FAR-NORTH SECTION SURVEY REPORT

Report prepared by:

Sea Research

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SURVEY REPORT

Incorporating:

Part I General Report on Survey Trip

Part II Coral Reconnaissance

Part III Distribution and Abundance of Coral Trout (*Plectropomus* spp.)

Part IV Abundance of the Crown of Thorns Star (*Acanthaster planci*)

Part V Monitoring of Fish Populations on Coral Reefs

A report to the Great Barrier Reef Marine Park Authority

prepared by:

Sea Research - A.M. Ayling and A.L. Ayling

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Contents

Part I. General Report

Introduction

Following a 7 day training trip 42 days were spent surveying a selection of reefs throughout the Far-North Section of the Great Barrier Reef Marine Park. A total of 31 reefs, grouped in four broad cross-shelf transects were surveyed. The survey team was made up of six workers: four involved in general reconnaissance of coral and crown of thorns stars on each reef using the manta tow technique, and two workers making quantitative counts of coral trout, crown of thorns, and some other organisms on part of each reef.

In addition an attempt was made to ground-truth some satellite imagery of the Princess Charlotte Bay area. Prior to the survey trip Brian classification of the image was conducted in Canberra with the assistance of Dr. D. Jupp at CSIRO Division of Water and Land Resources. The results of this work will be the subject of a separate report.

Apart from the formal survey information various other aspects of the Far-Northern reefs were noted during the trip and some of this information is presented here.

Water Masses

Throughout the Far-North Section of the Great Barrier Reef Marine Park the coastal water mass extends further across the shelf than in any region further South on the reef. This appears to be caused less by any increase in coastal influence than by a decrease in the penetration of oceanic water through the outer barrier rampart. Apart from a few limited deeper channels, most of the Far-North Section is relatively shallow; inter-reefal areas range from 20-30m deep, compared to 30-50m in the

Cairns Section and further South. This shallow water probably helps restrict the shoreward penetration of oceanic water over the shelf in this region.

As a result most of the mid-shelf reefs in this Section have a strong coastal influence, with only a few small reefs immediately inside the line of outer barrier reefs that can be regarded as true mid-shelf reefs. The water visibility is low throughout the coastal region, and the cross-shelf distribution of most species is affected. The approximate position of the seaward margin of this extended coastal water mass is shown by the bold dotted line on the map in fig. 1.

Reef Types

Several major reef types are represented in the Far-North Section. Along the coast are numerous small reefs, usually bearing a combination of vegetated low sandy islets and mangrove forests, along with a few small high islands surrounded by fringing reefs. The mid-shelf reefs and shoal areas are generally large - up to 20 n.miles in length - and sandy, with only a narrow fringe of live coral around the perimeter. Toward the outer barrier rampart are a number of small mid-shelf reefs (mentioned above) that lie in relatively clear water and are largely outside the influence of the coastal water mass. These reefs were not as sandy and supported large areas of live coral.

The outer barrier rampart is made up of an almost continuous line of reefs, the majority less than 5 n.miles long, with steep slopes falling to 30-35m depth on the inside and to well over 200m on the outer face. Beyond the outer barrier are about seven detached reefs rising abruptly from depths of 300-400m; a type of reef unique to the Far-North Section.

Giant Clams

During the survey it was noticed that there were large numbers of dead gaping clam shells on many of the northern outer- and mid-shelf reefs, presumably the result of past clam harvesting by foreign fishing vessels. Counts of dead and live Tridacna gigas were made on five reefs and these numbers, along with observations made on other reefs, are shown on the map in fig. 1. On most affected reefs all clams over about 20cm shell lengthhad been taken, not just the larger T. gigas, but also T. derasa, T. maxima, and T. squamosa. The approximate boundary of the area affected by this past harvesting is marked on the map by a dashed line. Somewhere in the region of 35% of the total area of the Far-North Section of the Park has been harvested, but this includes almost 70% of the outer reef area.

Sea Urchins

Conspicuous sea urchin populations are not a feature of the Great Barrier Reef, but on some coastal reefs the distinctive long-spined species Diadema setosum is common. Dense populations of this species were found on two reefs in Shelburne Bay (1-2 per square metre), and they were also present on the other coastal reefs visited (see map fig. 1).

Sharks

Twelve different species of shark were seen during the survey and sharks were common or abundant on all the reefs visited, especially the grey reef shark Carcharhinus amblyrhynchos. Sharks were more abundant and more aggressive than in any other section of the reef visited to date and they detrimentally affected the survey work on a few occasions. They were particularly numerous and aggressive on the following reefs:

10-352 Reef

Triangle Reef

Yule Detached Reef

Three Reefs

Tijou Reef - southern lagoon

14-034 Reef

Saltwater Crocodiles

Fishermen and CSIRO crayfish workers have reported sighting crocodiles on a number of islands and cays north of Cape Flattery. Reliable sightings are marked on the map in fig. 1 and include reefs up to 10-15 n.miles offshore. During the present survey a crocodile was seen on 11-169 Islet in Shelburne Bay, causing survey work to be abandoned on that reef.

Turtles

Green and Hawksbill turtles were seen regularly during the survey trip. Green turtleswere very common around Grub and Corbett Reefs in Princess Charlotte Bay, where they were feeding over the extensive sandy reef flats, and around the nesting site of Raine Is. Green turtles were seen nesting on Raine Is. and Boydong Islet, and hawksbills were seen nesting on Boydong Islet and Magra Islet.

Dugongs, Dolphins and Whales

Dugongs were only sighted commonly along the southern face of Flinders Island.

Irrawaddy dolphins were frequently seen in the coastal water mass, and occasional bottlenose dolphins in the clearer water further offshore.

A small whale, probably a minke whale, was sighted near Tijou Reef.

Part II. Coral Reconnaissance - Manta Tow Surveys

Manta tow coral reconnaissance surveys were made on 31 reefs (see map fig. 1), although parts of 12 of these were not surveyed due to weather and time restrictions.

Maps showing tow numbers and paths are included with the raw data forms presented separately from this report.

In general the technique gave a quick overview of the state of each reef but a few problems were encountered:

1. Where water visibility was less than 8m it became difficult for the manta towers to follow the edge of the reef and lowered the reliability of the survey results. This problem became more pronounced where visibility was less than 5m on some of the inner-shelf reefs, and collisions with coral heads and temporary loss of the manta board were frequent in these conditions.

2. Rough weather made it impossible to survey parts of some reefs. Most inner- and mid-shelf reefs could be fully surveyed in winds up to 15 knots, but on the outside of the outer-shelf reefs winds of 15 knots or more precluded survey.

Part III. Distribution and Abundance of Coral Trout Species *Plectropomus* spp. in the Far-North Section

Introduction

During 1983, surveys of coral trout abundance were made on 56 reefs in the Cairns and Central Sections of the Great Barrier Reef Marine Park (A.M. Ayling, reports to GBRMPA April 1983 and June 1983). In addition, surveys were made on ten reefs in the Swain Group of reefs, toward the southern end of the Great Barrier Reef, in early 1984. As well as providing a baseline from which to estimate any changes in coral trout populations resulting from the protection provided by the Park, these surveys established some broad patterns of distribution and abundance for the five different species of *Plectropomus* found on the Reef.

Shelf position; the position of a reef relative to the shore and the outer edge of the continental shelf, was shown to be the primary factor influencing the presence and abundance of these species on any reef. Latitude had a significant influence only on *P. leopardus* the common coral trout. This species showed an exponential increase in abundance toward the southern end of the Reef: mean densities in the Swain Group were 103 per ha compared to 24 per ha in the Cairns Section.

This report extends the survey of *Plectropomus* spp. to 28 reefs in the Far-North Section of the Park, covering the region from Cape York ($10^{o}45'S$) to Princess Charlotte Bay ($14^{o}S$). These data give a considerable extension to the latitudinal range of coral trout surveys. As has been mentioned, the coastal water mass extends further across the shelf in the Far-North Section compared to southern parts of the Reef

and it was suspected that this would influence the cross-shelf distribution of coral trout in this area. Fishing pressure on reef fish populations in the Far-North is probably lower than in any other area on the Reef, largely due to the remoteness of the region. It was envisaged that the present survey would give an indication of the normal abundance and length frequencies of relatively unfished populations of coral trout.

Methods

Survey reefs were selected in four broad transects across the shelf. On three of these transects five reefs were surveyed: one inner-shelf, two mid-shelf, two outer-shelf. However, on the Cape Grenville transect twelve reefs were selected in a wide range of shelf positions, including two of the detached reefs outside the outer barrier rampart. As in previous surveys the relative shelf position of each reef was established by the ratio of the distance off the coast of the reef, to the distance from the coast to the edge of the shelf (the 200m depth contour) at the latitude of the reef. This ratio ranges from 0 for reefs fringing the mainland coast, to 1.0 representing the outer face of the outer barrier or detached reefs.

In previous surveys latitude has been used as a measure for establishing N-S patterns of abundance on the Reef, but this distorts the picture to some extent. South of Cardwell the Reef turns out to the east, aligned roughly NW-SE, and as a result these southern reefs are pushed together on a latitudinal scale when compared to northern reefs. To get around this problem a N-S position index was calculated, using a baseline running from Cape York south to Cape Capricorn. Reef position was measured at right angles back to this baseline and

given an index proportional to Cape York with an index of 0, and Lady Elliot Island with an index of 1.0.

Ten 50 x 20 metre transects were searched for coral trout on each reef. The counts were scattered randomly along approximately one kilometre of reef edge. As in all the Cairns and Central Section surveys, the counts were confined to the sheltered back reef area, usually the NW facing side of the reef. An exception was Great Detached Reef where counts were made on the exposed outer face of the reef. On Cockburn Reef two widely separate back reef sites were surveyed.

Counts were made by two divers along a 50m fiberglass tape run from the reef edge at right angles down the slope. The observers counted all Plectropomus spp. within 10m of the central tape, each observer recording the individuals seen on one side of the line, and the two counts being combined to give the total number per 50 x 20m ($1000m^2$). Species, and estimated total length in cm was recorded for each coral trout seen.

Results

Five species in the genus Plectropomus were encountered during this survey. These were: P. leopardus the common coral trout, P. maculatus the bar-cheeked trout, P. sp. the blue-spot trout, P. laevis (=P. melanoleucas)the footballer or tiger trout, and P. truncatus the passionfruit trout.

The raw data from all counts are listed in appendix 1.

All the survey reefs are marked on the map in fig. 1 and the actual area surveyed on each reef is shown on the larger scale maps in figs. 2-6. The abundance of the Plectropomus spp. counted on each reef is recorded in table 1, along with listings

of the latitude and shelf position index of the reef.

The cross-shelf distribution of the three most abundant species is shown in fig. 7, along with the approximate position of the coastal/offshore water mass convergence. The bar-cheeked or coastal trout P. maculatus was abundant on most reefs in the coastal water mass and was not found on any reef outside the convergence. P. leopardus was only present in low numbers on inner-shelf reefs, and increased in abundance out to a peak on those small mid-shelf reefs outside the coastal water mass. Numbers dropped rapidly from this point to zero around the detached outer reefs. The blue-spot trout was only common around the outer-shelf reefs and was the only abundant species around the detached reefs.

The relationship between N-S position index and P. leopardus abundance for all 39 mid-shelf reefs surveyed to date is shown in fig.8. An exponential curve gives a reasonable fit to all these values, but if the reefs north of Cardwell are considered separately, N-S position has no effect on P. leopardus abundance in this northern area, and there is an exponential increase in numbers from this point south (dashed regression lines on graph).

It is not possible to separate the N-S effect from the cross-shelf influence for any of the other species except for P. sp. on the outer barrier rampart reefs from Ribbon Reefs off Cooktown north to Cape York. The relationship of P. sp. abundance to the N-S position index for these reefs is shown in figure 9, and suggests that there is no significant N-S change in the numbers of this species.

Length frequencies were constructed using estimated total length, and are shown in figure 10 for P. leopardus on the

mid-shelf reefs, the three mid-shelf reefs outside the coastal water mass, and the outer-shelf reefs. Mean size of this species on the three reef groups was (± standard deviation): 33.8 ± 11.5, 32.9 ± 10.4, and 35.3 ± 12.5 respectively. Overall, approximately 18.8% of all P. leopardus counted on mid- and outer-shelf reefs were new recruits, between 6 and 22cm T.L. (mean 14.7 ± 3.0).

Length frequencies of all individuals of the other three common species, P. maculatus, P. laevis, and P. sp., are constructed in figure 11.

Discussion

The results of this survey will be incorporated into a paper that presents and discusses the results of all previous surveys and an extensive discussion will not be given as part of this report.

As would be expected from previous results, cross-shelf position is the major factor determining the presence and abundance of Plectropomus spp. on any reef. However, in the Far-North Section the general pattern is modified to some extent compared to that previously demonstrated for reefs in the Cairns and Central Sections. In both cases P. leopardus was most abundant on mid-shelf reefs with a rapid decrease in numbers both toward the coast and toward the outer edge of the shelf, but in the Far-north Section the peak is displaced seaward (figure 12). This displacement is probably a result of the extended coastal water mass in this region: P. leopardus is generally much less abundant on turbid coastal reefs than in clearer mid-shelf waters.

Cross-shelf distribution of P. maculatus and P. sp.

is compared for the Far-North Section and the Cairns and Central Sections in figure 13. There is some indication that P. maculatus is more abundant on mid-shelf reefs in the Far-North; again probably a result of the offshore extension of the coastal water mass. In both regions the blue-spot trout P. sp. was most abundant on the outer-shelf reefs, but in the Far-North this species completely replaced P. leopardus on the outside of the detached reefs.

The footballer trout P. laevis was almost entirely restricted to reefs outside the influence of the coastal water mass, but this species was nowhere common.

The passionfruit trout P. truncatus , although rather rare, was encountered more frequently in the Far-North than on any of the previous surveys. A total of 12 individuals of this species were seen, all of them on the inside of the outer barrier reefs, and 4 were recorded in the counts. They were always associated with extensive Acropora thickets in protected lagoonal-like areas on these outer reefs, and were more wary of the observers than any of the other coral trout species.

The work of D.M. Williams of AIMS on the cross-shelf distribution of many fish species also suggests that shelf position is the single most important factor influencing the distribution of most fishes. Williams (pers. comm.) also found a similar seaward extension of the coastal influence in the Far-North.

N-S patterns of abundance and distribution were generally not as pronounced as cross-shelf changes, in spite of the presence of a 1000 n.mile N-S gradient from Cape York to the Capricorn and Bunker Groups. The only significant gradient detected to date is the increase in P.leopardus on mid-shelf

reefs south of Cardwell, with an approximately four-fold increase in numbers from the Far-North to the Swain Group. The data available to date suggest that P. maculatus, P. sp. and P.laevis show no significant changes in abundance over the length of the Reef. However, P. truncatus has so far only been observed on the inside of the true outer barrier reefs from Port Douglas north.

Fishing pressure varies markedly along the length of the Great Barrier Reef, although no comprehensive data are available to support this statement. In general fishing pressure is high in the Cairns to Whitsunday area, moderate in the Swain Group, and low in the Pompey Complex and Far-North Section. In spite of the difference in fishing pressure, length frequency histograms of P. leopardus populations from the mid-shelf reefs of three of these areas; Far-North Section, Cairns Section, Swain Group, are similar (figure 14). The major difference is in the smaller size classes and reflects the time of survey relative to the main recruitment episode for this species: recruitment had just started in the Swain Group in mid-January, was well underway during February/March in the Cairns Section (9.4% of total numbers), and largely completed in the Far-North in April (18.8% of total numbers).

Mean length of P. leopardus was similar in these three regions, ranging from 33.8 $\pm$ 11.5cm in the Far-North, to 36.2 $\pm$ 12.0cm in the Cairns Section, to 34.5 $\pm$ 8.1 in the Swain Group. These differences stem mainly from the relative numbers of large individuals in the population. Off Cairns, where fishing pressure was heaviest, 12.9% of P. leopardus counted were over 50cm T.L., compared to 4.4% in the Swain Group, and 4.8% in the Far-North.

In general these data, incorporating all mid-shelf reefs from each region, suggest that fishing pressure has little influence on the length frequency of P. leopardus populations. However, when data from specific heavily fished reefs is compared to that from low fished reefs a small influence on length frequency distributions can be detected (A.M. Ayling, data from previous surveys).

Table 1. Coral Trout Abundance in the Far-North Section

Recorded as the mean ± the standard deviation for ten 50 x 20m transect counts on each reef

Reef name	Latitude	Shelf Index	P. maculatus	P. leopardus	P. laevis	P. sp.	P. truncatus
Stanley Is.	14°10'	0.24	1.2 ± 1.2	0.4 ± 0.5	-	-	-
Night Is.	13°11'	0.13	0.9 ± 1.2	0.3 ± 0.5	-	-	-
Bird Is.	11°45'	0.14	1.3 ± 1.0	0.2 ± 0.4	-	-	-
Boydong Il.	11°29'	0.17	1.9 ± 1.2	0.4 ± 0.7	-	-	-
Whyborn	10°48'	0.10	0.6 ± 0.8	-	-	-	-
Corbett	13°55'	0.61	0.2 ± 0.4	2.0 ± 1.5	-	-	-
Grub	14°02'	0.35	0.7 ± 1.0	0.3 ± 0.5	-	-	-
Celebration	13°16'	0.36	0.2 ± 0.4	1.4 ± 1.5	-	-	-
13-055	13°18'	0.54	-	3.3 ± 1.3	-	-	-
Cockburn (site 1)	11°46'	0.27	0.7 ± 1.3	2.5 ± 1.6	-	-	-
Cockburn (site 2)	11°50'	0.51	2.3 ± 1.6	3.1 ± 1.1	-	-	-
Sir Charles Hardy	11°55'	0.47	0.2 ± 0.4	2.6 ± 1.9	0.1 ± 0.3	-	-
Middle Banks	11°47'	0.68	-	3.6 ± 1.3	0.3 ± 0.5	-	-
Ashmore Banks	11°54'	0.78	-	5.8 ± 1.5	0.4 ± 0.7	0.4 ± 0.5	-

Table 1. Coral Trout Abundance in the Far-North Section

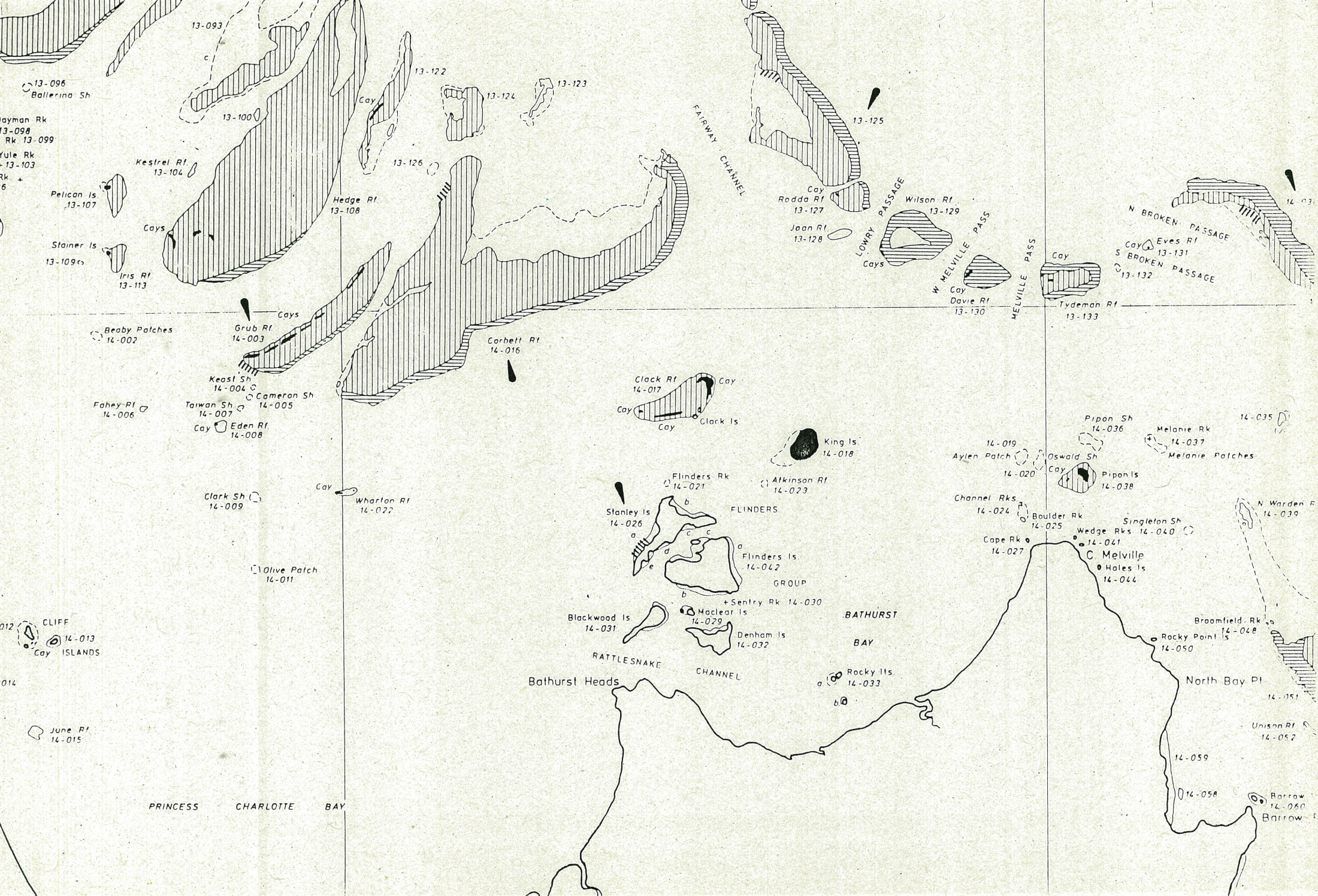
Recorded as the mean ± the standard deviation for ten 50 x 20m transect counts on each reef

Reef name	Latitude	Shelf Index	P. maculatus	P. leopardus	P. laevis	P. sp.	P. truncatus
11-211	11°34'	0.82	-	5.1 ± 1.9	0.1 ± 0.3	0.2 ± 0.6	-
10-351	10°44'	0.39	2.3 ± 1.3	1.9 ± 1.5	-	-	-
10-352	10°44'	0.50	1.9 ± 1.5	1.8 ± 2.3	-	-	-
14-034	13°56'	0.94	-	1.2 ± 0.9	0.3 ± 0.5	1.0 ± 1.1	0.1 ± 0.3
13-125	13°50'	0.98	-	2.6 ± 1.2	0.4 ± 0.7	0.2 ± 0.4	-
Cat	12°59'	0.93	-	2.9 ± 1.1	0.4 ± 0.7	1.0 ± 0.9	0.1 ± 0.3
Tijou	13°07'	0.97	-	4.1 ± 1.4	0.2 ± 0.4	0.4 ± 1.0	-
Lagoon	12°23'	0.93	-	1.2 ± 1.2	0.4 ± 0.7	0.6 ± 0.8	-
Three	11°46'	0.98	-	1.4 ± 1.1	0.2 ± 0.4	1.0 ± 1.1	-
11-229	11°49'	0.97	-	3.1 ± 2.1	0.6 ± 0.7	1.9 ± 1.2	-
10-386	10°42'	0.98	-	0.3 ± 0.5	-	0.2 ± 0.4	-
Triangle	10°43'	0.98	-	0.9 ± 1.2	-	0.9 ± 1.3	0.2 ± 0.6
Great Detached	11°43'	1.00	-	-	-	0.9 ± 0.9	-
Raine Is.	11°36'	1.00	-	-	0.1 ± 0.3	0.7 ± 0.7	

Figures 2-6 Survey Reefs - Showing Position of Quantitative Survey Area

Survey reefs indicated - 

Survey areas indicated - 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13-124
13-123
Cay
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FAIRWAY CHANNEL
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13-104
13-126
Pelican Is
13-107
Hedge Rf
13-108
Cays
Stainer Is
13-109
Iris Rf
13-113
Cay
Rodda Rf
13-127
Joan Rf
13-128
LOWRY PASSAGE
Wilson Rf
13-129
Cays
W MELVILLE PASS
Cay
Davie Rf
13-130
MELVILLE PASS
Cay
Tydeman Rf
13-133
N BROKEN PASSAGE
Cay
Eves Rf
13-131
S BROKEN PASSAGE
13-132
Cays
Grub Rf
14-003
Beaby Patches
14-002
Corbett Rf
14-016
Keast Sh
14-004
Cameron Sh
14-005
Fahey Rf
14-006
Taiwan Sh
14-007
Cay
Eden Rf
14-008
Clark Rf
14-017
Cay
Cay
Clack Is
King Is
14-018
Cay
Wharton Rf
14-022
Clark Sh
14-009
Olive Patch
14-011
Flinders Rk
14-021
Atkinson Rf
14-023
Stanley Is
14-026
FLINDERS
Flinders Is
14-042
GROUP
+Sentry Rk 14-030
Blackwood Is
14-031
Maclear Is
14-029
Denham Is
14-032
BATHURST
BAY
RATTLESNAKE
CHANNEL
Rocky Its
14-033
Bathurst Heads
CLIFF
14-013
Cay
ISLANDS
June Rf
14-015
PRINCESS
CHARLOTTE
BAY
Pipon Sh
14-036
Melanie Rk
14-037
Melanie Patches
14-035
14-019
Aylen Patch
14-020
Oswald Sh
Cay
Pipon Is
14-038
Channel Rks
14-024
Boulder Rk
14-025
Singleton Sh
Wedge Rks 14-040
Cape Rk
14-027
14-041
C. Melville
Hales Is
14-044
N. Warden R
14-039
Broomfield Rk
14-048
Rocky Point Is
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North Bay Pt
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Unison Rf
14-052
14-059
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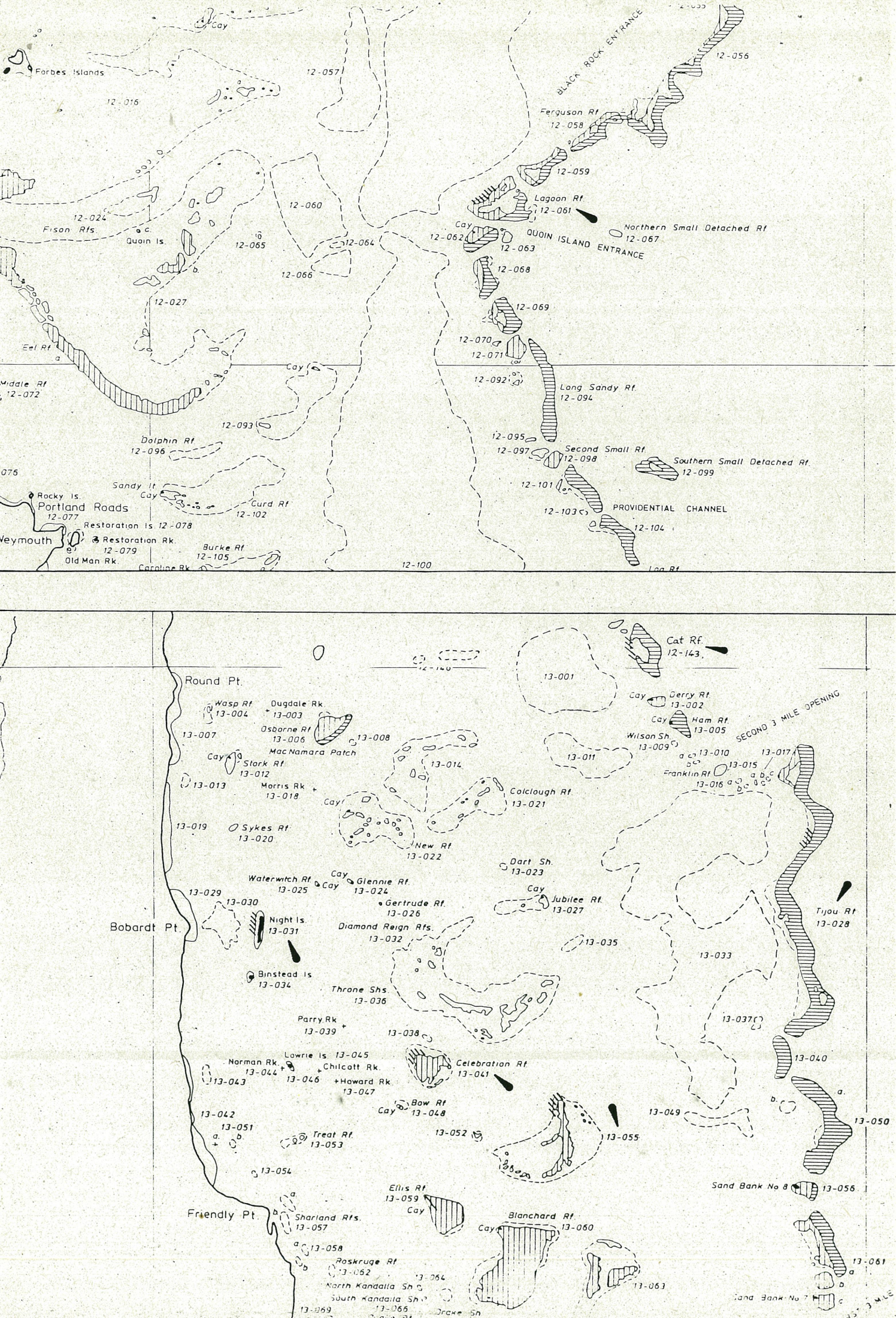
Barrow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12-056
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Ferguson Rf.
12-058
12-059
Lagoon Rf.
12-061
Northern Small Detached Rf.
12-067
Cay
12-062
QUOIN ISLAND ENTRANCE
12-063
12-068
12-069
12-070
12-071
12-024
Fison Rfs.
Quoin Is.
12-065
12-064
12-060
12-066
12-027
Eel Rf.
Cay
12-092
Long Sandy Rf.
12-094
12-093
Dolphin Rf.
12-096
12-095
12-097
Second Small Rf.
12-098
Southern Small Detached Rf.
12-099
12-101
Sandy It.
Cay
Rocky Is.
Portland Roads
12-077
Restoration Is. 12-078
Restoration Rk.
12-079
Old Man Rk.
Curd Rf.
12-102
12-103
PROVIDENTIAL CHANNEL
12-104
Weymouth
Burke Rf.
12-105
Caroline Rk.
12-100
Cat Rf.
12-143
13-001
Round Pt.
Wasp Rf.
13-004
Dugdale Rk.
13-003
Osborne Rf.
13-006
13-007
13-008
Mac Namara Patch
Cay
Stork Rf.
13-012
13-013
Morris Rk.
13-018
13-014
Colclough Rf.
13-021
Cay
13-019
Sykes Rf.
13-020
New Rf.
13-022
Cay
Waterwitch Rf.
13-025
Cay
Glennie Rf.
13-024
Dart Sh.
13-023
13-029
13-030
Gertrude Rf.
13-026
Cay
Jubilee Rf.
13-027
Bobardt Pt.
Night Is.
13-031
Diamond Reign Rfs.
13-032
13-035
13-033
Binstead Is.
13-034
Throne Shs.
13-036
Parry Rk.
13-039
13-038
13-037
Norman Rk.
13-044
Lowrie Is. 13-045
Chilcott Rk.
13-046
Howard Rk.
13-047
Celebration Rf.
13-041
13-043
13-040
Cay
Bow Rf.
13-048
13-042
13-049
13-050
13-051
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13-053
13-052
13-055
13-054
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13-056
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Cay
Friendly Pt.
Sharland Rfs.
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Blanchard Rf.
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Cay
13-058
Roskruge Rf.
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North Kandalla Sh.
South Kandalla Sh.
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Drake Sh.
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Sand Bank No 7
Wilson Sh.
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13-010
13-017
13-015
Franklin Rf.
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SECOND 3 MILE OPENING
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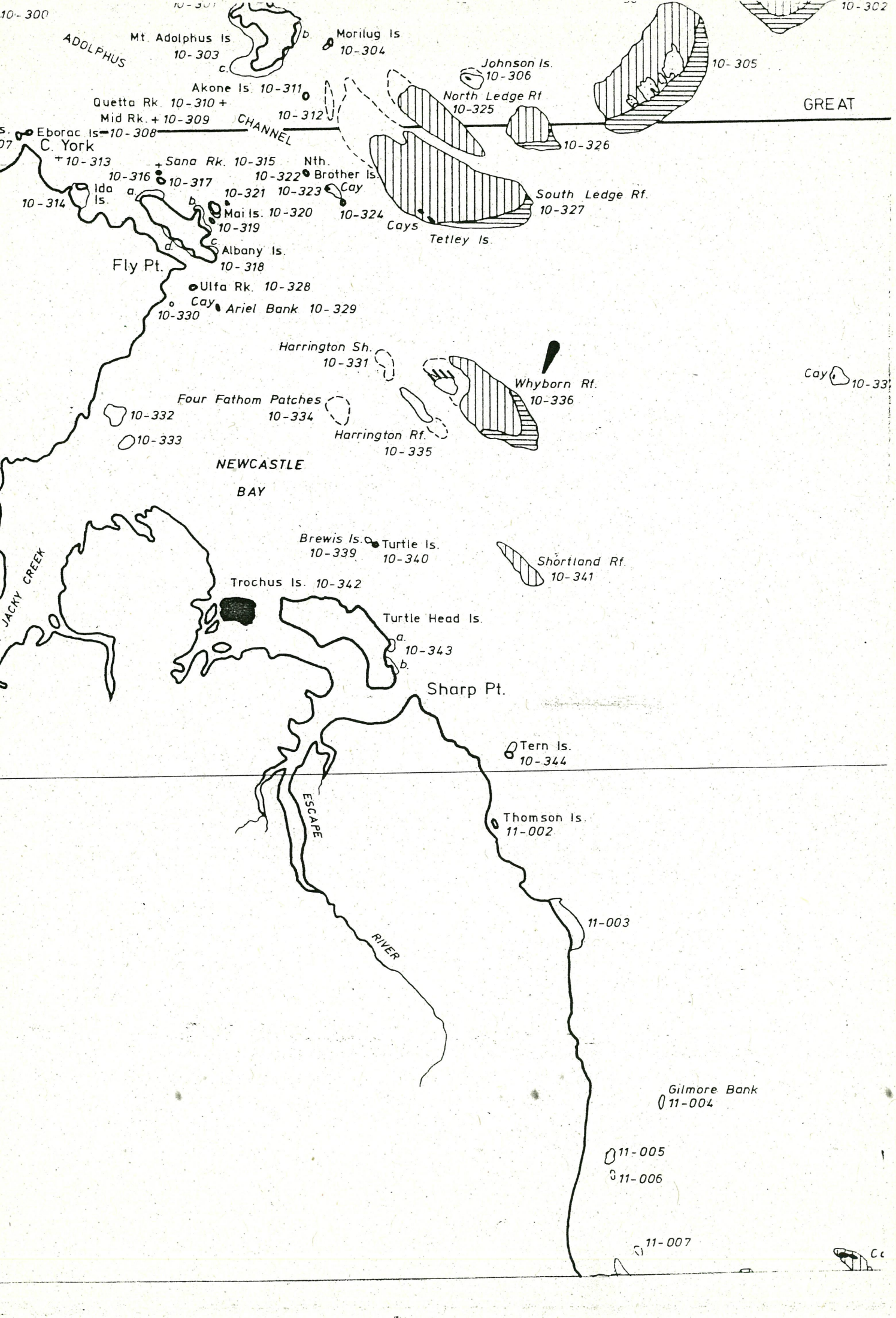
Cay
Ham Rf.
13-005
Cay
Tijou Rf.
13-028

False Orford Ness
Hunter Pt
Round Pt
SHELBURNE BAY
C Grenville
DENHAM PASSAGE
Turning Point Patches
Cholmondeley Is
Wallace Is
Little Boydong Is
Boydong Is
Boydong Cays
Wizard Rf
Viking Rf
Macarthur Is
Bird Is
Saunders Is
Thrush Rf
Farwood Rf
Fairway Rf
Gumiay Rf
Chimmo Sh
Cockburn Rf
COCKBURN ISLANDS
Pig Is
Bootie Is
Hunley Is
Buchan Rk
Magra Is
Cockburn Patch
Paluma Sh
Erlunyen Patch
NORTH CHANNEL
POLLARD CHANNEL
Queue Rf
Wreck Rf
Sir Charles Hardy Is
Inman Rk
Tynemouth Rk
Middle Banks
Salamander Rf
Ashmore Banks
BLACKWOOD CHANNEL
Sunday Is
Bremner Sh
Outer Rf
HOME ISLANDS
Nob Is
Clerke Is
Harvey Is
Hicks Is
Orton Is
Gore Is
Haggerstone Is
Mason Rf
Moody Rf
Three Rfs
Five Rfs
STEAD PASSAGE
Star Rf
Fore Detached Rf
Great Detached Rf
RAINE ISLAND ENTRANCE
NIMROD PASSAGE
Martha Ridgway Rf
WRECK


10-300
ADOLPHUS
Mt. Adolphus Is
10-303
Morilug Is
10-304
10-302
Johnson Is.
10-306
10-305
Akone Is. 10-311
Quetta Rk. 10-310 +
Mid Rk. + 10-309
10-312
CHANNEL
North Ledge Rf
10-325
GREAT
Eborac Is 10-308
C. York
10-313
Sana Rk. 10-315
Nth. Brother Is.
10-322
10-316
10-317
10-321
10-323
Cay
10-324
Ida Is.
10-314
Mai Is. 10-320
10-319
Albany Is.
10-318
Fly Pt.
Cays
Tetley Is.
10-326
South Ledge Rf.
10-327
Ulfa Rk. 10-328
Cay
10-330
Ariel Bank 10-329
Harrington Sh.
10-331
Whyborn Rf.
10-336
Cay
10-33
Four Fathom Patches
10-334
10-332
10-333
Harrington Rf.
10-335
NEWCASTLE
BAY
Brewis Is.
10-339
Turtle Is.
10-340
Shortland Rf.
10-341
JACKY CREEK
Trochus Is. 10-342
Turtle Head Is.
10-343
Sharp Pt.
Tern Is.
10-344
ESCAPE
RIVER
Thomson Is.
11-002
11-003
Gilmore Bank
11-004
11-005
11-006
11-007


BARRIER
REEF
Cay
10-345
10-346
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10-390
10-391
Triangle Rf
10-392
10-393
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11-112
11-113
11-114
11-121
11-124
Parsons Rf
11-030
144°

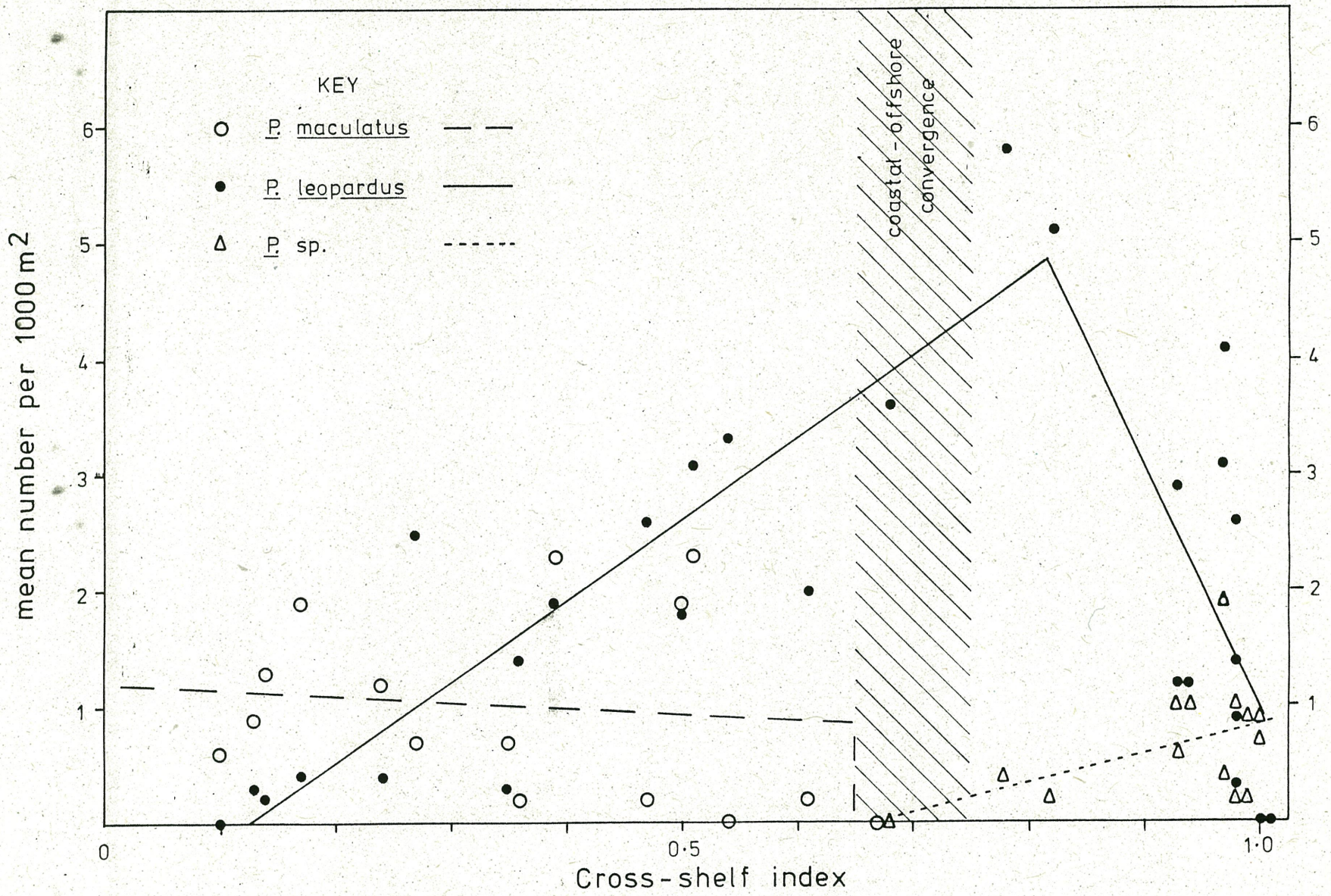


Figure 7. Cross-shelf patterns of Plectropomus spp. abundance - Far-North Section

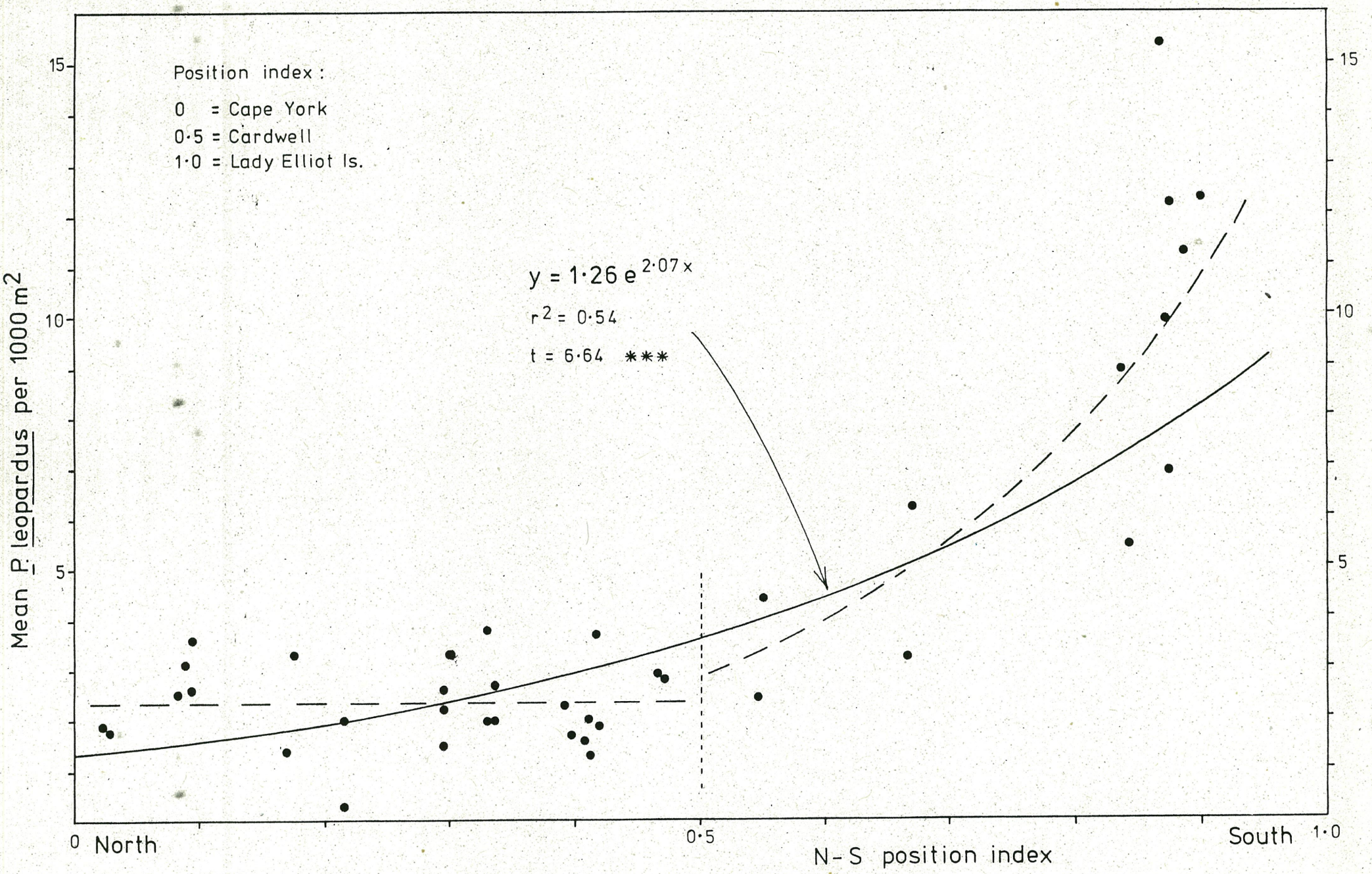
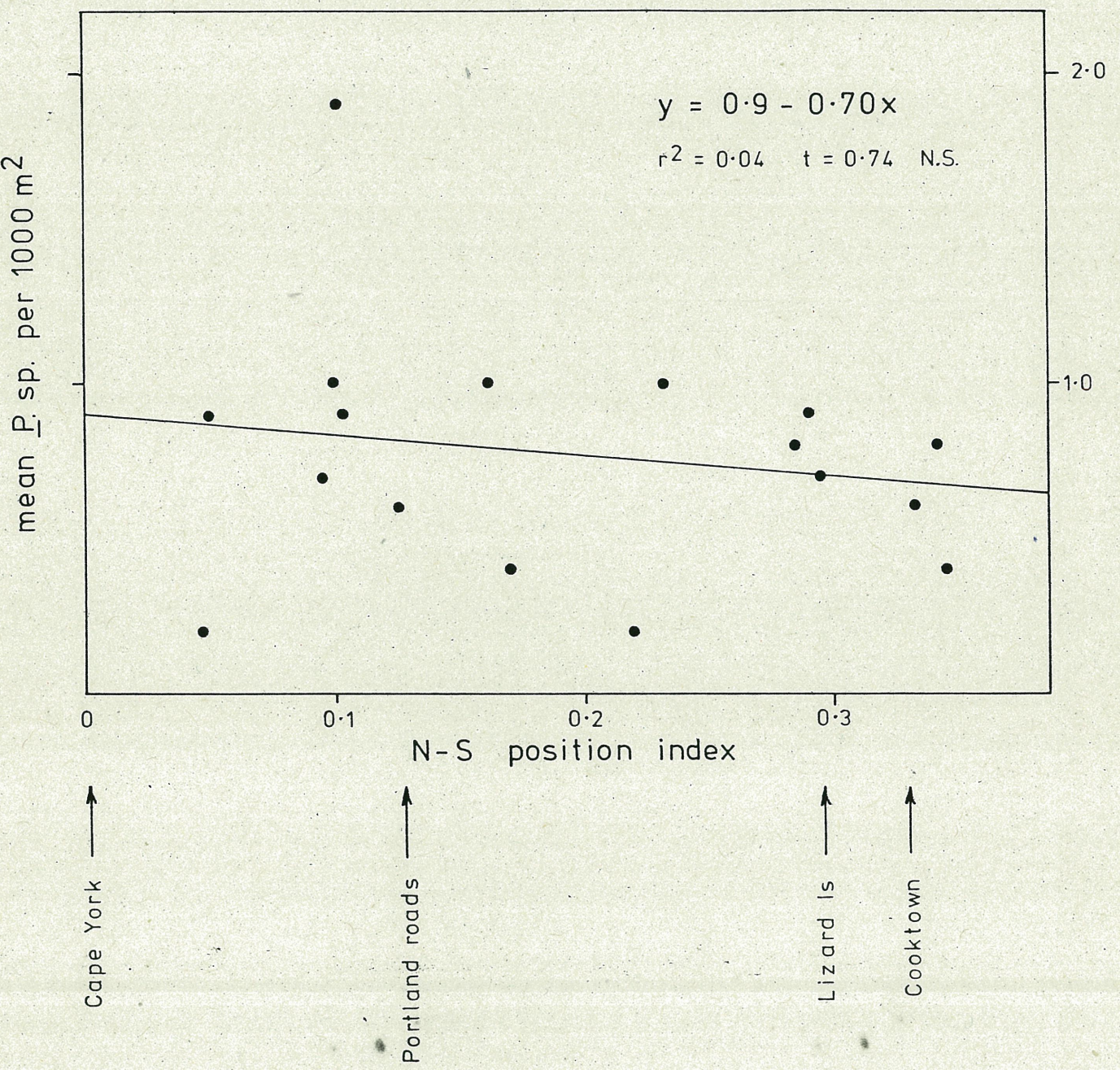


Figure 8. N-S patterns of abundance for Plectropomus leopardus on mid shelf reefs only

Figure 9. Relationship of Plectropomus sp. abundance to N-S position index for outer barrier reefs



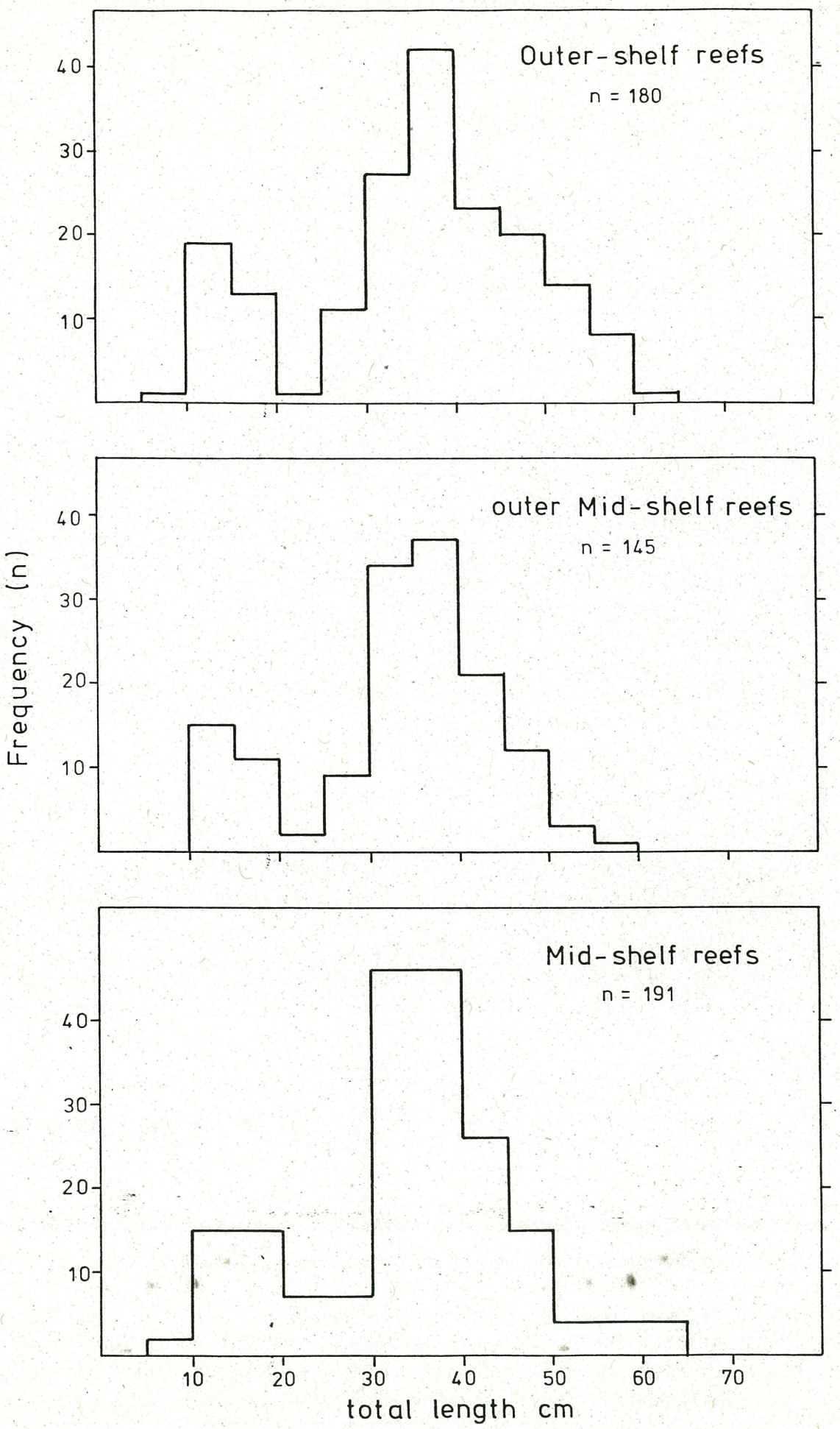


Figure 10. Plectropomus leopardus length frequencies

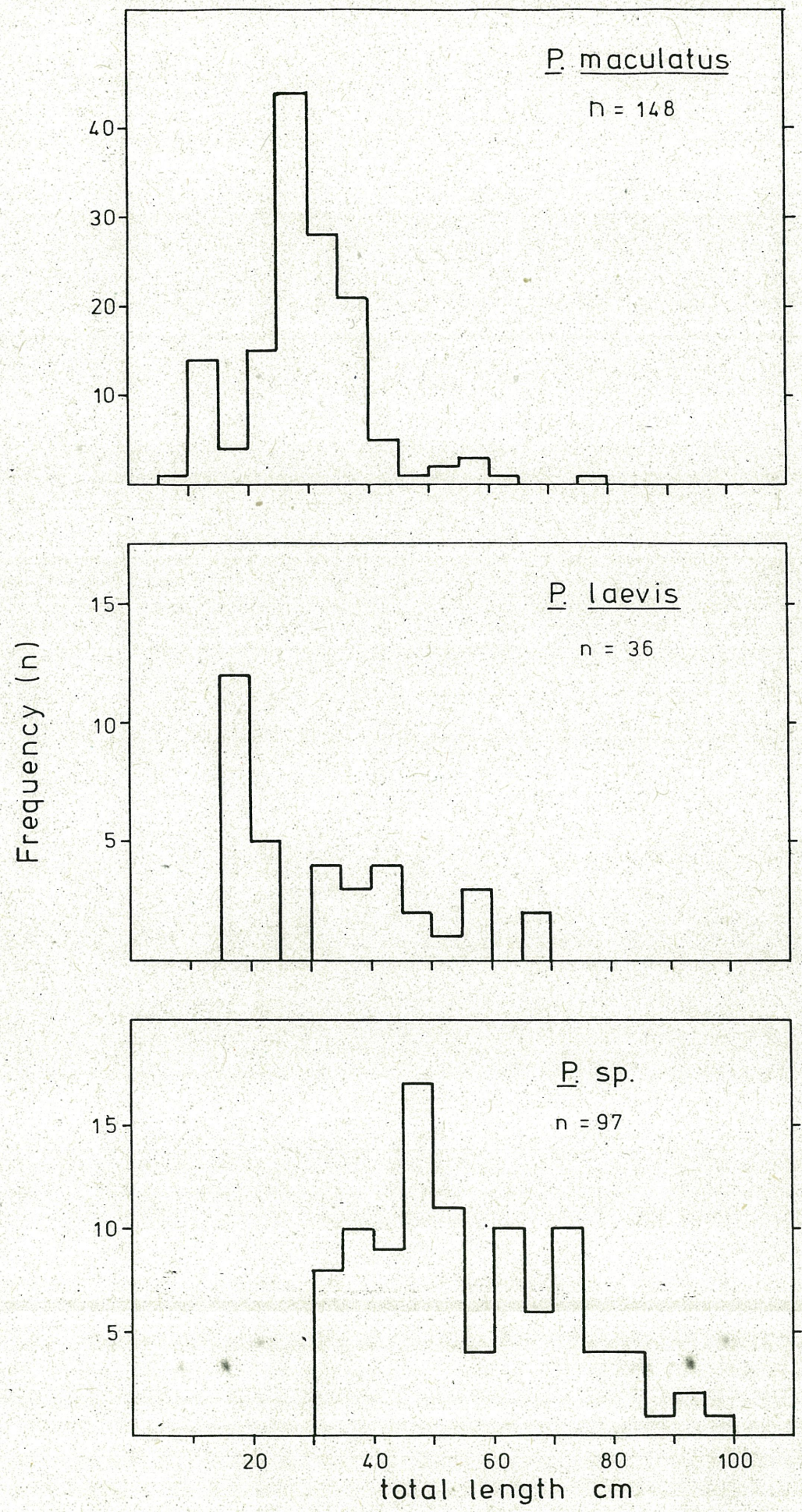


Figure 11. Plectropomus spp. length frequencies - all reefs

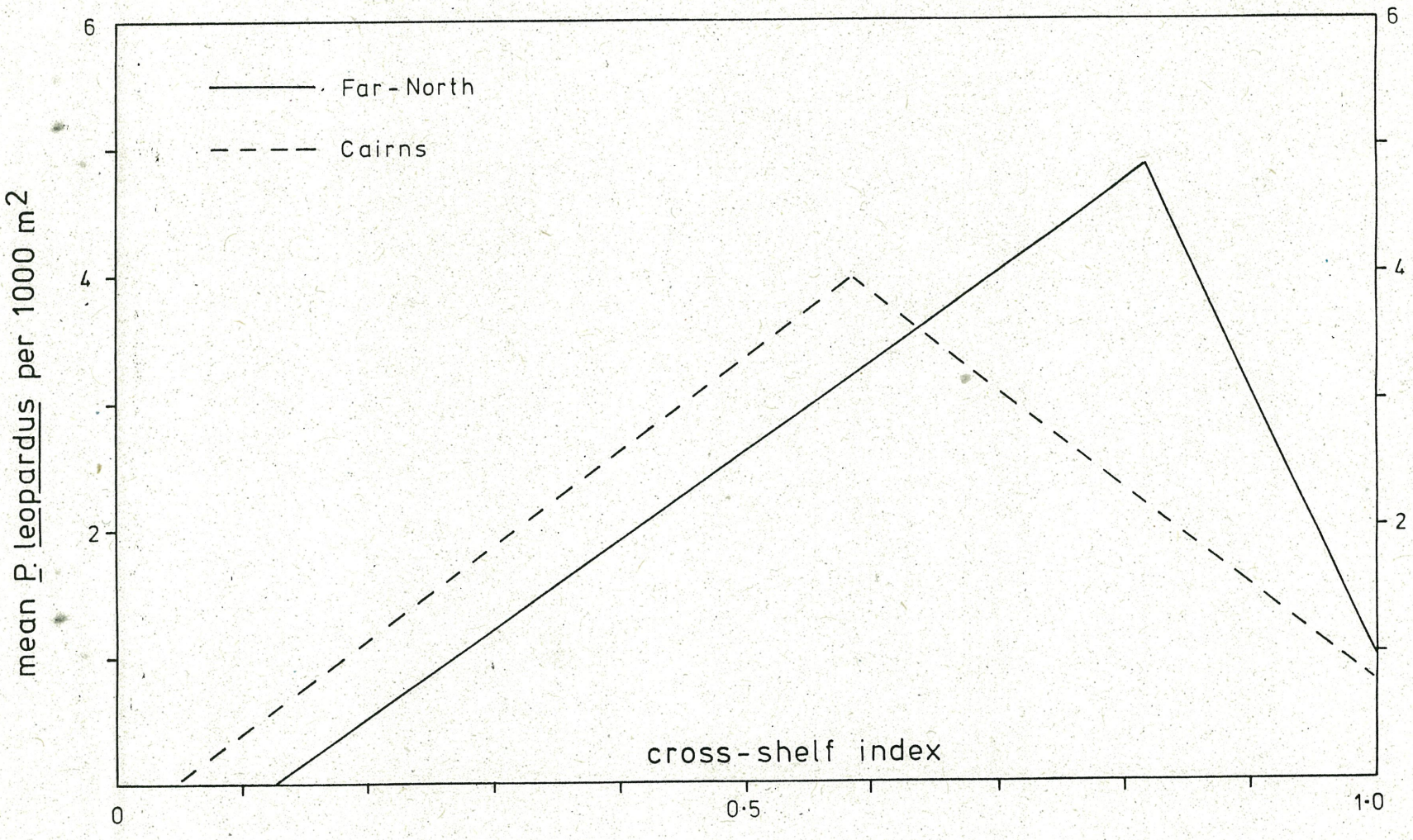


Figure 12. Comparison of P. leopardus cross-shelf abundance patterns for Cairns and Far - North Sections

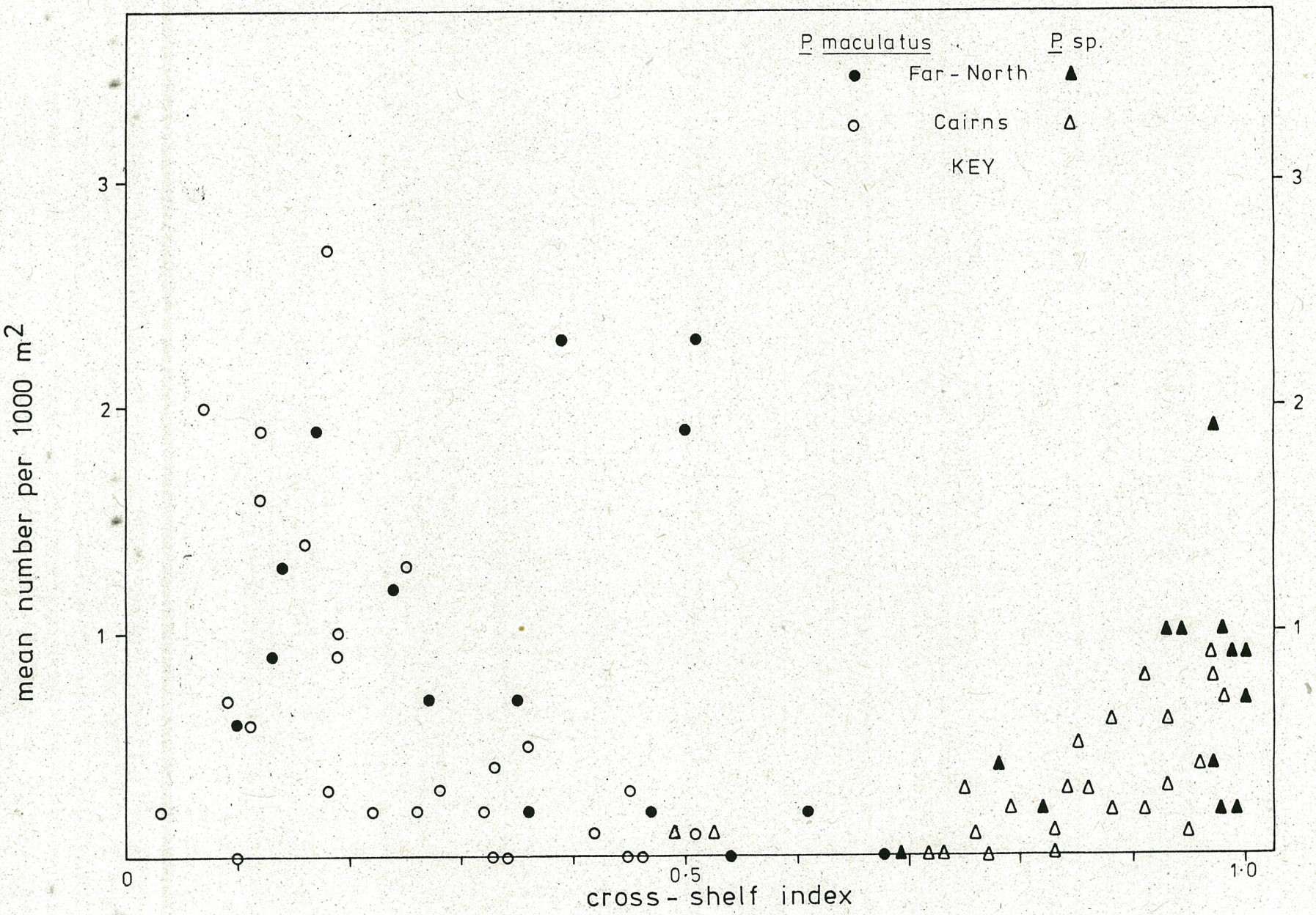


Figure 13. Comparison of cross-shelf distribution for P. spp. in Cairns and Far-North Sections

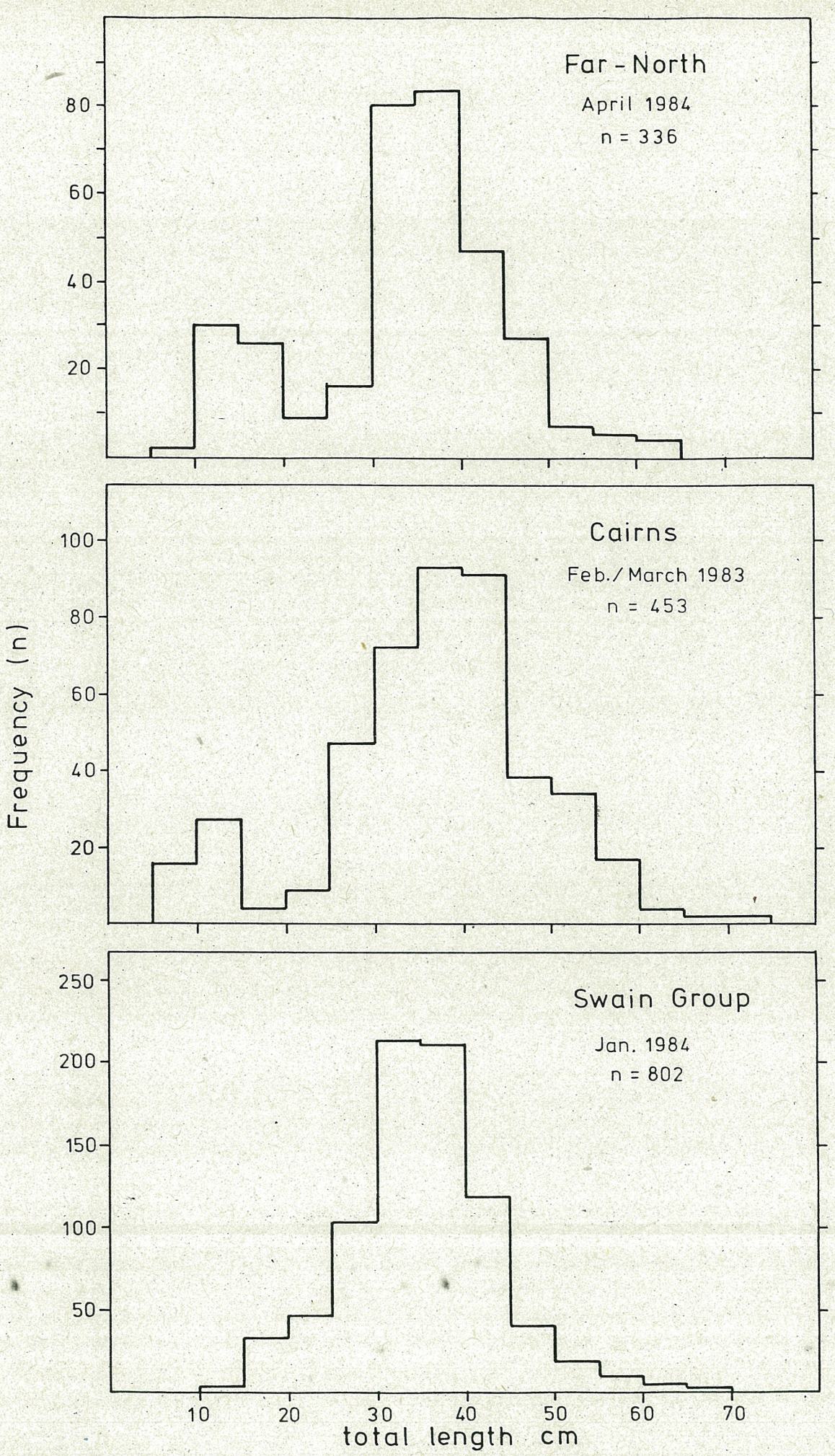


Figure 14. P. leopardus length frequency comparisons - Mid-Shelf

Part IV. Abundance of the Crown of Thorns Star (Acanthaster planci) in the Far-North Section

During the Far-North Section survey counts of the crown of thorns star were made in the same ten 50 x 20m transects laid out to count coral trout (see Part III methods). The results from these counts are presented in table 2, along with spot-check estimates of coral state and abundance in the survey area. Small numbers of Acanthaster were found on 11 of the 31 reefs surveyed, with densities ranging from 1 to 16 per ha (grand mean 4.1 per ha). No Acanthaster were found on inner-shelf reefs in this area, or on the outer detached reefs. In general no destructive aggregations were seen on any of the reefs surveyed and there was no evidence to suggest that any reefs had previously been damaged by such aggregations.

Table 2. *Acanthaster planci* Abundance and Coral State

Acanthaster numbers recorded as the mean ± the standard deviation for ten 50 x 20m transect counts on each reef

Reef	*Acanthaster*	Hard Coral	Soft Coral	Dead standing Coral	Comments
Inner-Shelf Reefs					
Stanley Is.	-	5-15%	1-5%	-	
Flinders Is.	-	30-50%	5-15%	1-5%	
Night Is.	-	15-30%	15-30%	1-5%	
Binstead Is.	-	30-50%	5-15%	1-5%	
Bird Is.	-	50-75%	15-30%	1-5%	*Diadema* common
Boydong Il.	-	30-50%	5-15%	1-5%	*Diadema* common
Whyborn	-	15-30%	30-50%	1-5%	
Mid-Shelf Reefs					
Corbett	0.1 ± 0.3	30-50%	15-30%	1-5%	
Grub	-	30-50%	5-15%	-	
Celebration	-	15-30%	5-15%	1-5%	
13-055	1.1 ± 1.6	30-50%	15-30%	1-5%	
S.Charles H.Is	0.1 ± 0.3	30-50%	5-15%	-	
Cockburn 1	-	5 -15%	5-15%	1-5%	sponges 5-15%
Cockburn 2	-	15-30%	15-30%	-	sponges 5-15%
Middle Bk.	0.1 ± 0.3	30-50%	1-5%	15-30%	
Ashmore Bk.	0.1 ± 0.3	75-100%	5-15%	1-5%	
11-211	-	3--50%	1-5%	1-5%	
10-351	-	30-50%	1-5%	1-5%	
10-352	0.3 ± 0.5	30-50%	1-5%	5-15%	

Table 2. *Acanthaster planci* Abundance and Coral State

Acanthaster numbers recorded as the mean ± the standard deviation for ten 50 x 20m transect counts on each reef

Reef	*Acanthaster*	Hard Coral	Soft Coral	Dead standing Coral	Comments
Outer-Shelf Reefs					
14-034	-	15-30%	1-5%	-	
13-125	-	30-50%	5-15%	-	
Tijou	-	30-50%	1-5%	-	
Cat	0.3 ± 0.7	50-75%	1-5%	5-15%	
Lagoon	-	15-30%	-	-	cyclone damage?
11-229	0.2 ± 0.4	30-50%	1-5%	-	
Three	0.1 ± 0.3	30-50%	1-5%	1-5%	sponges 5-15%
Triangle	1.6 ± 2.1	30-50%	1-5%	5-15%	
10-386	0.5 ± 0.7	30-50%	1-5%	5-15%	
Detached Reefs					
Great Detached	-	50-75%	5-15%	-	sponges 1-5%
Raine Is.	-	50-75%	5-15%	1-5%	sponges 1-5%
Yule Detached	-	30-50%	5-15%	1-5%	

Part V. Monitoring of Fish Populations on Coral Reefs

Introduction

Detecting changes in reef fish populations that may result from people pressure (fishing, collecting etc), or from natural effects such as crown of thorn outbreaks and cyclone damage, is an important component of reef management. However, there are several problems involved in estimating fish numbers that need to be considered. Of prime concern is the natural high variability evident in replicate counts of many fish species; the standard deviation is usually considerably more than 50% of the mean. This is generally a consequence of the clumped distribution patterns of many reef fish species, but it means that small changes in abundance often can not be detected, being swamped by the high variability.

For Management purposes it would be more efficient to direct census effort at fish species that undergo detectable changes in abundance in response to any shift in reef community structure, whether natural or man-induced. Ideally, counts should be made of fish species or groups that are good indicators of reef type and structure, respond quickly to changes in any community parameter, and have low variability within a reef habitat.

During the Far-North survey trip trial counts were made of two fish groups that observation, and prior work by D.M. Williams (pers. comm.), suggested would at least partially meet the above requirements. The groups counted were the families Chaetodontidae and Pomacentridae.

Methods and Results

1. Chaetodontidae

Chaetodontids were counted on 18 of the reefs visited, counts being made along five 50 x 20m transects on each reef. Counts were made on 11 of the reefs on the Cape Grenville cross-shelf transect to detect any cross-shelf patterns of abundance, and on a selection of 7 other reefs.

A total of 25 species of Chaetodontid were recorded. Results from the 11 reefs on the Cape Grenville Cross-shelf transect are listed in table 3 and shown on the graphs in figures 15,16 and 17. Many of the species respond precisely to shelf position and hence give a good indication of the broad scale environment of each reef. Some of the more abundant species had a relatively low variance for these counts; standard deviations were usually less than 50% of the mean and in a number of instances were less than 10% of the mean.

Chaetodontid counts were made on the sheltered western side of seven of the outer barrier reefs and these results are listed in table 4. These reefs were relatively similar in coral state and topography except Lagoon Reef, where there was extensive coral damage, probably the result of a cyclone hit in the past 2-3 years. Coral cover and bottom heterogeneity was markedly lower than on the other six reefs. Possibly as a consequence of this, total chaetodontid numbers on Lagoon Reef were only 35% of the mean total on the other outer reefs, and the number of species recorded was only 9 compared to a mean of 14.2 on the others.

In general these preliminary results indicate that Chaetodontid numbers give a good indication of reef type and

state, and may respond to changes in reef community structure. Detection of relatively small changes in abundance is possible, at least for the abundant species in which count variance was low.

2. Pomacentridae

Trial counts of all Pomacentrid species were made only on Tijou Reef in an attempt to determine the appropriate count size, and the time investment necessary to census this speciose family. A transect 2.5m wide could be counted with a single pass along the 50m tape and took approximately 20 minutes to complete. The mean $\pm$ the standard deviation for four of these counts are listed in table 5. Numbers of some of the more sedentary species exhibited a relatively low variance, but in general this family was more difficult to count accurately, and the numbers were more variable, than the Chaetodontidae.

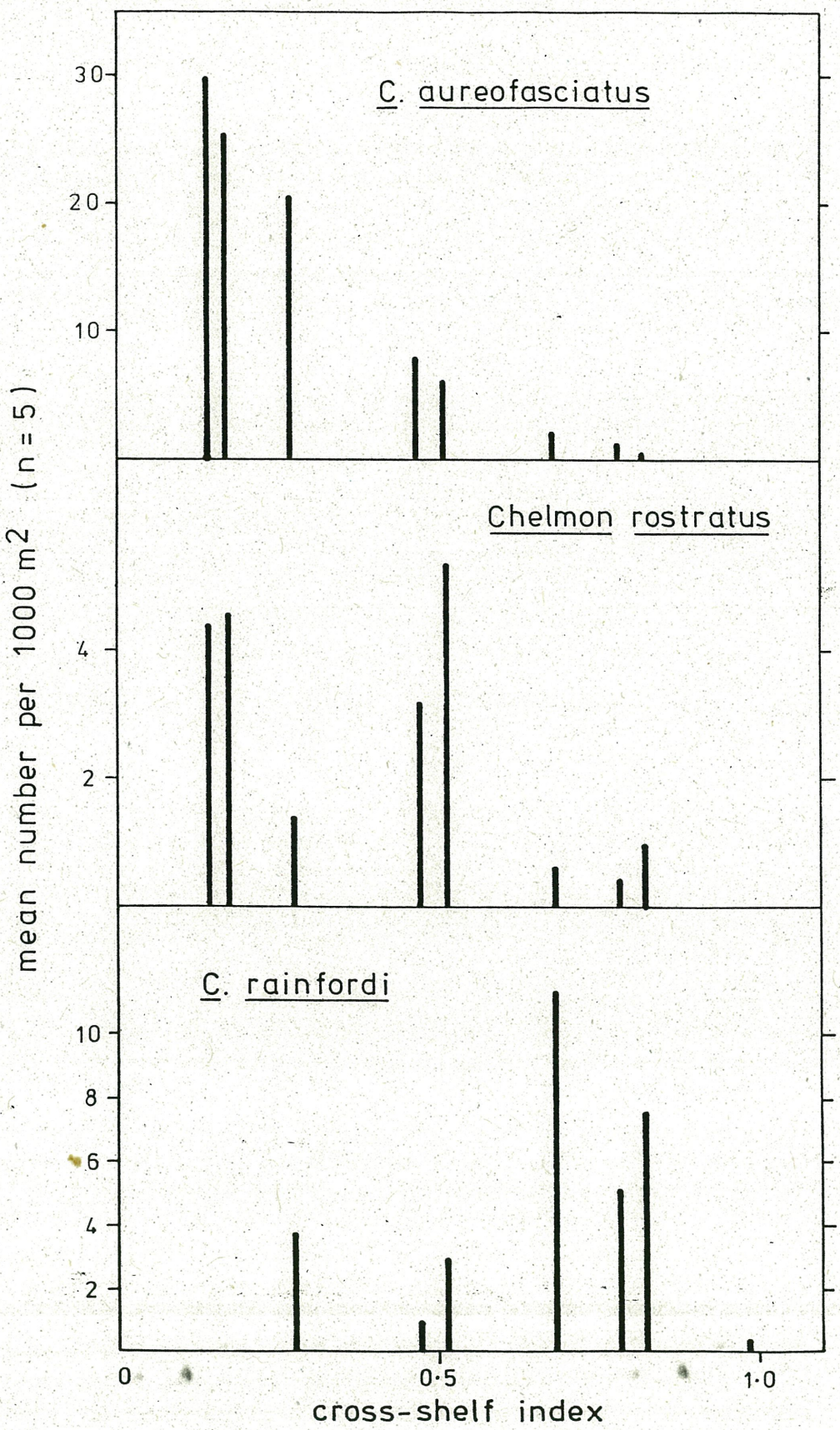


Figure 15. Cross-shelf patterns of Chaetodon spp. abundance

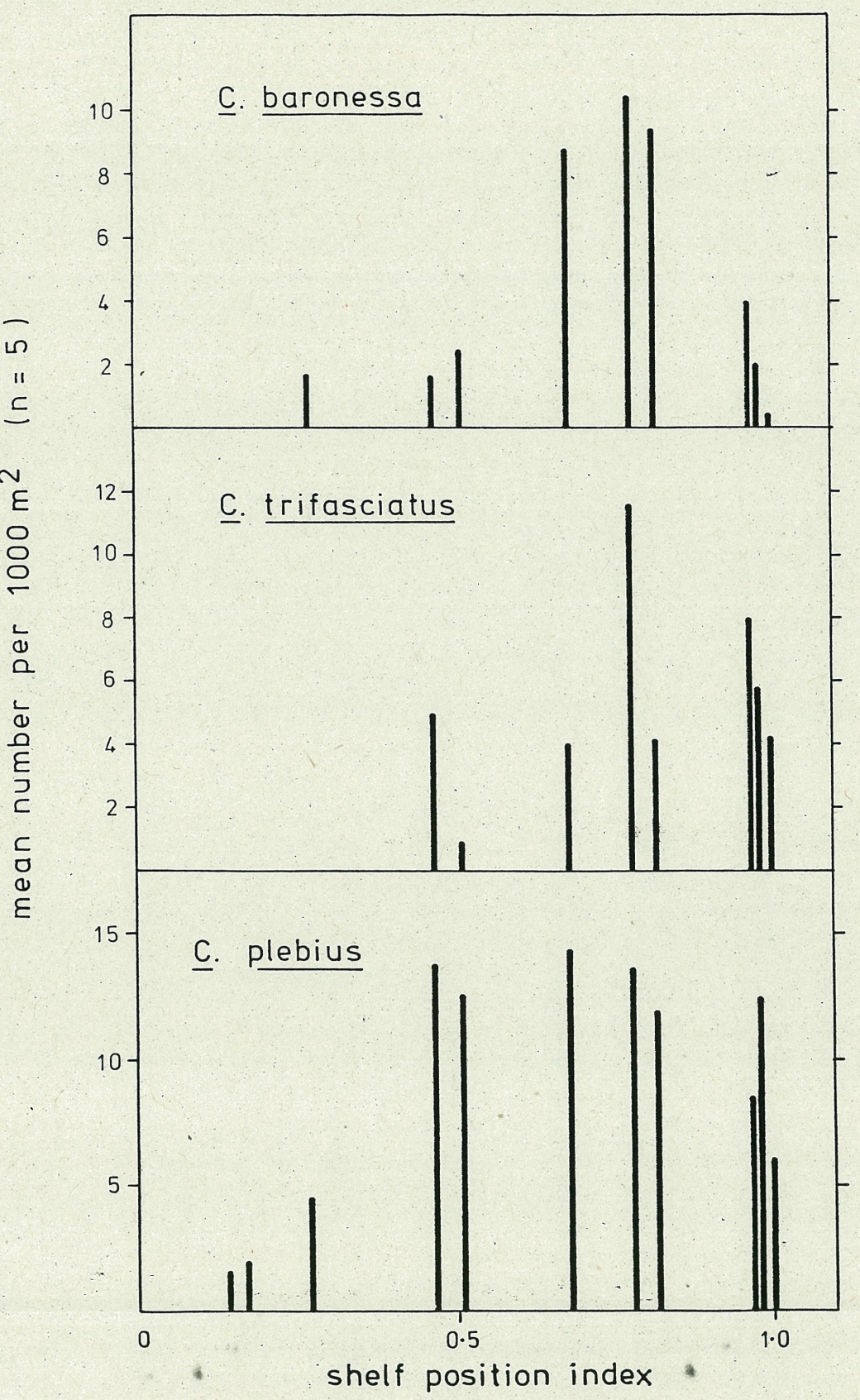


Figure 16. Cross-shelf patterns of Chaetodon spp. abundance

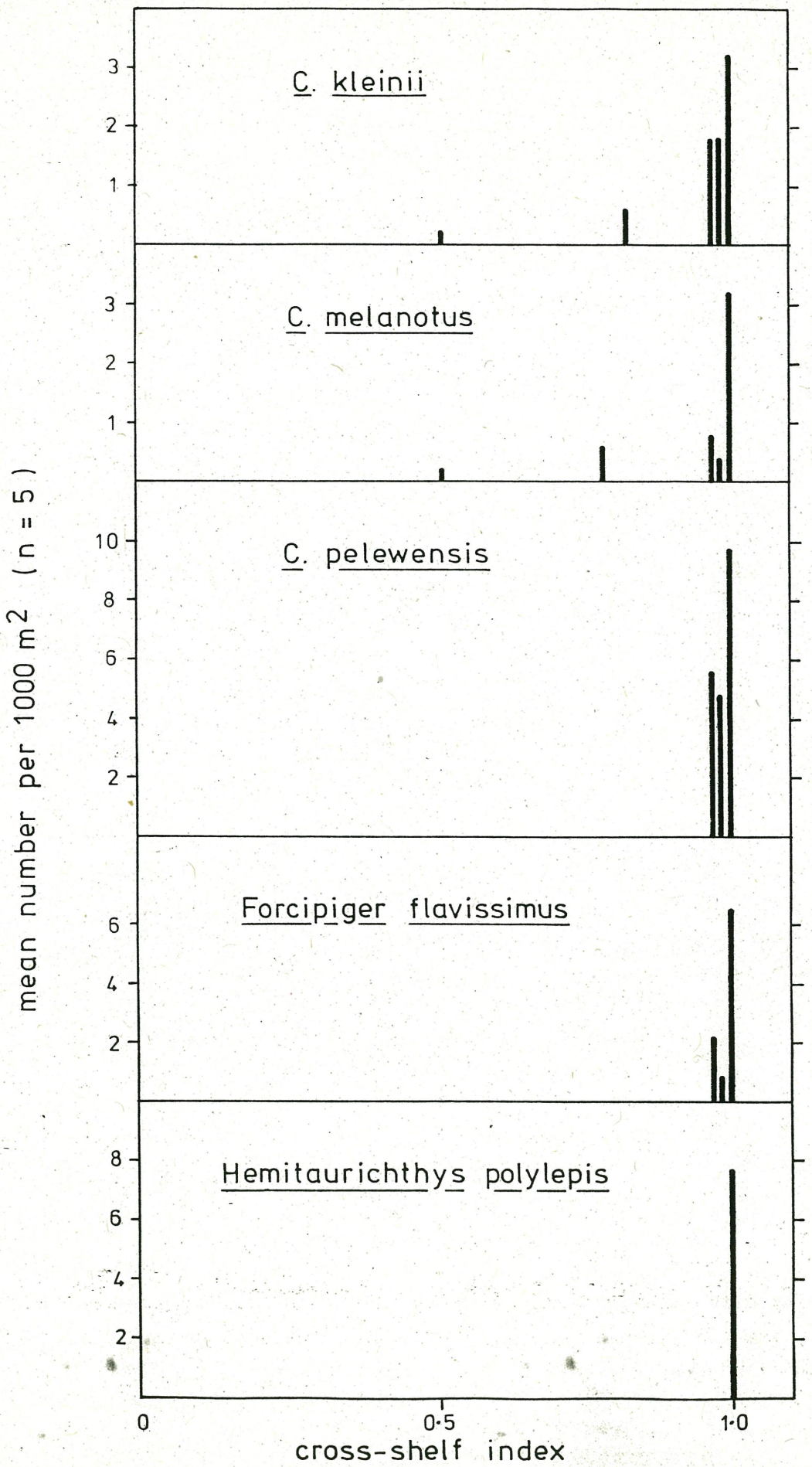


Figure 17. Cross-shelf patterns of Chaetodon spp. abundance

Table 4. Abundance of Chaetodontids on Outer-Shelf Reefs

Recorded as the mean ± the standard deviation from 5of 50 x 20m transect counts on back reef slope

Species	Reef						
	Lagoon	10-386	Great Detached	Cat	Tijou	Three	11-229
Chaetodon auriga	0.4 ± 0.9	2.0 ± 1.2	3.4 ± 2.1	-	2.2 ± 2.3	0.8 ± 1.3	1.2 ± 1.3
C. baronessa	1.4 ± 0.9	2.6 ± 1.8	1.4 ± 1.3	9.2 ± 3.8	1.0 ± 1.4	2.0 ± 2.0	4.0 ± 1.9
C. bennetti	0.4 ± 0.9	-	-	0.2 ± 0.5	-	-	-
C. citrinellus	-	0.6 ± 0.9	5.6 ± 2.9	1.0 ± 1.4	1.0 ± 1.4	1.2 ± 0.8	0.2 ± 0.5
C. ephippium	-	0.2 ± 0.5	0.2 ± 0.5	0.8 ± 1.1	0.8 ± 1.1	1.4 ± 1.1	1.2 ± 1.1
C. kleinii	-	3.2 ± 2.2	-	0.4 ± 0.9	0.2 ± 0.5	1.8 ± 2.0	1.8 ± 1.5
C. lineolatus	0.2 ± 0.5	-	-	0.4 ± 0.9	-	-	0.6 ± 0.9
C. lunula	-	-	0.4 ± 0.9	-	-	-	-
C. melanotus	0.4 ± 0.6	0.8 ± 1.3	2.2 ± 0.5	0.8 ± 0.8	-	0.4 ± 0.6	0.8 ± 0.8
C. ornatissimus	-	-	-	-	-	0.4 ± 0.9	-
C. pelewensis	-	1.0 ± 1.0	1.4 ± 1.7	2.2 ± 1.3	3.8 ± 1.3	4.8 ± 1.6	5.6 ± 2.1
C. plebius	3.8 ± 1.9	13.2 ± 3.3	3.8 ± 2.7	8.8 ± 2.6	7.8 ± 3.4	12.4 ± 1.5	8.6 ± 3.5
C. rainfordi	-	-	-	-	-	0.2 ± 0.5	-
C. speculum	-	0.2 ± 0.5	0.6 ± 0.9	-	-	-	-

Table 4. Abundance of Chaetodontids on Outer-Shelf Reefs

Recorded as the mean ± the standard deviation for five 50 x 20m transect counts on the back reef slope

Species	Reef						
	Lagoon	10-386	Great Detached	Cat	Tijou	Three	11-229
C. trifascialis	-	3.6 ± 2.0	6.4 ± 2.7	2.0 ± 1.9	0.2 ± 0.5	1.8 ± 1.8	0.6 ± 0.9
C. trifasciatus	5.0 ± 1.4	4.0 ± 1.2	6.4 ± 3.1	9.4 ± 2.9	16.6 ± 5.8	5.8 ± 2.9	8.0 ± 2.1
C. ulietensis	0.8 ± 0.8	0.8 ± 1.1	1.6 ± 0.9	1.6 ± 1.5	1.0 ± 1.0	0.4 ± 0.6	1.2 ± 0.8
C. unimaculatus	-	0.2 ± 0.5	-	1.0 ± 1.0	-	-	0.4 ± 0.9
C. vagabundus	-	-	1.2 ± 0.8	1.2 ± 0.8	1.2 ± 1.3	1.4 ± 1.3	1.8 ± 1.6
Forcipiger flavissimus	0.4 ± 0.9	1.4 ± 1.7	0.8 ± 1.3	2.2 ± 1.9	1.0 ± 1.4	0.8 ± 1.1	2.2 ± 2.3
Number of species	9	14	14	15	12	15	15
Total individuals	12.8	33.8	35.4	41.2	36.8	35.6	38.2
Coral cover in count area	15-30%	30-50%	50-75%	50-75%	30-50%	30-50%	30-50%

Table 5. Pomacentrid Abundance on Tijou Reef

Recorded as the mean ± standard deviation for four 50 x 2.5m transect counts in 6-8m depth on the back reef slope, Sth. end

Species	Abundance
Acanthachromis polyacanthus	0.3 ± 0.5
Chromis amboinensis	0.3 ± 0.5
C. atripectoralis	12.3 ± 4.4
C. caerulea	4.0 ± 8.9
C. retrofasciata	11.5 ± 7.4
C. ternatensis	77.0 ± 33.0
Dascyllus aruanus	11.0 ± 6.7
D. melanurus	0.3 ± 0.5
D. reticulatus	3.5 ± 4.1
Amblyglyphidodon curacao	4.5 ± 2.1
A. leucogaster	21.0 ± 2.6
Dischistodus melanotus	7.8 ± 2.2
Chrysiptera rollandi	20.8 ± 0.5
C. talboti	8.0 ± 2.9
Para glyphidodon nigroris	4.0 ± 2.9
Plectroglyphidodon lacrymatus	15.5 ± 8.1
Pomacentrus amboinensis	10.8 ± 5.7
P. bankanensis	0.3 ± 0.5
P. lepidogenys	1.3 ± 1.5
P. grammorhynchus	13.8 ± 2.8
P. brachialis	36.5 ± 7.2
P. moluccensis	89.5 ± 17.3

Appendix 1. Raw Data from all Coral Trout Counts

TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

Data from ten 50 x 20 metre visual counts April/May 1984

14-034 Reef (Scooterboot) Date: 6th May 1984 Time: 0830-1100hr

Estimated total length in cm recorded for each fish seen

Plectropomus leopardus	P. maculatus	P. sp.	P. melanoleucas	P. truncatus	Variola louti
		41, 60	17		
42		72, 75			
56		62	20		
35, 37, 48		39			
50		51, 71, 82			
45					
				56	
44		47	20		
44, 54			42		
49, 53					

TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

ta from ten 50 x 20 metre visual counts April/May 1984

13-125 Reef (Steene Rf.) Date: 4th May 1984 Time: 0800-1100

imated total length in cm recorded for each fish seen

Plectropomus leopardus	P. maculatus	P. sp.	P. melanoteucas	P. truncatus	Variola louti
41					
19, 39, 48					
32, 43, 47, 49					
48					
28, 45, 53			18		
32, 33, 36, 39					
35, 47		68			
49, 52			20		
32, 34, 40, 44		48			
32, 56			17, 18		

TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

Data from ten 50 x 20 metre visual counts April/May 1984

Cat Reef Date: 2nd May 1984 Time: 1100-1330hr

Estimated total length in cm recorded for each fish seen

Plectropomus leopardus	P. maculatus	P. sp.	P. melanoleucas	P. truncatus	Variola louti
18, 35, 50					
16		46	65		
14, 25, 47		59			
33, 43					
30, 35, 37		38, 43	43, 55	47	
8, 14, 15, 26, 50		74			
27, 36, 37		51	43		
17, 30, 45					
26, 31		40, 48, 63			
12, 36, 43, 50		82			

CORAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

Raw data from ten 50 x 20 metre visual counts April/May 1984

Reef: Tijou Reef Date: 1st May 1984 Time: 0830-1130hr

Estimated total length in cm recorded for each fish seen

Plectropomus leopardus	P. maculatus	P. sp.	P. melanoleucas	P. truncatus	Variola louti
34, 36, 36, 40, 42			32		
19, 34, 39, 43, 55					
13, 15, 23, 32, 38, 38					
33, 39, 41, 46			51		
28, 34, 58		92			
15, 19, 25, 39, 40					
17, 40					
36, 48					
11, 35, 37, 41, 51		48, 63, 70			
13, 14, 30, 36					

RAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

x data from ten 50 x 20 metre visual counts April/May 1984

f: Lagoon Reef Date: 29th Apr. 1984 Time: 1430-1700hr

stimated total length in cm recorded for each fish seen

Plectropomus leopardus	P. maculatus	P. sp.	P. melanoleucas	P. truncatus	Variola louti
37, 40					
		51	15		
35, 36, 38					
27, 32, 40		48			
34			17		
33		42, 48			
28, 31					
		46, 78	21, 32		

CORAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

Raw data from ten 50 x 20 metre visual counts April/May 1984

Reef: 11-211 Reef (Forty Winks) Date: 28th Apr. 1984 Time: 0830-1130hr

Estimated total length in cm recorded for each fish seen

#	Plectropomus leopardus	P. maculatus	P. sp.	P. melanoleucas	P. truncatus	Variola louti
	22, 33, 36, 40					
	12, 33, 35					
	34, 41					
	26, 31, 32, 35, 38, 56					28
	12, 34, 36, 37, 38, 40			36		
	11, 13, 27, 32, 36, 37, 40 48, 52		38, 65			
7	33, 34, 36, 37, 39					
	20, 26, 30, 32, 37, 38					
9	13, 34, 36, 39, 42					
10	31, 34, 38, 45, 47					

CORAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

Raw data from ten 50 x 20 metre visual counts April/May 1984

Reef: 11-229 Reef Date: 27th Apr. 1984 Time: 0830-1130hr

Estimated total length in cm recorded for each fish seen

Plectropomus leopardus	P. maculatus	P. sp.	P. melanoleucas	P. truncatus	Variola louti
14, 50		63, 70			48, 49
31		56, 68			53
35, 47		33, 46, 53 72	19		38, 50
13, 14, 38, 42		63	17		
11, 15, 32		31	18		
33, 37, 41		33			
28, 29		46, 51			
31		52	20, 36		
12, 14, 15, 34, 35, 36, 39 54		65			
12, 14, 32, 37, 38		38, 48, 60 85	31		

RAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

...v data from ten 50 x 20 metre visual counts April/May 1984

...f: Ashmore Banks Date: 26th Apr. 1984 Time: 1200-1430hr

...stimated total length in cm recorded for each fish seen

Plectropomus leopardus	P. maculatus	P. sp.	P. melanoleucas	P. truncatus	Variola louti
18, 31, 33, 35, 39, 40, 42 50		46	48		
12, 34, 37, 40, 42, 44, 50		52			
11, 31, 34, 35, 39, 40, 42			65		
29, 33, 34, 34, 40, 46					
17, 28, 33, 33, 42, 47					
13, 18, 37, 40, 43					
32, 35, 36, 42					
13, 17, 47		42			
12, 16, 30, 35, 36, 49		54			
31, 33, 38, 40, 42, 43			16, 18		

CORAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

Raw data from ten 50 x 20 metre visual counts April/May 1984

Reef: Cockburn Reef - Site 2 Date: 25th Apr. 1984 Time: 1430-1700hr

Estimated total length in cm recorded for each fish seen

Plectropomus leopardus	*P. maculatus*	*P.* sp.	*P. melanoleucas*	*P. truncatus*	*Variola louti*
13, 15, 33, 34	25, 31				
20, 35, 38	30				
18, 33, 37	11, 13, 16 32				
12, 34, 36, 51	14, 28				
32, 34, 39, 44, 60					
19, 33, 35	14				
23, 38, 42	14, 29				
29, 39, 41	35, 35				
16	13, 17, 23 32				
30, 34	12, 33, 40 40, 46				

CORAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

Raw data from ten 50 x 20 metre visual counts April/May 1984

Reef: Middle Banks Date: 25th Apr. 1984 Time: 1000-1230hr

Estimated total length in cm recorded for each fish seen

Plectropomus leopardus	*P. maculatus*	*P.* sp.	*P. melanoleucas*	*P. truncatus*	*Variola louti*
34, 35			46		
18, 29, 37, 39, 49					
13, 14, 16, 29					
14, 17, 44					
15, 29, 36			36		
27, 33, 38, 45			33		
31, 36, 36, 46					
32, 49					
17, 33, 46					
13, 14, 17, 30, 37, 38					

CORAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

Raw data from ten 50 x 20 metre visual counts April/May 1984

Reef: Three reefs Date: 24th Apr. 1984 Time: 1030-1300hr

Estimated total length in cm recorded for each fish seen

Plectropomus leopardus	*P. maculatus*	*P.* sp.	*P. melanoleucas*	*P. truncatus*	*Variola louti*
33, 36		39	42		44
		64			
39, 42					
13, 37		41, 71	58		38
12, 14		33, 38, 64			
50		30			
13, 37, 42		42, 51			18
16, 39					

RAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

w data from ten 50 x 20 metre visual counts April/May 1984

f: Triangle Reef Date: 22nd Apr. 1984 Time: 1300-1615hr

timated total length in cm recorded for each fish seen

Plectropomus leopardus	P. maculatus	P. sp.	P. melanoleucas	P. truncatus	Variola louti
		50, 55, 75 84			
		92			
60		68, 74			
47, 52, 57					
		43			
38, 47, 54				41, 48	
56		47			
45					

Raw data from ten 50 x 20 metre visual counts April/May 1984

Reef: 10-386 Reef Date: 21st Apr. 1984 Time: 1430-1730hr

Estimated total length in cm recorded for each fish seen

Plectropomus leopardus	*P. maculatus*	*P.* sp.	*P. melanoleucas*	*P. truncatus*	*Variola louti*
57					
45					
37					54
		72			
		63			

CORAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

Raw data from ten 50 x 20 metre visual counts April/May 1984

Reef: 10-352 Reef Date: 20th Apr. 1984 Time: 1430-1715hr

Estimated total length in cm recorded for each fish seen

	Plectropomus leopardus	P. maculatus	P. sp.	P. melanoleucas	P. truncatus	Variola louti
	17, 46	32, 35				
		32, 37, 39				
	34, 37, 56	28				
		35				
6						
7	33, 34, 38, 43, 45, 48, 55	36, 38, 40 42				
8	25, 31, 42, 46	33				
9	40	14, 30, 32 28				
10	31	27, 30, 31				

aw data from ten 50 x 20 metre visual counts April/May 1984

ef: 10-351 Reef Date: 20th Apr, 1984 Time: 0800-1130hr

stimated total length in cm recorded for each fish seen

Plectropomus leopardus	P. maculatus	P. sp.	P. melanoleucas	P. truncatus	Variola louti
	27				
13, 19	30				
21, 38	24, 31, 33 39				
29, 36, 37	33, 34				
14, 16, 48	32, 36, 44 47				
	17, 28, 32				
36, 38, 40	20, 30				
	13, 29, 31 48				
38, 43	35				
12, 35, 39, 45	14				

AL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

data from ten 50 x 20 metre visual counts April/May 1984

: Whyborn Reef Date: 15th Apr. 1984 Time: 1400-1630hr

timated total length in cm recorded for each fish seen

Plectropomus leopardus	P. maculatus	P. sp.	P. melanoleucas	P. truncatus	Variola louti
	33,35				
	32,36				
	24				
	43				

ORAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

aw data from ten 50 x 20 metre visual counts. April/May 1984

ef: Boydong Islet Date: 14th Apr. 1984 Time: 1400-1730hr

stimated total length in cm recorded for each fish seen

Plectropomus leopardus	P. maculatus	P. sp.	P. melanoteucas	P. truncatus	Variola louti
	35, 39, 48				
56					
	23, 34				
	39				
	30, 36, 42				
	41, 43				
42	25, 32				
33, 44	34				
	32, 33, 38 39				

OPAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

aw data from ten 50 x 20 metre visual counts April/May 1984

ef: Bird Island Date: 13th Apr. 1984 Time: 1000-1230hr

stimated total length in cm recorded for each fish seen

Plectropomus leopardus	*P. maculatus*	*P.* sp.	*P. melanoleucas*	*P. truncatus*	*Variola louti*
	37				
38	40				
	31, 34				
32	38, 44, 65				
	41				
	29, 62				
	35				
	27, 31				

RAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

aw data from ten 50 x 20 metre visual counts April/May 1984

ef: Cockburn Reef - Site 1 Date: 12th Apr. 1984 Time: 1430-1700hr

stimated total length in cm recorded for each fish seen

Plectropomus leopardus	P. maculatus	P. sp.	P. melanoleucas	P. truncatus	Variola louti
34					
32, 42	32, 42				
38					
36, 38					
33					
35, 45, 64	9, 15, 31 39				
31, 37, 39, 42, 44, 47	26				
47, 54					
35, 37, 39					
32, 33, 38, 40					

ORAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

aw data from ten 50 x 20 metre visual counts. April/May 1984

ef: Great Detached Reef Date: 10th Apr. 1984 Time: 0900-1200hr

stimated total length in cm recorded for each fish seen

Plectropomus leopardus	P. maculatus	P. sp.	P. melanoTeucas	P. truncatus	Variola louti
		37, 39			36, 41
					28
		34, 47			
		78			
		31			
					18, 25
		32			33
					32
		49, 93			40, 46 57

ORAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

Raw data from ten 50 x 20 metre visual counts April/May 1984

Reef: Raine Island Date: 9th Apr. 1984 Time: 1130-1400hr

Estimated total length in cm recorded for each fish seen

Plectropomus leopardus	*P. maculatus*	*P.* sp.	*P. melanoleucas*	*P. truncatus*	*Variola louti*
		48			
		42			
		53			
		65,72			
		38			
			19		
		82			

ORAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

aw data from ten 50 x 20 metre visual counts April/May 1984

ef: Sir Charles Hardy Is. Date: 8th Apr. 1984 Time: 1530-1800hr

stimated total length in cm recorded for each fish seen

Plectropomus leopardus	P. maculatus	P. sp.	P. melanoTeucas	P. truncatus	Variola louti
13, 15, 19, 30	13				
31, 42					
14, 27					
18, 32, 48	32				
16, 21, 24					
15, 30					
13, 14					
33					
12, 14, 20, 33, 35, 36, 39					

ORAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

aw data from ten 50 x 20 metre visual counts April/May 1984

ef: Suchen Reef 13-055 Date: 7th Apr. 1984 Time: 1015-1245hr

stimated total length in cm recorded for each fish seen

Plectropomus leopardus	P. maculatus	P. sp.	P. melanoleucas	P. truncatus	Variola louti
23, 29, 35, 38, 40					
44					
31, 37, 38, 39					
6, 10, 11, 30, 46					
11, 62					
12, 15, 39					
26, 34, 35					
16, 30, 31					
19, 33, 40, 56					
32, 33, 60					

ORAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

aw data from ten 50 x 20 metre visual counts April/May 1984

ef: Celebration Reef Date: 6th Apr. 1984 Time: 1500-1730hr

stimated total length in cm recorded for each fish seen

Plectropomus leopardus	*P. maculatus*	*P.* sp.	*P. melanoleucas*	*P. truncatus*	*Variola louti*
32					
40, 44, 47, 56					
31, 40					
37, 45, 46					
	38				
7					
38, 39, 47					
	32				

CORAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

Raw data from ten 50 x 20 metre visual counts April/May 1984

Reef: Night Island Date: 6th Apr. 1984 Time: 0800-1130hr

Estimated total length in cm recorded for each fish seen

Plectropomus leopardus	*P. maculatus*	*P.* sp.	*P. melanoteucas*	*P. truncatus*	*Variola louti*
	38				
	29				
	11, 27, 39				
	30, 30, 31				
42					
34					
53	42				

OPAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

aw data from ten 50 x 20 metre visual counts April/May 1984

ef: Grub Reef Date: 5th Apr. 1984 Time: 0900-1200hr

stimated total length in cm recorded for each fish seen

Plectropomus leopardus	P. maculatus	P. sp.	P. melanoteucas	P. truncatus	Variola louti
38					
27	44				
42					
	35,52				
	23,37				
	24,40				

RAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

v data from ten 50 x 20 metre visual counts April/May 1984

F: Corbett Reef Date: 2nd Apr. 1984 Time: 1300-1600hr

stimated total length in cm recorded for each fish seen

Plectropomus leopardus	P. maculatus	P. sp.	P. melanoleucas	P. truncatus	Variola louti
30, 32, 34, 40	41				
33, 42					
32, 38					
34	58				
37, 40, 50					
30, 34, 42					
31, 34, 34, 40					
43					

CORAL TROUT SURVEY FAR NORTH SECTION OF GREAT BARRIER REEF MARINE PARK

Raw data from ten 50 x 20 metre visual counts. April/May 1984

Reef: Stanley Island Date: 1st April 1984 Time: 0930-1230hr

Estimated total length in cm recorded for each fish seen

#	Plectropomus leopardus	P. maculatus	P. sp.	P. melanoleucas	P. truncatus	Variola louti
	34					
		47				
		33				
	32					
		23, 30, 63				
	38					
	54					
		33, 44				
		31, 32				
0		12, 41, 75				