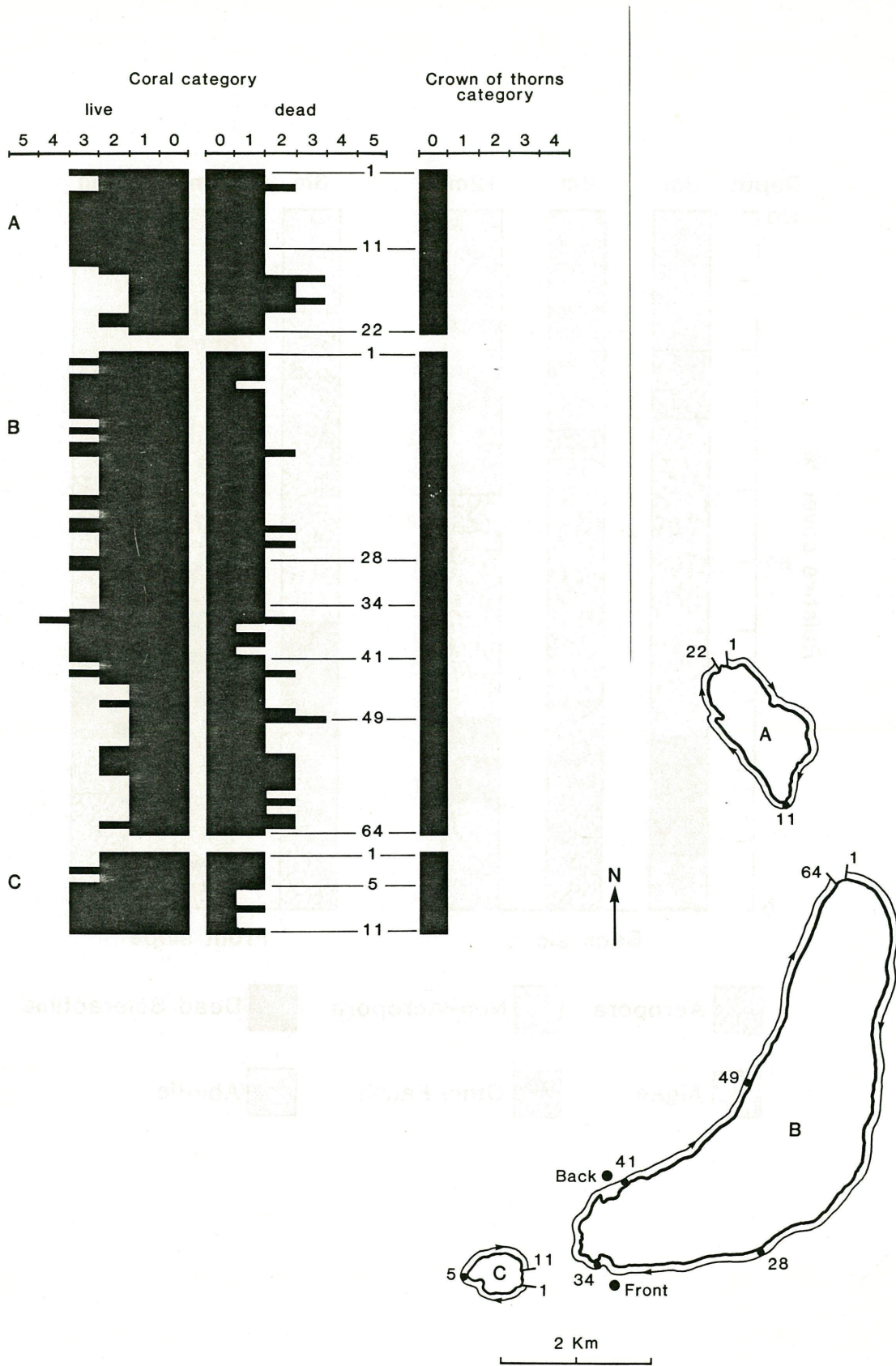


Figure 3b). Relative cover and abundance of life form categories on: Opal Reef.

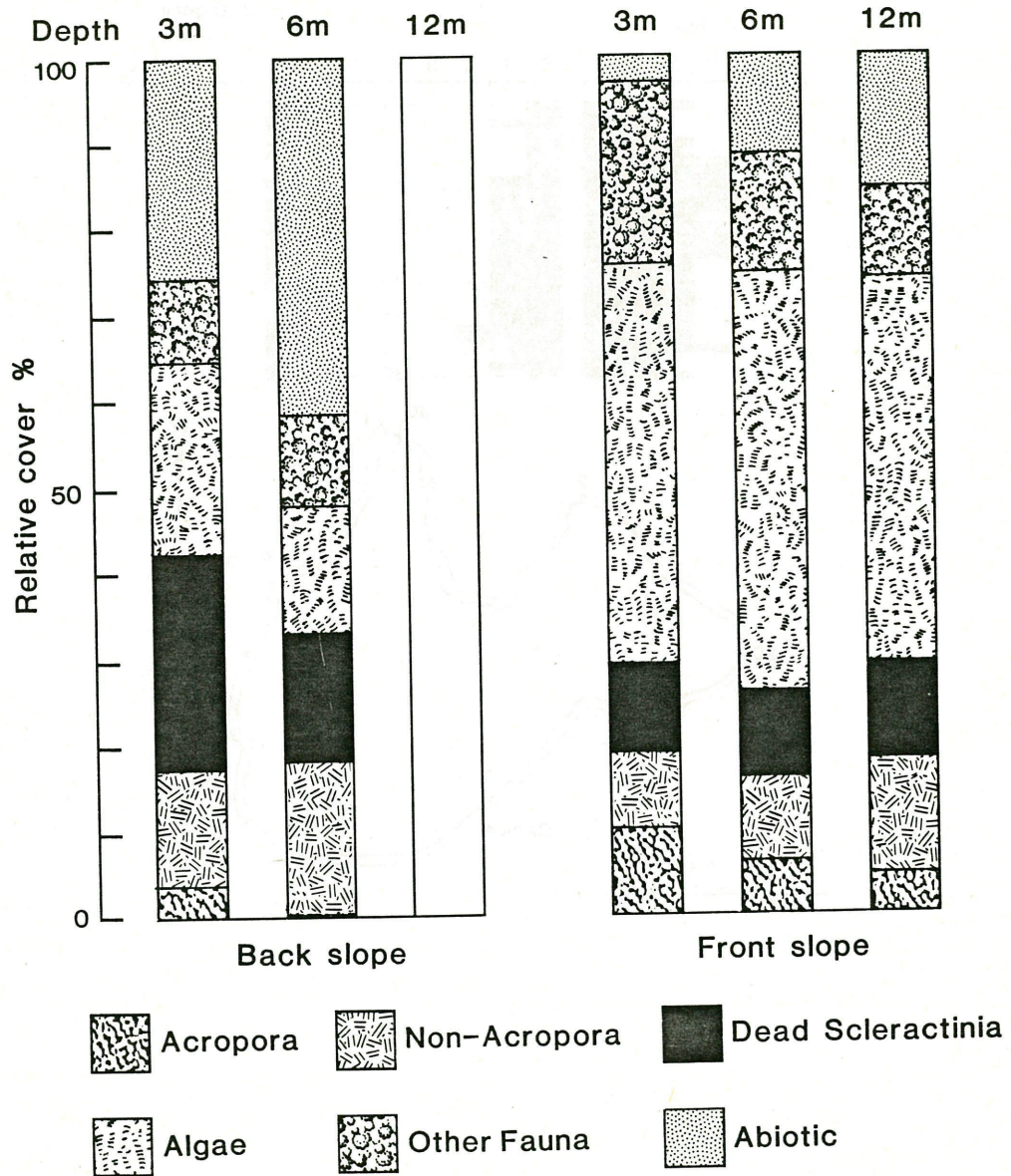


Figure 4a). Tow path, hard coral cover and *A. planci* numbers for: Low Isles.

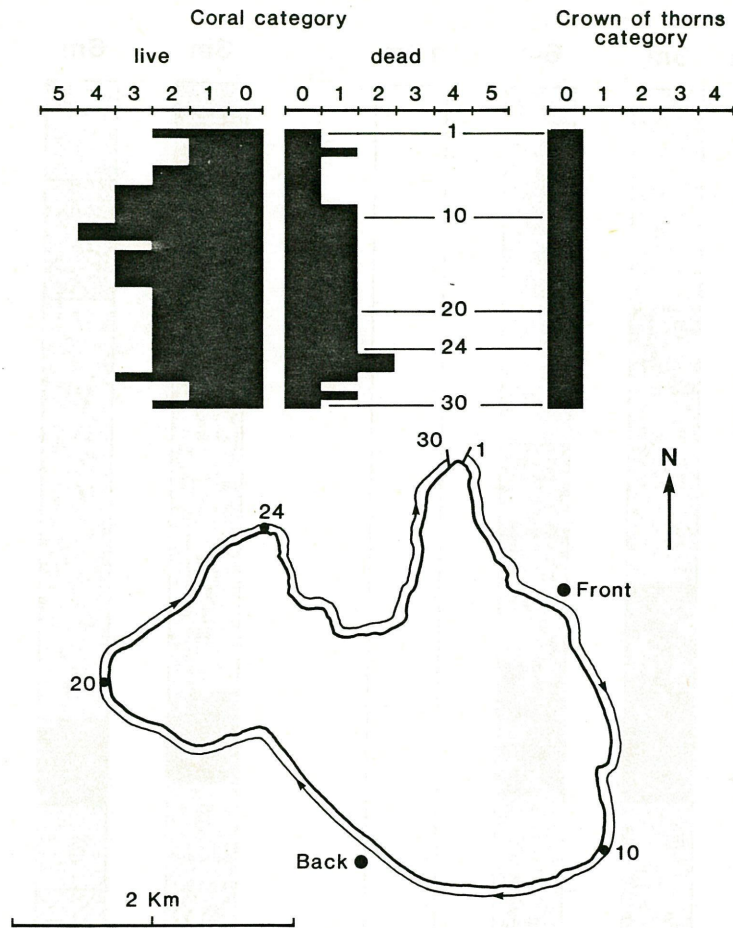


Figure 4b). Relative cover and abundance of life form categories on: Low Isles.

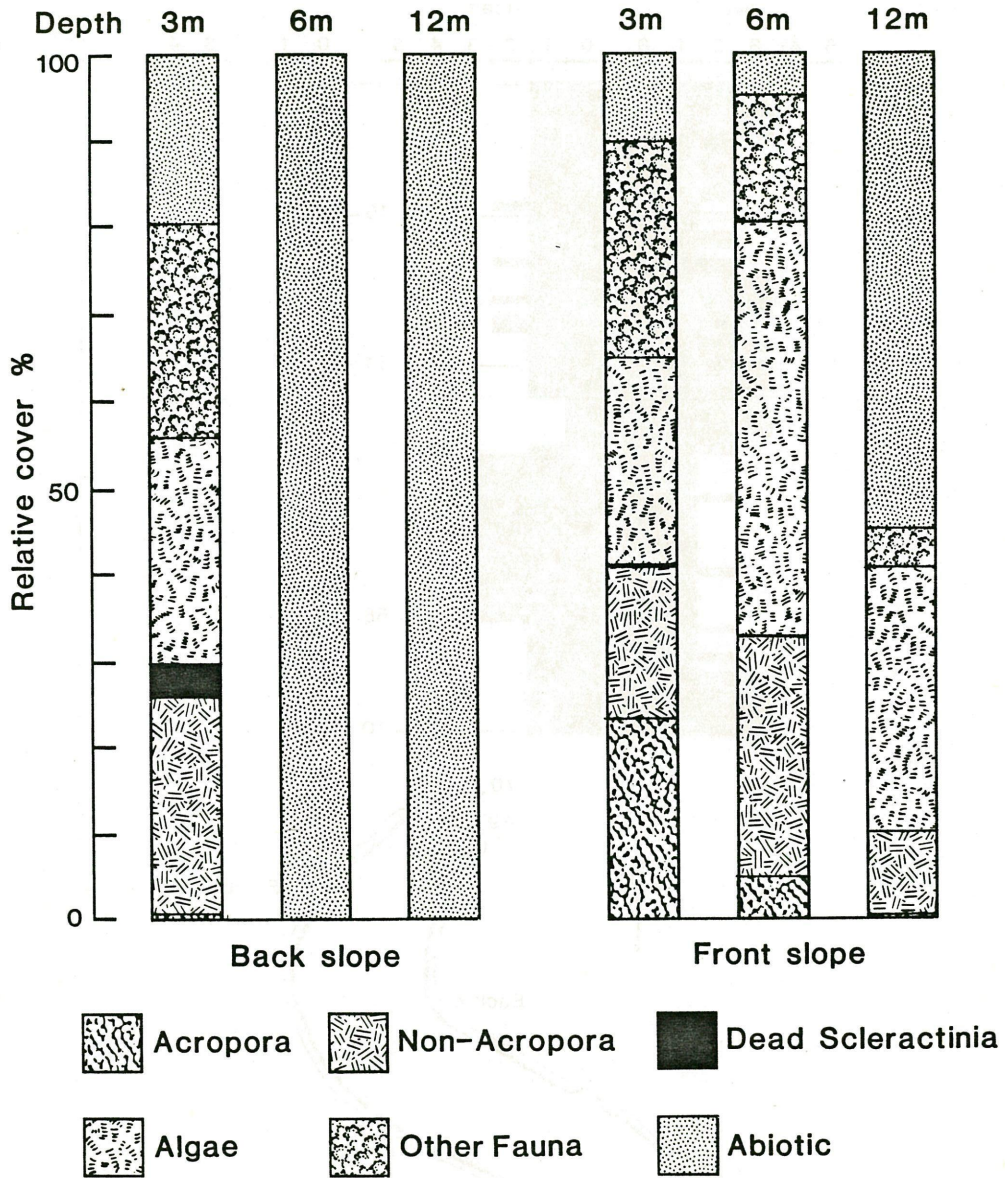


Figure 5a). Tow path, hard coral cover and *A. planci* numbers for: Hastings Reef.

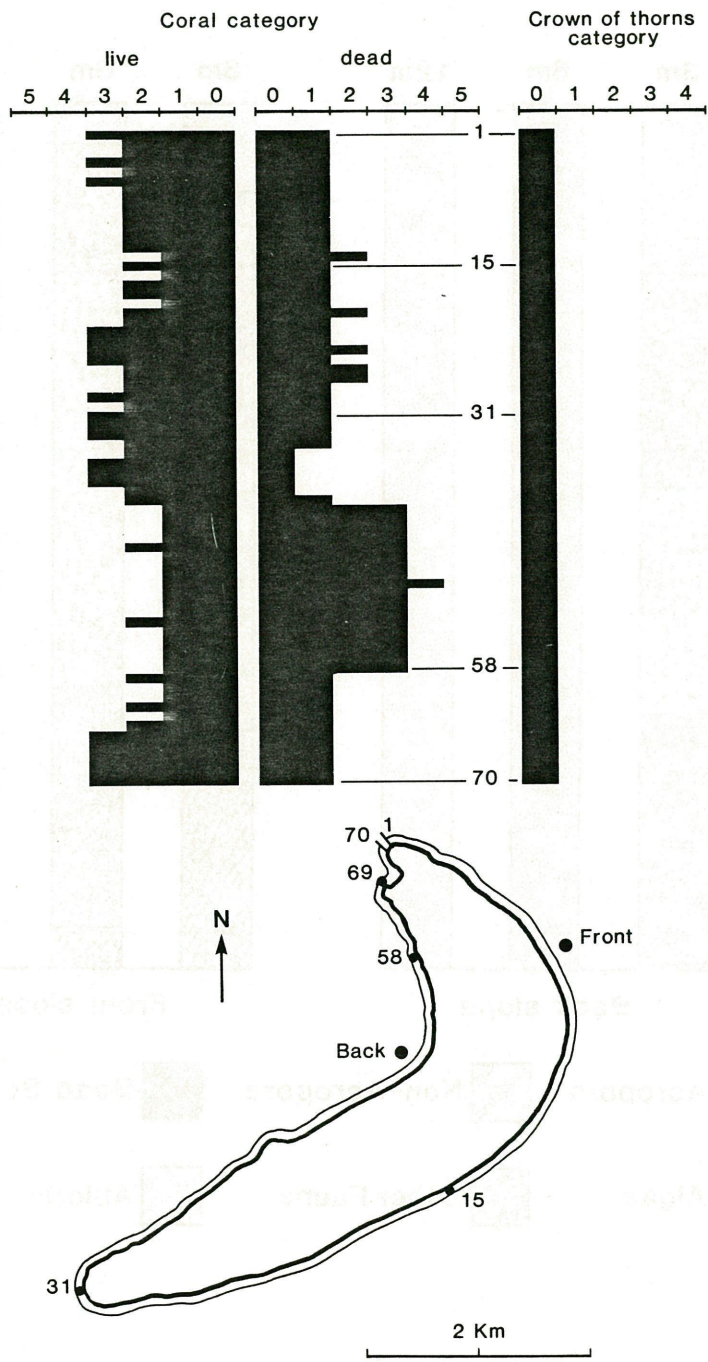


Figure 5b). Relative cover and abundance of life form categories on: Hastings Reef.

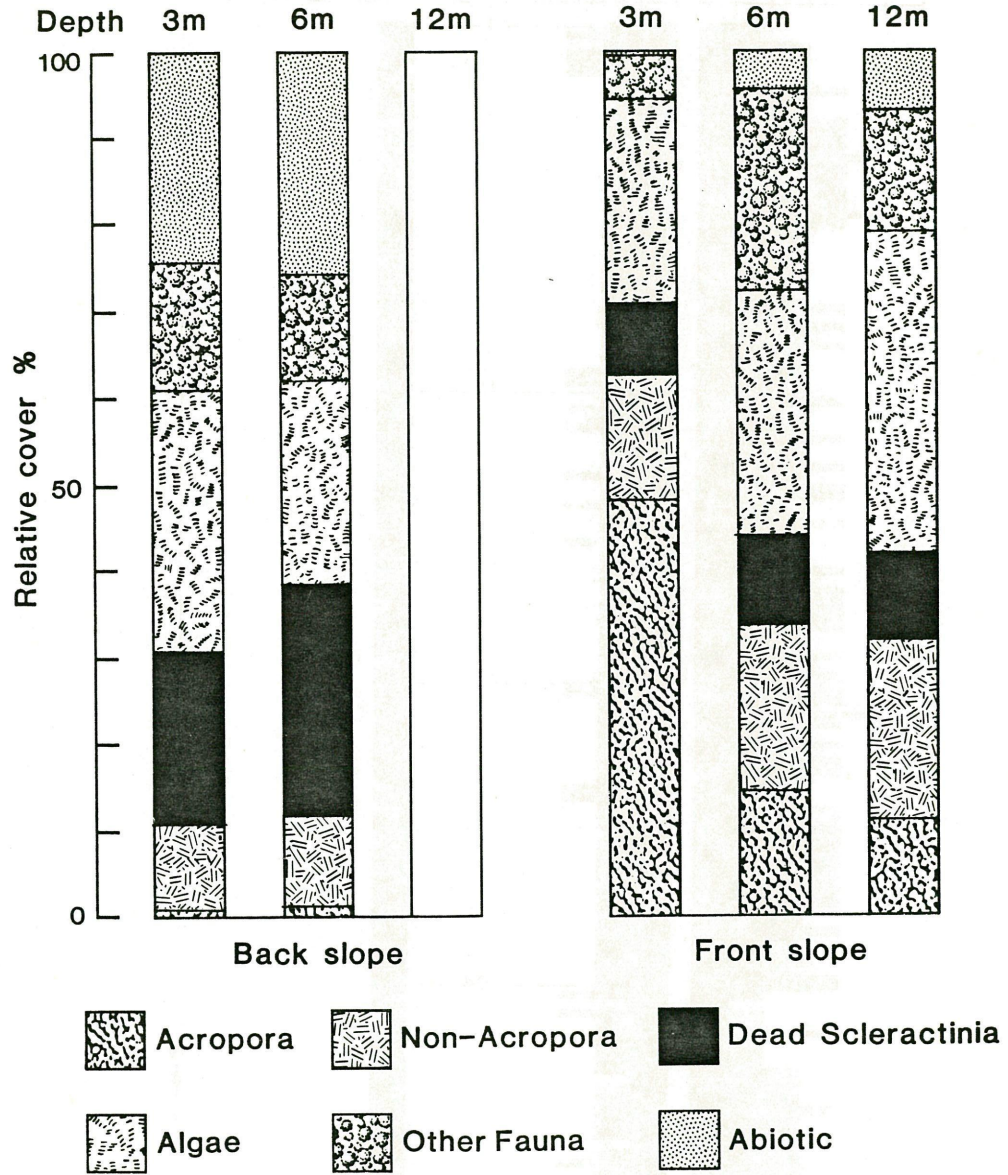




Figure 6a). Tow path, hard coral cover and *A. plani* numbers for: Michaelmas Reef.

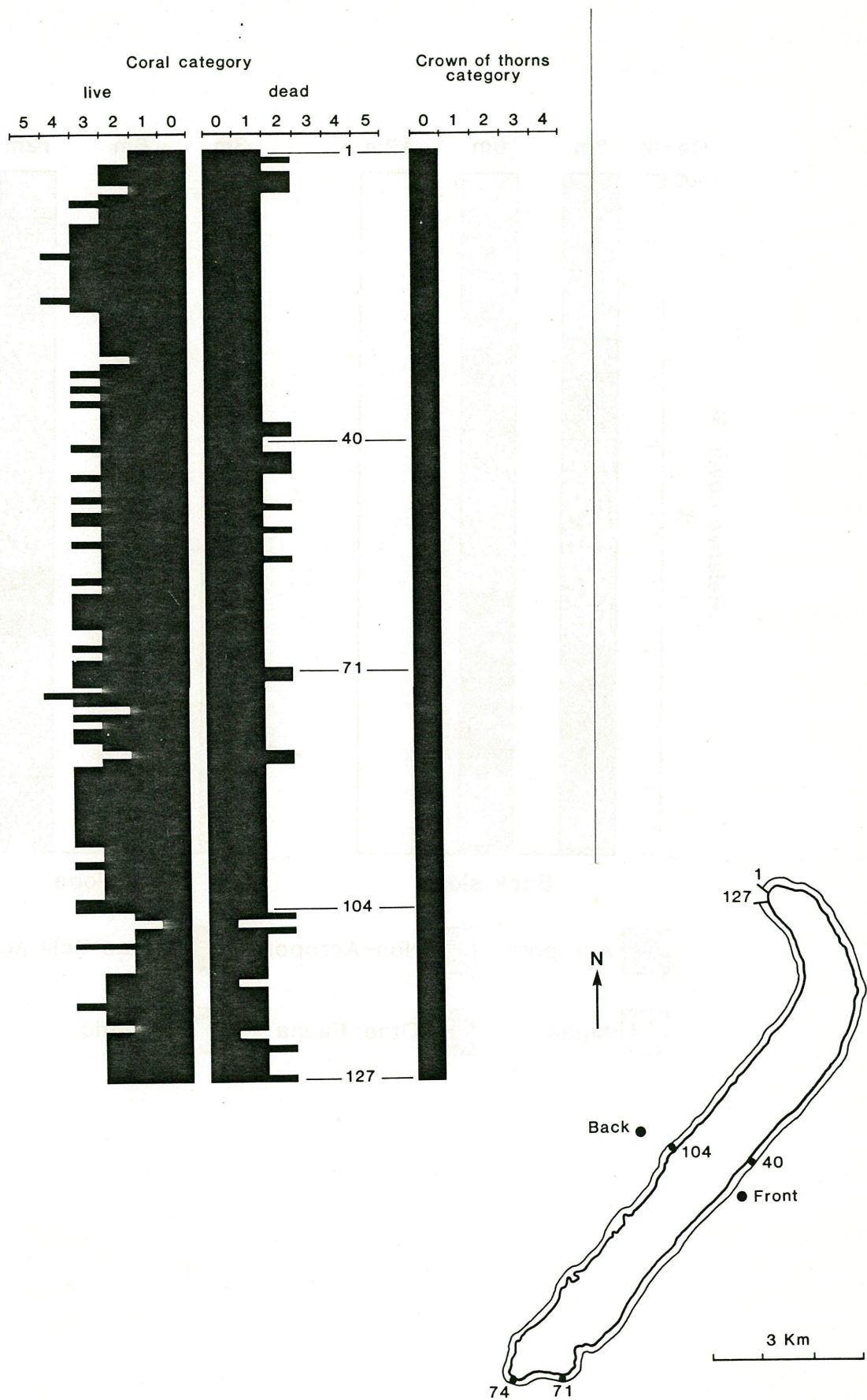


Figure 6b). Relative cover and abundance of life form categories on: Michaelmas Reef.

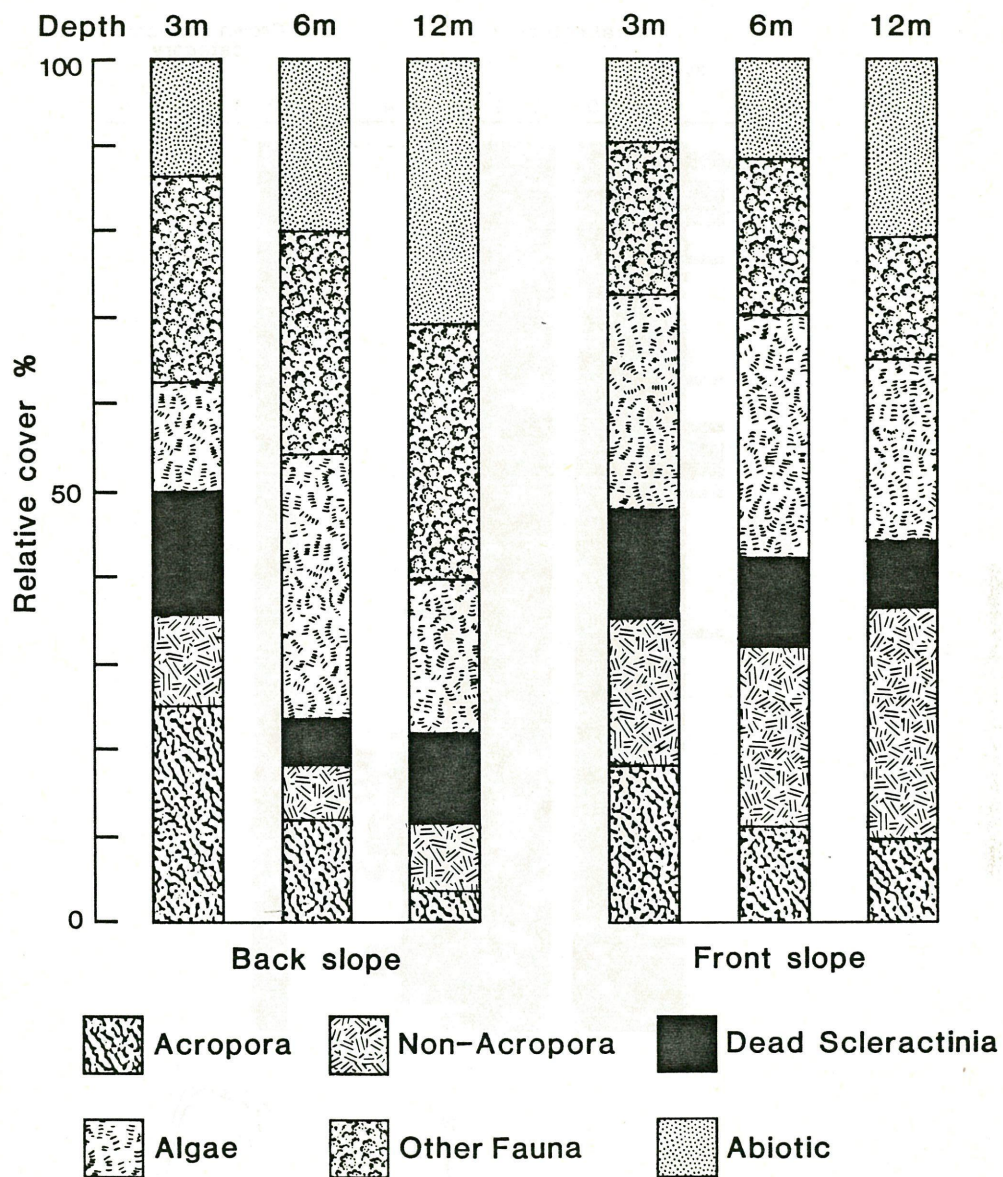


Figure 7a). Tow path, hard coral cover and *A. planci* numbers for: Arlington Reef.

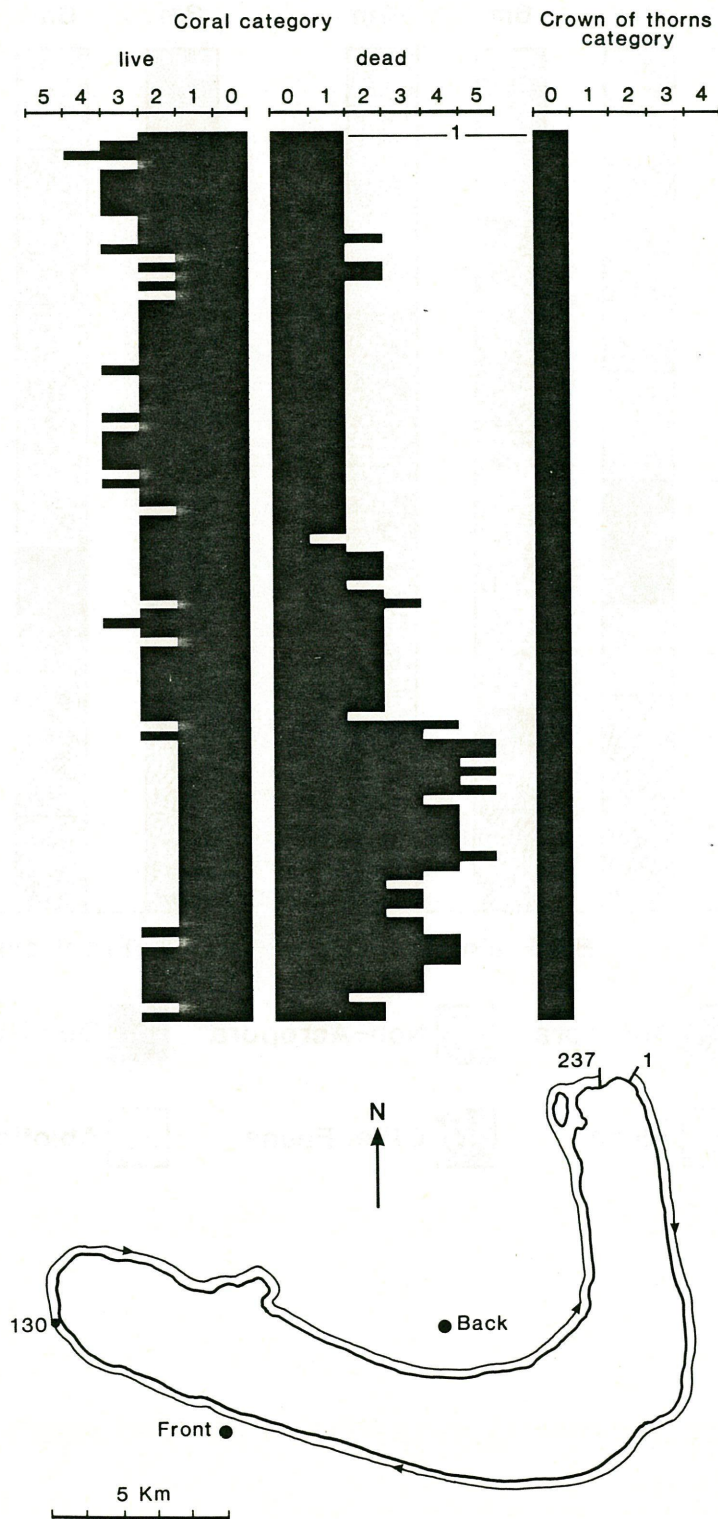


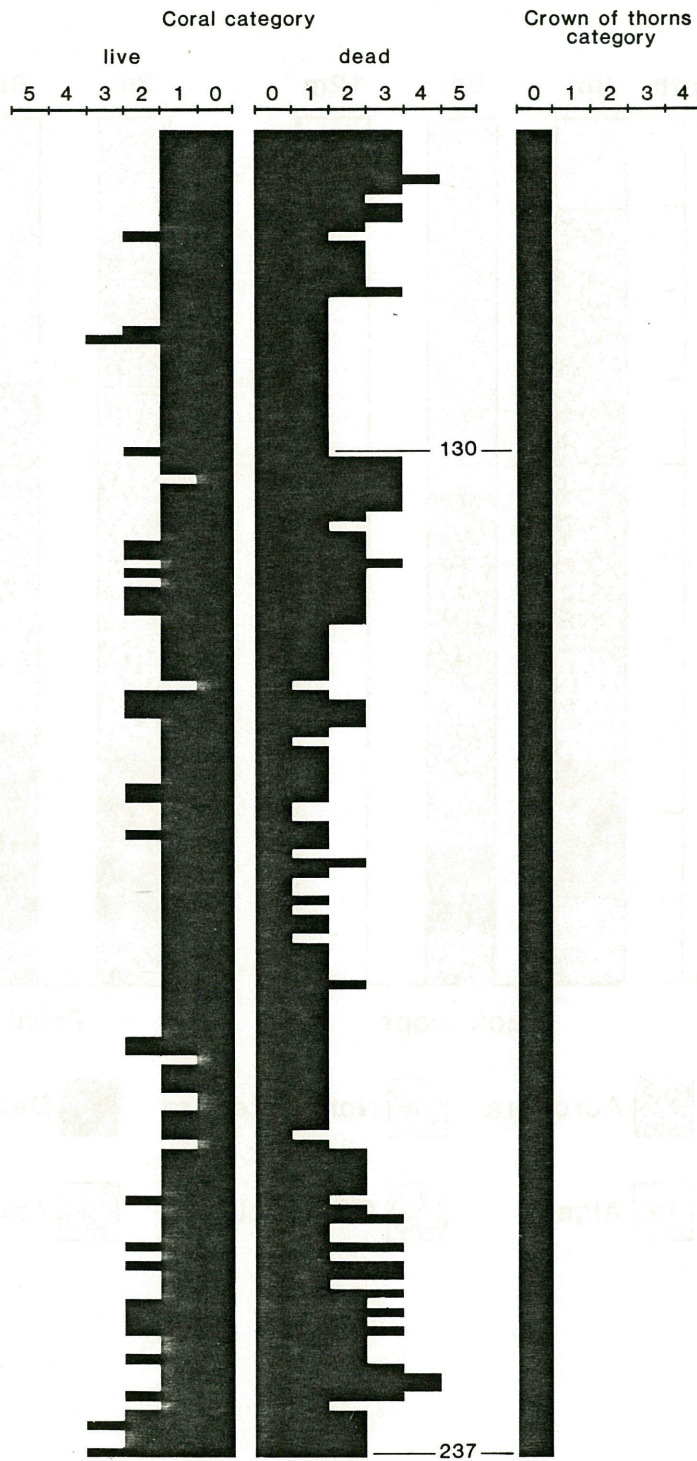
Figure 7a). Hard coral cover and *A. planci* numbers for: Arlington Reef (cont.).

Figure 7b). Relative cover and abundance of life form categories on: Arlington Reef.

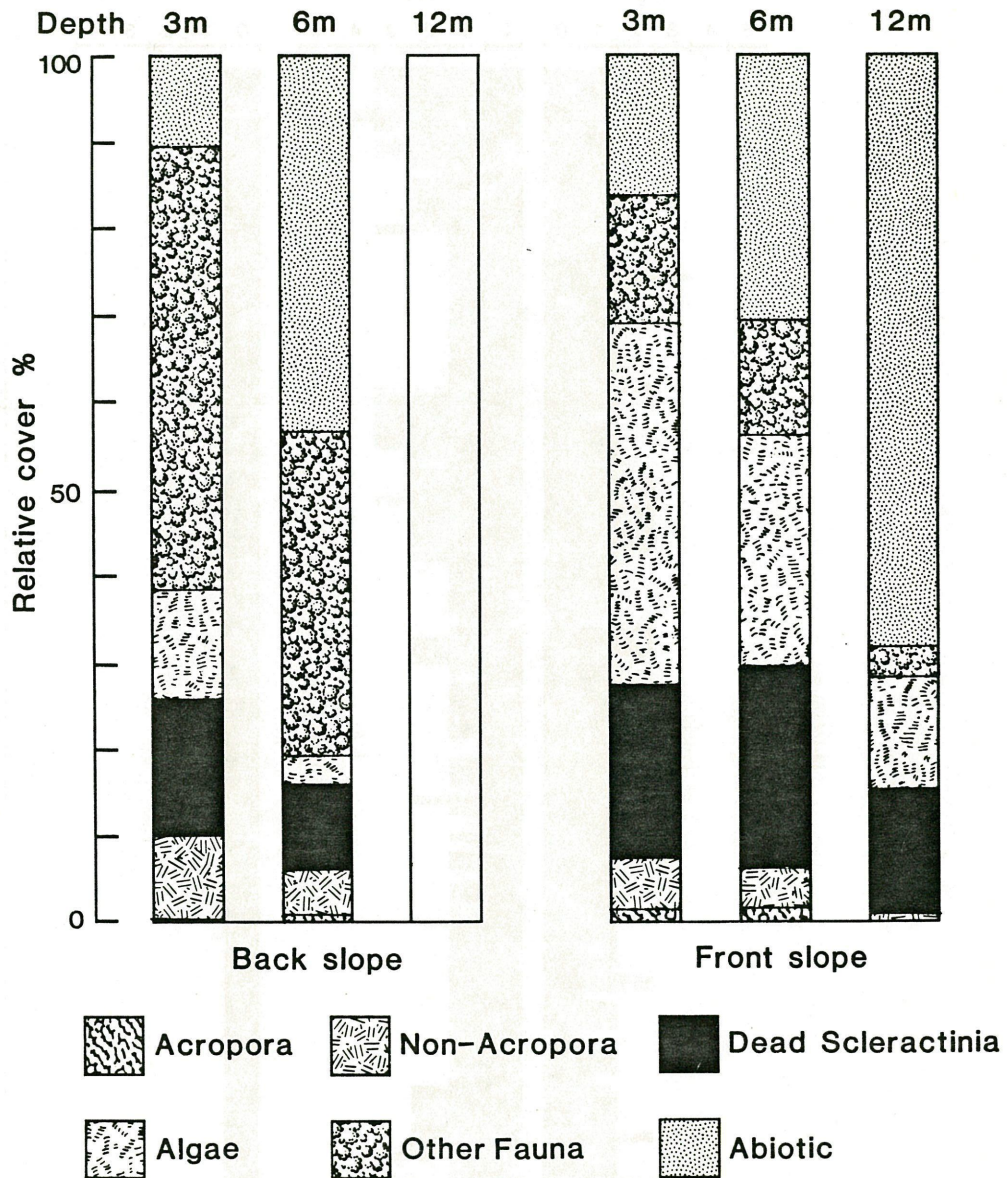


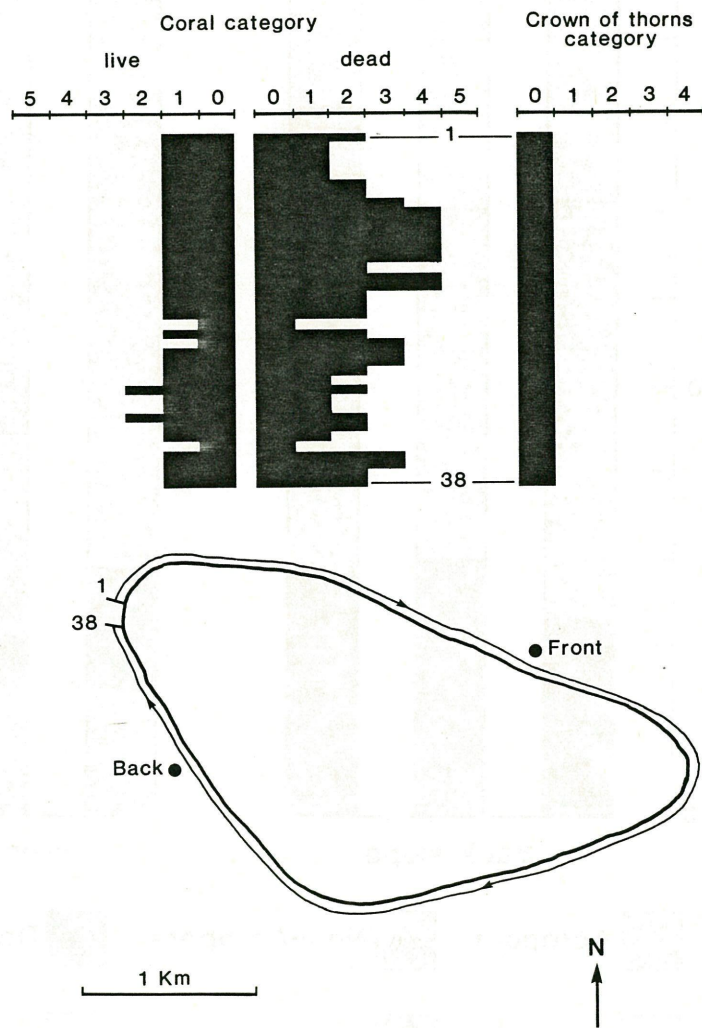
Figure 8a). Tow path, hard coral cover and *A. planci* numbers for: Green Island.

Figure 8b). Relative cover and abundance of life form categories on: Green Island.

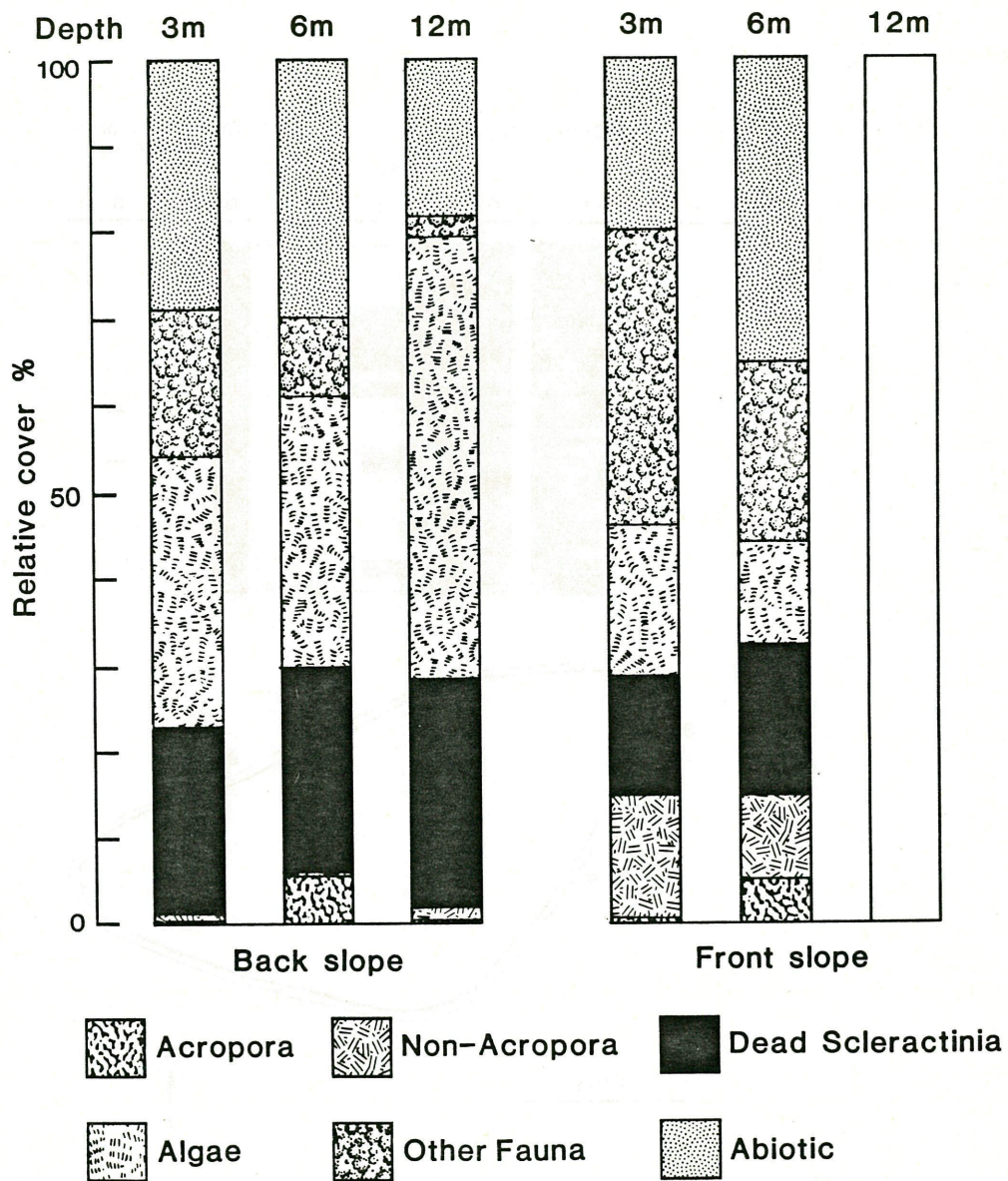


Figure 9a). Tow path, hard coral cover and *A. planci* numbers for: Fitzroy Island.

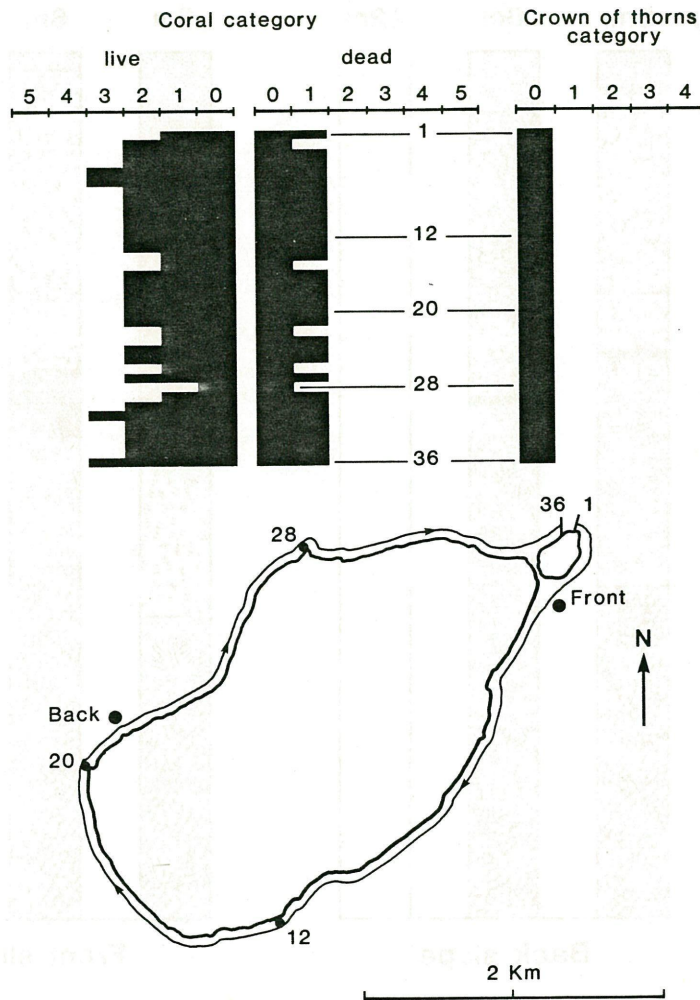




Figure 9b). Relative cover and abundance of life form categories on: Fitzroy Island.

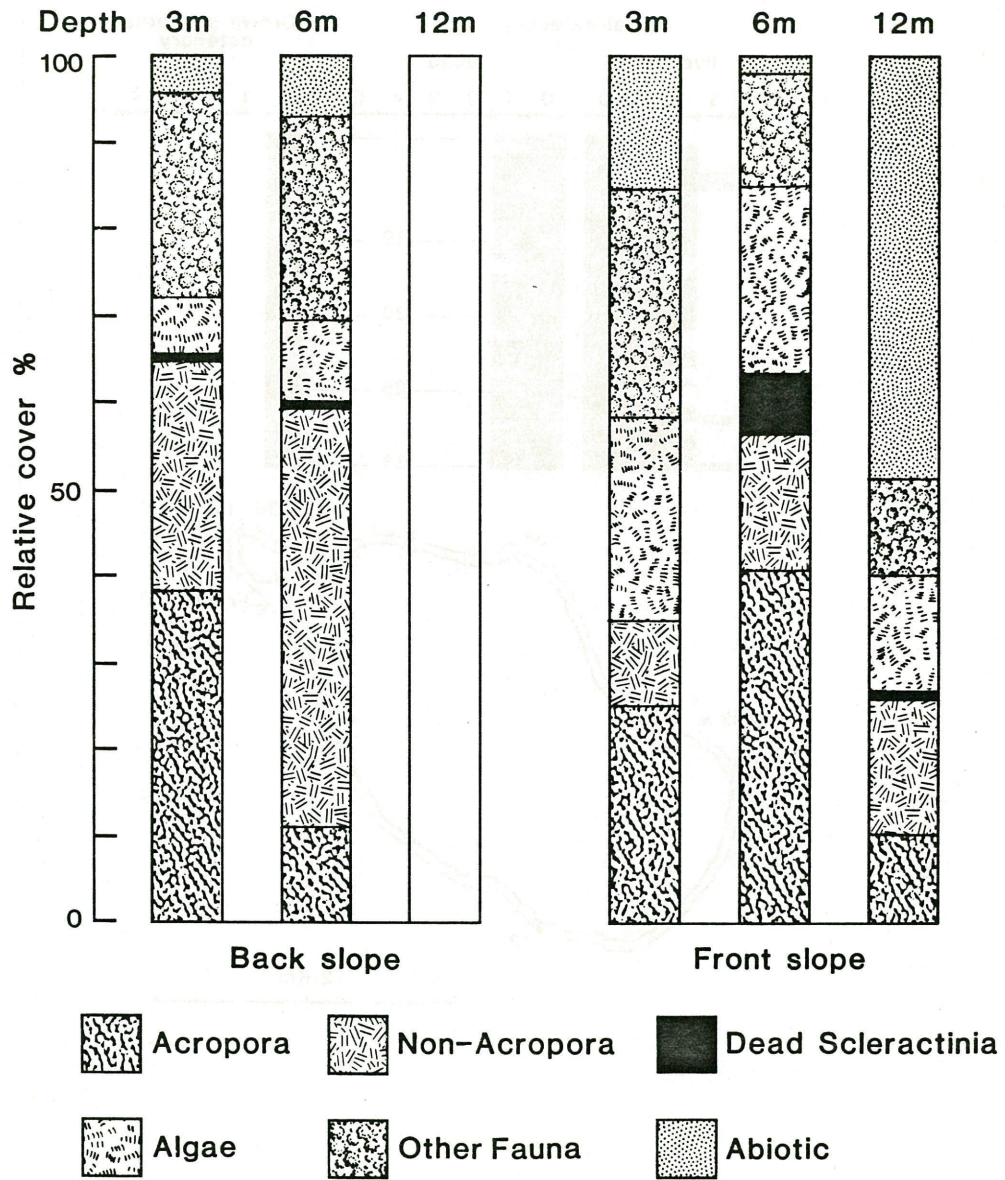


Figure 10a). Tow path, hard coral cover and *A. planici* numbers for: Escape Reef.

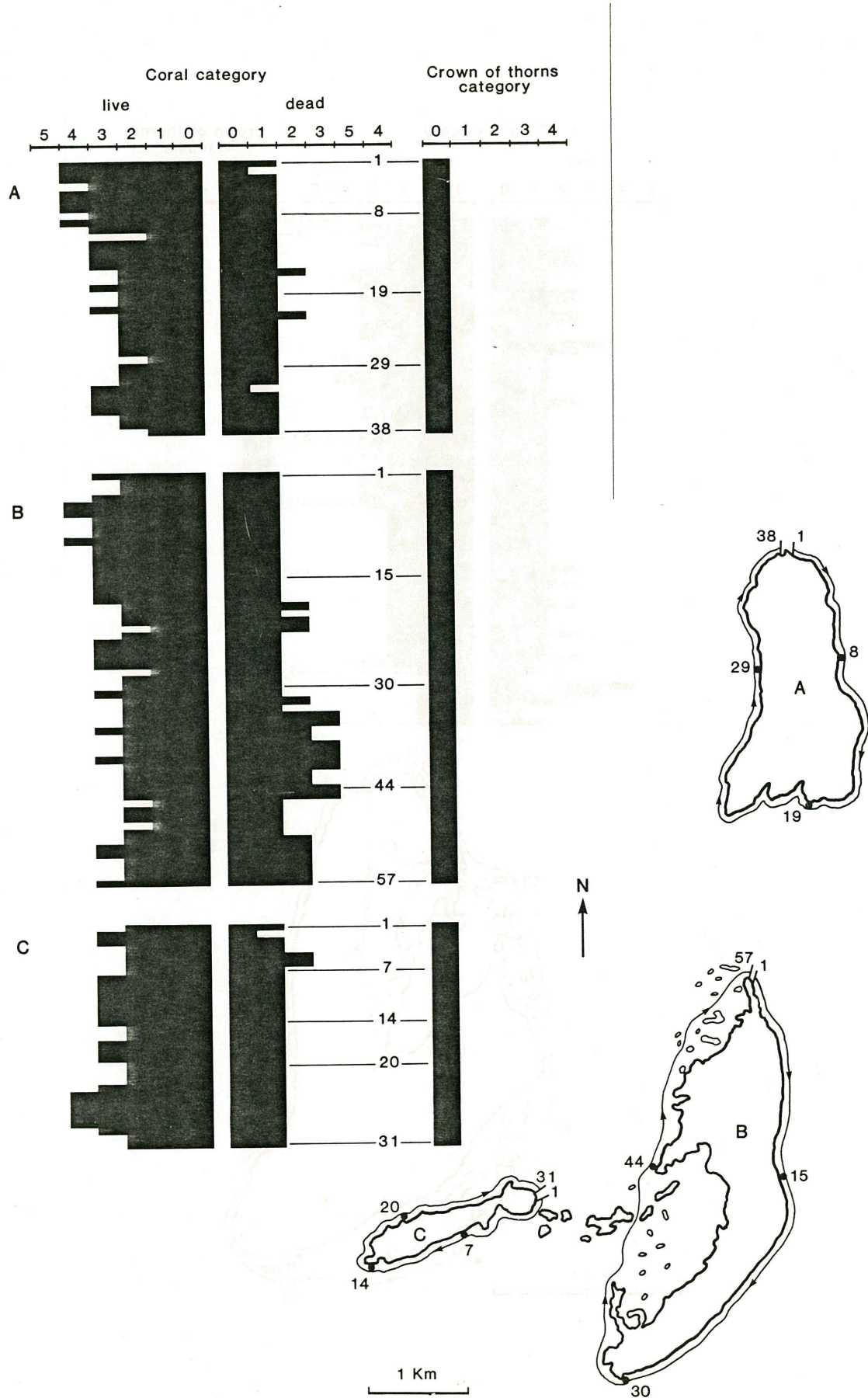


Figure 11a). Tow path, hard coral cover and *A. planci* numbers for: Pickersgill Reef.

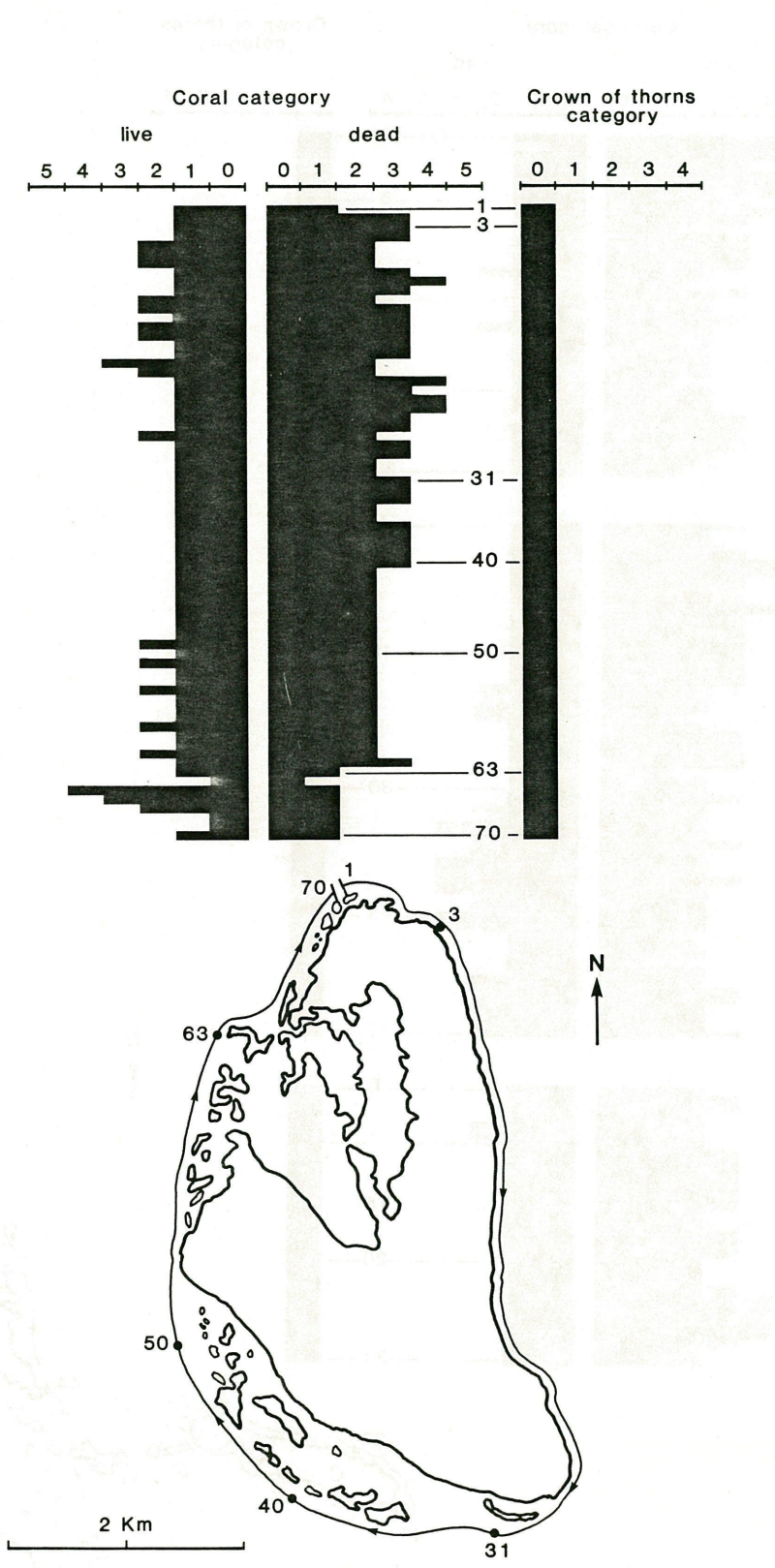


Figure 12a). Tow path, hard coral cover and *A. planci* numbers for: Evening Reef.

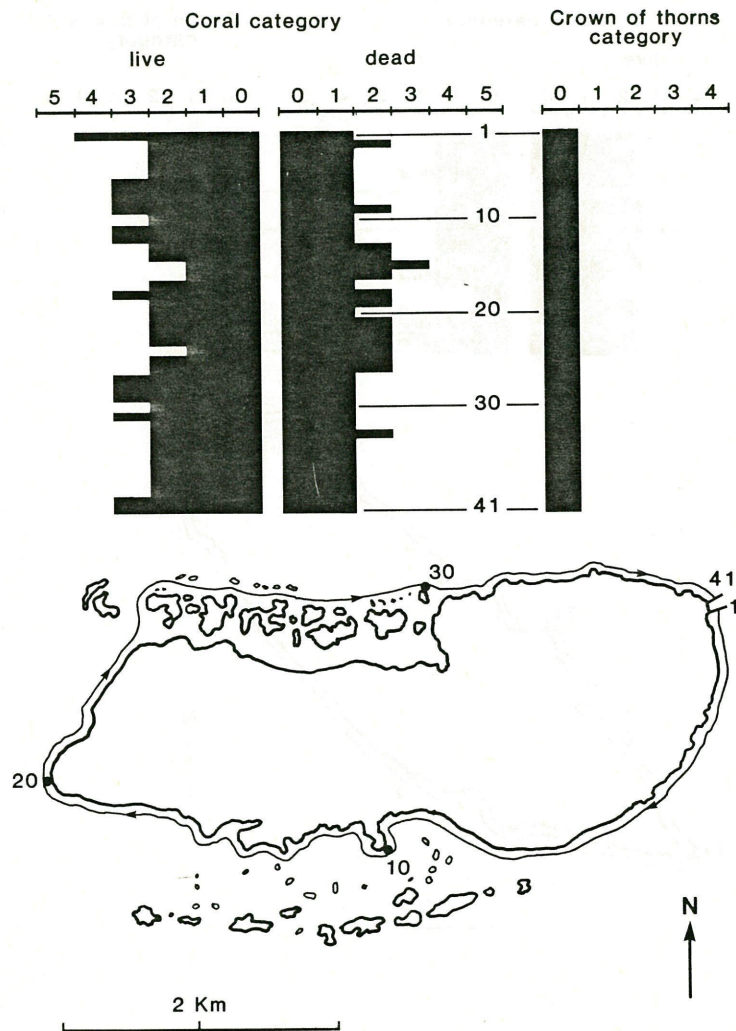


Figure 13a). Tow path, hard coral cover and *A. planci* numbers for: Mackay Reef.

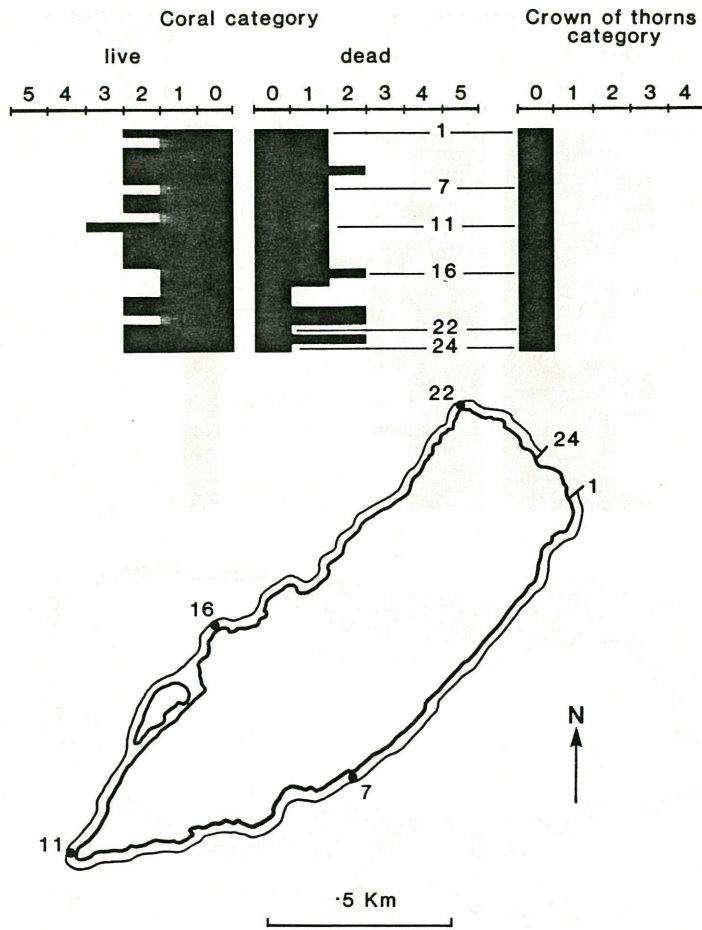


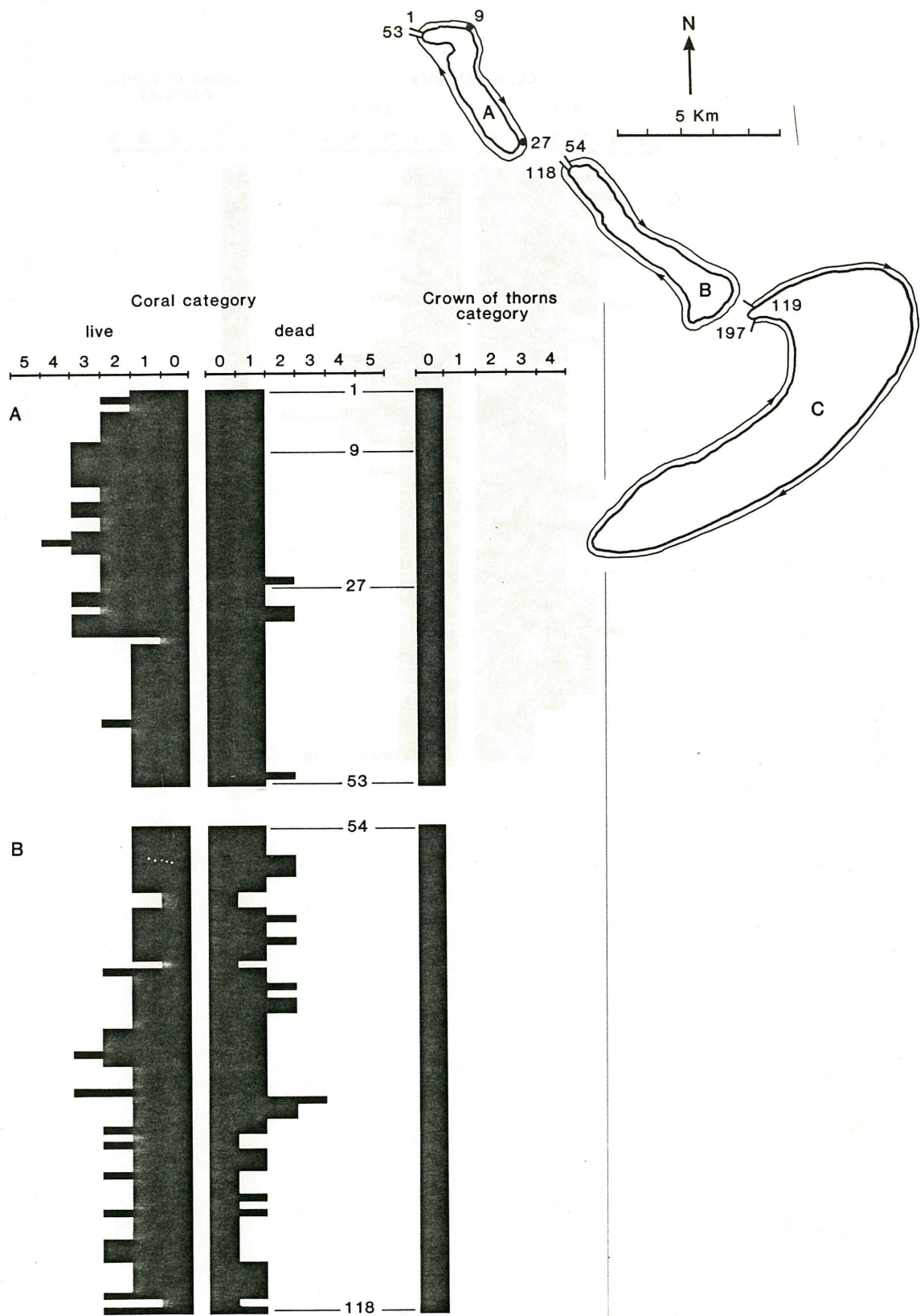
Figure 14a). Tow path, hard coral cover and *A. planci* numbers for: Tongue Reef.

Figure 14a). Hard coral cover and *A. planci* numbers for: Tongue Reef (cont.).

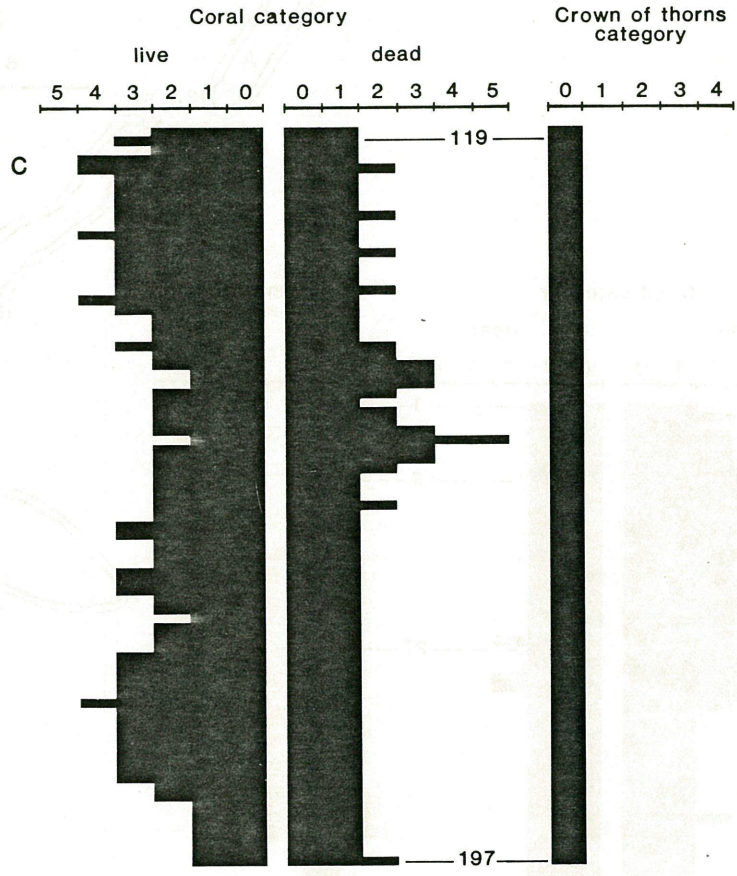


Figure 15a) Tow path, hard coral cover and *A. planci* numbers for: Norman Reef.

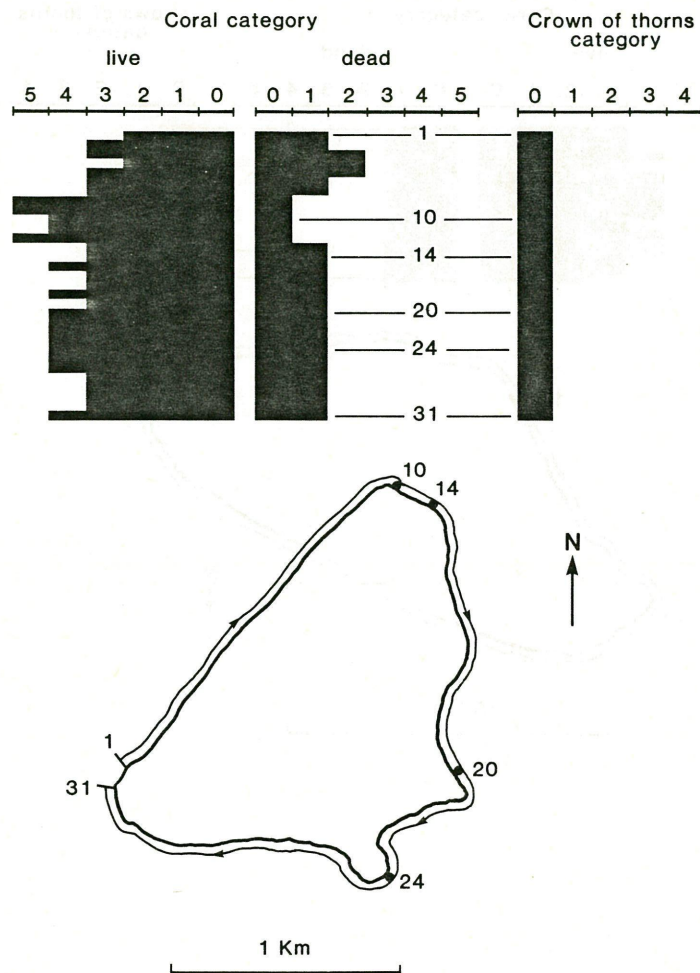




Figure 16a). Tow path, hard coral cover and A. planci numbers for: Saxon Reef.

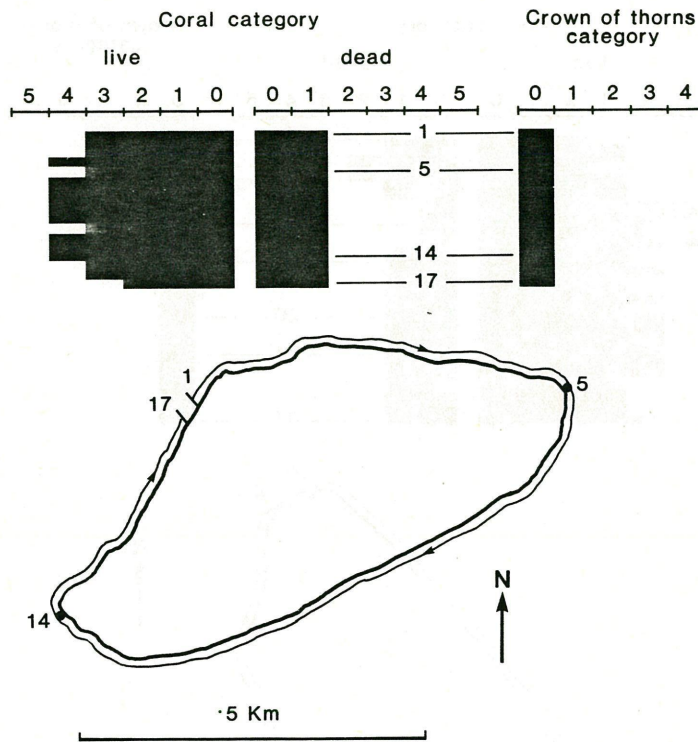


Figure 17a). Tow path, hard coral cover and A. planci numbers for: Pixie Reef.

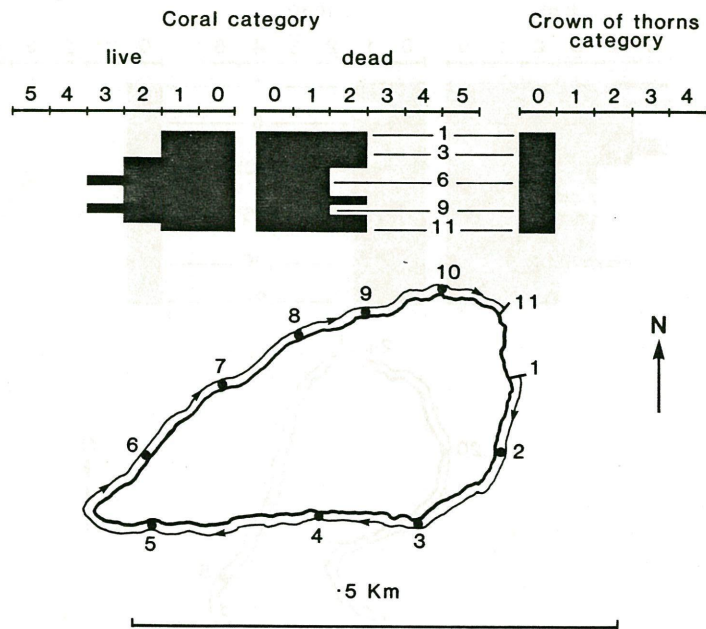


Figure 18a). Tow path, hard coral cover and *A. planci* numbers for: Hope Reef.

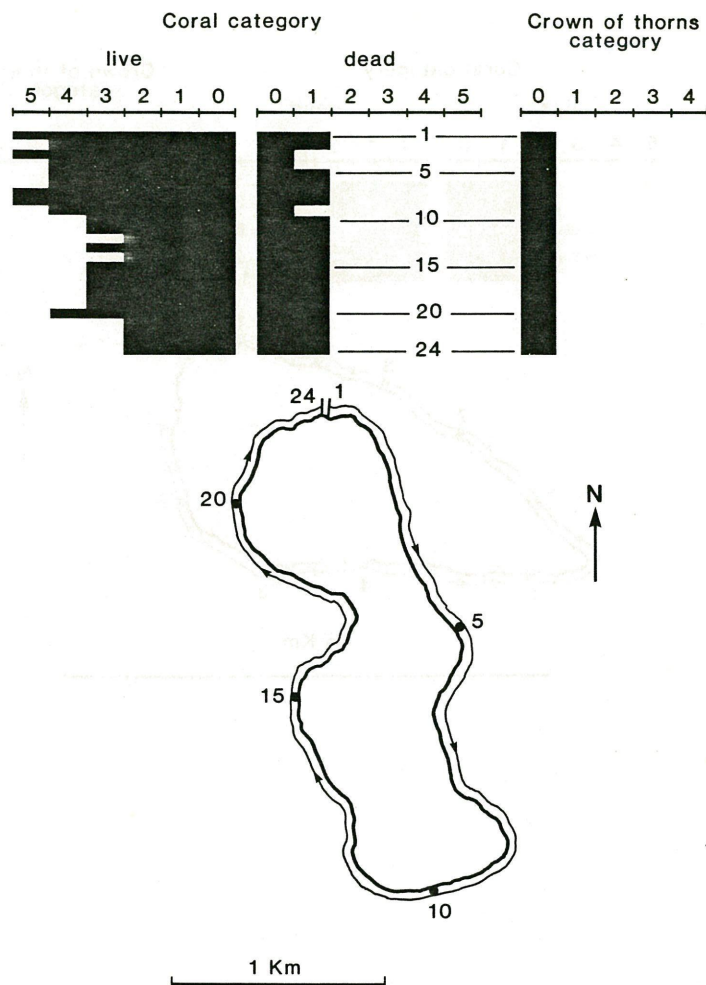


Figure 19a). Tow path, hard coral cover and *A. planci* numbers for: Flynn Reef.

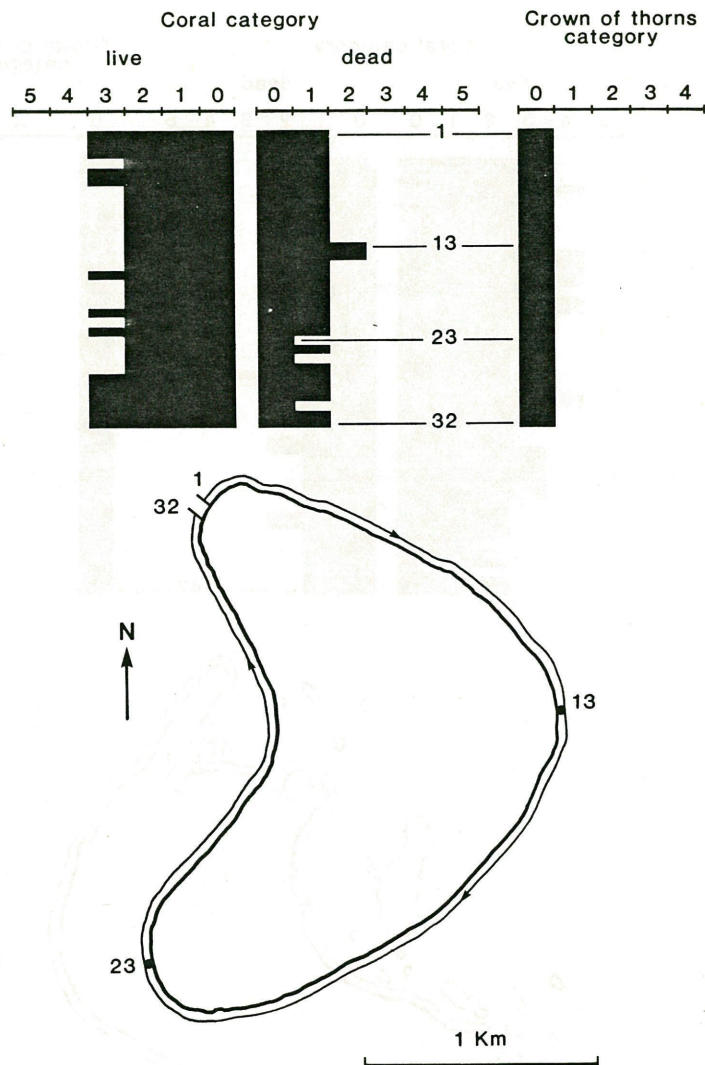


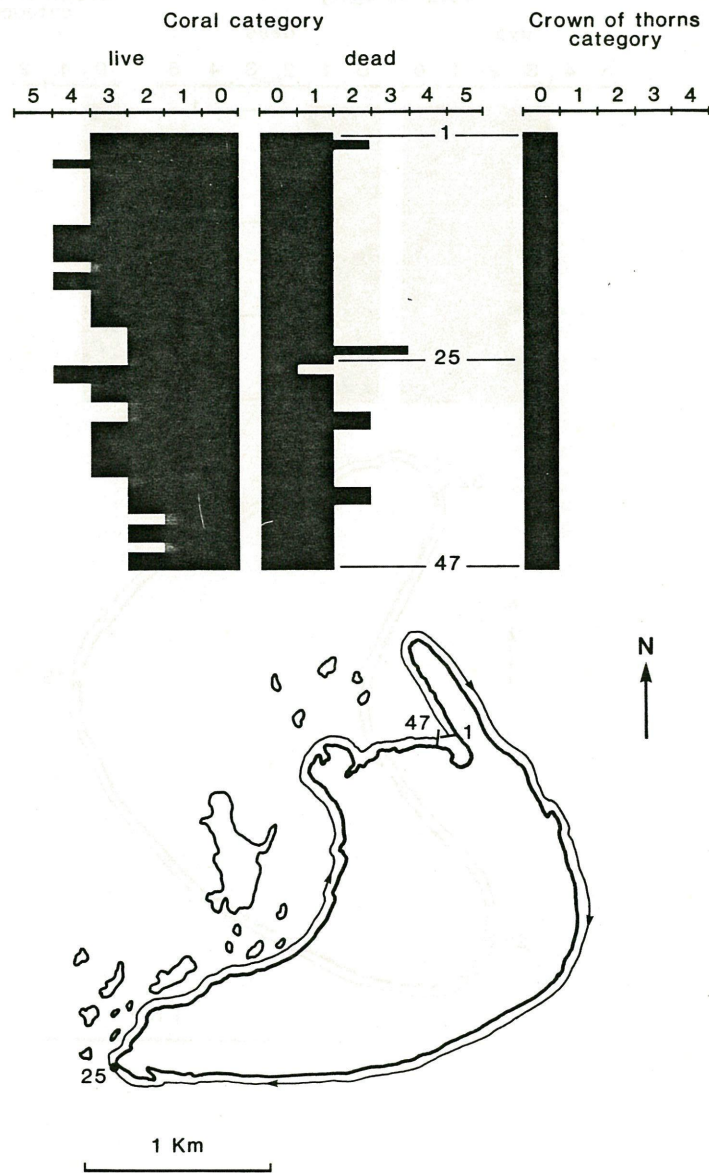
Figure 20a). Tow path, hard coral cover and *A. planci* numbers for: Thetford Reef.

Figure 21a). Tow path, hard coral cover and *A. planci* numbers for: Elford Reef.

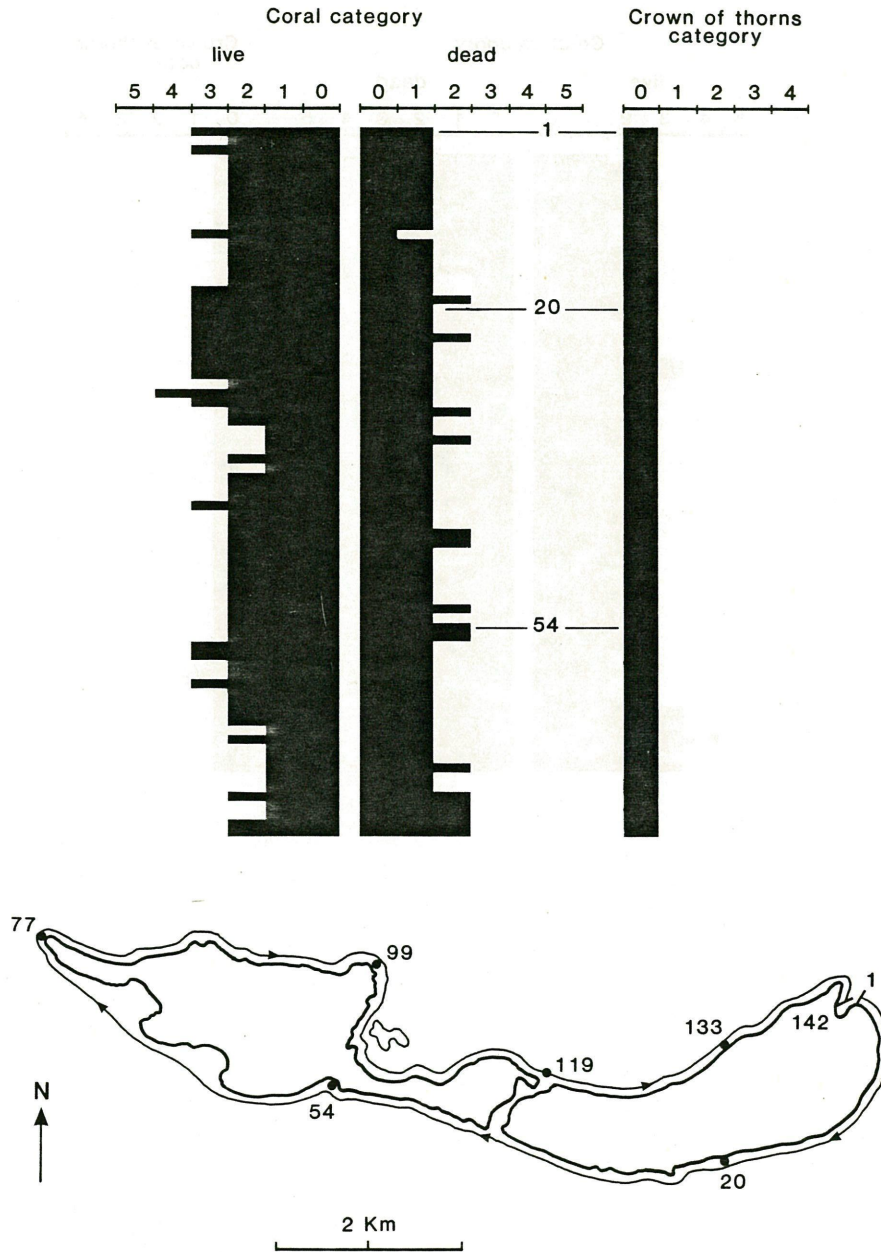


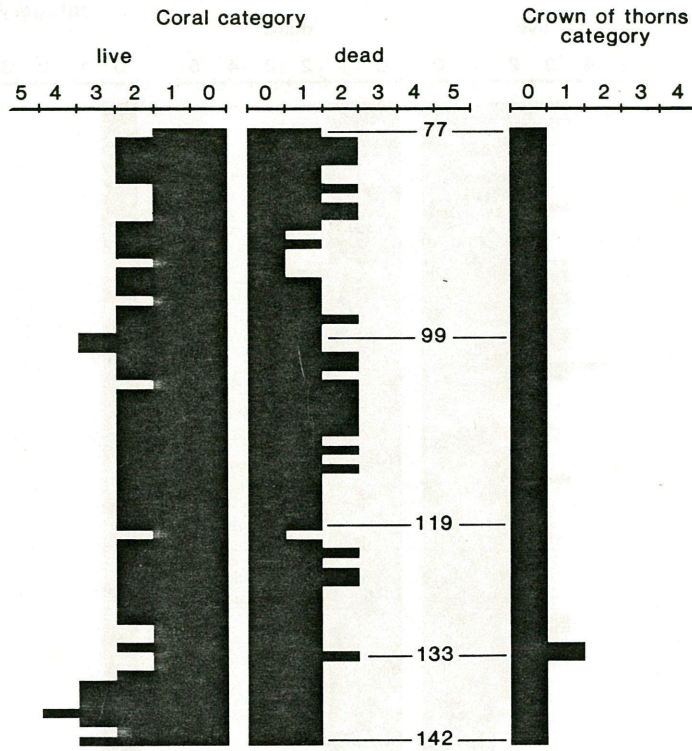
Figure 21a). Hard coral cover and *A. planci* numbers for: Elford Reef (cont.).

Table 2a). Relative cover and abundance of life form categories on: St. Crispin Reef: front: 3 m depth.

Date Sampled : 01/04/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	12	7.18		
Tabulate	ACT	2	1.47		
Encrusting	ACE	0	0.00		
Submassive	ACS	3	1.38		
				10.03	
<b>Non-Acropora</b>					
Branching	CB	23	7.05		
Massive	CM	6	2.26		
Encrusting	CE	26	4.83		
Submassive	CS	3	0.67		
Foliose	CF	0	0.00		
				14.81	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	36	16.32		
				16.32	
<b>Algae</b>					
Macro	MA	0	0.00		
Turf	TA	0	0.00		
Coralline	CA	23	7.41		
Halimeda	HA	0	0.00		
Algal assemblage	AA	10	3.50		
				10.91	
<b>Other Fauna</b>					
Soft Corals	SC	85	32.75		
Sponge	SP	2	0.25		
Other	OT	2	0.06		
				33.06	
<b>Abiotic</b>					
Sand & Rubble	SR	24	10.40		
Water	WA	5	4.47		
				14.87	



Table 2b). Relative cover and abundance of life form categories on: St. Crispin Reef: front: 6 m depth.

Date Sampled : 01/04/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	18	5.80		
Tabulate	ACT	0	0.00		
Encrusting	ACE	0	0.00		
Submassive	ACS	0	0.00	5.80	
<b>Non-Acropora</b>					
Branching	CB	36	11.80		
Massive	CM	25	7.75		
Encrusting	CE	15	2.20		
Submassive	CS	1	0.85		
Foliose	CF	0	0.00	22.60	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	30	19.10	19.10	
<b>Algae</b>					
Macro	MA	7	1.74		
Turf	TA	4	5.90		
Coralline	CA	7	0.97		
Halimeda	HA	3	0.48		
Algal assemblage	AA	48	20.13	29.22	
<b>Other Fauna</b>					
Soft Corals	SC	49	7.23		
Sponge	SP	12	1.65		
Other	OT	11	1.55	10.43	
<b>Abiotic</b>					
Sand & Rubble	SR	19	11.09		
Water	WA	3	1.76	12.85	

Table 2c). Relative cover and abundance of life form categories on: St. Crispin Reef: front: 12 m depth.

Date Sampled : 01/04/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	19	15.94		
Tabulate	ACT	0	0.00		
Encrusting	ACE	0	0.00		
Submassive	ACS	0	0.00		
				15.94	
<b>Non-Acropora</b>					
Branching	CB	12	2.21		
Massive	CM	7	1.69		
Encrusting	CE	13	1.93		
Submassive	CS	3	0.38		
Foliose	CF	6	0.84		
				7.05	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	19	14.70		
				14.70	
<b>Algae</b>					
Macro	MA	0	0.00		
Turf	TA	9	2.26		
Coralline	CA	6	1.22		
Halimeda	HA	2	0.27		
Algal assemblage	AA	35	13.95		
				17.70	
<b>Other Fauna</b>					
Soft Corals	SC	30	4.15		
Sponge	SP	13	1.16		
Other	OT	6	0.50		
				5.81	
<b>Abiotic</b>					
Sand & Rubble	SR	39	31.92		
Water	WA	4	6.88		
				38.80	

Table 2d). Relative cover and abundance of life form categories on: St. Crispin Reef: back: 3 m depth.

Date Sampled : 01/03/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	2	0.14		
Tabulate	ACT	0	0.00		
Encrusting	ACE	0	0.00		
Submassive	ACS	2	0.10		
				0.24	
<b>Non-Acropora</b>					
Branching	CB	12	2.43		
Massive	CM	26	3.40		
Encrusting	CE	14	1.52		
Submassive	CS	0	0.00		
Foliose	CF	0	0.00		
				7.35	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	11	16.85		
				16.85	
<b>Algae</b>					
Macro	MA	1	0.02		
Turf	TA	9	4.56		
Coralline	CA	11	2.41		
Halimeda	HA	0	0.00		
Algal assemblage	AA	58	39.23		
				46.22	
<b>Other Fauna</b>					
Soft Corals	SC	40	7.05		
Sponge	SP	7	0.51		
Other	OT	13	1.11		
				8.67	
<b>Abiotic</b>					
Sand & Rubble	SR	13	13.58		
Water	WA	5	7.09		
				20.67	

Table 2e). Relative cover and abundance of life form categories on: St. Crispin Reef: back: 6 m depth.

Date Sampled : 01/03/86		Transect length sampled : 100 metres		
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals
<b>Acropora</b>				
Branching	ACB	18	14.79	
Tabulate	ACT	0	0.00	
Encrusting	ACE	0	0.00	
Submassive	ACS	0	0.00	
				14.79
<b>Non-Acropora</b>				
Branching	CB	16	3.08	
Massive	CM	31	5.46	
Encrusting	CE	8	1.26	
Submassive	CS	5	0.54	
Foliose	CF	12	4.28	
				14.62
<b>Dead Scleractinia</b>				
(recent)	DC	0	0.00	
(algal covering)	DCA	5	1.01	
				1.01
<b>Algae</b>				
Macro	MA	3	0.81	
Turf	TA	3	1.99	
Coralline	CA	2	0.30	
Halimeda	HA	1	0.45	
Algal assemblage	AA	51	29.90	
				33.45
<b>Other Fauna</b>				
Soft Corals	SC	19	2.62	
Sponge	SP	7	0.77	
Other	OT	5	0.54	
				3.93
<b>Abiotic</b>				
Sand & Rubble	SR	27	29.49	
Water	WA	7	2.71	
				32.20

Table 2f). Relative cover and abundance of life form categories on: St. Crispin Reef: back: 12 m depth.

Date Sampled : 01/03/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	3	0.65		
Tabulate	ACT	0	0.00		
Encrusting	ACE	0	0.00		
Submassive	ACS	0	0.00		
				0.65	
<b>Non-Acropora</b>					
Branching	CB	7	0.85		
Massive	CM	44	6.05		
Encrusting	CE	37	4.38		
Submassive	CS	7	1.08		
Foliose	CF	12	2.44		
				14.80	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	28	11.82		
				11.82	
<b>Algae</b>					
Macro	MA	6	0.97		
Turf	TA	4	1.08		
Coralline	CA	0	0.00		
Halimeda	HA	5	0.54		
Algal assemblage	AA	63	22.79		
				25.38	
<b>Other Fauna</b>					
Soft Corals	SC	18	2.81		
Sponge	SP	11	2.31		
Other	OT	2	0.26		
				5.38	
<b>Abiotic</b>					
Sand & Rubble	SR	48	35.72		
Water	WA	14	6.25		
				41.97	

Table 3a). Relative cover and abundance of life form categories on: Opal Reef:  
front: 3 m depth.

Date Sampled : 01/05/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	31	7.23		
Tabulate	ACT	8	2.58		
Encrusting	ACE	0	0.00		
Submassive	ACS	6	1.10		
				10.91	
<b>Non-Acropora</b>					
Branching	CB	14	2.22		
Massive	CM	9	2.18		
Encrusting	CE	18	2.67		
Submassive	CS	8	1.08		
Foliose	CF	1	0.07		
				8.22	
<b>Dead Scleractinia</b>					
(recent)	DC	1	0.10		
(algal covering)	DCA	13	10.13		
				10.23	
<b>Algae</b>					
Macro	MA	0	0.00		
Turf	TA	8	1.97		
Coralline	CA	77	32.04		
Halimeda	HA	0	0.00		
Algal assemblage	AA	23	12.48		
				46.49	
<b>Other Fauna</b>					
Soft Corals	SC	79	20.29		
Sponge	SP	3	0.33		
Other	OT	5	0.55		
				21.17	
<b>Abiotic</b>					
Sand & Rubble	SR	0	0.00		
Water	WA	7	2.98		
				2.98	

Table 3b). Relative cover and abundance of life form categories on: Opal Reef:  
front: 6 m depth.

Date Sampled : 01/05/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	18	4.77		
Tabulate	ACT	4	1.45		
Encrusting	ACE	0	0.00		
Submassive	ACS	1	0.20	6.42	
<b>Non-Acropora</b>					
Branching	CB	4	0.79		
Massive	CM	27	4.70		
Encrusting	CE	26	4.28		
Submassive	CS	4	0.66		
Foliose	CF	0	0.00	10.43	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	20	9.61	9.61	
<b>Algae</b>					
Macro	MA	4	0.52		
Turf	TA	5	2.66		
Coralline	CA	75	26.77		
Halimeda	HA	2	0.13		
Algal assemblage	AA	40	18.37	48.45	
<b>Other Fauna</b>					
Soft Corals	SC	59	11.22		
Sponge	SP	6	0.76		
Other	OT	5	0.90	12.88	
<b>Abiotic</b>					
Sand & Rubble	SR	0	0.00		
Water	WA	14	12.21	12.21	

Table 3c). Relative cover and abundance of life form categories on: Opal Reef:  
front: 12 m depth.

Date Sampled : 01/05/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	6	1.59		
Tabulate	ACT	5	2.44		
Encrusting	ACE	0	0.00		
Submassive	ACS	1	0.40		
				4.43	
<b>Non-Acropora</b>					
Branching	CB	4	1.27		
Massive	CM	6	0.65		
Encrusting	CE	62	7.77		
Submassive	CS	8	1.40		
Foliose	CF	18	2.83		
				13.92	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	32	10.68		
				10.68	
<b>Algae</b>					
Macro	MA	20	3.06		
Turf	TA	7	1.68		
Coralline	CA	39	8.63		
Halimeda	HA	12	1.20		
Algal assemblage	AA	79	29.98		
				44.55	
<b>Other Fauna</b>					
Soft Corals	SC	59	6.64		
Sponge	SP	30	3.89		
Other	OT	8	0.60		
				11.13	
<b>Abiotic</b>					
Sand & Rubble	SR	1	0.99		
Water	WA	15	14.30		
				15.29	



Table 3d). Relative cover and abundance of life form categories on: Opal Reef:  
back: 3 m depth.

Date Sampled : 01/04/86      Transect length sampled : 100 metres

Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals
<b>Acropora</b>				
Branching	ACB	11	3.26	
Tabulate	ACT	0	0.00	
Encrusting	ACE	1	0.02	
Submassive	ACS	0	0.00	
				3.28
<b>Non-Acropora</b>				
Branching	CB	1	0.09	
Massive	CM	48	9.26	
Encrusting	CE	27	4.44	
Submassive	CS	0	0.00	
Foliose	CF	0	0.00	
				13.79
<b>Dead Scleractinia</b>				
(recent)	DC	0	0.00	
(algal covering)	DCA	39	25.76	
				25.76
<b>Algae</b>				
Macro	MA	0	0.00	
Turf	TA	10	3.96	
Coralline	CA	41	11.40	
Halimeda	HA	0	0.00	
Algal assemblage	AA	20	5.75	
				21.11
<b>Other Fauna</b>				
Soft Corals	SC	55	7.13	
Sponge	SP	17	1.74	
Other	OT	5	0.33	
				9.20
<b>Abiotic</b>				
Sand & Rubble	SR	59	26.73	
Water	WA	1	0.13	
				26.86

Table 3e). Relative cover and abundance of life form categories on: Opal Reef:  
back: 6 m depth.

Date Sampled : 01/04/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	6	0.64		
Tabulate	ACT	0	0.00		
Encrusting	ACE	0	0.00		
Submassive	ACS	0	0.00	0.64	
<b>Non-Acropora</b>					
Branching	CB	5	0.83		
Massive	CM	47	9.93		
Encrusting	CE	37	6.25		
Submassive	CS	3	0.33		
Foliose	CF	0	0.00	17.34	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	26	15.31	15.31	
<b>Algae</b>					
Macro	MA	0	0.00		
Turf	TA	6	1.94		
Coralline	CA	7	1.41		
Halimeda	HA	0	0.00		
Algal assemblage	AA	40	11.27	14.62	
<b>Other Fauna</b>					
Soft Corals	SC	56	6.21		
Sponge	SP	13	1.61		
Other	OT	17	2.06	9.88	
<b>Abiotic</b>					
Sand & Rubble	SR	71	41.91		
Water	WA	2	0.30	42.21	

Table 4a). Relative cover and abundance of life form categories on: Low Isles:  
front: 3 m depth.

Date Sampled : 11/27/85		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	39	10.56		
Tabulate	ACT	3	0.98		
Encrusting	ACE	0	0.00		
Submassive	ACS	36	12.32		
				23.86	
<b>Non-Acropora</b>					
Branching	CB	2	0.59		
Massive	CM	29	11.28		
Encrusting	CE	3	0.79		
Submassive	CS	11	3.60		
Foliose	CF	0	0.00		
				16.26	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	4	0.47		
				0.47	
<b>Algae</b>					
Macro	MA	0	0.00		
Turf	TA	1	0.10		
Coralline	CA	5	2.47		
Halimeda	HA	3	0.29		
Algal assemblage	AA	56	20.28		
				23.14	
<b>Other Fauna</b>					
Soft Corals	SC	61	19.21		
Sponge	SP	9	1.68		
Other	OT	17	5.45		
				26.34	
<b>Abiotic</b>					
Sand & Rubble	SR	20	9.93		
Water	WA	0	0.00		
				9.93	

Table 4b). Relative cover and abundance of life form categories on: Low Isles:  
front: 6 m depth.

Date Sampled : 11/27/85      Transect length sampled : 100 metres

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Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals
<b>Acropora</b>				
Branching	ACB	5	0.75	
Tabulate	ACT	3	0.45	
Encrusting	ACE	0	0.00	
Submassive	ACS	4	2.72	
				3.92
<b>Non-Acropora</b>				
Branching	CB	12	1.32	
Massive	CM	31	4.97	
Encrusting	CE	38	6.62	
Submassive	CS	74	12.20	
Foliose	CF	25	3.56	
				28.67
<b>Dead Scleractinia</b>				
(recent)	DC	0	0.00	
(algal covering)	DCA	1	0.13	
				0.13
<b>Algae</b>				
Macro	MA	5	0.41	
Turf	TA	10	1.48	
Coralline	CA	10	3.65	
Halimeda	HA	4	0.58	
Algal assemblage	AA	122	41.32	
				47.44
<b>Other Fauna</b>				
Soft Corals	SC	52	11.74	
Sponge	SP	12	2.36	
Other	OT	7	1.27	
				15.37
<b>Abiotic</b>				
Sand & Rubble	SR	3	1.67	
Water	WA	4	2.80	
				4.47

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Table 4c). Relative cover and abundance of life form categories on: Low Isles:  
front: 12 m depth.

Date Sampled : 11/27/85		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	2	0.24		
Tabulate	ACT	0	0.00		
Encrusting	ACE	0	0.00		
Submassive	ACS	0	0.00	0.24	
<b>Non-Acropora</b>					
Branching	CB	0	0.00		
Massive	CM	18	4.43		
Encrusting	CE	11	2.14		
Submassive	CS	14	2.87		
Foliose	CF	1	0.27	9.71	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	0	0.00	0.00	
<b>Algae</b>					
Macro	MA	1	0.16		
Turf	TA	18	11.93		
Coralline	CA	0	0.00		
Halimeda	HA	0	0.00		
Algal assemblage	AA	33	18.27	30.36	
<b>Other Fauna</b>					
Soft Corals	SC	8	1.15		
Sponge	SP	7	1.38		
Other	OT	17	1.24	3.77	
<b>Abiotic</b>					
Sand & Rubble	SR	33	55.92		
Water	WA	0	0.00	55.92	

Table 4d). Relative cover and abundance of life form categories on: Low Isles:  
back: 3 m depth.

Date Sampled : 11/27/85		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	1	0.90		
Tabulate	ACT	0	0.00		
Encrusting	ACE	0	0.00		
Submassive	ACS	2	0.26		
				1.16	
<b>Non-Acropora</b>					
Branching	CB	2	0.75		
Massive	CM	76	17.00		
Encrusting	CE	22	2.19		
Submassive	CS	9	3.61		
Foliose	CF	7	1.61		
				25.16	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	9	3.32		
				3.32	
<b>Algae</b>					
Macro	MA	1	0.05		
Turf	TA	6	1.91		
Coralline	CA	6	2.04		
Halimeda	HA	0	0.00		
Algal assemblage	AA	78	23.00		
				27.00	
<b>Other Fauna</b>					
Soft Corals	SC	94	22.57		
Sponge	SP	1	0.10		
Other	OT	10	0.57		
				23.24	
<b>Abiotic</b>					
Sand & Rubble	SR	36	19.58		
Water	WA	1	0.54		
				20.12	

Table 4e). Relative cover and abundance of life form categories on: Low Isles:  
back: 6 m depth.

Date Sampled : 11/27/85		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	0	0.00		
Tabulate	ACT	0	0.00		
Encrusting	ACE	0	0.00		
Submassive	ACS	0	0.00	0.00	
<b>Non-Acropora</b>					
Branching	CB	0	0.00		
Massive	CM	0	0.00		
Encrusting	CE	0	0.00		
Submassive	CS	0	0.00		
Foliose	CF	0	0.00	0.00	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	0	0.00	0.00	
<b>Algae</b>					
Macro	MA	0	0.00		
Turf	TA	0	0.00		
Coralline	CA	0	0.00		
Halimeda	HA	0	0.00		
Algal assemblage	AA	0	0.00	0.00	
<b>Other Fauna</b>					
Soft Corals	SC	0	0.00		
Sponge	SP	0	0.00		
Other	OT	0	0.00	0.00	
<b>Abiotic</b>					
Sand & Rubble	SR	1	100.00		
Water	WA	0	0.00		
				100.00	

Table 4f). Relative cover and abundance of life form categories on: Low Isles:  
back: 12 m depth.

Date Sampled : 11/27/85		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	0	0.00		
Tabulate	ACT	0	0.00		
Encrusting	ACE	0	0.00		
Submassive	ACS	0	0.00	0.00	
<b>Non-Acropora</b>					
Branching	CB	0	0.00		
Massive	CM	0	0.00		
Encrusting	CE	0	0.00		
Submassive	CS	0	0.00		
Foliose	CF	0	0.00	0.00	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	0	0.00	0.00	
<b>Algae</b>					
Macro	MA	0	0.00		
Turf	TA	0	0.00		
Coralline	CA	0	0.00		
Halimeda	HA	0	0.00		
Algal assemblage	AA	0	0.00	0.00	
<b>Other Fauna</b>					
Soft Corals	SC	0	0.00		
Sponge	SP	0	0.00		
Other	OT	0	0.00	0.00	
<b>Abiotic</b>					
Sand & Rubble	SR	1	100.00		
Water	WA	0	0.00		
				100.00	



Table 5a). Relative cover and abundance of life form categories on: Hastings Reef: front: 3 m depth.

Date Sampled : 01/07/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	76	15.21		
Tabulate	ACT	61	23.64		
Encrusting	ACE	16	4.16		
Submassive	ACS	26	4.67		
				47.68	
<b>Non-Acropora</b>					
Branching	CB	31	7.50		
Massive	CM	11	1.80		
Encrusting	CE	25	4.21		
Submassive	CS	9	1.38		
Foliose	CF	0	0.00		
				14.89	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	23	7.82		
				7.82	
<b>Algae</b>					
Macro	MA	0	0.00		
Turf	TA	10	2.92		
Coralline	CA	35	8.26		
Halimeda	HA	0	0.00		
Algal assemblage	AA	40	12.90		
				24.08	
<b>Other Fauna</b>					
Soft Corals	SC	11	4.03		
Sponge	SP	2	0.14		
Other	OT	3	0.28		
				4.45	
<b>Abiotic</b>					
Sand & Rubble	SR	0	0.00		
Water	WA	4	1.08		
				1.08	

Table 5b). Relative cover and abundance of life form categories on: Hastings Reef: front: 6 m depth.

Date Sampled : 01/07/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	43	9.50		
Tabulate	ACT	15	4.50		
Encrusting	ACE	0	0.00		
Submassive	ACS	4	0.57		
				14.57	
<b>Non-Acropora</b>					
Branching	CB	17	2.45		
Massive	CM	28	4.83		
Encrusting	CE	61	9.43		
Submassive	CS	11	1.76		
Foliose	CF	2	0.23		
				18.70	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	35	10.19		
				10.19	
<b>Algae</b>					
Macro	MA	1	1.44		
Turf	TA	12	5.01		
Coralline	CA	47	11.31		
Halimeda	HA	0	0.00		
Algal assemblage	AA	49	11.36		
				29.12	
<b>Other Fauna</b>					
Soft Corals	SC	126	22.66		
Sponge	SP	4	0.25		
Other	OT	6	1.16		
				24.07	
<b>Abiotic</b>					
Sand & Rubble	SR	1	0.14		
Water	WA	6	3.21		
				3.35	

Table 5c). Relative cover and abundance of life form categories on: Hastings Reef: front: 12 m depth.

Date Sampled : 01/07/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	17	4.49		
Tabulate	ACT	12	6.24		
Encrusting	ACE	0	0.00		
Submassive	ACS	2	0.44		
				11.17	
<b>Non-Acropora</b>					
Branching	CB	16	2.95		
Massive	CM	17	3.99		
Encrusting	CE	66	11.97		
Submassive	CS	6	0.75		
Foliose	CF	10	2.00		
				21.66	
<b>Dead Scleractinia</b>					
(recent)	DC	1	0.20		
(algal covering)	DCA	22	9.55		
				9.75	
<b>Algae</b>					
Macro	MA	1	0.88		
Turf	TA	5	1.81		
Coralline	CA	30	8.39		
Halimeda	HA	0	0.00		
Algal assemblage	AA	69	24.09		
				35.17	
<b>Other Fauna</b>					
Soft Corals	SC	65	12.95		
Sponge	SP	6	0.89		
Other	OT	5	0.73		
				14.57	
<b>Abiotic</b>					
Sand & Rubble	SR	2	0.68		
Water	WA	8	7.00		
				7.68	

Table 5d). Relative cover and abundance of life form categories on: Hastings Reef: back: 3 m depth.

Date Sampled : 01/07/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	5	1.03		
Tabulate	ACT	0	0.00		
Encrusting	ACE	0	0.00		
Submassive	ACS	3	0.23	1.26	
<b>Non-Acropora</b>					
Branching	CB	3	0.57		
Massive	CM	24	3.94		
Encrusting	CE	35	4.88		
Submassive	CS	2	0.08		
Foliose	CF	2	0.61	10.08	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	64	20.50	20.50	
<b>Algae</b>					
Macro	MA	0	0.00		
Turf	TA	2	0.38		
Coralline	CA	8	1.79		
Halimeda	HA	2	0.46		
Algal assemblage	AA	64	26.78	29.41	
<b>Other Fauna</b>					
Soft Corals	SC	74	10.37		
Sponge	SP	21	3.19		
Other	OT	8	0.68	14.24	
<b>Abiotic</b>					
Sand & Rubble	SR	33	23.76		
Water	WA	3	0.75	24.51	

Table 5e). Relative cover and abundance of life form categories on: Hastings Reef: back: 6 m depth.

Date Sampled : 01/07/86      Transect length sampled : 100 metres

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Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals
<b>Acropora</b>				
Branching	ACB	5	1.28	
Tabulate	ACT	1	0.35	
Encrusting	ACE	0	0.00	
Submassive	ACS	0	0.00	
				1.63
<b>Non-Acropora</b>				
Branching	CB	9	3.62	
Massive	CM	22	1.91	
Encrusting	CE	37	5.13	
Submassive	CS	4	0.20	
Foliose	CF	1	0.15	
				11.01
<b>Dead Scleractinia</b>				
(recent)	DC	0	0.00	
(algal covering)	DCA	50	26.00	
				26.00
<b>Algae</b>				
Macro	MA	1	0.02	
Turf	TA	0	0.00	
Coralline	CA	2	0.40	
Halimeda	HA	2	0.32	
Algal assemblage	AA	63	23.48	
				24.22
<b>Other Fauna</b>				
Soft Corals	SC	61	7.75	
Sponge	SP	17	1.62	
Other	OT	10	2.07	
				11.44
<b>Abiotic</b>				
Sand & Rubble	SR	24	24.50	
Water	WA	2	1.20	
				25.70

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Table 6a). Relative cover and abundance of life form categories on: Michaelmas Reef: front: 3 m depth.

Date Sampled : 01/09/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	31	11.27		
Tabulate	ACT	10	3.47		
Encrusting	ACE	1	0.21		
Submassive	ACS	16	2.79		
				17.74	
<b>Non-Acropora</b>					
Branching	CB	25	4.34		
Massive	CM	52	10.54		
Encrusting	CE	10	1.92		
Submassive	CS	9	0.76		
Foliose	CF	1	0.60		
				18.16	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	25	12.07		
				12.07	
<b>Algae</b>					
Macro	MA	3	0.36		
Turf	TA	9	2.94		
Coralline	CA	53	13.00		
Halimeda	HA	27	4.30		
Algal assemblage	AA	17	4.08		
				24.68	
<b>Other Fauna</b>					
Soft Corals	SC	78	17.55		
Sponge	SP	3	0.34		
Other	OT	0	0.00		
				17.89	
<b>Abiotic</b>					
Sand & Rubble	SR	25	9.30		
Water	WA	1	0.16		
				9.46	

Table 6b). Relative cover and abundance of life form categories on: Michaelmas Reef: front: 6 m depth.

Date Sampled : 01/09/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	33	8.82		
Tabulate	ACT	7	2.42		
Encrusting	ACE	0	0.00		
Submassive	ACS	4	0.47		
				11.71	
<b>Non-Acropora</b>					
Branching	CB	30	6.27		
Massive	CM	40	7.96		
Encrusting	CE	24	6.18		
Submassive	CS	4	0.64		
Foliose	CF	0	0.00		
				21.05	
<b>Dead Scleractinia</b>					
(recent)	DC	1	0.15		
(algal covering)	DCA	29	9.79		
				9.94	
<b>Algae</b>					
Macro	MA	0	0.00		
Turf	TA	6	1.94		
Coralline	CA	19	3.86		
Halimeda	HA	44	10.56		
Algal assemblage	AA	34	11.79		
				28.15	
<b>Other Fauna</b>					
Soft Corals	SC	75	15.35		
Sponge	SP	4	0.47		
Other	OT	7	0.88		
				16.70	
<b>Abiotic</b>					
Sand & Rubble	SR	14	12.45		
Water	WA	0	0.00		
				12.45	

Table 6c). Relative cover and abundance of life form categories on: Michaelmas Reef: front: 12 m depth.

Date Sampled : 01/09/86		Transect length sampled : 100 metres		
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals
<b>Acropora</b>				
Branching	ACB	15	6.43	
Tabulate	ACT	7	2.35	
Encrusting	ACE	0	0.00	
Submassive	ACS	3	0.35	
				9.13
<b>Non-Acropora</b>				
Branching	CB	16	4.12	
Massive	CM	30	12.85	
Encrusting	CE	37	7.37	
Submassive	CS	8	2.67	
Foliose	CF	5	0.69	
				27.70
<b>Dead Scleractinia</b>				
(recent)	DC	0	0.00	
(algal covering)	DCA	18	6.87	
				6.87
<b>Algae</b>				
Macro	MA	2	0.30	
Turf	TA	9	2.33	
Coralline	CA	2	0.27	
Halimeda	HA	50	9.74	
Algal assemblage	AA	21	8.25	
				20.89
<b>Other Fauna</b>				
Soft Corals	SC	64	12.19	
Sponge	SP	7	1.48	
Other	OT	4	0.27	
				13.94
<b>Abiotic</b>				
Sand & Rubble	SR	10	21.02	
Water	WA	2	0.45	
				21.47



Table 6d). Relative cover and abundance of life form categories on: Michaelmas Reef: back: 3 m depth.

Date Sampled : 01/08/86      Transect length sampled : 100 metres

Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals
<b>Acropora</b>				
Branching	ACB	33	7.81	
Tabulate	ACT	24	15.61	
Encrusting	ACE	2	0.68	
Submassive	ACS	3	0.45	24.55
<b>Non-Acropora</b>				
Branching	CB	9	3.10	
Massive	CM	23	3.85	
Encrusting	CE	24	3.46	
Submassive	CS	1	0.20	
Foliose	CF	8	1.37	11.98
<b>Dead Scleractinia</b>				
(recent)	DC	0	0.00	
(algal covering)	DCA	40	14.04	14.04
<b>Algae</b>				
Macro	MA	1	0.02	
Turf	TA	8	2.16	
Coralline	CA	26	3.25	
Halimeda	HA	7	0.64	
Algal assemblage	AA	23	6.23	12.30
<b>Other Fauna</b>				
Soft Corals	SC	125	32.39	
Sponge	SP	6	0.96	
Other	OT	4	0.23	33.58
<b>Abiotic</b>				
Sand & Rubble	SR	0	0.00	
Water	WA	6	3.55	3.55

Table 6e). Relative cover and abundance of life form categories on: Michaelmas Reef: back: 6 m depth.

Date Sampled : 01/08/86		Transect length sampled : 80 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	12	5.14		
Tabulate	ACT	4	1.94		
Encrusting	ACE	1	0.25		
Submassive	ACS	0	0.00		
				7.32	
<b>Non-Acropora</b>					
Branching	CB	1	0.05		
Massive	CM	10	1.96		
Encrusting	CE	26	6.57		
Submassive	CS	4	1.21		
Foliose	CF	5	0.65		
				10.45	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	22	6.06		
				6.06	
<b>Algae</b>					
Macro	MA	4	0.77		
Turf	TA	11	5.19		
Coralline	CA	24	5.92		
Halimeda	HA	10	1.09		
Algal assemblage	AA	38	17.05		
				30.02	
<b>Other Fauna</b>					
Soft Corals	SC	91	21.71		
Sponge	SP	20	3.38		
Other	OT	7	0.56		
				25.65	
<b>Abiotic</b>					
Sand & Rubble	SR	3	1.65		
Water	WA	20	18.84		
				20.49	

Table 6f). Relative cover and abundance of life form categories on: Michaelmas Reef: back: 12 m depth.

Date Sampled : 01/08/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	5	3.45		
Tabulate	ACT	1	0.46		
Encrusting	ACE	0	0.00		
Submassive	ACS	0	0.00		
				3.91	
<b>Non-Acropora</b>					
Branching	CB	15	3.04		
Massive	CM	15	1.63		
Encrusting	CE	22	2.70		
Submassive	CS	2	0.17		
Foliose	CF	4	1.53		
				9.07	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	35	9.20		
				9.20	
<b>Algae</b>					
Macro	MA	6	0.64		
Turf	TA	14	4.82		
Coralline	CA	3	0.57		
Halimeda	HA	3	0.19		
Algal assemblage	AA	43	10.70		
				16.92	
<b>Other Fauna</b>					
Soft Corals	SC	140	25.17		
Sponge	SP	15	2.21		
Other	OT	13	2.12		
				29.50	
<b>Abiotic</b>					
Sand & Rubble	SR	34	28.03		
Water	WA	11	3.37		
				31.40	

Table 7a). Relative cover and abundance of life form categories on: Arlington Reef: front: 3 m depth.

Date Sampled : 01/11/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	18	1.76		
Tabulate	ACT	0	0.00		
Encrusting	ACE	0	0.00		
Submassive	ACS	1	0.18		
				1.94	
<b>Non-Acropora</b>					
Branching	CB	4	0.62		
Massive	CM	9	1.02		
Encrusting	CE	37	3.01		
Submassive	CS	3	0.08		
Foliose	CF	0	0.00		
				4.73	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	36	20.77		
				20.77	
<b>Algae</b>					
Macro	MA	2	0.17		
Turf	TA	8	2.98		
Coralline	CA	21	5.11		
Halimeda	HA	1	0.20		
Algal assemblage	AA	56	32.89		
				41.35	
<b>Other Fauna</b>					
Soft Corals	SC	59	12.46		
Sponge	SP	4	0.65		
Other	OT	7	0.51		
				13.62	
<b>Abiotic</b>					
Sand & Rubble	SR	26	17.59		
Water	WA	0	0.00		
				17.59	

Table 7b). Relative cover and abundance of life form categories on: Arlington Reef: front: 6 m depth.

Date Sampled : 01/11/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	21	2.44		
Tabulate	ACT	0	0.00		
Encrusting	ACE	0	0.00		
Submassive	ACS	1	0.09		
				2.53	
<b>Non-Acropora</b>					
Branching	CB	1	0.05		
Massive	CM	8	0.53		
Encrusting	CE	17	1.18		
Submassive	CS	0	0.00		
Foliose	CF	2	1.00		
				2.76	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	33	24.39		
				24.39	
<b>Algae</b>					
Macro	MA	0	0.00		
Turf	TA	17	6.12		
Coralline	CA	10	2.71		
Halimeda	HA	0	0.00		
Algal assemblage	AA	41	18.24		
				27.07	
<b>Other Fauna</b>					
Soft Corals	SC	52	10.44		
Sponge	SP	15	1.42		
Other	OT	6	0.75		
				12.61	
<b>Abiotic</b>					
Sand & Rubble	SR	30	30.64		
Water	WA	0	0.00		
				30.64	

Table 7c). Relative cover and abundance of life form categories on: Arlington Reef: front: 12 m depth.

Date Sampled : 01/11/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	0	0.00		
Tabulate	ACT	0	0.00		
Encrusting	ACE	0	0.00		
Submassive	ACS	0	0.00		
				0.00	
<b>Non-Acropora</b>					
Branching	CB	0	0.00		
Massive	CM	2	0.54		
Encrusting	CE	3	0.18		
Submassive	CS	0	0.00		
Foliose	CF	3	0.97		
				1.69	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	19	13.09		
				13.09	
<b>Algae</b>					
Macro	MA	3	0.42		
Turf	TA	5	1.65		
Coralline	CA	1	0.19		
Halimeda	HA	0	0.00		
Algal assemblage	AA	20	10.00		
				12.26	
<b>Other Fauna</b>					
Soft Corals	SC	10	1.81		
Sponge	SP	14	2.02		
Other	OT	6	0.44		
				4.27	
<b>Abiotic</b>					
Sand & Rubble	SR	26	68.69		
Water	WA	0	0.00		
				68.69	

Table 7d). Relative cover and abundance of life form categories on: Arlington Reef: back: 3 m depth.

Date Sampled : 01/10/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	6	0.54		
Tabulate	ACT	0	0.00		
Encrusting	ACE	0	0.00		
Submassive	ACS	1	0.05	0.59	
<b>Non-Acropora</b>					
Branching	CB	6	0.88		
Massive	CM	25	6.83		
Encrusting	CE	4	1.78		
Submassive	CS	0	0.00		
Foliose	CF	1	0.36	9.85	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	52	14.71	14.71	
<b>Algae</b>					
Macro	MA	1	0.14		
Turf	TA	0	0.00		
Coralline	CA	1	0.30		
Halimeda	HA	5	0.60		
Algal assemblage	AA	51	11.67	12.71	
<b>Other Fauna</b>					
Soft Corals	SC	203	51.03		
Sponge	SP	3	0.65		
Other	OT	5	0.25	51.93	
<b>Abiotic</b>					
Sand & Rubble	SR	28	9.67		
Water	WA	5	0.54	10.21	

Table 7e). Relative cover and abundance of life form categories on: Arlington Reef: back: 6 m depth.

Date Sampled : 01/10/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	5	1.76		
Tabulate	ACT	0	0.00		
Encrusting	ACE	0	0.00		
Submassive	ACS	0	0.00	1.76	
<b>Non-Acropora</b>					
Branching	CB	6	1.29		
Massive	CM	12	2.15		
Encrusting	CE	6	0.89		
Submassive	CS	0	0.00		
Foliose	CF	0	0.00	4.33	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	27	10.50	10.50	
<b>Algae</b>					
Macro	MA	0	0.00		
Turf	TA	0	0.00		
Coralline	CA	0	0.00		
Halimeda	HA	0	0.00		
Algal assemblage	AA	18	2.90	2.90	
<b>Other Fauna</b>					
Soft Corals	SC	151	35.71		
Sponge	SP	2	0.25		
Other	OT	3	0.58	36.54	
<b>Abiotic</b>					
Sand & Rubble	SR	65	43.97		
Water	WA	0	0.00	43.97	



Table 8a). Relative cover and abundance of life form categories on: Green Island: front: 3 m depth.

Date Sampled : 01/13/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	5	0.94		
Tabulate	ACT	0	0.00		
Encrusting	ACE	0	0.00		
Submassive	ACS	0	0.00		
				0.94	
<b>Non-Acropora</b>					
Branching	CB	2	0.65		
Massive	CM	13	6.18		
Encrusting	CE	3	0.11		
Submassive	CS	0	0.00		
Foliose	CF	13	5.15		
				12.09	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	41	15.89		
				15.89	
<b>Algae</b>					
Macro	MA	2	0.51		
Turf	TA	0	0.00		
Coralline	CA	0	0.00		
Halimeda	HA	0	0.00		
Algal assemblage	AA	27	16.14		
				16.65	
<b>Other Fauna</b>					
Soft Corals	SC	102	33.57		
Sponge	SP	3	0.35		
Other	OT	0	0.00		
				33.92	
<b>Abiotic</b>					
Sand & Rubble	SR	31	20.15		
Water	WA	2	0.36		
				20.51	

Table 8b). Relative cover and abundance of life form categories on: Green Island: front: 6 m depth.

Date Sampled : 01/13/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	14	3.35		
Tabulate	ACT	1	0.20		
Encrusting	ACE	0	0.00		
Submassive	ACS	0	0.00		
				3.55	
<b>Non-Acropora</b>					
Branching	CB	16	2.97		
Massive	CM	22	5.83		
Encrusting	CE	5	1.03		
Submassive	CS	1	0.22		
Foliose	CF	3	0.80		
				10.85	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	32	18.19		
				18.19	
<b>Algae</b>					
Macro	MA	2	0.58		
Turf	TA	0	0.00		
Coralline	CA	0	0.00		
Halimeda	HA	0	0.00		
Algal assemblage	AA	30	10.46		
				11.04	
<b>Other Fauna</b>					
Soft Corals	SC	68	20.93		
Sponge	SP	1	0.05		
Other	OT	1	0.28		
				21.26	
<b>Abiotic</b>					
Sand & Rubble	SR	54	34.76		
Water	WA	2	0.35		
				35.11	

Table 8c). Relative cover and abundance of life form categories on: Green Island: back: 3 m depth.

Date Sampled : 01/12/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	7	0.85		
Tabulate	ACT	0	0.00		
Encrusting	ACE	0	0.00		
Submassive	ACS	0	0.00	0.85	
<b>Non-Acropora</b>					
Branching	CB	2	0.44		
Massive	CM	1	0.03		
Encrusting	CE	10	1.34		
Submassive	CS	0	0.00		
Foliose	CF	0	0.00	1.81	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	35	20.32	20.32	
<b>Algae</b>					
Macro	MA	14	1.89		
Turf	TA	15	6.19		
Coralline	CA	8	2.62		
Halimeda	HA	43	4.46		
Algal assemblage	AA	33	14.88	30.04	
<b>Other Fauna</b>					
Soft Corals	SC	83	17.94		
Sponge	SP	2	0.34		
Other	OT	3	0.33	18.61	
<b>Abiotic</b>					
Sand & Rubble	SR	48	28.22		
Water	WA	1	0.15	28.37	

Table 8d). Relative cover and abundance of life form categories on: Green Island: back: 6 m depth.

Date Sampled : 01/12/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	11	4.38		
Tabulate	ACT	0	0.00		
Encrusting	ACE	0	0.00		
Submassive	ACS	0	0.00		
				4.38	
<b>Non-Acropora</b>					
Branching	CB	0	0.00		
Massive	CM	3	0.33		
Encrusting	CE	9	0.52		
Submassive	CS	1	0.05		
Foliose	CF	0	0.00		
				0.90	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	30	24.20		
				24.20	
<b>Algae</b>					
Macro	MA	5	0.30		
Turf	TA	15	5.76		
Coralline	CA	1	0.13		
Halimeda	HA	29	4.14		
Algal assemblage	AA	45	21.53		
				31.86	
<b>Other Fauna</b>					
Soft Corals	SC	29	7.21		
Sponge	SP	6	0.53		
Other	OT	9	0.85		
				8.59	
<b>Abiotic</b>					
Sand & Rubble	SR	31	29.99		
Water	WA	1	0.08		
				30.07	

Table 8e). Relative cover and abundance of life form categories on: Green Island: back: 12 m depth.

Date Sampled : 01/12/86		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	4	0.76		
Tabulate	ACT	0	0.00		
Encrusting	ACE	1	0.05		
Submassive	ACS	0	0.00		
				0.81	
<b>Non-Acropora</b>					
Branching	CB	0	0.00		
Massive	CM	2	0.23		
Encrusting	CE	12	1.14		
Submassive	CS	0	0.00		
Foliose	CF	0	0.00		
				1.37	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	28	25.94		
				25.94	
<b>Algae</b>					
Macro	MA	13	2.53		
Turf	TA	11	15.22		
Coralline	CA	2	0.25		
Halimeda	HA	1	0.02		
Algal assemblage	AA	21	32.60		
				50.62	
<b>Other Fauna</b>					
Soft Corals	SC	6	0.50		
Sponge	SP	10	2.17		
Other	OT	5	0.42		
				3.09	
<b>Abiotic</b>					
Sand & Rubble	SR	18	14.02		
Water	WA	3	4.15		
				18.17	

Table 9a). Relative cover and abundance of life form categories on: Fitzroy Island: front: 3 m depth.

Date Sampled : 11/28/85		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	14	5.57		
Tabulate	ACT	19	9.42		
Encrusting	ACE	0	0.00		
Submassive	ACS	42	11.09	26.08	
<b>Non-Acropora</b>					
Branching	CB	1	0.26		
Massive	CM	20	4.77		
Encrusting	CE	25	4.28		
Submassive	CS	4	0.41		
Foliose	CF	0	0.00	9.72	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	0	0.00	0.00	
<b>Algae</b>					
Macro	MA	0	0.00		
Turf	TA	16	7.42		
Coralline	CA	25	6.74		
Halimeda	HA	0	0.00		
Algal assemblage	AA	27	8.10	22.26	
<b>Other Fauna</b>					
Soft Corals	SC	54	19.06		
Sponge	SP	7	3.34		
Other	OT	10	3.26	25.66	
<b>Abiotic</b>					
Sand & Rubble	SR	10	13.99		
Water	WA	4	2.29	16.28	

Table 9b). Relative cover and abundance of life form categories on: Fitzroy Island: front: 6 m depth.

Date Sampled : 11/28/85      Transect length sampled : 100 metres

Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals
<b>Acropora</b>				
Branching	ACB	73	34.19	
Tabulate	ACT	5	3.37	
Encrusting	ACE	0	0.00	
Submassive	ACS	11	2.72	40.28
<b>Non-Acropora</b>				
Branching	CB	6	0.70	
Massive	CM	29	10.10	
Encrusting	CE	5	1.39	
Submassive	CS	13	1.76	
Foliose	CF	8	2.73	16.68
<b>Dead Scleractinia</b>				
(recent)	DC	0	0.00	
(algal covering)	DCA	11	5.27	5.27
<b>Algae</b>				
Macro	MA	1	0.37	
Turf	TA	4	1.72	
Coralline	CA	5	1.56	
Halimeda	HA	0	0.00	
Algal assemblage	AA	52	17.99	21.64
<b>Other Fauna</b>				
Soft Corals	SC	42	12.27	
Sponge	SP	5	0.41	
Other	OT	5	0.60	13.28
<b>Abiotic</b>				
Sand & Rubble	SR	5	2.85	
Water	WA	0	0.00	2.85

Table 9c). Relative cover and abundance of life form categories on: Fitzroy Island: front: 12 m depth.

Date Sampled : 11/28/85		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	10	5.15		
Tabulate	ACT	11	4.78		
Encrusting	ACE	2	0.73		
Submassive	ACS	2	0.18		
				10.84	
<b>Non-Acropora</b>					
Branching	CB	13	2.11		
Massive	CM	19	2.38		
Encrusting	CE	30	5.01		
Submassive	CS	15	2.37		
Foliose	CF	8	2.53		
				14.40	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	5	1.16		
				1.16	
<b>Algae</b>					
Macro	MA	3	0.34		
Turf	TA	9	2.69		
Coralline	CA	0	0.00		
Halimeda	HA	0	0.00		
Algal assemblage	AA	32	9.94		
				12.97	
<b>Other Fauna</b>					
Soft Corals	SC	65	9.61		
Sponge	SP	4	0.58		
Other	OT	9	1.74		
				11.93	
<b>Abiotic</b>					
Sand & Rubble	SR	61	48.70		
Water	WA	0	0.00		
				48.70	



Table 9d). Relative cover and abundance of life form categories on: Fitzroy Island: back: 3 m depth.

Date Sampled : 11/28/85		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	71	36.73		
Tabulate	ACT	2	0.36		
Encrusting	ACE	0	0.00		
Submassive	ACS	5	1.71		
				38.80	
<b>Non-Acropora</b>					
Branching	CB	3	0.88		
Massive	CM	3	1.15		
Encrusting	CE	2	0.14		
Submassive	CS	53	23.03		
Foliose	CF	2	0.26		
				25.46	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	6	1.30		
				1.30	
<b>Algae</b>					
Macro	MA	1	0.04		
Turf	TA	0	0.00		
Coralline	CA	0	0.00		
Halimeda	HA	1	0.06		
Algal assemblage	AA	18	6.65		
				6.75	
<b>Other Fauna</b>					
Soft Corals	SC	57	21.66		
Sponge	SP	0	0.00		
Other	OT	8	2.86		
				24.52	
<b>Abiotic</b>					
Sand & Rubble	SR	7	3.17		
Water	WA	0	0.00		
				3.17	

Table 9e). Relative cover and abundance of life form categories on: Fitzroy Island: back: 6 m depth.

Date Sampled : 11/28/85		Transect length sampled : 100 metres			
Benthic Life Form	Code	Number of Occurrences	Percent Cover	Category Totals	
<b>Acropora</b>					
Branching	ACB	40	11.75		
Tabulate	ACT	1	0.14		
Encrusting	ACE	0	0.00		
Submassive	ACS	0	0.00		
				11.89	
<b>Non-Acropora</b>					
Branching	CB	7	1.86		
Massive	CM	20	5.68		
Encrusting	CE	13	1.87		
Submassive	CS	64	33.69		
Foliose	CF	15	3.87		
				46.97	
<b>Dead Scleractinia</b>					
(recent)	DC	0	0.00		
(algal covering)	DCA	6	1.33		
				1.33	
<b>Algae</b>					
Macro	MA	0	0.00		
Turf	TA	0	0.00		
Coralline	CA	0	0.00		
Halimeda	HA	0	0.00		
Algal assemblage	AA	37	9.55		
				9.55	
<b>Other Fauna</b>					
Soft Corals	SC	79	19.80		
Sponge	SP	2	0.56		
Other	OT	12	2.86		
				23.22	
<b>Abiotic</b>					
Sand & Rubble	SR	16	7.04		
Water	WA	0	0.00		
				7.04	

Table 10a). Frequency and median of hard coral cover and A. planci numbers from manta tow surveys in the Cairns sector.

Reef	Live Coral Category							Dead Coral Category							A. planci numbers	Total manta tows
	0	1	2	3	5	4	Median	0	1	2	3	4	5	Median		
Evening	0	3	24	13	1	0	2	0	26	14	1	0	0	1	0	41
Pickersgill	3	50	14	2	1	0	1	1	8	33	24	4	0	2	0	70
Mackay	0	13	25	2	0	0	2	4	26	10	0	0	0	1	0	24
Low Isles	0	10	25	10	4	0	2	16	35	4	0	0	0	1	0	32
Fitzroy Is.	2	12	34	8	0	0	2	9	47	0	0	0	0	1	0	36
Thetford	0	2	14	22	9	0	3	1	40	5	1	0	0	1	0	47
Flynn	0	0	18	14	0	0	2	3	27	2	0	0	0	1	0	32
Elford	0	24	89	27	2	0	2	6	0	36	0	0	0	1	2	142
Escape	0	3	15	12	8	0	3	2	34	2	0	0	0	1	0	38
Escape	0	4	27	23	3	0	2	0	34	15	8	0	0	1	0	57
Escape	0	0	12	14	5	0	3	1	28	2	0	0	0	1	0	31
St. Crispin	0	35	13	28	7	0	2	11	58	12	2	0	0	1	0	83
St. Crispin	0	0	0	3	0	0	3	0	3	0	0	0	0	1	0	3
St. Crispin	0	7	17	6	0	0	2	0	23	6	1	0	0	1	0	30
Pixie	0	4	5	2	0	0	2	0	4	7	0	0	0	2	0	11
Hastings	0	22	28	20	0	0	2	5	42	5	17	1	0	1	0	70
Norman	0	0	2	14	12	3	3	5	23	3	0	0	0	1	0	31
Saxon	0	0	1	7	9	0	4	0	16	1	0	0	0	1	0	17
Michaelmas	1	13	59	51	3	0	2	3	4	20	0	0	0	1	1	127
Arlington	6	33	79	18	1	0	1	11	10	60	36	15	6	1	0	237
Hope	0	0	6	8	6	4	3	3	21	0	0	0	0	1	0	24
Green Is	3	33	2	0	0	0	1	2	8	14	6	8	0	2	0	38
Opal	0	6	5	11	0	0	3	0	16	4	2	0	0	1	0	22
Opal	0	14	26	23	1	0	2	3	46	14	1	0	0	1	0	64
Opal	0	0	3	8	0	0	3	4	7	0	0	0	0	1	0	11
Tongue	1	20	16	15	1	0	2	0	49	4	0	0	0	1	0	54
Tongue	4	45	14	2	0	0	1	16	38	10	1	0	0	1	0	65
Tongue	0	11	30	33	5	0	2	0	60	12	6	0	1	1	0	79

Table 10b). Categories used for live and dead coral cover and A. planci.

Category	Live and Dead Coral (percent)	Category	<u>A. planci</u> (No. of individuals)
0	0	0	0
1	1-10	1	1-9
2	10-30	2	10-39
3	30-50	3	40-100
4	50-75	4	100
5	75-100		

Table II. Previous Crown-of-thorns surveys in the Cairns Sector.

Reef	Area Surveyed	Survey date	Data Source*	Method	A. planci numbers	Coral state (Live/Dead%)
Escape	unspec. fronts.	1980	(a)	-	0	-
		1982	(a)	-	15	-
Pickersgill	front	1966	P & E	swim	37	95/5
Evening	front	1966	P & E	swim	0	-
	back N.	1979	(a)	manta	3	-
	unspec	1980	(a)	swim	1	-
Mackay	fronts	1966	P & E	swim	184	-
	fronts	1967	P & E	swim	26	-
	unspec	1980	(a)	swim	6	-
St. Crispin	Front(s)	1966	P & E	swim	42	40/60
	Front & Back (N)	1970	(a)	swim	2	
	-	1983	Ayl	transect	3	
Opal	back (W)	1966	P & E	swim	9	85/15 M-High Cover
	whole	1970	(a)	swim	0	
	-	1983	Ayl	transect	1	
Tongue	back (N)	1966	P & E	swim	74	-
	back (N)	1970	(a)	swim	0	-
	whole	1980	N & Z	manta	2	Low dead cover
	-	1983	Ayl	transect	5	Moderate cover
Low	Front (S)	1966	P & E	swim	26	-
	Front (S)	1967	P & E	swim	20	-
	whole	1980	N & Z	manta	-	Low dead cover
	-	1983	Ayl	transect	1	-
Norman	Back (N)	1966	P & E	swim	1	-
Saxon	no previous data					
Hope	no previous data					
Hastings	-	1983	Ayl	transect	0	Moderate cover
	whole	1980	N & Z	manta	0	Low dead cover
	whole	1983	(a)	swim	13	25/10
Pixie	Back N	1980	(a)	scuba	100	80/20
Michaelmas	Back N	1966	P & E	swim	42	Low damage
	-	1968	P & E	swim	51	Low damage
	Back N	1970	E & S	swim	10	Marked damage
	-	1983	Ayl	transect	1	
	-	1980	N & Z	manta	0	Low dead cover
	-	1983	(a)	tow	1	10-60/5-10

Reef	Area Surveyed	Survey date	Data Source*	Method	<u>A. planci</u> numbers	Coral state (Live/Dead%)
Arlington	Back NE, Front S	1966	P & E	swim	191	
	Back N	1967	P & E	swim	181	30/70
	-	1970	E & S	swim	10	High damage
	Back S	1979	(a)	tow	400	High mortality
	whole	1980	N & Z	manta	-	Moderate dead cover
	-	1983	Ayl	transect	3	Moderate cover
Flynn	Back N, Front S	1970	E & S	swim	18	Low damage
	Back N	1980	(a)	tow	0	-
		1983	Ayl	tran	0	M-High Cover
Green		1966	P & E	swim	410	High damage
		1966	"	"	560	"
		1966	"	"	1552	High damage
		1966	"	"	199	"
		1967	"	"	36	"
		1968	"	"	5	"
		1969	"	"	3	"
	whole	1980	N & Z	manta	-	High dead cover
		1983	Ayl	transect	0	Low cover
Thetford	Front S	1966	P & E	swim	1	
	Front S	1970	E & S	"	10	Low damage
Elford	Back S	1966	P & E	swim	21	-
	Front	1980	(a)	tow	1	-
Fitzroy	Back N	1966	P & E	swim	28	-
	Back	1967	P & E	swim	1368	-
	Front	1968	P & E	swim	25	Large damage
	Back	1980	(a)	tow	3	-
		1983	Ayl	transect	0	Moderate cover

- (a) - GBRMPA database  
P & E - Pearson and Endean (1969)  
E & S - Endean and Stablum (1973a,b).  
Ayl - Ayling (1983)  
N & Z - Nash and Zell (1981)

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