



Economic Characteristics of Fishing in the Capricornia Section

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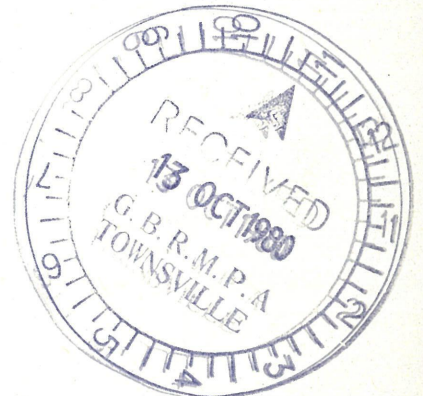
ECONOMIC CHARACTERISTICS
OF FISHING IN THE
CAPRICORNIA SECTION OF THE
GREAT BARRIER REEF MARINE PARK

A report prepared for the Great Barrier Reef Marine Park Authority.

T. J. Hundloe, S. M. Driml, S. W. Lack and G. T. McDonald

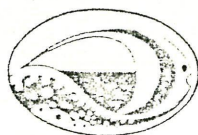
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With regard to the report on the Economic Characteristics of Fishing in the Capricornia Section, by the Institute of Applied Social Research, the Authority decided to accept the report.

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The Authority decided to approve limited distribution, at this stage, to contributors to the study: a more substantial publication for the entire Region might be considered following completion of the current economic study for the remainder of the Region.

A publication covering the entire Great Barrier Reef Region supercedes this volume. It is:

Fisheries of the Great Barrier Reef

Tor Hundloe

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Name of Project Officer: Tor Hundloe/Wendy Craik

THE ECONOMIC CHARACTERISTICS OF FISHING
IN THE CAPRICORNIA SECTION

ADDENDA

- SUMMARY Commercial Fishing, point (IV), substitute the sentence:
"Vessels to the replacement value of \$12 million were
employed in fishing in the Capricornia Section - though
most of these vessels fished elsewhere as well.
- SUMMARY Commercial Fishing, point (V). The value \$2.5 million
should replace \$2.4 million.
- Page 11 Paragraph 4, substitute the sentence: "Three boats in
every ten were selected".
- Page 17 Paragraph 2, add the sentence: "It would be approximately
6,200 trips" at the end of the paragraph.
- Page 19 Paragraph 3, substitute the sentence: "It is seen that
approximately 100% of boats were bought in Queensland,
and that approximately 84% were bought within the Region".
- Page 35 Paragraph 2, substitute the sentence: "Approximately
23% of the boat owners fishing in the Capricornia
Section reported that they had sold fish in the previous
12 months, though the fish were not necessarily caught in
the Capricornia Section".
- Page 46 Line 20, substitute the sentence: "The total expenditure
outlayed by guests specifically going to take part in the
competitions should be attributed to fishing".
- Page 75 Paragraph 3, substitute the sentence: "The data indicate
that vessels having a replacement value of almost \$12
million fished in the Capricornia Section during 1978/79".

p 74

para 2. substitute p 42)
32 to 37)

- Page 75 Paragraph 4, substitute the sentence: "The depreciation rate adopted by the Australian Taxation Office for use with commercial fishing vessels is 11.25% per annum (diminishing value method)".
- Page 76 Paragraph 1, substitute the sentence: "42% of that \$1.6 million - \$670,000 - may be roughly attributed as being new investment for fishing in the Capricornia Section".
- Page 76 Paragraph 2, substitute the sentence: "The mean and modal year of purchase by the present owner was 1976".
- Page 85 Last sentence, substitute: "Table 22, below, gives estimates of the number of persons including skippers and owner/skippers, employed by local commercial fishing vessel owners".
- Page 88 Point (IV), substitute the sentence: "Vessels to the replacement value of \$12 million were employed in fishing in the Capricornia Section - though most of these vessels fished elsewhere as well".
- Page 88 Point (V). The value of \$2.5 million should replace \$2.4 million.

ABSTRACT

The purpose of this report is to present data gathered on amateur and commercial fishing in the Capricornia Section of the Great Barrier Reef. Preliminary analysis of this data has been undertaken. The major findings of the research are summarised as follows :

AMATEUR FISHING

PRIVATE MOTOR BOAT FISHING

Approximately 800 owners of registered private motor boats fish in the Capricornia Section. Most of these fishermen live in the adjacent coastal area, though some come from the inland mining towns.

- (i) Total investment in boats and associated equipment is over \$7 million.
- (ii) Their approximate annual expenditure to fish in the Capricornia Section is \$630,000.

CHARTER BOAT FISHING

- (i) Fishermen spend approximately \$¹/₃ million annually in charter boat fees to fish the Capricornia Section.
- (ii) The approximate value of the charter boats regularly engaging in fishing charter work in the Capricornia Section is \$2 million.

(Both these estimates are lower limits, as only boats in survey working regularly in the Capricornia Section are considered.)

HERON ISLAND FISHING

The economic aspects of Heron Island recreational fishing are insignificant. Nevertheless, the only Reef fishing experience a large number of visitors to the Capricornia Section have is in the way of a resort organised excursion.

COMMERCIAL FISHING

- (i) The number of commercial fishing units operating from the ports of Bundaberg, Gladstone and Rockhampton/Yeppoon was found to be 269.
- (ii) $57\% \pm 9\%$ of "local" commercial fishing units, that is, 129 to 177 units, did some of their fishing in the Capricornia Section. 40% of those units did most of their fishing in the Capricornia Section.
- (iii) The types of fishing undertaken by commercial fishing units which did some fishing in the Capricornia Section were: prawn and/or scallop trawling 40%; pelagic and/or demersal fishing 28%; both trawling and fin fishing 28%; net fishing and aquarium fish collecting 4%.
- (iv) Vessels to the value of almost \$12 million dollars were employed in fishing in the Capricornia Section - though most of those vessels fished elsewhere as well.
- (v) Commercial fishing units which did some fishing in the Capricornia Section incurred operating costs of \$6 million (including \$4.8 million in depreciation) during the 1978-79 financial year. Of these costs, 42%, \$2.4 million, was attributed to be a direct cost of actually fishing within the Capricornia Section.
- (vi) Over 80% of expenditure on operating costs and vessels occurred within the Wide Bay - Fitzroy region. Almost 100% of all expenditure occurred within Queensland.

- (vii) Income from the sale of fish and seafood caught within the Capricornia Section totalled over \$2.5 million in 1978-79. Of this income, 49% was from the sale of scallops, 27% was from the sale of prawns, 14% was from the sale of pelagic fish and 9% was from the sale of demersal fish.

ACKNOWLEDGEMENTS

This study would not have been possible without the assistance and co-operation of many people.

The authors wish to especially thank those hundreds of fishermen who provided the raw data for the analysis. In fact, over 1,000 fishermen (both amateurs and commercial), plus the small number of charter boat operators working in the area, gave their time by participating in mail surveys, boat ramp surveys, telephone interviews and personal interviews. Their co-operation, so readily given, was essential for the success of the project.

The authors are indebted to the officers of many government agencies. First mention must go to Dr Wendy Craik of the Great Barrier Reef Marine Park Authority. It is hoped that the information contained herein will be a more than useful adjunct to Wendy's already extensive knowledge of the Great Barrier Reef fishery.

Very useful help was given by the following people: Frank Meany and his staff in the Fisheries Division of the Commonwealth Department of Primary Industry; Angela Pashen and Meryl Williams of the Queensland Fisheries Service; Queensland Fish Board staff; the Harbour Masters at Bundaberg, Gladstone and Rockhampton; the Queensland Marine Board; and the Queensland Tourist and Travel Commission.

The authors are grateful for the co-operation of many private sector organisations: the Queensland Commercial Fishermen's Organisation; the Capricorn Coast Master Fishermen's Association; the Queensland Amateur Fishing Council; various amateur fishing clubs; diving/under-water clubs; and the Heron Island Research Station.

The authors wish to thank those members of the business community who so readily assisted. Special mention must be made of Markwell Fisheries Pty Ltd, and Heron Island resort for their assistance. The other business concerns involved are too many to individually mention.

Dr Andrew Dragun, who made an important contribution to the precursor to this study, is acknowledged for his keen interest and continued moral support.

Finally, a special thanks must go to those ladies, Suzanne Ainger and Jane Biggs, who painstakingly typed the report.

C O N T E N T S

ABSTRACT

ACKNOWLEDGEMENTS

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1. INTRODUCTION

FISHERIES OF THE CAPRICORNIA SECTION

This report presents the findings to date of an economic study of fishing in the Capricornia Section of the Great Barrier Reef Marine Park. While it is the most detailed description thus far of the economics of fishing in the area, it is not the definitive statement on the matter. The fishery is too complex and subject to change for that to be the case.

The findings presented herein are part of a larger study of the economics of Great Barrier Reef fishing. The term fishing is used to describe the harvesting of fishes, crustaceans and molluscs.

The Capricornia Section of the Great Barrier Reef Marine Park (hereafter the Capricornia Section) is an area of approximately 12,000 square kilometres, located off the southern Queensland ports of Bundaberg, Gladstone and Rockhampton. (Rockhampton is taken to include the adjacent coastal centres of Yeppoon and Rosslyn Bay.) The Capricornia Section is a small part of the total Great Barrier Reef fishery.

The Great Barrier Reef fishery, which for practical purposes commences at Lady Elliott Island in the south and extends along the whole Queensland coast to the tip of Cape York, is a major component of the Queensland east coast fishery. A number of different fisheries comprise the Queensland east coast fishery. They can be categorised as follows : the east coast prawn fishery; the scallop fishery; the Spanish mackerel fishery; the demersal reef fishery; the black marlin fishery; the long-line fishery; the crab fishery; and the beach, estuarine and inlet fisheries.

The major fisheries of the Capricornia Section are the prawn, scallop, mackerel, and demersal reef fisheries. The first three, in particular, transgress the boundaries of the Capricornia Section.

That is, the same boats might fish both within and without its boundaries.

This report is confined to consideration of harvesting within the Capricornia Section. Data were by necessity gathered on all fishing activity in the general area from Bundaberg in the south to Yeppoon in the north. In most cases where the data are not relevant to the Capricornia Section they have not been analysed.

The Capricornia Section fishery is both a commercial and recreational (or amateur) fishery, though with regard to fin fishes (but not prawns and scallops) any separation of the two facets is blurred.

As an introduction to the data and preliminary analysis presented in the following chapters, a brief description of the major component fisheries is given.

East Coast Prawn Fishery

This fishery extends along the entire Queensland coast, though it can be divided into a Moreton Bay section (which extends from the Queensland/New South Wales border to approximately the northern tip of Fraser Island) and the remaining section of Queensland coast. It should be noted that the northern prawn fishery in the Gulf of Carpentaria is excluded.

This east coast prawn fishery is the subject of a recent temporary freeze on the entry of vessels, though boats under construction at the time of the announcement of the freeze are being allowed to enter the fishery. To the extent that a temporary freeze on entry is in force, the fishery could be considered to be approaching a closed (or limited entry) fishery.

The major types of prawns trawled are eastern king, brown tiger, banana and green-tail. The standard gear used is the otter trawl. As the prawn grounds are relatively close to the coast the average size of vessels is comparatively small.

Though the trawl industry is mainly based upon prawns, there is a trawl-scallop industry, with some boats working both. By-product catches of non-prawn crustacea are associated with trawling.

Scallop fishery

This fishery extends from Tin Can Bay in the south to Townsville in the north. As mentioned above, scallops are often trawled by boats otherwise working the prawn fishery.

Spanish mackerel fishery

This fishery extends north along the Queensland coast from the southern end of the Great Barrier Reef to north of Cairns. Fishing is undertaken by trolling, that is, running lines from a moving boat. Mackerel fishing is an open entry fishery, and is undertaken by both commercial and amateur fishermen.

Demersal Reef fishery

This fishery is an open entry fishery, with emphasis on demersal species such as coral trout, sweet lip, parrot, etc. It is largely a handline operation, undertaken by both commercial and amateur fishermen.

Other fisheries

The other components of Queensland east coast fishing, (marlin, long-line, inshore and crab fishing) are not relevant in this study of the Capricornia Section. Though limited crayfish and squid harvesting takes place in the Capricornia Section, they are not considered in this report.

Amateur fishery

Some further introductory comment is warranted on amateur fishing within the Capricornia Section. This fishing is undertaken by both individuals and fishing clubs. As with any off-shore fishery, mode of

access is a useful means of categorising the components of amateur fishing in the Capricornia Section. Firstly, there is fishing undertaken from privately owned motor boats; secondly, there is fishing undertaken by parties hiring charter boats; and thirdly, there are organised fishing trips by Heron Island resort guests.

Spearfishing is undertaken from both private motor boats and charter boats, however, the amount of spearfishing undertaken is too small to justify further consideration of spearfishing in this report. Some fishing is done from yachts cruising through the Capricornia Section, but as extreme difficulty would be encountered in gathering data on this type of fishing it is also not considered in this report.

Recreational and professional - amateur

The term "amateur" fishing as used above refers to fishing done by persons not licenced as full-time commercial fishermen. (A system of "short term" licencing does exist for "amateurs" wishing to sell excess catches. As useful data are not kept on these fishermen it is not possible to treat them separately from other amateur fishermen.) As some non-licenced fishermen sell part of their catch, the term therefore covers both recreational fishermen and professional-amateurs ("pro-ams"). Recreational fishermen can be considered to be fishermen whose motivation is solely recreational, though of course they (and in some cases their friends) would consume any fishes caught. "Pro-am" fishermen can be defined as those who regularly or occasionally sell all or part of their catch. It should be noted that a particular fisherman could fit into either category depending upon circumstances.

RESEARCH OBJECTIVES

To conclude this introduction it is appropriate to briefly comment on the type of data gathered and analyses undertaken. Both are circumscribed by the aim of the research. This aim is to present economic information which will assist the Great Barrier Reef Marine Park Authority with regard to declaring, planning and managing multiple-use Marine Parks. Hence the data and analyses seek to describe the

important economic attributes of Great Barrier Reef fishing (for present purposes confined to the Capricornia Section); for example, the number of fishermen and boats engaged in fishing; the costs involved; the dependent shore-based industries; the economic value of various component fisheries of the fishery; and the employment involved.

Most of the data gathered and presented pertains to a time period of 12 months, for example, annual expenditure, trips per year, etc. The data were gathered on the economic activities of fishermen over the 1978-79 financial year in the case of commercial enterprises and for the 12 months preceding the study in the case of amateur fishing. It therefore presents the position as of the present and hence is a static analysis. To attempt to gather data of a historical nature is fraught with problems of recall for those fishermen who do not keep detailed records.

The only potential problem with using the information from any particular 12 month period is that it might not have been a "typical" (or "average") year. This methodological limitation is not only confined to a description and analysis of fishing but applies to economic research of most primary industries. Most primary production is of the same nature; that is, influenced by exogenous economic factors (for example, overseas demand) and non-economic phenomena, the most important being the vagaries of nature (for example, fluctuations in harvest, weather, etc.).

Notwithstanding this caveat, most of the cost variables measured in the study could be expected to remain reasonably constant in real terms over time. This would certainly be the situation with regard to fixed costs (for example, interest on borrowed funds for boat purchase). With regard to variable costs, compensating factors exist; for example, if catches are poor, less trips and expenditure may occur in fishing *per se*, but more time and expenditure may result in searching. Those variables which cannot be assumed to remain constant, such as seasonal catch and market price, are of relatively minor importance given the aims of this investigation.

NATURE OF THE REPORT

This report is issued as a draft. It is hoped that review of it by interested and informed parties will facilitate the correction of any errors or omissions. The final report will be prepared taking into account any comments received.

2. AMATEUR FISHING IN THE CAPRICORNIA SECTION

INTRODUCTION

As stated in the Introduction, amateur fishing in the Capricornia Section is best studied according to the means of gaining access to the fishing grounds: by privately-owned motor boat; by charter boat; and from Heron Island resort. These components of amateur fishing are discussed separately below. Before proceeding to do this some general comment on the collection of amateur fishing data is warranted.

Data Collection Methods

It is only in recent years that attempts have been made to gather data on amateur fishing, and usually only very limited social and economic information has been sought. Collecting amateur fishing statistics has been described as both "difficult and expensive".¹ This is a valid statement of fact - the more so if economic information is required. Much of the work to date has been undertaken in the United States of America, where a variety of methods have been used, with varying degrees of success. The collection methods adopted for this study were formulated paying due cognizance to the reported success or otherwise of the overseas experience.

Three major types of data gathering are normally used: mail questionnaires, face-to-face (or field) interviews, and telephone interviews. All of these methods can be used in any one particular study.

The following comments on the three approaches are based on a documented analysis of the U.S. experience² and on the experience of the research team responsible for this study.

-
- 1 Brown, G.L., A Review of Literature in Selected Areas Relevant to the Conduct of Marine Recreational Fisheries Surveys, Human Sciences Research Inc., prepared for National Marine Fisheries Service, Washington, D.C., 1 August, 1977, p.2.
 - 2 Ibid and Hiett, R.L. and Ghosh, D.N. A Recommended Approach to the Collection of Marine Recreational Finfishing and Shellfishing Data on the Pacific Coast, as above, 8 August, 1977.

Mail questionnaires are less expensive than face-to-face and long distance telephone interviewing and the data obtained is probably more reliable than that gathered by the other methods. The major problem with this method is the low response rate. The U.S. experience is that the response rate can be as low as 20 percent, and generally does not get beyond the 30 to 40 percent range. Various methods can be used to attempt to improve the rate: pre-contact, follow-up by mail, and follow-up by telephone.

Face-to-face interviews are expensive. A response bias larger than that resulting from mail surveys, though similar to telephone interviews, has been found to occur. This is because respondents interviewed in person have a psychological predisposition to give "socially desirable" answers. On the other hand if relevant documents are viewed during face-to-face interviews very reliable data can be obtained.

Telephone interviews are less expensive than face-to-face surveys. The cost per interview depends upon, among other things, the residence of the respondent in relation to the interviewer. The response rate for telephone interviews has been found to vary a great deal, though it is generally high (from 60 percent upwards). As with face-to-face interviewing, response bias can occur.

The difficulty in obtaining information of a sensitive nature, and economic data is generally considered to be the most sensitive, needs to be stressed. This problem is exacerbated in Queensland fisheries due to the existence of a large "black market" in fresh fish. Some amateur fishermen are not strictly recreational fishermen but are "pro-ams" (professional amateurs) selling part or all of their catch. For obvious reasons fishermen in this situation might be fearful of providing financial data - even with absolute confidentiality guaranteed.

As respondents can desire anonymity in answering questions of a sensitive nature, the mail questionnaire should be favoured. The desire for anonymity is a personal thing, and no definitive statement as to the extent of that feeling in the community can be made.

One further matter is worth mentioning. A major difference separates most amateur fisheries from commercial fisheries. It is that for the latter a clearly defined and known population exists, but with the former the population is not initially known. It usually has to be estimated by means other than the checking of official records of registration or licencing.

Collection Methods used in this Research

All the abovementioned methods (mail questionnaires, face-to-face interviews, and telephone interviews) were used to gather the data reported in this study. The details of the data collection methods used are discussed, as appropriate, in the sections dealing with separate components of amateur fishing. Only brief introductory comment is made here. The major instrument used was a mail questionnaire.

Face-to-face interviews were used for two primary purposes: (i) in the research methods design phase, some small number of personal interviews with amateur fishermen were undertaken as a means of obtaining an overview of the fishery and the fishermen involved; and (ii) at various stages during the research, the occasional fisherman was interviewed (usually at length) as a means of gathering more detailed information than that gathered in the mail questionnaires. Telephone interviewing was used as a method of comparing characteristics of mail-surveyed non-respondents to the characteristics of respondents.

The primary data gathering followed the documentation of readily available secondary data on amateur fishing. These data were reported in The Economics of Fishing in the Capricornia Section of the Great Barrier Reef: Part A, A Baseline Study of Activity and Resources of the Sector. This report was prepared for the Great Barrier Reef Marine Park Authority in 1979 by the Institute of Applied Social Research.

2.1 AMATEUR FISHING UNDERTAKEN BY PRIVATE MOTOR BOAT OWNERS

DATA COLLECTION

As stated previously a major means of gaining access to the Capricornia Section fishery is by private motor boat. Three major ports are adjacent to this part of the Great Barrier Reef. They are, from south to north, Bundaberg, Gladstone and Rockhampton. Bundaberg is taken to include Burnett Heads, Elliott Heads and Bargara. Rockhampton is taken to include Yeppoon, Rosslyn Bay and the rest of the Capricorn Coast. Between Bundaberg and Rockhampton some relatively minor embarkation points exist; the most important being the Town of Seventeen-Seventy and Turkey. (The majority of fishermen using these two areas as the point of embarkation live in the nearby coastal cities and towns, though some come from as far afield as Brisbane and Toowoomba.) Private motor boat owners, whether living in the coastal ports or further afield, haul their boats to ramps at the ports.

The major instrument used in gathering economic data on fishing from registered private motor boat owners was a mail survey. Other instruments, in particular a boat ramp survey, personal interviews and telephone interviews, played a minor but important back-up role. These methods and the rationale for selecting them is discussed in more detail below.

Preliminary investigations, specifically personal interviews with fishermen and knowledgeable local residents, field investigations in Reef waters and a boat ramp survey (undertaken by the Great Barrier Reef Marine Park Authority and the authors) helped establish important parameters. One of the most useful was the determination of a geographical "catchment" area from within which Capricornia Section fishermen could be expected to come. That area had to include the coastal cities/towns, their environs and the rural area in between. In addition, important towns (most of which are mining towns) as far west as Emerald had to be included in the "catchment" area. The boundary established set the areal limit for a survey of private motor

boat owners. The postcodes for the locations surveyed are presented in Appendix 1 and some social indicators for some of the locations are presented in Appendix 2. These indicators (such as household income, type of employment, etc.) are useful background information on the population from which the fishermen are drawn. The significant road distance from locations such as Emerald and Moura to the coastal ports is noteworthy. Locations a similar distance to the south of Bundaberg or north of Yeppoon were not included in the "catchment" area. This is simply explained. Close substitutes for Reef fishing are available for people living near the coast, while such is not the case for those inland. Another factor which gives further weight to including distant inland towns is that there is a higher proportion of longer boats registered for those towns than for the coastal areas. The ratio of 4.5 metre and over boats to the total boat population in the coastal area is $\frac{1}{3}$ while for the inland towns this ratio equals $\frac{1}{2}$.

Another useful parameter established by the preliminary investigations related to boat length and probability of venturing into the Capricornia Section. It was found that a boat length of 4.5 metres could be considered the minimum size for a trip into the Capricornia Section.

These two parameters established the population of private motor boat owners to be surveyed. A total of 7679 private motor boats of all lengths are registered by the Queensland Marine Board in the "catchment" area. A total of 2758 are 4.5 metres and over. This figure is the population of interest. It is noted in passing that not all private motor boats are registered and therefore the Marine Board records marginally underestimate the real population. It also should be noted that the number of boats would be marginally greater than the number of boat owners. These differences would be small and of virtually no significance.

A sample of the population (2758) was randomly selected from Marine Board registration records. The third boat in every ten was selected. This resulted in a sample of 851 boat owners, which is approximately 30% of the population. This number of owners was selected

with the aim of obtaining between 250 and 300 valid responses, on the assumption that the response rate for a "one-shot" mail survey (that is, with no follow-up) would be in the order of 30% to 40%.

Of the 851 boat owners who were mailed questionnaires, 15 were not located by the postal service. Therefore the actual sample was 836. The total response was 276, giving a response rate of approximately 33%, which is normal for mail surveys.

Some comment on sampling and non-sampling errors is warranted. In any sample survey there will be differences in estimates based on that sample and on those that would have been obtained by collecting information from the total population. These differences are known as sampling errors. The scale of sampling error is related to total sample size. Non-sampling errors can occur as a result of biases introduced by non-respondents having different characteristics to respondents; errors in reporting by respondents; or processing errors.

One of the most important variables measured in this study was the proportion of boat owners who fished in the Capricornia Section over the 12 month period preceding the survey. It was found that the sample proportion (that is, percentage of the sample who had fished in the Capricornia Section) was approximately .30 (or 30%).

To find, at the 95% confidence interval, the potential error involved in applying the sample proportion to the whole population, the standard error of the proportion is multiplied by 1.96 and the product is added and subtracted from the sample proportion. This can be expressed as follows :

the 95% confidence interval = $P \pm (1.96) \sigma_p$

where P = the sample proportion

σ_p = standard error of the proportion

By formula,

$$\sigma_p = \frac{P(I-P)}{N}$$

where N = the total number in the sample.

Solving this for the proportion fishing in the Capricornia Section the result is: there are 95 chances out of 100 that $30\% \pm 5\%$ of boat owners fished in the Capricornia Section. Converting percentages to actual numbers of boat owners, the result is that $30\% \pm 5\%$ of 2758 (the population) fished in the Capricornia Section, which is 827 ± 138 boat owners.

One further potential bias exists as a result of using a mail survey. This is that respondents (from a randomly selected sample) are self-selecting, and it is thought that the degree of interest in the subject matter of the survey can be a factor determining response. The question that has to be resolved is whether with regard to important characteristics, respondents are representative of non-respondents.

A telephone survey of a randomly selected sample of non-respondents was used as the instrument to assess this potential bias. As stated above, the response rate was 33% with the result that 560 non-respondents existed. Approximately 1 in 9 non-respondents (that is, 61 boat owners) were surveyed by telephone and asked two questions: had they fished in the Capricornia Section in the previous 12 months? and what number of trips were made?

It was found that approximately 34% of non-respondents had fished in the Capricornia Section during the period. This percentage is slightly higher than that for respondents. Nevertheless, it can be considered to be a reliable validation of the finding that $30\% \pm 5\%$ of boat owners fished in the Capricornia Section. The number of trips made was consistent with the information provided by respondents.

With regard to errors in reporting (which for this research is related, amongst other things, to accuracy in recall) some small number of returned mail questionnaires were validated by reference to the answers the same respondents gave in personal interviews or boat ramp surveys. With regard to processing errors, strict quality control would have eliminated these.

DATA AND ANALYSIS

It is estimated that 2758 private motor boats over 4.5 m were registered within the "catchment" area for the Capricornia Section. A sample of this population was randomly selected and surveyed.

From the survey results it is possible to describe the important economic characteristics of these fishermen. The rest of this section is devoted to reporting those results. With respect to location of expenditure, of most interest in this study is whether or not expenditure occurred within the local Wide Bay-Fitzroy Region (hereafter the Region).³

Boats fishing in the Capricornia Section

At the 95% confidence interval, it is estimated that 827 (± 138) boat owners fished at least once in the Capricornia Section in the 12 month period prior to the survey. In percentage terms this is approximately 30% ($\pm 5\%$) of boats over 4.5 m in the "catchment" area.

Percentage of fishing undertaken in the Capricornia Section

The amount of fishing done in the 12 month period in the Capricornia Section as a percentage of all fishing for that period undertaken by these 827 boat owners is presented in Table 1.

Approximately 50% of boat owners did 70% and or more of their fishing in the Capricornia Section, and approximately 80% of boat owners did 20% and or more of their fishing there.

Boat length

The mean length of boats that fished in the Capricornia Section was found to be 6.4 metres. The median length was 5.9 metres and the

³ The Wide Bay-Fitzroy Region consists of the Queensland Statistical Divisions of Wide Bay-Burnett and Fitzroy. This region includes all the coastal towns adjacent to the Capricornia Section - Bundaberg to Rockhampton. Input/output tables exist for this region.

TABLE 1: Percentage of Fishing in Capricornia Section

<u>Percentage of Fishing</u>	<u>Relative frequency (%)</u>	<u>Cumulative frequency (%)</u>
5	6.1	6.1
10	4.9	11.0
15	1.2	12.2
20	7.3	19.5
25	3.7	23.2
30	1.2	24.4
33	1.2	25.6
40	6.1	31.7
50	6.1	37.8
60	4.9	42.7
66	1.2	43.9
70	7.3	51.2
80	11.0	62.2
90	9.8	72.0
95	1.2	73.2
100	26.8	100.0
	<hr/>	
TOTAL	100.0	
	<hr/>	

modal length 5.5 metres. The range of lengths was found to vary from 4.5 metres to 21 metres. The distribution is slightly skewed (positively) with the mean influenced by the extremes. As the median length is modified little by extremes, it is the most useful measure of central tendency. This can be compared to the mean measure of 5.3 metres calculated from the boat ramp survey. Table 2 presents the percentage of boats (grouped in length classes) according to the location of the registration.

TABLE 2: Boat Length and Area of Registration

	4.5m to 4.9m	5m to 5.9m	6m to 8.9m	9m and over	
<u>Location of boat registration</u>					
Bundaberg (including Childers) and environs.	0%	61 %	39 %	0%	100%
Gladstone and environs.	6%	42.5%	45.5%	6%	100%
Rockhampton, Capricorn Coast and environs.	27%	33 %	27 %	13%	100%
Inland towns.	13%	31 %	50 %	6%	100%

Horse power

The mean horse power was found to be 130 hp; while the median was 135 hp. Over 80% of boats were powered by motors with a capacity in the range of 70 hp to 200 hp.

Number of trips per annum

The mean number of fishing trips per annum into the Capricornia Section was found to be 7.5 trips.⁴ The modal number of trips was 6

⁴ This figure can be compared to the mean number of trips calculated from the boat ramp survey. From that survey the mean was found to be 7 trips per annum.

trips and the median number was 5.5. The range of trips was 1 to 42, though approximately 80% of boat owners made 10 or less trips per annum and approximately 30% of boat owners made 3 or less trips. As the distribution was positively skewed, the median number of trips was the most useful measure of central tendency.

The total number of trips into the Capricornia Section was calculated by obtaining the product of the "average" number per boat owner by the number of boat owners. Accepting the median as the average, the result was approximately 4,500 trips. The figure could be somewhat larger if the mean number of trips were used.

Fishing location within the Capricornia Section

Respondents were asked to mark on a map the area/s in the Capricornia Section which they fished most. 15% fished through the entire Capricornia Section. 46% fished throughout the Capricorn Group. 7% fished throughout the Bunker Group. The remainder nominated specific locations as follows :

Northern Shoals - 4%

North Reef Island/Tryon Island/North West Island/Broomfield Reef/Wilson Island - 12%

Masthead Island/Erskine Island/Wistari Reef - 4%

Rock Cod Shoals - 2%

Hoskyn Islands/Fairfax Islands/Lady Musgrave Island - 6%

Lady Elliott Island - 4%

Value of boats⁵

The range of values of boats was found to be from \$1,500 to \$50,000. The distribution was found to be positively skewed, with the modal value being \$6,000, the median value \$7,500 and the mean value \$10,450. The median value (\$7,500) in this case was the most

⁵ This includes the value of trailers.

useful measure of central tendency.⁶ The value being considered here is actual cost in the year of purchase, not replacement value. Given the rate of inflation that has prevailed over recent years (from June 1976 to March 1980, the Consumer Price Index has increased by 43.5%) to replace an older boat by a new one today would cost considerably more than the original purchase price. On the other hand the older boats would have depreciated in value at a rate at least consistent with the inflation rate.

Year the boat was purchased

The modal year was 1979, with 29% of boats being purchased in that year. Both the mean and median year of purchase was 1977. Approximately 90% of boats were purchased after 1974. Table 3 below presents year of purchase.

TABLE 3: Year Boat Purchased

<u>Year</u>	<u>Relative frequency (%)</u>	<u>Cumulative frequency (%)</u>
1974 and before	3.7	11.0
1975	9.8	20.7
1976	12.2	32.9
1977	14.6	47.6
1978	20.7	68.3
1979	29.3	97.6
1980	2.4	100.0
TOTAL	<u>100.0</u>	

6 These data can be compared with the data obtained in the boat ramp survey. The two sets of data are similar. In the boat ramp survey the purchase price of boats (including the price of trailers and, in this case, motors) fishing in the Capricornia Section was found to range from \$2,200 to \$28,000, with a mean value of \$8,000. The boat ramp data were from 35 boat owners who fished one or more times in the Capricornia Section in the preceding 12 months.

The high percentage of relatively new boats is consistent with the general trend in boat purchases and registrations throughout Queensland. The findings of this research indicate an increased visitation to the Capricornia Section from that found by Domm in her investigations in 1976/1977.⁷ One explanation of this is the growth in boat purchases.

Place where boat was purchased

As could be expected most boats were bought in the coastal cities of Bundaberg, Gladstone and Rockhampton. Table 4 below presents the data on place of purchase.

TABLE 4: Place Boat Purchased

<u>Place</u>	<u>Relative frequency (%)</u>	<u>Cumulative frequency (%)</u>
Interstate	2.4	2.4
Brisbane/Gold Coast	11.0	13.4
Bundaberg	24.4	37.8
Gladstone	36.6	74.4
Rockhampton	20.8	95.2
Yeppoon	2.4	97.6
Inland towns	2.4	100.0
 TOTAL	 100.0	

It is seen that approximately 100% of boats were bought in Queensland, and that approximately 87% were bought within the Region.

Value of motors

Approximately 30% of boat owners purchased a motor, or motors, separate to their purchase of a boat. The median value of those

⁷ Domm, A, A Review of Selected Recreational and Professional Activities on the Great Barrier Reef, G.B.R.M.P.A, Townsville. No date.

purchases was found to be \$1,150 with values ranging very widely. The mean value for the whole sample was found to be \$580.

Year motors were purchased

Virtually 100% of motors were purchased in 1977 or later, with about $\frac{2}{3}$ being bought in 1978 and 1979. This high percentage of motors bought recently indicates that motors are replaced more often than boats.

Place of purchase of motors

Virtually 100% of motors were purchased within the Region.

Value of echo sounder

Approximately $\frac{1}{3}$ of boat owners purchased echo sounders since purchasing their boats. The range of costs were found to be from \$100 to \$620. The median value of those purchases was \$300. For the whole sample the mean value was \$100.

Year of purchase of echo sounder

Most purchases were made since 1976. In fact 80% of purchases were made in the years 1977 to 1980.

Place of purchase of echo sounder

Virtually 100% of purchases were made within the Region.

Value of radio

Approximately $\frac{1}{3}$ of boat owners purchased radios since purchasing their boats. The median cost for those buying radios was found to be \$240. For the whole sample the mean value was \$115.

Year of purchase of radio

Approximately 80% of purchases were made in the years 1977 to 1980.

Place of purchase of radio

Virtually 100% of radios were bought within the Region.

Value of refrigeration unit

Approximately 13% of boat owners purchased a refrigeration unit since buying their boats. The median value for those buying a unit was found to be \$250. The mean value for the whole sample was \$145.

Year refrigeration unit was purchased

All units were bought from 1975 and onwards, with 90% being bought in the years 1978 to 1980.

Place where the refrigeration unit was purchased

90% of units were purchased within the Region.

Value of "other" equipment purchased

Equipment other than that nominated in the preceding categories was bought by 44% of boat owners. The range of expenses incurred was found to be wide, extending from \$15 to \$4000. The items nominated in this category included canopies, trim tabs and ice boxes, and at the higher end of the range, items such as generator, auto pilot, hydraulic steering, radar and auxilliary motor. Approximately 70% of those buying this category of equipment spent between \$100 and \$600. The median expenditure for those buying "other" equipment was found to be \$190. For the whole sample the mean was \$210.

Year of purchase of "other" equipment

87% of equipment was bought in the years 1978 to 1980.

Place of purchase of "other" equipment

As could be expected place of purchase correlates with the place of purchase of boat and residence of boat owners, with over 90% of purchases being made within the Region.

Cost of fishing gear

So as to be consistent with the categories of goods and services used in the existing input/output tables of the Queensland economy it was necessary to divide fishing gear into two categories: gear made of metal, such as lures, sinkers, hooks, etc; and gear not made of metal, such as rods, lines, nets, etc.

Cost of fishing gear made of metal

Most boat owners (94%) purchased some gear of this nature. For these boat owners the range of expenditure was found to be from \$6 to \$400. The median expenditure was \$50. Given the skewness of the distribution in this case, the median (\$50) is the most useful measure of central tendency. The mean expenditure was \$83.

Place of purchase of metal fishing gear

Virtually 100% of this type of gear was purchased within the Region.

Cost of fishing gear not made of metal

95% of boat owners bought some gear of this nature. The range of expenditure was from \$10 to \$500. The median (and modal) expenditure was \$100, while the mean expenditure was approximately \$130.

Place of purchase of non-metal fishing gear

Over 95% of this gear was bought within the Region.

Cost of repairs

During the 12 months period covered by this study, 25% of boat owners paid out no money for repairs, while the remaining 75% paid out sums ranging from \$20 to \$500. It should be noted that some owners would have made repairs themselves. In strict economic terms the owners' labour would be considered a cost of running their boats. No attempt to calculate that cost was made in this study.

It was appropriate to consider the total range of repair costs, including those which were nil for the year in question. This is because repairs are a normal running cost and if they did not occur in one year they would presumably occur in other years.

The distribution of values was found to be positively skewed as a result of a few high values. The mean was found to be approximately \$370. Major refittings to the more expensive boats would be a reason for the high figures. Approximately 90% of boats had repair costs of \$600 or below. The median value was found to be \$100. Given the skewness of the distribution, the median value was the most useful measure of central tendency.

Place where repairs were made

All repairs were undertaken within the Region.

Cost of insurance and fees to government

At least 95% of boat owners paid for boat insurance and virtually all paid a fee of some sort to the government. The median amount was found to be \$175, while the mean was approximately \$225. Though the distribution was positively skewed, the mean value would appear acceptable as the "average". The range of expenditure was \$5 to \$1400.

Value of boat fuel

The cost of boat fuel per boat for the 12 month period was found to vary from \$40 to \$3000. Such cost is, of course, correlated to the

number of trips into the Capricornia Section and to a lesser extent the amount of travelling while fishing. Nearly 90% of boat owners had a fuel bill between \$100 and \$1000. The distribution was found to be positively skewed, and therefore the median value of \$300 could be accepted as the most useful measure of central tendency.

Place of purchase of fuel

As would be expected all fuel was bought within the Region. Nearly 100% was bought in the coastal ports.

Last trip data

Certain information was obtained with regard to boat owners' most recent fishing trip into the Capricornia Section. Trip expenditure data for the "last trip" are not subject to recall bias to the extent that data from previous trips are. Distance travelled by road and sea, and the related costs were found. Information on the sale of the catch was also sought.

If "last trip" data is representative of other trips, and there is evidence to suggest this is a valid assumption,⁸ it can be accepted for calculation of "averages".

Road distance travelled on last trip

For all except boat owners temporarily living away from home, road distance is correlated to place of residence. The range was found to be 0 kilometres to 640 kilometres. Boat owners living virtually next to embarkation ports, or holidaying at such ports, account for the 0 kilometres. At the top end of the range were boat owners living in more distant inland towns. Approximately 25% of boat owners travelled over 200 kilometres.

⁸ Data from the boat ramp survey is one example of such evidence. See footnote 9.

The modal distance was found to be 10 kilometres. Approximately 25% of boat owners travelled less than 10 kilometres. The median distance was found to be 46 kilometres, which converts to a 23 kilometre one-way journey. The mean distance was found to be 140 kilometres.

Cost of motor vehicle fuel for the last trip

The motor vehicle cost of travel is a function of distance and type of vehicle. Generally powerful vehicles are used to tow boats. Consistent with the data quoted above on distance travelled, the cost distribution was found to be positively skewed. The distance travelled and reported fuel costs were found to be closely correlated.

The median cost was found to be \$4.5, and the mean cost \$11. Given the skewness and the propensity for those living close to the embarkation ports to make more trips than those residing further afield, the median value is a more useful measure of central tendency.

Sea distance travelled on last trip

The distribution of sea kilometres travelled was found to be close to the normal curve. The modal, median and mean value fell between 100 kilometres and 125 kilometres. The median distance of 110 kilometres is considered the best measure of an "average" trip. It is worth reporting that some 17% of boat owners travelled a sea distance of 200 kilometres or more.

Cost of boat fuel for last trip

The cost of fuel for boat travel is a function of distance travelled, size of motor, and type of boat. The cost of boat fuel was found to be consistent with the data reported on distance travelled. The modal, median and mean values fell between \$30 and \$43. The median value of approximately \$40 was considered the best measure for an "average" trip.⁹

9 Data obtained from the boat ramp survey are reasonably close to these findings. In that survey, a small number of respondents who had fished in the Capricornia Section at least once over the preceding 12 month period reported a mean sea fuel cost of \$35.

Other expenditure

Included in this category are bait, fishing magazines and books, fishing club membership fees, camping gear and away-from-home accommodation. The data on these items of expenditure were gathered in the boat ramp survey. They can be accepted as representative for the population of boat owners. In the boat ramp survey reasonably detailed economic data was gathered from 262 fishermen over a three week period (covering weekends and weekdays) during July/August 1979.

Bait

Approximately 50% of boat owners caught all or part of their bait. Nevertheless, it is estimated that the mean expenditure on bait per trip was \$6. For a relatively successful trip the value of the bait caught would more than equal this amount.

Fishing magazines and books

Approximately 20% of boat owners had purchased fishing magazines and/or books (including a small number who had purchased boating publications) in the preceding 12 months. The mean annual expenditure on publications by those fishermen was \$25.

Applying this information to the estimated population of boat owners fishing in the Section (827) the total annual expenditure would approximate \$4000. In other words, the "average" boat owner spent approximately \$5 over a year on fishing publications.

Fishing club membership fees

Approximately 20% of boat owners paid fishing club membership fees in the preceding 12 months. The mean annual expenditure by those fishermen was \$13.

Applying this information to the estimated population of boat owners the total annual expenditure would approximate \$2000. Using the concept of an "average" boat owner, it is estimated that he spent approximately \$2.50 over a year on club fees.

Camping gear

Approximately 10% of boat owners purchased camping gear during the preceding 12 months. The mean expenditure was approximately \$260.

There is a major practical difficulty in including this item as a component of a fisherman's gross expenditure. To so include this item, it is necessary that the camping gear be bought with only one purpose in mind - as a necessary adjunct to fishing.

With regard to Reef fishing, two groups of fishermen can be identified as having a need to purchase camping gear as a prerequisite for fishing trips: (i) those that camp on Reef islands and; (ii) those that travel to and stay at an embarkation point for longer than one day. This latter group would include: (i) fishermen from inland areas, for example, the central Queensland mining towns, and those from Brisbane and further south; and (ii) local fishermen, that is, those from the coastal cities and towns adjacent to the Section who stay at a location other than their usual residence, for example, Bundaberg fishermen camping at the Town of Seventeen-Seventy.

While it is possible to estimate the percentage of fishermen in these groups, it is difficult to assign their total expenditure for camping gear to fishing expenditure with any degree of certainty. This is particularly the case for extended trips in which activities other than fishing take place, for example, a family or group holiday in which fishing is a component. Nevertheless, the data available suggests that as an upper limit approximately 10% of boat owners bought camping gear in the last twelve months as a prerequisite for fishing, and that the average expenditure per fisherman for that year was \$260.

In the calculation of total gross expenditure by boat owners fishing in the Capricornia Section, this item of expenditure is excluded.

Away-from-home accommodation

Approximately 8% of boat owners spent some nights away from their normal residence so that they could go fishing. Family and/or friends usually accompanied the fishermen. The most common accommodation was a caravan. Own holiday home, friend's home, tent, rented house and hotel/motel were other types of accommodation used.

The period of accommodation varied widely. Periods greater than 4-5 weeks should be considered as extended vacation or retirement trips. Periods of 1 week or over should probably be considered as vacations. On vacation, activities other than fishing are generally undertaken, and therefore it is not valid to include total accommodation expenditure as a component of fishing expenditure.

Only 3% of boat owners spent periods of between 1 to 3 days in away-from-home accommodation. A stay of this period is consistent with spending a night before and after a fishing expedition in accommodation at the embarkation port. (Fishermen staying overnight in Reef waters either camp on an island or sleep in their boat.)

As the number of boat owners in this category is very small and the expenditure for the most common accommodation (caravan) is relatively low, this component of expenditure is excluded in the calculation of total gross expenditure below.

Length of trips into the Section

Information on the time spent on a fishing trip in the Capricornia Section was gathered in the boat ramp survey and by personal interviewing and field observations. For an "average" boat owner the range was 1 to 3 days; though extensive periods were spent by a small number of boat owners. Approximately half of the boat owners went on a 1 day trip. The other half spent at least 1 night in the Capricornia Section, therefore spending at least part of 2 days there.

Fishermen per boat

From the boat ramp survey, personal interviews and field observations, it was found that an "average" boat carried 2 to 3 fishermen, with some carrying a larger number. This information can be compared to the boat ramp survey results for both inshore and Reef fishermen. It was found that the mean number of fishermen was 2.35. The figure 2.35 fishermen is somewhat lower than could be expected for Reef fishermen, as a sizeable proportion of inshore boats carried only one fisherman.

BOAT OWNER EXPENDITURE (AVERAGES AND TOTALS)

From the data presented above a profile of the "average" boat owner fishing in the Capricornia Section can be constructed; and from that profile the gross expenditure for this component of the fishery can be estimated.

The "average" boat owner had three types of expenditure. The first was for purchase of a boat and associated equipment. The second type was annual expenditure of a relatively "fixed" nature, that is expenditure not closely related to the amount of fishing or number of trips made. It should be noted that "fixed" expenditure is not being used here in the strict economic sense. Obviously expenditure on some of the items included below in this category is a function of the amount of fishing done (for example, repairs and fishing gear expenditure). Convenience dictates what items are included in this category. The third type was expenditure necessarily incurred in undertaking a fishing trip (for example, boat fuel). These categories of expenditure are presented separately below. Trip expenditure is then converted into annual expenditure so that total annual expenditure can be calculated.

The "average" boat owner's boat and equipment

Table 5 presents the relevant data. Whether the mean or median is used to represent the "average" is indicated in brackets. The reason for using one or the other has been given above.

TABLE 5: The "Average" Boat

Length	Horse power	Year of purchase	Cost
5.9m (mdn.)	130 hp. (mean)	1977 (mean & mdn.)	\$7,500 (mdn.)

As detailed above, many boat owners had purchased new equipment or replaced old equipment, since purchasing their boats. The major items were motors, echo sounders, radios and refrigeration units. Once fitted to a boat, items such as these become (in a sense) part of the boat. Except for motors these items would have a life expectancy similar to that of the boat.

Considering the boat and its equipment as a unit, the value of the "average" boat would be greater than the median boat price given previously, due to the replacement of equipment. For the whole sample the mean value of equipment bought was found to be \$1,150.

Total "investment" in boats and equipment

As estimated above, 827 boat owners fished in the Capricornia Section. The "average" of these purchased a boat and associated equipment costing \$8,650. The total value of boats and equipment was therefore \$7,153,550.

The "average" boat owner's annual "fixed" expenditure

Table 6 below presents the relevant information, again indicating which measure is used to represent the "average".

TABLE 6: Annual "Fixed" Expenditure (\$)

Repairs	Insurance and Licence Fees	Fishing/ Boating Publications	Fishing Club Membership Fees	Metal Fishing Gear	Non-metal Fishing Gear
100 (mdn.)	225 (mean)	5 (mean)	2.50 (mean)	50 (mdn.)	100 (mdn.)

The "average" boat owner's trip expenditure

Table 7 below presents the relevant information, again indicating which measure is used for the "average".

TABLE 7: Trip Expenditure (\$)

Boat fuel per trip	Motor vehicle fuel per trip	Bait
40 (mdn.)	4.50 (mdn.)	6 (mean)

So as to present for the "average" boat owner his annual expenditure, it is necessary to convert trip expenditure into annual expenditure. Previously the "average" number of trips per annum was found to be 5.5 (the median number). Table 8 below is trip expenditure converted into what is termed annual "variable" expenditure.

TABLE 8: Annual "Variable" Expenditure (\$)

Boat fuel per annum	Motor vehicle fuel per annum	Bait per annum
220	25	33

The "average" boat owner's total annual expenditure

Table 6 and 8 are brought together in Table 9 to present the annual costs of the "average" boat owner.

TABLE 9: Total Annual Expenditure

Category of expenditure	Annual expenditure (\$)
Repairs	100
Insurance and licence fees	225
Fishing/boating publications	5
Fishing club membership fees	2.50
Metal fishing gear	50
Non-metal fishing gear	100
Boat fuel	220
Motor vehicle fuel	25
Bait	33
	<hr/>
TOTAL ANNUAL EXPENDITURE	760.50
	<hr/> <hr/>

(As stated before expenditure on camping equipment and away-from-home accommodation is not included.)

Total annual expenditure for the population

As estimated above, 827 boat owners fished in the Capricornia Section. The data in Table 9 are for one of those fishermen, in fact, the "average" fisherman. The total annual expenditure for all boat owners fishing the Capricornia Section is 827 times the "average". The result is \$628,900. It should be noted that by using the mean throughout as the average, the result would have been \$1,045,700.

SUMMARY

Boat owners fishing in the Capricornia Section have "invested" over \$7 million in boats and associated equipment. They spend approximately \$630,000 annually to fish in the Capricornia Section.

Some caveats

Because of possible sampling error, which is an inescapable problem if characteristics of a population are being estimated from data on a sample of that population, some caution is warranted in interpreting these results. As stated previously, at the 95% confidence interval the population of boat owners fishing in the Section is 827 ± 138 .

A question of a different nature pertains to whether it is theoretically valid to claim that all expenditure should be attributed to fishing in the Capricornia Section. As shown in Table 1, fishing by most of these boat owners was not exclusively undertaken in the Capricornia Section. Clearly "trip" expenditure in the form of boat and motor vehicle fuel expenses were exclusively due to fishing in the Capricornia Section. It is, however, more difficult to claim boat and other annual costs to be solely due to fishing in the Capricornia Section. Only if boats were bought (and other costs incurred) for the primary purpose of fishing in the Capricornia Section can that claim be substantiated. The authors believe there is no sure way of realistically determining this matter.

Nevertheless, two facts suggest that it is not altogether inappropriate to attribute the total expenditure to fishing in the Capricornia Section. Firstly, most boat owners undertook a relatively high percentage of their total fishing in the Capricornia Section; and secondly, the decision to purchase a boat with the capacity to travel safely to the Capricornia Section is indicative of a conscious decision to fish there.

Another matter of potential interest is that the data on total costs could have been presented in a different form. Instead of using the concept of an "average" boat owner, the expenditures for the various items could have been totalled for the sample and then converted to reflect expenditures by the population. That approach would have produced marginally different results. This is so because in the approach adopted the "average" used was not always the mean.

Had the mean been used in all occasions to represent the "average" the results would have been the same as if the sample totals had been converted directly to population totals. As indicated in various places above, the mean was not necessarily the "best" measure of the "average".

A concluding and very important point is that the data presented in this section of the study is "gross expenditure" data. Certain elements of this data are necessary prerequisites for determining the "net economic" value of boat fishing in the Capricornia Section. That has not been calculated as the purpose of this report is to present data and preliminary analysis only. A later section of this study presents brief comment of the question of measuring net economic value.

FISH CATCH BY MOTOR BOAT FISHERMEN

An estimate of the total catch from the Capricornia Section by boat owners can be made from the available data, though it must be stressed that wide confidence margins exist for this estimate.

From the trip data presented above it is calculated that 827 boat owners made on average 5.5 trips per annum, of 1.5 days duration, and that they were accompanied by 1.5 fishermen. The result is approximately 17,000 man days of fishing in the Capricornia Section. From the boat ramp survey it was found that each fisherman caught on average approximately 15 fishes per day of fishing in the Capricornia Section. On these figures it appears that approximately 250,000 fishes are caught per annum in the Capricornia Section by boat fishermen. At an average weight of 1 kg per fish the total weight would be 250,000 kg.

Sales of fish

Unlike the economic data on expenditure related to fishing by small boat owners (reported above) which can be considered reasonably accurate, the data on sales of fish must be considered as nothing better than a rough estimate. Whether or not amateur fishermen sell fish, to whom

they sell fish, and at what price, are sensitive questions, notwithstanding the legality of selling fish to approved buyers if a licence is held. Nevertheless, some estimate of sales by amateurs is necessary if the value of the total catch is to be approximated.

Approximately 23% of boat owners fishing the Capricornia Section reported that they had sold fish in the previous 12 month period. Approximately half of these fishermen sold fish to friends; approximately one-third sold to Queensland Fish Board outlets; the remainder sold fish to shops and restaurants or did not nominate a buyer.

Fishermen selling fish were found to have made on average (mean) 10 trips in the preceding 12 months. This is somewhat higher than the mean for all boat owners. More than half of those selling fish were found to more than cover fuel costs from sales.

Just over 6% of respondents reported sales of fish caught in the Capricornia Section. To find out the 95% confidence interval, the potential error of applying the sample proportion to the whole population, the standard error of the proportion is multiplied by 1.96 and the product is added and subtracted from the sample proportion. The result is that there are 95 chances out of 100 that $6\% \pm 3.5\%$ of boat owners sold fish; that is 165 ± 95 boat owners (70 to 260 boat owners).

Approximately 10% of all boat owners, that is, those who fished inside as well as outside the Capricornia Section reported that they sold fish over the 12 month period.

Sales value of fish caught in the Section

The mean value of fish sales, for the most recent trip into the Capricornia Section by those who sold fish, was found to be \$137.50¹⁰

10 At a selling price of \$3.00 per kg (whole fish) \$137.50 equates to approximately 45 kg of whole fish being sold on average.

and the median value was found to be \$115.00. The mean value (for the most recent trip into the Capricornia Section) for all those fishing in the Section would be approximately \$27.00.

If the most recent trip can be assumed to represent the "average" trip, the total value of sales for the 12 month period can be estimated. Accepting the median value of 5.5 trips per annum (which is notably lower than the mean for those selling fish) and the mean value of fish sold for the last trip (\$27), the minimum annual value of fish sales would be approximately \$120,000. From the reported data it is estimated that approximately one-third of this amount (\$40,000) was sold to Queensland Fish Board outlets, and the remainder (\$80,000) was cash sales.

2.2 AMATEUR FISHING FROM CHARTER BOATS

INTRODUCTION

Hiring of charter boats is the other main means of access amateur fishermen have to the Capricornia Section. Charter boats work out of the adjacent ports of Bundaberg, Gladstone and Rockhampton/Capricorn Coast.

It is possible to estimate the dollar value fishermen clients of charter boat operators place on Reef fishing by calculating their total "willingness-to-pay" for the experience. The major components of this "willingness-to-pay" are charter fees plus travel and associated costs incurred in getting to and from the embarkation port. If travel costs can be ascertained, a derived demand schedule for Reef fishing can be formulated. From the data gathered, fishermen's charter fees can be calculated with a fair degree of accuracy, while travel costs to and from their homes cannot be estimated with the same accuracy. The reasons for this are presented below.

While a fisherman's "willingness-to-pay" to fish in Reef waters is extremely important information, other data, particularly expenditure by charter boat operators, is of considerable interest. Both aspects are considered below. It must be stressed that only charter fishing trips, not other types of charter work, are considered.

DATA COLLECTION

The major instrument used in gathering the relevant data was a mail questionnaire (with a follow-up). Prior to the administration of the questionnaire some operators were personally interviewed.

The names of charter boat operators working out of the ports adjacent to the Capricornia Section were obtained from the Harbour Masters at those ports. It should be noted that not all those operators would be chartering in the Capricornia Section. The Swain

Reefs, and to a lesser extent the Keppel Islands, offer substitute destinations. Some operators would be working both the Capricornia Section and the Swain Reefs. (Data on operations in the latter area will be presented in a study of the remainder of the Great Barrier Reef.) It should also be noted that some charter work is undertaken by boats not in survey (that is, not holding government approval to operate charter operations). For obvious reasons accurate data cannot be obtained on such operations.

In total, 21 operator's names were supplied: 15 working out of Gladstone, 5 out of Rockhampton/Capricorn Coast and 1 out of Bundaberg. The total is marginally less than the author's early investigations had indicated; the numbers by port also varied slightly. On the other hand the total is considerably greater than that suggested by the Queensland Tourist and Travel Corporation. Such differences are partly explained by the fact that operators shift their place of operation, and on occasions take boats out of service. The Harbour Masters' records are considered to be the most reliable information.

The response rate for the mail survey was as follows: for Rockhampton/Capricorn Coast and Bundaberg 100%; for Gladstone 60% (a percentage which accounts for all operators working regularly in the Capricorn Section from Gladstone).

DATA AND ANALYSIS

Number of operators

Nine operators were found to be regularly chartering for fishing trips in the Capricornia Section, with all but one of them also working the Swain Reefs.¹¹ At least another two boats were chartering

11 The data on number of operators can be compared with the information given in the report titled "Zoning Strategy Study based on the proposed Capricornia Section of the Great Barrier Reef Marine Park", (Environment Science and Services in association with the Zoning Strategy Study Group, G.B.R.M.P.A.; Townsville, October, 1979). That report indicated that 4 operators worked regularly in the Capricornia Section out of Roslyn Bay (Capricorn Coast); 6 worked regularly and 7 occasionally out of Gladstone; and 3 regularly and 3 occasionally out of Bundaberg; giving a total of 13 regular operators and 10 occasional operators. The major change that has occurred is that operators have moved from Bundaberg to northern ports; less significant changes have occurred in the other ports.

intermittently in the Capricornia Section, though from other information it can be accepted that this figure is considerably higher. Of those working regularly in the Capricornia Section and the Swain Reefs, over half did some charter work elsewhere in the Great Barrier Reef. The data below are for regular operators and hence represents the lower limits.

Number of trips

On a yearly basis the total number of trips into Reef waters by regular Capricornia Section operators was found to be over 350. Approximately 60% of those trips were made into the Capricornia Section (that is, 210 trips); and approximately $33\frac{1}{3}\%$ of the total trips were made into the Swain Reefs.

Of the 210 annual trips, 80 were of 5 to 7 days duration and the remaining 130 of 2 to $3\frac{1}{2}$ days duration.

Average number of fishermen per trip

The average number of fishermen per trip was found to be 8. (For this item and all others in this section of the study "average" should be read as "the mean".)

Total charter fees on a per annum basis

The total amount spent by fishermen in chartering boats for fishing in the Capricornia Section was found to be marginally over $\$1\frac{1}{3}$ million per annum. This figure excludes incidentals bought on the boat (for example, drinks, bait, etc.) which are not included in the charter fee. Purchases of incidentals was found to be insignificant.

The amount of approximately $\$1\frac{1}{3}$ million per annum is one component of fishermen's "willingness-to-pay" to fish in the Capricornia Section. As stated above, a proxy for the other major component is a demand schedule derived from their "willingness-to-pay"

in travel (and time) costs to get from home to the embarkation port and back home again. The gross dollar value for this component can be roughly estimated. No attempt is made here to derive a demand schedule.

Travel cost

It was found from the survey, that as an average for all charter boats, over 70% of fishermen came from places other than the local coastal cities or towns (such as Gladstone); between 35% and 40% came from Brisbane or nearby areas; approximately 25% came from southern states; and between 5% and 10% came from overseas.

By making a number of reasonable assumptions, the annual travel cost for these fishermen can be calculated. The assumptions made are: (i) Gladstone is the embarkation port; (ii) half the fishermen from Brisbane and nearby travelled by vehicle (shared with others), and the other half travelled by commercial aircraft; (iii) half the southern-state fishermen travelled by air from Sydney, and the other half travelled by air from Melbourne; (iv) all overseas fishermen travelled from the United States of America. Accepting the above assumptions it is estimated that in the order of \$420,000 was spent in travel costs for the year in question to fish by charter boat in the Capricornia Section.

The overseas component of this sum is approximately $\$1\frac{1}{4}$ million. It is only if the sole (or major) reason for overseas travel was to fish in the Capricornia Section that all this amount can be attributed to fishing travel costs. If approximately $\frac{2}{3}$ of the overseas trips were primarily for fishing in the Capricornia Section, the annual total cost for all fishermen using charter boats would be approximately $\$1\frac{1}{3}$ million.

Any away-from-home accommodation costs plus other expenditure over and above that normally incurred (for example, increased consumption of food and drinks) should be added to the above amount to get a better approximation of the gross "willingness-to-pay" to fish in the Capricornia Section. Not enough is known about travel

patterns to allow reasonable assumptions to be made. This component of travel cost is therefore excluded in this analysis.

Other costs

In some cases the fishermen provide their own fishing equipment and bait. Such costs are minimal given the nature of the fishing done. Handlines, hooks and sinkers are required. Expenditure between \$8 to \$10 would outfit the average fisherman. Bait used is mainly West Australian pilchards. Approximately \$4 per day per fisherman is the normal bait cost.

Total catch per annum

Given that large variations in "average" catch per fisherman per trip were reported, and the small number of charter boats involved, confident estimation of the total annual catch is not possible. The best estimate possible is that for the year in question the total catch would have been between 70,000 kg and 104,000 kg (cleaned whole fish). Based on these figures, the value of a kilogram of fish would have to be in the order of \$3 to \$4.50 if the fishermen were to cover the estimated annual charter fee of \$¹/₃ million.

Catches, or part thereof, are disposed of in various ways: taken home by the fishermen, or sold to local Queensland Fish Board outlets and/or other buyers.

Value of charter boats

The mean replacement value for a charter boat was found to be approximately \$213,000, and the median value approximately \$190,000. For a fleet of 9 to 10 boats regularly fishing the Capricornia Section the total replacement value would be between \$1,710,000 (at the lower extreme) and \$2,130,000 (at the higher extreme). A figure of \$2 million would be a reasonable approximation.

Operators' expenditure

Certain data are presented below on expenditure by the operators. It is emphasised that the data are for all charter work undertaken by these operators (that is, fishing, diving, island "drop-offs", government and other charter work) and hence are not attributable solely to fishing charters in the Capricornia Section. While it would be possible to roughly proportion operators' expenses to the various components of their work this is not attempted here. Therefore, the expenditure data cannot be compared to the charter fees for fishing in the Capricornia Section. Total fees paid are obviously greater than those solely for fishing in the Capricornia Section.

The charter operators' expenditure patterns reflect the large amount of food, drink and other provisions that must be supplied to their patrons. Repairs and maintenance, fuel, insurance, interest and labour are other major items of expense. Minor expenditure items include such things as mooring fees, boat registration, licence fees, survey fees and advertising, as well as the usual expenses of running a business (for example, telephone and postal charges, etc.).

Nearly 90% of expenditure for supplies, fuel, repairs, and maintenance was found to be made in the home ports (and therefore within the Wide Bay-Fitzroy region).

Annual repairs and maintenance expenditure

The annual expenditure on repairs and maintenance per boat was found to be approximately \$10,000 (both the mean and median), giving a total sum of approximately \$100,000 per annum. Repairs and maintenance annual expenditure was found to range from 3% to 10% of a boat's value, with 5% of a boat's value being the approximate average. These amounts would represent a minimum, as operators tend to undertake minor, routine repairs themselves.

Annual expenditure on loan repayments, insurance and licence fees

Total expenditure for these items was found to be marginally over \$100,000, with the average figure per boat being approximately \$11,000. (It should be noted that some boats are unencumbered.) Annual insurance rates vary according to characteristics of boats and from insurance company to insurance company. As an approximation, the annual premium would be in the order of \$1,000 for every \$65,000 to \$70,000 of a boat's value. A sum of approximately \$30,000 per annum would be paid by the fleet. The remainder of the \$100,000 total would be for loan repayments and licence fees.

Other expenditure items

Major expenditure items such as food and drinks for clients and fuel are variable costs, depending on the type of charter work done and distance travelled. A rough approximation of food and drink expenditure was calculated at 20% of charter fees. Depreciation on boats could be calculated at 11¼% of replacement value per annum while electronic equipment depreciated at 15% per annum.

Detailed information was obtained from some operators on all expenditure items but is not reported here because of its confidential nature.

Crew

Most boats were found to have a total crew (that is, including the skipper) of 2 men. A boat's wage bill would comprise the cost of hired labour plus an imputed wage for the skipper (if he were the owner/operator). Hired labour would be a variable cost, while that of the skipper-operator would be a fixed annual cost.

SUMMARY

For the year in question, \$¹/₃ million was spent by fishermen in charter boat fees to fish in the Capricornia Section. (This should be

considered the lower limit, as some fees would have been paid to non-surveyed boats and surveyed operators chartering only occasionally in the Capricornia Section.) This sum reflects the "willingness-to-pay" for this means of fishing in the Capricornia Section.

With far less precision it can be assumed that approximately another \$¹/₃ million was spent by fishermen in travel expenses to and from the embarkation ports.

It was found that in the order of 70,000 kg to 104,000 kg (cleaned whole fish) were caught in the Capricornia Section (in that particular year) by fishermen hiring charter boats.

2.3 RECREATIONAL FISHING BY HERON ISLAND RESORT GUESTS AND OTHER HERON ISLAND FISHING

FISHING BY RESORT GUESTS

As previously stated, a minor component of the Capricornia Section amateur fishery is recreational fishing undertaken by guests of the Heron Island resort. It is a straight forward matter to calculate the economic value of this fishing as "willingness-to-pay" is known. "Willingness-to-pay" is the objective measure of users' valuation of the activity. In terms of other economic measures (for example, employment generated) the activity is too insignificant to be considered.

The "willingness-to-pay" for this recreational fishing on an annual basis was calculated as follows. Weather conditions permitting, guest fishing in organised groups takes place every day of the year. Again, according to weather, 2 trips per day are made, with on average 6 fishermen per trip. That is, on average 12 fishermen fish per day. The charge per adult fisherman is \$9. On average a trip would include 1 to 2 children, paying half price. That is, on average, the adult-equivalent of 10½ fishermen fish per day. This results in a daily charge (= willingness-to-pay) of \$94.50. In the order of 300 upwards (full-day equivalent) good weather fishing days can be expected in a normal year (see below). Therefore, the annual total "willingness-to-pay" is in the order of \$30,000.

Weather conditions do have an effect on guest fishing from the Heron Island resort. Another study¹² has reported surface wind observations read at 3:00 pm on Heron Island for the months January, April, July and October. If it is assumed that those readings represent the "normal" conditions in the morning and afternoon (when the fishing excursions take place), not many more than 200 days occur

12 Environmental Science and Services in association with the Zoning Study Group, Zoning Strategy Study based on the Proposed Capricornia Section of the Great Barrier Reef Marine Park, prepared for the Great Barrier Reef Marine Park Authority, Townsville, October 1979, pp. 32-33.

with easterly or south-eastly winds less than 20 km/hr. Winds of above 20 km/hr could be considered too strong for fishing. However, these assumptions are not realistic. Winds can change throughout the day and the "calm" season is longer than 3 months; furthermore, 20 km/hr winds might not preclude fishing in the lee of the island. The estimate of over 300 full-day equivalent fishing days can be considered realistic.

A "willingness-to-pay" in the order of \$30,000 per annum is the economic value of recreational fishing undertaken by Heron Island guests. This amount of money would hardly cover the costs to the resort in providing the service.

The total quantity of fishes caught by guests is not large. Guests appear to be happy with a catch of one or two reasonable sized fishes, which is the number landed on average. It is reported that an unofficial "bag limit" is imposed by the resort management.¹³

Annual fishing competitions were, until recently, promoted by the resort (usually in June and October). The total expenditure outlayed by costs specifically going to take part in the competitions should be attributed to fishing. A demand schedule derived from their travel costs would present their "willingness-to-pay". As it would be extremely difficult to ascertain with a reasonable degree of certainty that participation in a fishing competition was the specific drawcard, no attempt is made here to calculate such a demand schedule. The "willingness-to-pay" reported above is therefore the lower limit.

It should be noted in passing that Heron Island Research Station staff (and a percentage of visiting scientists) engage in amateur fishing.

13 Great Barrier Reef Marine Park Authority, Case Study: The Impact of Tourism on the Environment : Heron Island, for the O.E.C.D., G.B.R.M.P.A., Townsville, 1978, p. 12.

SUMMARY

A "willingness-to-pay" in the order of \$30,000 per annum is the economic value of recreational fishing undertaken by Heron Island resort guests. This amount of money would hardly cover the costs to the resort in providing the service.

HERON ISLAND "COMMERCIAL" FISHERY

As would be expected of a resort on the Great Barrier Reef, fish is a frequent, but not necessarily daily, menu item. The fishes normally served are either sweetlip or trout, and sometimes "mixed" fish (mackerel mixed with sweetlip).

The supply of fish to the resort is a professional operation, but as most is supplied by Heron Island locals, and not by commercial fishing boats, it is dealt with here rather than in the chapter on commercial fishing. It should be noted, though, that the resort does on occasion purchase fish from passing commercial boats.

Confidentiality demands that detailed information is not reported here. Nevertheless, it is estimated that the resort would use on average 30 kg to 45 kg of fillets per day; that is, 11,000 to 16,000 kg of fillets per annum. (The whole fish equivalents can be calculated from these figures.) The requirements would be lower in the off-season and higher in peak holiday seasons (such as Easter). The annual fish purchase bill for the resort would be in the order of \$33,000 to \$48,000.

Provision of fish to the resort would appear to be a lucrative business. Fuel, bait (usually West Australian pilchards bought in Gladstone), boat repairs, maintenance and depreciation would be the major costs. Nevertheless, the daily hours spent fishing are long and fishing takes place virtually every day of the year.

2.4 AMATEUR FISHING: A SUMMARY

The data presented in the preceding parts of this chapter can be summarised as follows.

PRIVATE MOTOR BOAT OWNERS

Approximately 800 owners of registered private motor boats fish in the Capricornia Section. Most of these fishermen live in the adjacent coastal area, though some come from the inland mining towns.

- (i) Total investment in boats and associated equipment is over \$7 million.
- (ii) Their approximate annual expenditure to fish in the Capricornia Section is \$630,000.

CHARTER BOAT FISHING

- (i) Fishermen spend approximately \$¹/₃ million annually in charter boat fees to fish the Capricornia Section.
- (ii) The approximate value of the charter boats regularly engaging in fishing charter work in the Capricornia Section is \$2 million.

(Both these estimates are lower limits, as only boats in survey working regularly in the Capricornia Section are considered.)

HERON ISLAND FISHING

The economic aspects of Heron Island recreational fishing are insignificant. Nevertheless, the only Reef fishing experience a large number of visitors to the Capricornia Section have is in the way of resort organised excursion.

2.5 MEASURING THE ECONOMIC VALUE OF RECREATIONAL FISHING

The analyses of data presented in this study are, as previously determined by the Great Barrier Reef Marine Park Authority, of a preliminary nature. Further analyses are possible. In fact, the data are presented in a form suitable for subsequent analysis. What sort of further analyses will be undertaken on the data will be determined by the information needs of the Great Barrier Reef Marine Park Authority.

As one of the most interesting and difficult questions which could be posed pertains to the net economic benefit of recreational fishing, brief attention is given to some of the issues here.

The net economic benefit of recreational fishing is something entirely different from the gross expenditure incurred in undertaking that type of fishing. Brief comment on the use of gross expenditure as a measure of the economic value of recreational fishing follows.

Gross expenditure for recreational fishing includes the cost of all those items a fisherman purchases that in some way are associated with his fishing. Such items as the cost of a boat, vehicle, gear, travel, food, drink, accommodation and other incidentals could be included. The resulting total figures can be very large indeed. All these expenditures are incurred not just to obtain the benefits (that is, satisfaction or "utility") of fishing but also to procure many other services that are useful in their own right and would have been incurred notwithstanding a fishing outing or excursion. Thus, the gross expenditure approach measures far more than the benefit from fishing. This is not to argue that indirect economic impacts of recreational fishing are not important. They are, and the indirect impacts are correctly measured by the derivation of the multiplier effects, as calculated by the input/output methodology. The type of data gathered in this investigation and the manner of their presentation are such that estimates of both indirect economic benefits and net economic benefits can subsequently be made.

In the following, attention is given to the correct method of valuing net benefits. Recreational fishing, as with commercial fishing, is undertaken in a "commons". No-one owns (or has property rights over) the fishing grounds, therefore no property owner can charge an entry fee for fishing. (A private property owner such as a theatre or zoo owner, to use comparable cases, can charge a customer wishing to gain the services (benefits) of the theatre or zoo, a price determined by the interaction of supply and demand.) Because no entry fee is charged there is no readily available measure of a fisherman's willingness-to-pay for his fishing experience. Therefore a surrogate for an entry fee has to be found. Of course, fisheries are by no means the only common property resources - National Parks are another common example.

Economic theory and practice has a means of determining the value of such resources to the users and to society as a whole. The method is usually referred to as the 'travel-cost' method. This method is based on the fact that someone wishing to use the services of a commons pays a de facto entry fee in the monetary cost of his travel and time spent to reach the commons.

For a recreational fisherman his travel cost is the expense of travelling to the fishery - from home to boat-ramp or port and from there to the fishing grounds. Also included would be any other expenditures over and above those normally incurred at home (extra food, drink, and accommodation expenses). The application of this method is relatively straight-forward if a fisherman's journey is solely for fishing, that is, if fishing is not just a component of his journey from home as would be the case for a multi-purpose outing or holiday. In such cases, his travel expenses would have to be proportioned: some to fishing, the remainder to other activities.

Proportioning does not cause insurmountable problems for analysing net economic recreational fishing benefits for users of the Capricornia Section. Most boat trips into the Section (whether by private motor boats or charter boats) can be categorised as predominantly fishing or predominantly non-fishing (diving, sailing, etc.). Recreational

fishing benefits by resort guests at Heron Island can be readily separated from their general holiday benefits.

At this stage what is meant by recreational fishing must be made clear. It is the recreational fishing experience - the opportunity to fish, the pleasure of fishing, the pleasure of company, the pleasure of experiencing the natural environment - that is being measured. It is not only the catching of fish which is involved. (The approach here is no different from that applied in the economic measurement of any other good or service. One usually pays for more than food in a visit to a restaurant - company and "atmosphere" are part of the value of the experience. The economic value to the customer is only practically measured by the sum of money paid for the meal.)

The above approach implies that the economic value of any fish caught is incidental to evaluation of recreational fishing. This is not necessarily the case. For the unsuccessful fisherman the economic value of the outing is not less than his travel cost; for the successful fisherman a bonus is gained in the form of a high valued food. These further economic benefits accrue irrespective of how the fisherman disposes of these fish, that is, whether he consumes them himself, gives them away or sells them.

3. COMMERCIAL FISHING IN THE CAPRICORNIA SECTION

3.1 COMMERCIAL FISHING DATA COLLECTION AND REPORTING

This section of the report is primarily concerned with describing the economic characteristics of commercial fishing operations in the Capricornia Section. The difficulty of treating the Capricornia Section in isolation from the remainder of the southern part of the Queensland east coast fishery must be recognised. There is also some difficulty in separating the Capricornia Section fishery from the entire east coast (or Great Barrier Reef) fishery.

The Capricornia Section is the sole fishing area for some commercial fishermen, however, this study found that the majority of fishermen working there also fished elsewhere on the east coast and in the Great Barrier Reef Region. This reflects the trend for trawl and mackerel fishermen, in particular, to be mobile.

The boundaries of the Capricornia Section obviously do not delimit economic activity in terms of commercial fishing. Nevertheless, to the extent that it is possible to gather data and describe the Capricornia Section fishery without the data on the rest of the east coast fishery, such has been done. Shortcomings in the data and description of the Capricornia Section fishery should be overcome with the investigation of fishing in the rest of the Great Barrier Reef (to be the subject of a further report).

Information on commercial fishing operations in the Capricornia Section readily available before this investigation began was collected and summarised in a previous report by the Institute of Applied Social Research, titled "The Economics of Fishing in the Capricornia Section of the Great Barrier Reef: Part A, A Baseline Study of Activity and Resources of the Sector".

Research undertaken in preparation of that report revealed a number of very important gaps in the available information. For example, adequate information was not held on the following: the actual number of commercial fishing units operating in the Capricornia Section; the extent of various types of fishing undertaken there; estimated total catches; the sales value of the catches; the costs involved; and the economic impact on the regional economy.

Within the limits of this investigation - limits mainly due to the interrelatedness of the Capricornia Section to the east coast fishery - the data presented below should assist in closing those information gaps.

THE COLLECTION OF COMMERCIAL FISHING DATA

Commercial fisheries have had far more attention paid to them by researchers than have recreational fisheries. Although economic and social research has been undertaken for some years overseas, it is a relative newcomer in Australia. The research in this country has tended to concentrate on the financial aspects of particular fisheries, such as amount of capital investment, effort, and return on investment. Data for studies of this nature are (in theory) relatively easy to collect from co-operative fishermen and processors. Face-to-face interviews with the sighting of financial documents is appropriate if the number of operators in the fishery is small. Mail questionnaires, desirably filled-in by the fishermen's accountants, are appropriate for fisheries with many operators, or those spread over a wide geographical area.

The data required for this study had to be on one hand descriptive of commercial fishing activities, and on the other hand of a type that could be used in subsequent input-output analyses. Information from fishermen, processors, and industrial support industries had to be sought.

For the commercial fishermen the approach was similar to that used in the amateur fishing survey in that a mail questionnaire was adopted as the major data collection instrument.

There are advantages as well as disadvantages in using mail questionnaires. (Some discussion on this has already taken place.) Preliminary investigations (mainly personal interviews of some commercial fishermen) suggested the benefits of a mail survey would outweigh the costs. The alternative to mail surveys - personal interviews - are costly in resources (time and money) for any type of survey, but more so in situations where interviews have to be arranged with a large number of mobile fishermen. The very nature of trawling and pelagic fishing, in particular, means that fishermen can be at sea for relatively lengthy and in some cases (as determined by catch success) somewhat indeterminate periods; furthermore, during a season the decision on when to go to sea is determined by the vagaries of nature (weather, in particular). To some extent the problem of finding fishermen in port for personal interviews can be overcome by making use of "out-of-season" periods. When the fishery being studied is comprised of various component fisheries with different seasons - as in the case for the Capricornia Section - this is not always an option. If various home ports are involved further costs and logistic difficulties arise.

The other major advantage of the mail survey is the guarantee of anonymity, which, though not necessarily required by all fishermen, is nevertheless appreciated by respondents who are asked to provide financial and other data of a potentially sensitive or private nature. The major disadvantage of mail questionnaires is that the response rate can be low. Of course, inevitably there are refusals for personal interviews and the problem of inferring to the population characteristics held by some percentage of it, will always exist.

In sum, it was recognised that a mail survey would be cost effective, allowing a large number of fishermen to be surveyed (in this case the entire target population). Location of fishermen was no problem as questionnaires were posted to respondents' homes - to be filled out at a time that suited the respondent.

There was, of course, a trade-off involved in using a mail survey in that the quantity of information gained from a respondent

was likely to be less than that which would be obtained from a personal interview. It was possible, nevertheless, to include in the mail survey an adequate number of questions to cover the scope of the investigation. All questions, including those of a more sensitive nature, were answered satisfactorily.

To supplement the mail survey, some personal interviews were conducted. Personal interviews conducted before the design of the mail questionnaire assisted in the design stages, whilst those conducted both before and after the administration of the mail survey served as a check on results.

In addition to face-to-face interviews, some personal interviews were conducted by telephone. These were conducted as a further follow-up to the original mail survey and subsequent mail follow-up, and as such were brief interviews, seeking answers to a few essential questions.

The target units adopted in the survey of commercial fishing activity were owners of licenced commercial fishing vessels. The names and addresses of the vessel owners were selected from commercial fishing vessel registration records kept by the Queensland Fisheries Service. These records cover all commercial fishing vessels licenced under both State and Commonwealth legislation.

The population selected consisted of all commercial fishing vessel owners resident in areas with a postcode between 4670 and 4703. This area encompasses the coastal towns of Bundaberg, Gladstone, Rockhampton and Yeppoon as well as smaller settlements between these towns and some small distance inland.

The selection of this population of fishermen was made on the basis that most commercial fishing undertaken in the Capricornia Section was undertaken by vessel owners resident in the coastal area adjacent to this part of the Great Barrier Reef. It is recognised that these "local" fishermen do not comprise the total population fishing in the Capricornia Section. As mentioned above, fishermen have a propensity to trawl or fish where the catches are considered

best, though within limits determined by economic factors. It is known, for example, that fishermen from ports further south move up the Queensland coast to fish. The research done to date on mobility of fishermen suggests that prawn trawlers in particular are highly mobile with only 53.7% fishing solely in their local area.¹

Further information on "non-local" fishing in the Capricornia Section will be gathered for the study of fishing in the remainder of the Great Barrier Reef. The data and analysis presented in this report is limited to the "local" commercial fishing population.

A search of the relevant records held by the Queensland Fisheries Service was conducted in December 1979 and resulted in the location of 349 commercial fishing vessel owners resident in the abovementioned area. These people owned a total of 556 vessels between them. It was decided to survey the entire population of 349 commercial fishing vessel owners by mail.

The 349 owners were sent mail questionnaires. The response rate for the initial posting was 33% (which was similar to the rate for the amateur survey). A follow-up letter and copy of the original questionnaire was sent to non-respondents. This was followed by an attempt to contact the remaining non-respondents by telephone. An obvious limitation of the telephone contact method was that not all non-respondents had telephones. Telephone contact was limited to asking major question such as what type of fishing was undertaken by the respondent, and if the respondent ever fished in the Capricornia Section. The respondents were also encouraged to fill in and return the mail questionnaire forms.

It is not possible to determine to what extent the follow-up measures increased the response rate. This is due to the fact that some fishermen were continuously engaged in fishing during the period in which the survey was conducted and when they eventually replied

¹ Williams, M. 1979. "Survey shows prawn fishing is Queensland's most important fishery". Australian Fisheries, August 1979.

it was not possible to ascertain whether it was to the first, second or third request.

In the following, the unit comprising a commercial fishing vessel owner and all vessels owned by him has been termed a "commercial fishing unit". Most data is presented in terms of a "unit" rather than in terms of individual vessels. The terms "commercial fishing unit owner" and "commercial fishing operator" are used interchangeably below.

Survey Response Rate

The following table (Table 1) contains a breakdown of the responses received from the mail survey.

TABLE 1: Responses to Mail Survey

No longer fishing and not yet fishing	32
Not located	15
Located, currently fishing commercially	125
TOTAL	<u>172</u>

The initial step taken in calculating response rate was to derive the overall rate of return. This was simply the number of returns as a percentage of the population surveyed. A response rate of approximately 50% was achieved. That rate should be adequate to ensure little bias in the results. However, a number of checks were made as to the "representativeness" of the respondents' returns. Some of these are discussed below.

It was appropriate to take account of the fact that some number of commercial fishing vessel owners indicated that their vessels were no longer engaged in fishing or had not yet commenced to fish commercially. This actually reduces the population of interest - those actively engaged in commercial fishing at the time of

receival of the questionnaire. The number of respondents who indicated they were not actively engaged in fishing was 32. This was adjusted to account for the fact that the number of responses represented just under half the total population, by assuming that the same percentage of non-respondents were no longer fishing or not yet fishing. The total number in this category would therefore be 65 fishermen. In other words, this meant that approximately 18% of the commercial fishing vessel owners registered with the Queensland Fisheries Service as at December 1979 were either no longer fishing or not yet fishing commercially at the time of the survey. Therefore, the population actively engaged in commercial fishing was taken to equal the number of licence holders minus those not actively fishing, which gave a figure of 284 (349-65).

"Return to Sender" replies were also not included with the population of active fishing operations as insufficient information was available to allow confident inclusion of these units. It was therefore assumed that, as these people had changed address and could not be located from official records, they were no longer resident in the "local" area. The questionnaire forms returned by the postal service comprised the absolute number of people not located - not a proportion of the population.

The population of those actively engaged in commercial fishing was therefore found to be 269 (284-15).

The response rate was therefore able to be calculated more accurately. A total of 125 returns from the population actively engaged in commercial fishing (269) gave a response rate of 46%. When the number of responses containing sufficient information for a full analysis of results was considered (105 responses), the sample analysed became 39% of the population. Tables 2 and 3 below give further information on the responses suitable and not suitable for analysis.

TABLE 2: Returns from Active Commercial Fishing Operators

Insufficient information for full analysis	20
Full analysis possible	105
TOTAL	<u>125</u>

Those responses containing insufficient information for a full analysis include questionnaires returned containing little or no information,² and contacts made by telephone only. A breakdown of the type of fishing undertaken by these respondents is presented in the following table.

TABLE 3: Returns with Insufficient Information for Full AnalysisType of fishing :

River fishing	9
Crab fishing	2
Trawling	3
Demersal fishing	2
Unidentified	4
TOTAL	<u>20</u>

A breakdown of returns used in the full analysis is presented in Table 4 below. Of particular interest here is the type of fishing undertaken, and whether or not they fished in the Capricornia Section. The categories of "type of fishing" used here are somewhat crude - a finer breakdown of categories is presented later in the report.

² A number of fishermen who did not fish in Reef waters returned questionnaires only partially answered, explaining that they were estuary or river fishermen and therefore, in their minds, not relevant to the study.

TABLE 4: Returns used in Full Analysis

Type of Fishing	Units which fished in Capricornia Section	All "Local" Units*
Prawn and/or scallop trawling	38	49
Demersal and/or Pelagic fishing	17	28
Other (crabs, estuary, inshore, net, bait, aquarium)	<u>5</u>	<u>28</u>
TOTAL	60	105

(* All commercial fishing units registered in Bundaberg, Gladstone, Rockhampton/Jeppoon including those which do not fish in the Capricornia Section.)

Checks on Representativeness

It was necessary to check where possible on the representativeness of the returns. This was done by checking the survey results against any known (published) information about the target population. The only variables on which published information was available were number of fishing vessels, and length of vessels.

Number of Commercial Fishing Vessels

Three possible populations could have been adopted for survey purposes. These were fishing vessels, fishing vessel owners or Master Fishermen. As the survey adopted fishing vessel owners as the target population (the response rate for this has been discussed), it was relevant to see how well the results represented the population of fishing vessels. (Published statistics on Master Fishermen were not available.)

The Queensland Fisheries Service records indicated that the number of fishing vessels owned by the 349 owners resident from Bundaberg to Jeppoon was 556. A breakdown of the number of boats per owner is presented on Table 5 below.

TABLE 5: Commercial Fishing Vessels owned by Target Population

No. of boats/owner	No. boat owners	No. boats
1	192	192
2	115	230
3	35	105
4	6	24
5	1	5
TOTAL	349	556

Source : Queensland Fisheries Service

The number of vessels owned by the 172 respondents (this includes the 15 owners not located) to the mail survey was 272. This represents 49% of all the vessels registered by owners resident in the local area. The survey responses therefore represented the same percentage of commercial fishing vessels as the percentage of commercial fishing vessel owners. It is possible to accept that both possible target populations (commercial fishing vessels and commercial fishing vessel owners) were adequately and evenly represented by the respondents.

Table 6 below contains information on the number of commercial fishing vessels owned by the 105 respondents whose returned questionnaires were analysed in this study.

TABLE 6: Commercial Fishing Vessels owned by Respondents

No. boats/owner	No. owners	No. boats
1	55	55
2	34	68
3	17	51
TOTAL	105	174

Vessel Length

A further check on the representativeness of the survey results is to compare the lengths of vessels owned by respondents with published statistics on vessel lengths. This comparison (Table 7), indicates that the survey responses are biased towards larger vessels.

TABLE 7: Vessel Length
Comparison of published statistics and survey response data

Vessel Length	ABS statistics ³		Survey response	
	No. of Boats	% of Total	No. of Boats	% of Total
0 to 6m	332	63	83	47
6.1 to 9m	72	14	34	20
9.1 to 15m	99	19	45	26
Over 15m	26	5	12	7
TOTAL	529	100	174	100

This finding has two implications, the first one being that the fishing operations in which the study is interested (that is, the larger vessels capable of fishing in Reef waters) are well represented in the survey responses. The second implication of the bias is that any direct conversion of results from the sample to the population might result in an overestimate of factors such as total expenditure and income due to the relatively higher expenditure and sales by the larger boats.

Converting from Sample to Population

To account for the bias illustrated above, data from the questionnaires were weighted with respect to vessel lengths where appropriate.⁴ Table 8 presents the response rate associated with each of three vessel length classes.

³ Australian Bureau of Statistics, Fisheries Statistics, Queensland, 1978-79.

⁴ This analysis is based on the length of the "main" vessel owned by each respondent - see full definition in section entitled "Capital Expenditure Items".

TABLE 8: Response rate according to vessel length

Vessel length	Response rate
0 to 6 m	24%
6.1 to 15 m	55%
Over 15 m	36%
All vessels	39%

THE CAPRICORNIA SECTION FISHERY

Of immediate interest in this study is the number and type of commercial fishing operations active within the Capricornia Section.

It was found that at the 95% confidence interval, $57\% \pm 9\%$ of commercial fishing units originating from the "local" area did at least some of their fishing in the Capricornia Section. The number of commercial fishing units represented is 153 ± 24 , that is, between 129 and 177 units.

The number fishing in any one particular season, or 12 month period, would vary. In particular, prawn and scallop populations can concentrate in different locations from season to season and large trawler fleets are attracted to these areas of concentration, which may or may not be within the boundaries of the Capricornia Section.

Respondents to the questionnaire were asked to indicate what types of fishing they undertook. It was found that some operations concentrated on trawling for prawns and/or scallops (with most of these respondents indicating that both species were sought). Similarly, some fin fishing operations pursued both pelagic and demersal fish. Over one-quarter of vessel owners combined trawling operations with fin fishing. All types of fishing which did not fall into the abovementioned categories were grouped together as "other"

fishing. This category includes crabbing and inshore and river fishing but it also includes a small number of net fishermen and aquarium fish collectors who sometimes visit the Capricornia Section. The estimated proportions of commercial fishing operations originating from the "local" area which fall within each of the categories of type of fishing undertaken are as follows. Of those who fished in the Capricornia Section, 40% trawled for prawns and/or scallops, 28% fished for demersal and/or pelagic species, 28% engaged in both trawling and fin fishing and about 4% were net fishermen or aquarium fish collectors.

TABLE 9: Type of fishing undertaken

Type of Fishing	Units which Fished in Capricornia Section	Do not Fish in Capricornia Section	All "local" Commercial Fishing Units
Prawns, Scallop, Demersal and Pelagic	43 (28%)	5 (4%)	48 (18%)
Prawn and Scallop	61 (40%)	72 (63%)	133 (49%)
Demersal and Pelagic	43 (28%)	23 (20%)	66 (25%)
Other*	5 (4%)	15 (13%)	20 (7%)
TOTAL	153 (100%)	115 (100%)	269 (100%)

(* Crabs, net fishing, bait fishing and aquarium collecting.)

Of interest is the finding that about 55% of prawn and/or scallop trawlers from the "local" area did not trawl within the Capricornia Section, while 35% of pelagic and/or demersal fishermen did not fish in the Capricornia Section.

It was found that of those commercial fishing units which did some of their fishing in the Capricornia Section, only 40% (about 60 units) did most of their fishing there. Of the remainder, 33% did most fishing locally - either inshore, in the Curtis Channel or in the Swain Reefs area - while 27% ranged more widely along the Queensland east coast. Of those units which never fished in the Capricornia Section, almost 50% did most of their fishing in rivers and estuaries. Table 10 below presents data on the areas nominated by respondents as those "most fished".

TABLE 10: Areas most fished

Area Most Fished	Units which fished in Capricornia Section	Units which do not fish in Capricornia Section	All "local" commercial fishing units
Capricorn Group only	10%		6%
Bunker Group only	8%		5%
Capricorn/Bunker Groups	22%		12%
TOTAL CAPRICORNIA SEC.	40%	0%	23%
Rivers & Estuaries	3%	49%	23%
Curtis Channel	20%	33%	26%
Swain Reefs	10%	2%	6%
East Coast	27%	16%	22%
	100%	100%	100%

DATA REPORTING AND ANALYSIS

Gross income and gross expenditure figures have at times been used as measures of the "worth" of an industry. While these figures may be of interest in indicating the scale of an industry's operation and "impact", they have no real meaning in economic terms. Of more relevance in gauging the "worth" of an industry is the impact of the industry on the regional economy in terms of output, income and employment (measured using input-output analysis) and the opportunity cost associated with investment in the industry, (measured using return-on-investment models).

A major portion of the mail questionnaire was devoted to collecting data on expenditure and income for subsequent use in the abovementioned analyses. The raw data is presented here as it is of interest both in respect to scale and distribution of expenditure and scale and source of income. However, these data are of most value when used in the abovementioned types of analyses.

EXPENDITURE ASSOCIATED WITH COMMERCIAL FISHING

Data on expenditure associated with commercial fishing are presented below. The data was gathered in a form appropriate for use in input-output analysis, and therefore is presented in categories which can subsequently be inserted into the input-output model of the regional economy. The data relate solely to expenses incurred in relation to commercial fishing.

Categories of Expenditure Data

The items on which money is spent by commercial fishing operations fall into two categories, annual operating expenses and investment in capital equipment. Annual operating cost items were grouped under the following headings : fishing gear made of metal; fishing gear not made of metal; food for fishing trips; fuel for fishing trips; repairs and maintenance; loan repayments, insurance, licence fees; and wages to skipper and crew.

Capital equipment items (fishing vessels, motors, electrical equipment, etc) were grouped together and the respondent was asked to indicate the replacement value of this equipment.

In order to determine the impact of expenditure associated with commercial fishing on the local economic region (the Wide Bay - Fitzroy region) respondents were asked to indicate in what city or town expenditure was incurred. Therefore, it was possible to obtain estimates of total expenditure, and expenditure within the Region, from the survey results.

A further subdivision of expenditure data is achieved by considering separately expenditure incurred by respondents who never fished the Capricornia Section and respondents who did some of their fishing within the boundaries of the Capricornia Section. It is important to emphasise that expenditure directly associated with fishing in the Capricornia Section is in most cases only a portion of the total expenditure incurred by fishing units. Estimates of the actual expenditure which could be attributed to fishing activities undertaken within the Capricornia Section were imputed. These were based on a knowledge of the proportion of total income from the sales of seafoods by commercial fishing units that was earned from product caught in the Capricornia Section. It was deliberately decided to impute this value rather than measure it directly because the difficulty experienced by commercial fishing operators in attributing a proportion of their expenditure directly to fishing in the Capricornia Section would have caused this data to be relatively inaccurate and would have lowered the response rate to the survey.

Annual Operating Costs

The following discussion concerns annual expenditure on operating costs.⁵ Tables 10 to 14 show expenditure data presented according to several criteria. The breakup of expenditure on operating

5 As expenditure data has been placed in input-output analysis categories, it has been necessary to include loan repayments with annual operating costs. Loan repayment data has been removed from expenditure data in later investment analysis.

cost items, based on whether or not a unit fished in the Capricornia Section, is given in Table 11. This is complemented by Table 12 which presents the expenditure on operating cost items imputed to be actually due to fishing within the Capricornia Section. The imputing was based on the finding that 42% of fish catch taken by commercial fishing units which did some fishing in the Capricornia Section was actually caught within the Capricornia Section. The assumption that a similar proportion of annual expenditure was due to fishing within the Capricornia Section was made. This calculation was, however, based on imprecise income data⁶ and therefore the table presents crude estimates only.

Tables 13 to 16 show a further breakup of expenditure data according to the location of expenditure with respect to the Wide Bay - Fitzroy region, and the State of Queensland. All data are for the 1978-79 financial year.

TABLE 11: Total (Population) Annual Operating Costs 1978-79

Expenditure Item	Units which fished in Capricornia Section \$	Units which did not fish in Capricornia Section \$	All "Local" Commercial Fishing Units
Metal gear	429,300	84,000	513,300
Non-metal gear	563,900	260,100	824,000
Food	210,500	119,400	329,900
Fuel	717,900	340,600	1,058,500
Repairs/maintenance	640,600	209,500	850,100
Finance/fees	654,200	237,500	891,700
Wages	1,853,900	277,000	2,130,900
TOTAL	5,070,300	1,528,100	6,598,400

⁶ See the section entitled "Income Associated with Commercial Fishing".

TABLE 12: Total Annual Operating Costs (1978-79)
for Fishing in the Capricornia Section

Expenditure Item	Imputed Expenditure due to fishing in Capricornia Section
Metal gear	180,300
Non-metal gear	236,800
Food	88,400
Fuel	301,500
Repairs/maintenance	269,000
Finance/fees	274,800
Wages	778,600
TOTAL	2,129,400

TABLE 13: Place of Expenditure on Operating Cost Items
: All "Local" Commercial Fishing

Expenditure Item	Inside Region %	Outside Region %	Within Queensland %
Metal gear	80	20	100
Non-metal gear	85	15	100
Food	90	10	100
Fuel	90	10	100
Repairs/maintenance	90	10	100
Finance/fees	100	0	100
Wages	100	0	100

TABLE 14: Place of Expenditure on Operating Cost Items:
All "Local" Commercial Fishing

Expenditure Item	Expenditure inside Region \$	Expenditure outside Region \$	Total Expenditure (100% within Queensland)
Metal gear	410,600	102,700	513,300
Non-metal gear	700,400	123,600	824,000
Food	296,900	60,000	329,900
Fuel	952,700	105,800	1,058,500
Repairs/maintenance	765,100	85,000	850,100
Finance/fees	891,700	-	891,700
Wages	2,130,900	-	2,130,900
TOTAL	6,148,300	477,100	6,598,400

TABLE 15: Place of Expenditure on Operating Cost Items:
Units Doing Some Fishing in Capricornia Section

Expenditure Item	Expenditure inside Region \$	Expenditure outside Region \$	Total Expenditure (100% within Queensland)
Metal gear	343,400	85,900	429,300
Non-metal gear	479,300	89,600	563,900
Food	189,500	21,000	210,500
Fuel	646,100	71,800	717,900
Repairs/maintenance	576,500	64,100	640,600
Finance/fees	654,200	-	654,200
Wages	1,853,900	-	1,853,900
TOTAL	4,742,900	327,400	5,070,300

TABLE 16: Place of Expenditure on Operating Cost Items:

Imputed Expenditure due directly to
Fishing in the Capricornia Section

Expenditure Item	Expenditure Inside Region \$	Expenditure Outside Region \$	Total Expenditure (100% within Queensland) \$
Metal gear	144,200	36,100	180,300
Non-metal gear	201,300	35,500	236,800
Food	79,600	8,800	88,400
Fuel	271,400	30,100	301,500
Repairs/maintenance	242,100	26,900	269,000
Finance/fees	274,800	-	274,800
Wages	778,600	-	778,600
TOTAL	1,992,000	137,400	2,129,400

Place of Expenditure

Respondents were asked to nominate the location of the major part of their expenditure on the various items purchased annually. The results are presented in Table 12. In all cases, the major part of expenditure occurred within the Wide Bay - Fitzroy region (hereafter, the Region). Where purchases were not made within this Region, they tended to be made in Brisbane or in the Townsville/Cairns area. One hundred percent of expenditure on items in the operating cost categories occurred within Queensland.

Expenditure on Metal Gear

This category of gear includes cables, chains, hooks, sinkers and metal containers amongst other equipment items. It was found that 80% of purchases of metal equipment occurred within the Region.

In all instances expenditure on metal gear made up about 8% of annual expenditure on operating cost items. Total purchases of metal gear comprised \$429,300 by those commercial fishing unit owners who did some fishing in the Capricornia Section, and \$180,300 imputed to be the costs of specifically fishing in the Capricornia Section.

Expenditure on Non-metal Gear

Non-metal fishing gear includes ropes, nets, lines and all plastic and fibre items. Overall this item comprised 11% to 12% of expenditure on annual operating costs. Of note is that \$563,900 was spent by commercial fishing boat owners who did some fishing in the Capricornia Section and \$236,800 was the proportion attributed to fishing done in the Capricornia Section. Around 85% of this expenditure occurred within the Region.

Expenditure on Food

The provision of food for the skipper and crew is a necessary expense associated with commercial fishing operations. This expense

comprised about 5% of annual expenses on operating cost items and as such was the smallest component of all operating costs. A total of \$210,500 was spent on food by commercial fishing units who did some fishing in the Capricornia Section, and \$88,400 accrued as a cost of specifically fishing within the Capricornia Section. Of this expenditure, about 90% occurred within the Region.

Expenditure on Fuel

Fuel costs are an important component of expenses in commercial fishing operations, making up 14% to 16% of annual operating costs. In the 1978-79 financial year, \$717,900 was spent on fuel by those commercial fishing units which did some fishing in the Capricornia Section, and \$301,500 was spent specifically for fishing in the Capricornia Section. 90% of this expenditure took place within the Region.

Expenditure on Repairs and Maintenance

This category covers repair and maintenance work paid for or done by vessel owners. In the former case, costs consist of those payments made for parts and services, and in the latter case, costs cover the purchase of parts, paint, etc, but not labour costs. Repairs and maintenance accounted for 13% of expenditure on operating costs.

The amount spent in 1978-79 on repairs and maintenance by commercial fishing vessel owners who did some fishing in the Capricornia Section was \$640,600 whilst the expenditure due specifically to fishing in the Capricornia Section was imputed to be \$269,000. Around 90% of this expenditure occurred within the Region.

Expenditure on Finance and Fees

The Finance and Fees category covers costs such as loan repayments, insurance and mooring and licence fees. Such costs made up about 13% of the expenditure on nominated operating cost items. In the 1978-79 financial year \$654,200 was paid out by commercial fishing

vessel owners who did some fishing in the Capricornia Section, whilst \$274,800 was attributed as costs of specifically fishing in the Capricornia Section. All of this expenditure occurred within the Region.

Expenditure on Wages

Wage payments are not a straightforward matter where commercial fishing is concerned. Often crew are paid on the basis of a percentage of the value of the catch. Where the owner is also the skipper of the vessel (as is most often the case), a wage as such is not paid. Return to labour then becomes a component of "net profit". It was possible, however, to base estimates of expenditure on wages on those survey responses where a value for wage payments was nominated. Annual wage payments were calculated at \$1,854,000 for those commercial fishing operators who did some fishing in the Capricornia Section and \$779,000 was imputed for fishing specifically undertaken in the Capricornia Section. These amounts comprised 32% to 37% of operating costs and were the major components of this expenditure. Approximately 100% of wages were paid to people resident within the Region.

Capital Expenditure Items

Respondents were asked to nominate the replacement value of their fishing vessels plus all electrical and mechanical equipment on board. These abovementioned items are referred to in this report as capital equipment.⁷ This term refers to the types of items which are not replaced annually and for which an annual cost figure may most correctly be determined by depreciating purchase price.

Almost half the respondents owned more than one vessel. In most cases, a commercial fishing unit consisted of one "main" fishing vessel and one or two smaller auxilliary vessels. In some cases,

⁷ Equipment items include: auxilliary engine, alternator, compressors, refrigeration, echo sounders, radio transceivers, automatic pilot, trawl winch, anchor winch, hydraulic steering, auxilliary boats, outboard motors.

however, a commercial fishing vessel owner owned more than one trawler size vessel (over 9 metres). In this discussion, vessels belonging to a unit are referred to as, main, second and third vessels. It was found that 52% of respondents owned only one vessel, 30% of respondents owned two vessels and 18% of respondents owned three vessels. The mean length of the main vessels was 9.7 metres, that of second vessels was 4.8 metres and the mean length of third vessels was 4.3 metres.

The replacement values of commercial fishing vessels are given in the following table (Table 17).

TABLE 17: Replacement Value Commercial Fishing Vessels

Replacement Value Commercial Fishing Vessels	Units which Fished in Capricornia Section	Units which did not fish in Capricornia Section	All "Local" Commercial Fishing
Main vessel	11,193,600	2,882,200	14,075,800
Second vessel	648,200	218,600	866,800
Third vessel	20,800	22,600	43,400
TOTAL	11,862,600	3,123,400	14,986,000

The data indicate that vessels to the value of almost \$12 million fished in the Capricornia Section during 1978-79.

The depreciation rate adopted by the Australian Taxation Office for use with commercial fishing vessels is 11.25% per annum.⁸ Adopting this figure, an annual value for depreciation of commercial fishing vessels and equipment was found to be approximately \$1 million for all "local" vessels and \$839,000 for vessels which did some fishing in the Capricornia Section.

⁸ The depreciation rate on electrical equipment is somewhat higher at 15%, however, for the purposes of this analysis, vessel and equipment are treated as one. Depreciation is calculated on purchase price rather than replacement value.

During the 1978-79 financial year \$2 million was spent in purchasing fishing vessels which subsequently operated from Bundaberg, Gladstone or Rockhampton. Of those, vessels to the value of \$1.6 million fished in the Capricornia Section. 42% of that \$1.6 million - \$670,000 - may be roughly attributed as being costs of actually fishing within the Capricornia Section.

Age of Commercial Fishing Vessels

Some of the main vessels are quite old, with the oldest reported to have been built in 1930. However, the majority (60%) of main vessels have been built since 1970. It was found that approximately 40% of main vessels were built before 1970, 30% were built between 1970 and 1975, and 30% were built since 1976. The mean and modal year of vessel purchase was 1976.

Of the smaller, second and third vessels owned by commercial fishing operators, approximately 50% were built since 1976.

Place of Purchase of Commercial Fishing Vessels

Of the main vessels owned by commercial fishing operators, those under 6 metres in length were mostly purchased within the Wide Bay - Fitzroy region. Around 90% of these vessels were bought (or made with materials purchased) inside the Region. There is a low incidence of owners of these relatively smaller vessels having built the vessels themselves.

In the case of main vessels over 6 metres in length, survey results indicate that between 30% to 40% of these vessels were built by the owners themselves. Around 65% of the vessels/materials were purchased within the Region.

In cases where more than one vessel was owned, it was found that the smaller second and third vessels displayed similar characteristics to the main vessels under 6 metres, in that over 90% of purchases of vessels/materials were made within the Region and less than 10% of vessels were built by their owners.

In all cases, an insignificant proportion of purchases (less than 5%) were made outside Queensland.

The Economic Impact of Expenditure

It is not the case that the total amount of money spent within the Region remains within the Region. In the case of goods in particular, an item may be imported into the Region by a retailer and therefore the only component of the cost of that item which remains within the Region is the retail markup. Payment for services is more likely to remain within the Region as labour costs are a major component of service costs. In order to have some idea of the extent to which expenditure associated with commercial fishing operations is likely to have direct and indirect effects within the Region it is necessary to consider to what extent this expenditure is likely to remain within the Region. This is discussed in qualitative terms below. The information on which this discussion is based comes from Australian Bureau of Statistics publications,⁹ field observation of the industrial base of the Region and discussions with fishermen, retailers and manufacturers.

Metal fishing gear in the forms of hooks, sinkers, lures, etc, is mostly manufactured overseas or elsewhere in Australia and distributed to fishermen through local wholesale and retail outlets. Some items made of sheet metal are fabricated locally.

Non-metal gear consists mostly of ropes, nets, lines and plastic items. Apart from a local net making industry, most non-metal items are imported into the Region.

As could be expected, a portion of the food purchased for the crew comes from the local agricultural sector, however, much of the processed food is imported into the Region.

9 Census of Retail Establishments and Selected Service Establishments
Part 1 - Details of Operations by Industry Class, Queensland, 1973-74.
Census of Wholesale Establishments, Australia, States and
Territories, 1968-69.
 Australian Bureau of Statistics.

All fuel must be imported into the Region as none is produced locally.

A large component of expenditure on repairs and maintenance is money paid for services provided by local engineering and boat repair industries. A major component of this money goes to wages and salaries and therefore remains within the Region. Where owners undertake their own repairs, the items purchased, paint, spare parts, etc., are mostly imported into the Region.

Payments for finance and fees, and wages made within the Region may be exported from the Region in "secondary" transactions, but for the purposes of this analysis (and any subsequent input-output analysis) it is correct to attribute the total amount of payments to the regional economy.

The Region supports a number of boat building firms (many of which also undertake repair and maintenance work). Bundaberg boasts two firms constructing vessels of up to trawler size. Trawlers and smaller vessels are also constructed in Gladstone, Rockhampton and Yeppoon. All the ports in the Region support firms which fit out smaller boats. In addition, boat building is undertaken on a private basis. It was previously noted that some number of commercial fishing vessels were built by their owners.

Total Annual Cost

The total costs associated with commercial fishing during the year 1978-79 may be calculated by adding the value of all purchases, including vessels, during that year. Alternatively, and more appropriately, annual expenditure on operating costs plus depreciation on capital items (vessels and equipment) gives a measure of total annual cost of fishing.

The addition of \$6.6 million spent on operating costs (Table 14) and \$1 million depreciation on vessels and equipment (page 75), gives a total annual expenditure of \$7.6 million by "local" commercial fishing units.

Similarly, \$5.1 million (Table 15) plus \$830,000 (page 76) gives a value for total annual costs of \$5.9 million to operators who fished in the Capricornia Section. A component of 42% of that \$5.9 million may be considered as the costs incurred in actually fishing within the Capricornia Section. This value is \$2.4 million.

A major component of this expenditure occurs within the Wide Bay - Fitzroy region. It is necessary, however, to state as a caveat that not all of this money remains within the Region - much is exported in payment for goods produced outside the Region. Nevertheless, the commercial fishing industry supports retail and wholesale outlets and service and manufacturing industries within the Region. An important component of the regional impact of expenditure is that which goes both directly and indirectly in wages to residents of the Region. The use of input-output analysis would allow accurate identification of regional direct, indirect and induced income and employment impacts associated with commercial fishing.

INCOME ASSOCIATED WITH COMMERCIAL FISHING

While the authors consider expenditure data to be reasonably accurate, the same cannot be said with regard to data on income from commercial fishing. It is known that in Queensland a significant proportion of fin fish, and to a lesser extent prawns and scallops, pass through "black market" channels.¹⁰ This probably leads to an under-reporting of income from the sale of fish and seafoods.¹¹ The existence of the "black market" presents a very real incentive for under-reporting of income from sales by those fishermen disposing of catch in that manner. The illegal nature of "black marketing" and the opportunity for tax avoidance cannot but be significant motives for under-reporting, notwithstanding explicit guarantees of confidentiality. The extent of under-reporting cannot be accurately calculated at present. The data on income which was gathered through

10 See Appendix 4 for a discussion on the "black market".

11 The Fisheries Division of the Commonwealth Department of Primary Industries reported a similar situation in their most recent publication The South East Queensland Prawn Fishery 1972-73 to 1974-75, A Statistical Report of An Economic Survey. June 1980.

the mail survey is presented below (Table 18), with the qualification that it represents a minimum estimate of income accruing to commercial fishing units for the financial year 1978-79.

TABLE 18: Income from the Sale of Fish and Seafood 1978-79

Sale of Fish/Seafood	Units which Fished in Capricornia Section \$	All Local Commercial Fishing \$
All fish/seafood catch	6,020,800	7,704,500
Fish/seafood caught in Capricornia Section	2,530,800	2,530,800

The gross income for all commercial fishing by local commercial fishing units was approximately \$7.7 million and of this amount, approximately \$6 million was earned by commercial fishing units which did some fishing in the Capricornia Section. Of more interest is the gross income reported to have been earned from the sale of fish and seafoods actually caught within the Capricornia Section. This amounted to approximately \$2.5 million in 1978-79.

Of this total, approximately 49% (\$1,240,000) was from the sale of scallops, 27% (\$683,000) was from the sale of prawns, 14% (\$354,000) was from the sale of pelagic fish and 9% (\$228,000) was from the sale of demersal fish.

RETURNS ASSOCIATED WITH COMMERCIAL FISHING

The overall net returns to commercial fishing were simply calculated by subtracting annual costs from annual gross income. For all "local" commercial fishing units, annual costs (excluding loan repayments) totalled \$6,950,000 while gross income totalled \$7,705,000. The "profit" involved (return to capital) was approximately \$755,000 - out of which loan repayments had to be made. Of the "local" commercial fishing units, those who did some fishing in the Capricornia Section incurred costs of \$5,380,000 and

generated a gross income of \$6,021,000 in the 1978-79 financial year. The "profit" in this case was \$641,000. The calculation of returns, however, has more meaning when returns are equated to the type of fishing operation involved and the level of capital funds invested. This analysis is presented below.

Returns to the "Average" Fishing Unit

Investigations of costs, incomes and returns were undertaken with respect to the different types of fishing operation. In the analysis below, returns were calculated for the "average" commercial fishing unit engaged in: prawn and scallop trawling; pelagic fishing; and demersal fishing. In all cases, the "average" was taken to be the mean and therefore did not show the extremes of low or high costs and incomes which some respondents experienced.

Prawn and Scallop Trawling

As most "local" trawlers engage in both activities, average expenditure and income figures are presented for joint prawn and scallop trawling operations. The data suggest that the average unit consisted of a main vessel of about 13 metres in length (the trawler) plus two smaller boats. The replacement value of vessels for the average trawling unit was \$110,700. The mean year of purchase of trawlers was 1976. An average unit had one full-time skipper (usually the owner) plus one to two crew employed on a near to full-time basis.

The return on investment for the average trawling unit is calculated in Table 19 below. Operating costs are calculated as before but with the addition of business administration costs, and excluding loan repayments and skipper's wages. The returns, therefore, are returns to capital and owner's labour. The value given for "capital funds employed" is the purchase price of vessels and equipment, not the replacement value reported above.

The average trawling unit caught \$48,600 worth of product in the Capricornia Section. That value represented 78% of the total income from the sale of fish/seafood for that unit. The data below pertains to all fishing, that is, both within and outside of the Capricornia Section.

Some caution is warranted in interpreting the data on the "average" fishing unit. As previously stated the "average" has been calculated as the mean and hence extremes do not show up. A wide range of income and costs were reported. While both income and costs could be expected to be positively correlated to effort, not enough is presently known about the sum of the factors that determine effort - or the interrelationship between the factors - to allow any worthwhile correlations to be made. It should also be restated that seasonal factors, in particular overseas demand for prawns, have an effect on incomes.

It also should be noted that some of the fishermen earning an acceptable return of capital funds employed could face a cash flow problem if large loan repayments are required. Such a problem would be exacerbated by fluctuations in catch and price.

In the tables below the figures have been rounded off to the nearest \$100. The owner/skipper's wages that are used to illustrate the effect of deducting such as a cost of production are not meant to reflect the actual amount of money an owner/skipper would value his work at. Nevertheless, the figures used could be a reasonable estimation of his opportunity cost.

TABLE 19: Returns to Prawn and Scallop Trawling:
The "Average" Trawler

Income from sale of fish/seafoods	62,400
Operating costs*	<u>34,400</u>
Pre-tax operating surplus	28,000
Depreciation of fixed assets	<u>6,400</u>
Pre-tax operating profit	21,600
Capital funds employed	77,200
Return on capital funds employed and owner/skipper's labour	27.9%

* Excluding loan repayments and owner/skipper's "wages".

The return to capital and labour was found to be 27.9%. If the owner/skipper's labour is converted into a "wage" of \$12,000, the return on capital funds employed would be 12.4%. In those cases where the trawler was owned outright by the operator, his return on investment would be the 12.4% calculated above. On the other hand, if the trawler was being purchased by way of a loan, annual loan repayments would have to be met out of the net return.

Pelagic Fishing

The average pelagic fishing unit consisted of a main vessel of about 8.5 metres in length plus one smaller vessel. The average replacement cost of vessels was \$34,700. Most units employed an owner/skipper who fished for about nine months per year plus minimum assistance from part-time crew.

The return to capital and owner's labour was about 19% (Table 20). This return is comparatively low. When wage payments to owner/skipper (\$10,000) are taken into account, the average operation was

found to make a loss of about \$4,800 per annum. The loss calculated from survey data could be a function of under-reporting of income from the sale of fish catch on the part of pelagic fishermen, as well as effort expended. With regard to the latter, it should be noted that not all fishermen worked throughout the season. Information gained in personal interviews with pelagic fishermen indicated that such operations return around \$10,000 per annum net. (The amount is the return on owner/skipper's capital and labour.)

The average pelagic fisherman caught 25% of his total catch in the Capricornia Section.

TABLE 20: Returns to Pelagic Fishing:
The "Average" Fisherman

Income from sale of fish/seafoods	14,200
Operating costs*	<u>6,300</u>
Pre-tax operating surplus	7,900
Depreciation of fixed assets	<u>2,700</u>
Pre-tax operating profit	5,200
Capital funds employed	27,400
Return on capital funds employed and owner/skipper's labour	19%

* Excluding loan repayments and owner/skipper's "wages".

Demersal Fishing

Demersal fishing operations on average consisted of a main vessel of about 8.5 metres plus two smaller vessels. The average replacement value of vessels was \$29,700. An average unit employed

an owner/skipper plus one or two part-time crew. The return to capital and labour was calculated to be low, at approximately 18.7% (Table 21). When wage payments (\$10,000) to owner/skipper are considered, the average demersal fishing unit was found to lose over \$5,600 per annum. Again, as with pelagic fishing, it is thought that catch may have been under-reported. Effort also varied considerably. Sales of catch on the "black market" would ensure that demersal fishing operations would be profitable at the level of optimum effort.

About 73% of income associated with demersal fishing came from the sales of fish caught in the Capricornia Section.

TABLE 21: Returns to Demersal Fishing
The "Average" Fisherman

Income from sale of fish/seafoods	18,500
Operating costs*	11,800
	<hr/>
Pre-tax operating surplus	6,700
Depreciation of fixed assets	2,300
	<hr/>
Pre-tax operating profit	4,400
Capital funds employed	23,500
Return on capital funds employed and owner/skipper's labour	18.7%

* Excluding loan repayments and owner/skipper's "wages".

EMPLOYMENT IN COMMERCIAL FISHING

Commercial fishing provides a relatively high proportion of part-time employment. Table 22, below, gives estimates of the number of persons including skippers, employed by local commercial fishing vessel owners.

TABLE 22: Employment in Commercial Fishing

Period of Employment per annum	Number of Employees
Less than 3 months	91
3 months to 6 months	95
6 months to 9 months	53
9 months to 12 months	42
full 12 months	300
TOTAL	581

In full-time equivalents, the total employment would be 416 men. The figure of 300-full-time fishermen is considerably higher than the most recent census data (1976) for the ports adjacent to the Capricornia Section. The employment reported above is considered accurate. The difference between it and the census data does not necessarily reflect an increase in full-time fishermen (though some increase obviously occurred) but rather fishermen allocating themselves to a different employment category in the census.

VOLUME OF FISH/SEAFOOD CATCH

The catch data reported in dollar terms was translated into kilograms of product based on average Queensland Fish Board prices for fish and seafoods over the year 1978-79.¹² Table 23, below, presents catch data for the Capricornia Section. The values given in this table are a minimum as they are based on minimum income data.

12 Queensland Fish Board Annual Report 1979.

TABLE 23: Volume of Fish/Seafood Catch from Capricornia Section

	Dollar value of catch	Average price per kg	Kilograms
Scallops	\$1,240,000	\$2.60	476,900
Prawns	\$ 683,000	\$3.70	184,600
Pelagic fish	\$ 354,000	\$1.40	246,400
Demersal fish	\$ 228,000	\$1.70	134,000

3.2 COMMERCIAL FISHING: A SUMMARY

The data presented on commercial fishing may be summarised as follows :

- (i) The number of commercial fishing units operating from the ports of Bundaberg, Gladstone and Rockhampton/Yeppoon was found to be 269.
- (ii) $57\% \pm 9\%$ of "local" commercial fishing units, that is, 129 to 177 units, did some of their fishing in the Capricornia Section. 40% of those units did most of their fishing in the Capricornia Section.
- (iii) The types of fishing undertaken by commercial fishing units which did some fishing in the Capricornia Section were: prawn and/or scallop trawling 40%; pelagic and/or demersal fishing 28%; both trawling and fin fishing 28%; net fishing and aquarium fish collecting 4%.
- (iv) Vessels to the value of almost \$12 million dollars were employed in fishing in the Capricornia Section - though most of those vessels fished elsewhere as well.
- (v) Commercial fishing units which did some fishing in the Capricornia Section incurred operating costs of \$6 million (including \$4.8 million in depreciation) during the 1978-79 financial year. Of these costs, 42%, \$2.4 million, was attributed to be a direct cost of actually fishing within the Capricornia Section.
- (vi) Over 80% of expenditure on operating costs and vessels occurred within the Wide Bay - Fitzroy region. Almost 100% of all expenditure occurred within Queensland.

- (vii) Income from the sale of fish and seafood caught within the Capricornia Section totalled over \$2.5 million in 1978-79. Of this income, 49% was from the sale of scallops, 27% was from the sale of prawns, 14% was from the sale of pelagic fish and 9% was from the sale of demersal fish.

4. FISH AND SEAFOOD PROCESSING

INTRODUCTION

So far this report has dealt with the economic characteristics of catching fish and seafood. Processing and distribution of the catch is a relatively important economic activity.

It is not possible to present a comprehensive set of data on processing in this report. There are two important reasons why this is so. Firstly, not until information is gathered from all processors handling the entire Great Barrier Reef catch will all data relevant to the Capricornia Section be available. Secondly, given the small number of processing establishments operating in the local area, it would be virtually impossible to publish detailed information and still meet confidentiality requirements with regard to certain business data.

The data which has been gathered, plus that which will be gathered for the study of the remainder of the Great Barrier Reef fishery, will be extremely useful in any subsequent input-output modelling of the Capricornia Section fishery and other parts of the Great Barrier Reef fishery.

Some general information pertaining to the major shore-based processors presently operating in the area adjacent to the Capricornia Section is presented below. Information on that part of the Capricornia Section catch landed at other ports is not presented.

It must be noted that the data pertains to the catch processed in the establishments regardless of where it was taken. That is, the Capricornia Section catch is not separated from the catch from other areas, such as the Swain Reefs and the fishing grounds closer to the coast.

One further introductory comment is warranted. It is that the processing industry is not static but changing as a result of market forces. Institutional changes could lead to significant changes in the future.

NUMBER OF LOCAL PROCESSORS

Shore-based processing in the local area is presently done by Queensland Fish Board depots (and one agency) and licenced private enterprise processors. There are Queensland Fish Board depots at Bundaberg, Gladstone, Rosslyn Bay and Rockhampton. At Yeppoon there is an agency.

At present the major shore-based private processor is Markwell Fisheries Pty Ltd. That firm's major plant and equipment is located in Bundaberg. Receival depots are located at Gladstone and Rosslyn Bay.

Various other shore-based processing firms are operating in the local ports; for example, Conn and Preston in Bundaberg (with a refrigerated storage capacity of 3840 cubic feet); K. R. Appo in Gladstone (with a refrigerated storage capacity of 5 tons); Beconsall's Seafood Market in Rockhampton (with a refrigerated storage capacity of 2400 cubic feet); Supreme Fisheries at Yeppoon (storage capacity unknown); and Ocean Pantry at Bundaberg (storage capacity unknown). Wales Carpentaria Pty Ltd was until fairly recently processing in Bundaberg. That firm is no longer established there.

EMPLOYMENT

Employment in the processing industry fluctuates during the year, and from one year to the other. The number employed is a function of seasonal and catch factors. For example, during a good scallop season in Bundaberg up to 200 casuals have been employed. Casual employment in the other ports is nowhere near as significant. The total permanent staff for the major processors (the Queensland Fish Board depots and Markwell Fisheries Pty Ltd) is presently about 45 persons. On average, for each \$100,000 of sales, these major processors employ the equivalent

of about one person full-time, though the ratio of turnover to employment differs widely from plant to plant, and bears little relationship to the size of the operation.

QUANTITY OF PRODUCE AND SALES

The reported sales of fish/seafood to the Queensland Fish Board at the depots in Bundaberg, Gladstone, Rockhampton, Rosslyn Bay and the agency in Yeppoon during the period April 1978 to April 1979 by commercial fishing units were as follows. The sales of scallops totalled \$939,000, prawn sales totalled \$612,000, pelagic fish sales totalled \$121,000 and demersal fish sales totalled \$145,000. The value of all sales to the Queensland Fish Board depots over that period was \$1.8 million. These sales included product not just from the Capricornia Section but from other fishing areas adjacent to the abovementioned parts. A detailed breakdown of Queensland Fish Board receivables and value thereof is presented in Appendix 3.

For the 1978-79 financial year, the two largest processors (the Queensland Fish Board and Markwell Fisheries Pty Ltd) sold fish and other seafood (wholesale and retail) worth over \$6 million. Details on this aspect of the operations of the other processors is not presented because of confidentiality requirements.

All of the Markwell Fisheries Pty Ltd sales were outside of Queensland, that is, interstate or overseas. Queensland Fish Board sales were either to the local trade, or to Brisbane. Taking all the Queensland Fish Board depots together, 41% sales were to local buyers; 58% went to Brisbane; and the remaining 1% were to other depots.

The figures above do not reflect the situation for individual depots. The largest depot, Bundaberg, made approximately 75% of its sales to Brisbane. For the Gladstone depot, the split was approximately 60% to local buyers and 40% to Brisbane. The Rosslyn Bay depot sent virtually all its produce to Brisbane, while the Rockhampton depot and the Yeppoon agency sold virtually all their produce to local buyers.

EXPENDITURE

The normal operating costs for a processing establishment are wages/salaries, fuel/power, transport, repairs and maintenance, materials, depreciation, and financial costs (for example, rent, interest on borrowed funds, and loan repayments).

While the confidential nature of these business expenses prohibits their publication in this study, one important fact can be recorded. It is that 100% of the expenditure on items such as labour, power, repairs and maintenance, and transport is made within the Wide Bay - Fitzroy region. It is only in the case of purchase of some items of machinery and equipment that purchases are made outside the Region.

CONCLUSION

The processing and distribution of fish and seafood products (with reference to the Queensland Fish Board) are presently subjects of investigation by a committee established by the Queensland Government.¹ Some of the committee's findings are worth reporting, notwithstanding the following comment: "The Committee has experienced considerable difficulty in assessing the relative shares of fish supplies handled by proprietary processors, the Board and non-processing wholesalers and distributors ...(and) found it virtually impossible to obtain information in relation to the breakup of market share for either the export or local market".²

The Committee reported that, excluding the Gulf of Carpentaria, the Queensland Fish Board receives about 40% of the total Queensland prawn catch and about 75% of all fish; while private processors receive about 34% of all prawns and only a minor percentage of the fish catch.³

1 Committee to Enquire into Matters Relating to Fish Marketing and the Future of Operations of the Fish Board.

2 Report of Committee, Department of Harbours and Marine, 1980, p. 44.

3 Ibid.

With regard to the marketing of wet fish and cooked prawns, private wholesalers are reported by the Committee to obtain 27% of the former and 31% of the latter in South Queensland (which includes the Capricornia Section).⁴ While such was the estimate given to the Committee by the Queensland Fish Board, a higher percentage leakage to private wholesalers was suggested by the industry. In fact, the suggestion is that private wholesalers receive about the same volume of product as does the Queensland Fish Board.

A clearer picture should evolve with the continuation of the investigation by the committee and further research by the authors.

⁴ Ibid, p. 49.

5. CONCLUSION

This report has presented preliminary analysis of raw data gathered on the important characteristics of fishing in the Capricornia Section of the Great Barrier Reef Marine Park.

The type of data gathered and the form of analysis were determined by the current information needs of the Great Barrier Reef Marine Park Authority. As mentioned on occasions throughout the report, further analysis of the data is possible. In fact, the data relevant for input-output modelling are presented in a form suitable for such modelling. Input-output analysis could be used to find, for example, the employment multipliers for Capricornia Section fishing. Relevant data are also presented in a form amenable to use in derivation of a recreational fisherman's demand schedule for fishing in the Capricornia Section. Either or both of these analyses could be done with little effort if the need for such should arise. It should be noted that a considerable amount of data gathered in the course of gathering relevant data have not been included or analysed because they pertain to fishing outside of the Capricornia Section.

The methods of data gathering and analyses undertaken have been described where appropriate in the study. Similarly, the question of accuracy has been addressed at certain points. Nevertheless, it is appropriate to conclude by restating some caveats already made.

The data on expenditure - the costs of fishing - for the "average" amateur or commercial fisherman are considered accurate. The total expenditure figures are as accurate as the estimation of the total population of fishermen is accurate. For amateur fishing by boat owners (given the sample size and sampling techniques used) the estimate of total numbers must be reasonably accurate. For commercial fishing, a more accurate estimation of the total number of operators will only be possible with the completion of the study of the remainder of the Great Barrier Reef fishery.

The data on catches and incomes cannot be considered to have a similar degree of accuracy as that of expenditure. The existence of a "black market" (cash sales) and the obvious sensitive nature of information pertaining to sales outside of legal channels is the major frustration. A higher degree of accuracy will be obtainable with analysis of the larger amount of data that will be gathered in the study of the remainder of the Great Barrier Reef.¹ For the time being, the data presented in this report can be accepted as a guide to the likely magnitude of catches and incomes. (An interesting calculation of a possible size of the Queensland "black market" is presented in Appendix 4.)

Fishermen, maybe more so than any other group in society, have interesting tales to relate. The authors heard their share during the course of their investigations. This fact alone made their task very enjoyable, interesting and, it must be stated, frustrating. The frustration arose because of the extreme difficulty, if not impossibility, of validating those pieces of information which, if they could have been proven, might have added potentially important data to the study. Within the obvious constraints of time and money, anything of interest was followed-up. Nevertheless, the authors can only report on the evidence to hand. If "evidence" is given its legal meaning and the legal analogy is continued with, some of the interesting things the authors were told are best described as "hearsay" (second-hand information not validated by first-hand experience) - for the time being at least.

1 A recent investigation is not as optimistic. The Report of Committee to Enquire into Matters Relating to Fish Marketing and the Future of Operations of the Fish Board states: "No reliable data is presently available on the total size of the Queensland catch. It is unlikely that accurate statistics of total catch can ever be completed because of the substantial quantities of fish taken by amateur fishermen and the extent of unrecorded sales by some commercial fishermen". That report goes on to make the following point: "Nevertheless, if future planning is to be effective, there is a need for an assessment to be made of the fish resources available or likely to be available off the Queensland coast".

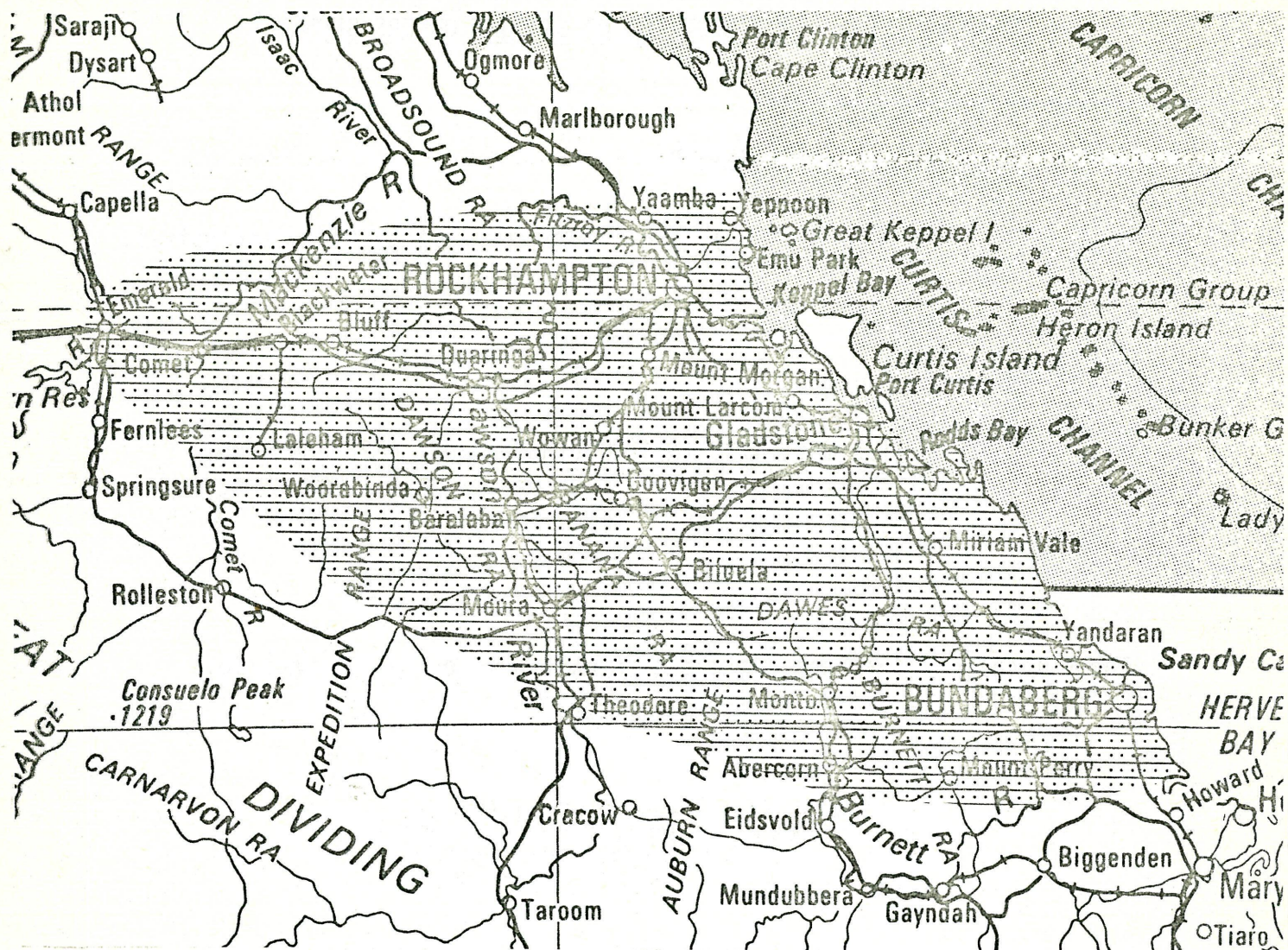
APPENDIX IPOSTCODES OF LOCATIONS
OF PRIVATELY OWNED REGISTERED MOTOR BOAT OWNERS SURVEYEDCoastal and near coastal locations

4660, 4670 to 4680 (inclusive), 4682, 4686 and 4694 to 4703 (inclusive).

Inland locations

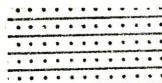
4717 to 4716 (inclusive), 4718 to 4720 (inclusive), 4728 and 4745.

These locations form the "Catchment Area" shown on Map 1, page 98.



MAP 1 "CATCHMENT AREA" FOR SURVEY OF
PRIVATELY OWNED REGISTERED MOTOR BOATS

"CATCHMENT AREA"



APPENDIX 2

SOME SOCIAL INDICATORS

INTRODUCTION

This appendix presents a limited amount of socio-economic information on some of the more important cities and towns in the "catchment" area for motor boat fishermen. Data of the nature presented are not only useful as background, descriptive information but can assist in explaining some of the economic characteristics of Capricornia Section fishing. For example, demand for boats, fishing trips, charter hire, etc, is a function of, among other things, income. Notwithstanding other contributing factors, it is not surprising that fishermen travel from the relatively distant inland but "high income" mining towns to fish in Reef waters.

The social indicators are drawn from the most recent census (1976). The household income data has been adjusted to reflect the percentage movement in earnings since the census was taken. The movement in average weekly earnings (defined as wages/salaries plus bonuses, overtime, etc.) per employed male unit (on a seasonally adjusted basis) from June 1976 to March 1980, has been 36.8%. The actual figures given have been rounded off to the nearest \$100. All other data are as collected in the census.

TABLE 1

Blackwater : Population

	<u>Males</u>	<u>Females</u>
Total population	2450	2188
Labour force		
- employed	1400	405
- unemployed	21	16
- not in labour force	1029	1767

TABLE 2

Blackwater : Education

	<u>Males</u>	<u>Females</u>
Qualifications-highest level obtained		
Doctoral, Masters Degree	1	0
Graduate Diploma	6	10
Bachelor Degree	35	5
Diploma	34	48
Technicians Certificate	61	34
Trade Certificate	387	21
Level not applicable	5	20
No qualifications	778	1026
Not stated	188	129
Total population 15 years +	2788	

TABLE 3

Blackwater : Industry Employed

A. Agriculture, etc		
Agriculture, Ag services	1	0
Forestry, Timber	0	0
Fishing, Hunting	0	0
Undefined	0	0
Total Division A	1	0
B. Mining		
Metal	0	0
Coal	975	29
Oil, Natural Gas	0	0
Other and undefined	3	0
Total Division B	978	29
C. Manufacturing		
Food, Drink, Tobacco	8	4
Textiles, Clothing	0	0
Wood, Furniture	0	0
Metal Products, Machinery	5	2
Other and undefined	11	0
Total Division C	24	6
D. Electricity, Gas, Water		
Electricity, Gas	11	1
Water, Sewerage, Drainage	2	0
Undefined	0	0
Total Division D	13	1
E. Construction Total	100	11
F. Wholesale, Retail Trade		
Wholesale and undefined	4	2
Retail	43	83
Total Division F	47	85
G. Transport and Storage		
Road Transport	11	7
Rail Transport	14	0
Water Transport	0	0
Air Transport	0	0
Storage, Other Transport, undef.	0	0
Total Division G	25	7
H. Communications Total	11	6
I. Finance, etc, Total	9	12
J. Pub Admin., Defence, Total	6	2
K. Community Services		
Health	8	12
Education	30	69
Other and undefined	16	2
Total Division K	54	83
L. Ent, Recr, Hotel, Restaurants		
Entertainment, Recreation	2	8
Restaurants, Hotels, Clubs	22	42
Other and undefined	0	5
Total Division L	24	55
M. Other, Nei, N/S, Total	108	105
Total employed population	3097	

TABLE 4

Blackwater : Household Income

<u>Annual Amount</u>	<u>No. of Households</u>
None	0
Under \$2,100	2
\$2,100-\$2,700	2
\$2,700-\$4,100	4
\$4,100-\$5,500	0
\$5,500-\$6,800	4
\$6,800-\$8,200	6
\$8,200-\$9,600	20
\$9,600-\$10,900	18
\$10,900-\$12,300	44
\$12,300-\$16,400	238
\$16,400-\$20,500	152
\$20,500-\$24,600	116
Over \$24,600	246
Not stated	168
Total households (excluding private boarding houses)	1020

From the above, 50% of households have an annual income over \$16,400.

TABLE 5

Bundaberg : Population

	<u>Males</u>	<u>Females</u>
Total population	15416	15773
Labour force		
- employed	8030	3909
- unemployed	316	290
- not in labour force	7071	11572

TABLE 6

Bundaberg : Education

Doctoral, Masters Degree	11	2
Graduate Diploma	18	19
Bachelor Degree	148	37
Diploma	271	340
Technicians Certificate	351	420
Trade Certificate	2450	232
Level not applicable	58	65
No qualifications	6450	9270
Not stated	1327	1323
Total population 15 years +	22792	

TABLE 7

Bundaberg : Industry Employed

	<u>Males</u>	<u>Females</u>
A. Agriculture, etc.		
Agriculture, Ag Services	372	121
Forestry, Timber	8	2
Fishing, Hunting	43	5
Undefined	0	0
Total Division A	424	128
B. Mining		
Metal	2	0
Coal	2	0
Oil, Natural Gas	0	0
Other and undefined	12	0
Total Division B	12	0
C. Manufacturing		
Food, Drink, Tobacco	915	105
Textiles, Clothing	1	6
Wood, Furniture	190	38
Metal Products, Machinery	1182	73
Other and undefined	190	28
Total Division C	2479	251
D. Electricity, Gas, Water		
Electricity, Gas	51	5
Water, Sewerage, Drainage	21	0
Undefined	0	0
Total Division D	72	5
E. Construction Total	1204	134
F. Wholesale, Retail Trade		
Wholesale and undefined	624	175
Retail	983	925
Total Division F	1610	1100
G. Transport and Storage		
Road Transport	148	48
Rail Transport	292	12
Water Transport	11	0
Air Transport	14	0
Storage, Other Transport, undef.	22	12
Total Division G	493	72
H. Communications Total	105	21
I. Finance, etc, Total	372	333
J. Pub Admin, Defence, Total	228	75
K. Community Services		
Health	117	520
Education	222	394
Other and undefined	159	93
Total Division K	498	1007
L. Ent, Recr, Hotel, Restaurants		
Entertainment, Recreation	38	58
Restaurants, Motels, Clubs	88	270
Other and undefined	51	99
Total Division L	179	432
M. Other, Nei, N/S, Total	372	365
Total employed population	19209	

TABLE 8

Bundaberg : Household Income

<u>Annual Amount</u>	<u>No. of Households</u>
None	140
Under \$2,100	54
\$2,100-\$2,700	266
\$2,700-\$4,100	674
\$4,100-\$5,500	662
\$5,500-\$6,800	272
\$6,800-\$8,200	468
\$8,200-\$9,600	618
\$9,600-\$10,900	706
\$10,900-\$12,300	620
\$12,300-\$16,400	1470
\$16,400-\$20,500	994
\$20,500-\$24,600	712
Over \$24,600	862
Not stated	908
Total Households	9426
(excluding private boarding houses)	

From the above, 27% of households have an annual income over \$16,400.

TABLE 9

<u>Gladstone : Population</u>	<u>Males</u>	<u>Females</u>
Total population	9713	8878
Labour force		
-employed	5478	2100
-unemployed	175	157
-not in labour force	4061	6623

TABLE 10

<u>Gladstone : Education</u>	<u>Males</u>	<u>Females</u>
Qualifications-Highest level obtained		
Doctoral, Masters Degree	10	0
Graduate Diploma	8	14
Bachelor Degree	110	35
Diploma	139	202
Technicians Certificate	199	248
Trade Certificate	1709	132
Level not applicable	41	76
No qualifications	3443	4428
Not stated	785	691
Total population 15 years +	12270	

TABLE 11

Gladstone : Industry Employed

A. Agriculture, etc.		
Agriculture, Ag Services	15	11
Forestry, Timber	6	0
Fishing, Hunting	16	4
Undefined	0	0
Total Division A	38	15
B. Mining		
Metal	2	0
Coal	13	5
Oil, Natural Gas	0	0
Other and undefined	3	0
Total Division B	18	5
C. Manufacturing		
Food, Drink, Tobacco	97	83
Textiles, Clothing	2	3
Wood, Furniture	42	2
Metal Products, Machinery	1335	54
Other and undefined	58	14
Total Division C	1529	157
D. Electricity, Gas, Water		
Electricity, Gas	255	20
Water, Sewerage, Drainage	30	0
Undefined	0	0
Total Division D	286	20
E. Construction Total		
	1266	97
F. Wholesale, Retail Trade		
Wholesale and undefined	176	62
Retail	475	470
Total Division F	649	532
G. Transport and Storage		
Road Transport	79	22
Rail Transport	449	0
Water Transport	142	22
Air Transport	13	6
Storage, Other Transport, undef.	19	2
Total Division G	698	53
H. Communications Total		
	46	23
I. Finance, etc, Total		
	260	203
J. Pub Admin, Defence, Total		
	101	33
K. Community Services		
Health	48	189
Education	90	209
Other and undefined	97	22
Total Division K	235	420
L. Ent, Recr, Hotel, Restaurants		
Entertainment, Recreation	16	75
Restaurants, Motels, Clubs	69	202
Other and undefined	7	36
Total Division L	92	310
M. Other, Nei, N/S, Total		
	253	237
Total employed population	11988	

TABLE 12

Gladstone : Household Income

<u>Annual Amount</u>	<u>No. of Households</u>
None	44
Under \$2,100	24
\$2,100-\$2,700	52
\$2,700-\$4,100	138
\$4,100-\$5,500	100
\$5,500-\$6,800	74
\$6,800-\$8,200	134
\$8,200-\$9,600	226
\$9,600-\$10,900	304
\$10,900-\$12,300	374
\$12,300-\$16,400	860
\$16,400-\$20,500	790
\$20,500-\$24,600	488
Over \$24,600	716
Not stated	622
Total households (excluding private boarding houses)	4946

From the above, 40% of households have an annual income over \$16,400.

TABLE 13

Moura : Population

	<u>Males</u>	<u>Females</u>
Total population	1444	1250
Labour force		
- employed	848	230
- unemployed	11	13
- not in labour force	586	1007

TABLE 14

Moura : EducationQualifications-Highest Level Obtained

Doctoral, Masters Degree	0	0
Gladuate Diploma	2	1
Bachelor Degree	10	6
Diploma	20	41
Technicians Certificate	46	32
Trade Certificate	240	13
Level not applicable	19	2
No qualifications	439	576
Not stated	110	40
Total population 15 years +	1597	

TABLE 15

Moura : Industry Employed

	<u>Males</u>	<u>Females</u>
A. Agriculture, etc		
Agriculture, Ag Services	14	7
Forestry, Timber	0	0
Fishing, Hunting	0	0
Undefined	0	0
Total Division A	14	7
B. Mining		
Metal	0	0
Coal	573	0
Oil, Natural Gas	0	0
Other and undefined	0	0
Total Division B	573	0
C. Manufacturing		
Food, Drink, Tobacco	1	2
Textiles, Clothing	0	0
Wood, Furniture	16	4
Metal Products, Machinery	4	0
Other and undefined	0	2
Total Division C	21	8
D. Electricity, Gas, Water		
Electricity, Gas	6	0
Water, Sewerage, Drainage	2	0
Undefined	0	0
Total Division D	8	0
E. Construction Total	44	0
F. Wholesale, Retail Trade		
Wholesale and undefined	19	10
Retail	36	44
Total Division F	55	54
G. Transport and Storage		
Road Transport	4	0
Rail Transport	6	0
Water Transport	0	0
Air Transport	0	0
Storage, other Transport, undef.	14	0
Total Division G	24	0
H. Communications Total	11	12
I. Finance, etc, Total	17	12
J. Pub Admin, Defence, Total	0	0
K. Community Services		
Health	4	16
Education	18	54
Other and undefined	12	4
Total Division K	34	74
L. Ent, Recr, Hotel, Restaurants		
Entertainment, Recreation	0	2
Restaurants, Motels, Clubs	12	24
Other and undefined	0	4
Total Division L	12	30
M. Other, Nei, N/S, Total	35	33
Total employed population	1883	

TABLE 16

Moura : Household Income

<u>Annual Amount</u>	<u>No. of Households</u>
None	2
Under \$2,100	4
\$2,100-\$2,700	0
\$2,700-\$4,100	8
\$4,100-\$5,500	6
\$5,500-\$6,800	12
\$6,800-\$8,200	6
\$8,200-\$9,600	12
\$9,600-\$10,900	18
\$10,900-\$12,300	16
\$12,300-\$16,400	116
\$16,400-\$20,500	88
\$20,500-\$24,600	98
Over \$24,600	142
Not stated	86
Total households (excluding private boarding houses)	614

From the above, 53% of households have an annual income over \$16,400.

TABLE 17

Rockhampton : Population

	<u>Males</u>	<u>Females</u>
Total population	24633	25499
Labour force		
- employed	13058	6820
- unemployed	467	291
- not in labour force	11105	18387

TABLE 18

Rockhampton : Education

	<u>Males</u>	<u>Females</u>
Qualifications-Highest Level Obtained		
Doctoral, Masters Degree	70	7
Graduate Diploma	42	36
Bachelor Degree	346	133
Diploma	407	587
Technicians Certificate	501	671
Trade Certificate	3348	345
Level not applicable	110	141
No qualifications	11110	15399
Not stated	1807	1803
Total population 15 years +	36863	

TABLE 19

Rockhampton : Industry Employed

A. Agriculture, etc.		
Agriculture, Ag Services	160	76
Forestry, Timber	6	2
Fishing, Hunting	12	2
Undefined	0	0
Total Division A	178	80
B. Mining		
Metal	17	1
Coal	20	0
Oil, Natural Gas	0	0
Other and undefined	53	3
Total Division B	90	4
C. Manufacturing		
Good, Drink, Tobacco	1287	332
Textiles, Clothing	1	10
Wood, Furniture	129	23
Metal Products, Machinery	449	26
Other and undefined	374	64
Total Division C	2243	456
D. Electricity, Gas, Water		
Electricity, Gas	528	82
Water, Sewerage, Drainage	23	0
Undefined	0	0
Total Division D	551	82
E. Construction Total	1909	180
F. Wholesale, Retail Trade		
Wholesale and undefined	930	257
Retail	1750	1378
Total Division F	2675	1633
G. Transport and Storage		
Road Transport	253	46
Rail Transport	1446	68
Water Transport	42	4
Air Transport	132	26
Storage, Other Transport, undef.	23	23
Total Division G	1892	167
H. Communications Total	327	80
I. Finance, etc, Total	655	545
J. Pub Admin, Defence, Total	516	162
K. Community Services		
Health	327	1116
Education	474	751
Other and undefined	375	158
Total Division K	1176	2025
L. Ent, Recr, Hotel, Restaurants		
Entertainment, Recreation	120	182
Restaurants, Motels, Clubs	173	531
Other and undefined	73	113
Total Division L	365	830
M. Other, Nei, N/S, Total	467	551

Total Employed Population

31089

TABLE 20

Rockhampton : Household Income

<u>Annual Amount</u>	<u>No. of Households</u>
None	232
Under \$2,100	106
\$2,100-\$2,700	386
\$2,700-\$4,100	974
\$4,100-\$5,500	858
\$5,500-\$6,800	392
\$6,800-\$8,200	832
\$8,200-\$9,600	938
\$9,600-\$10,900	1028
\$10,900-\$12,300	882
\$12,300-\$16,400	2372
\$16,400-\$20,500	1730
\$20,500-\$24,600	1164
Over \$24,600	1642
Not stated	1190
Total households (excluding private boarding houses)	14726

From the above, 31% of households have an annual income over \$16,400.

TABLE 21

Yeppoon : Population

	<u>Males</u>	<u>Females</u>
Total population	2749	2826
Labour force		
- employed	1178	666
- unemployed	76	47
- not in labour force	1495	2113

TABLE 22

Yeppoon : EducationQualifications-Highest Level Obtained

Doctoral, Masters Degree	8	3
Graduate Diploma	8	12
Bachelor Degree	41	19
Diploma	47	82
Technicians Certificate	63	79
Trade Certificate	303	29
Level not applicable	21	23
No qualifications	1121	1411
Not stated	391	398
Total population 15 years +	4059	

TABLE 23

Yeppoon : Industry Employed

	Males	Females
A. Agriculture, etc.		
Agriculture, Ag Services	102	39
Forestry, Timber	6	0
Fishing, Hunting	14	4
Undefined	0	0
Total Division A	122	43
B. Mining		
Metal	0	0
Coal	0	0
Oil, Natural Gas	0	0
Other and undefined	3	0
Total Division B	3	0
C. Manufacturing		
Food, Drink, Tobacco	48	13
Textiles, Clothing	5	2
Wood, Furniture	23	2
Metal Products, Machinery	20	1
Other and undefined	39	13
Total Division C	136	30
D. Electricity, Gas, Water		
Electricity, Gas	23	0
Water, Sewerage, Drainage	7	0
Undefined	0	0
Total Division D	30	0
E. Construction Total	241	19
F. Wholesale, Retail Trade		
Wholesale and undefined	48	10
Retail	125	116
Total Division F	173	126
G. Transport and Storage		
Road Transport	19	3
Rail Transport	7	1
Water Transport	5	0
Air Transport	3	0
Storage, Other Transport, undef.	2	1
Total Division G	37	5
H. Communications Total	21	3
I. Finance, etc, Total	76	45
J. Pub Admin, Defence, Total	47	7
K. Community Services		
Health	16	60
Education	61	100
Other and undefined	26	24
Total Division K	103	184
L. Ent, Recr, Hotel, Restaurants		
Entertainment, Recreation	16	14
Restaurants, Motels, Clubs	31	43
Other and undefined	5	20
Total Division L	51	75
M. Other, Nei, N/S, Total	138	135
Total Employed Population	2683	

TABLE 24

Yeppoon : Household Income

<u>Annual Amount</u>	<u>No. of Households</u>
None	52
Under \$2,100	16
\$2,100-\$2,700	46
\$2,700-\$4,100	138
\$4,100-\$5,500	128
\$5,500-\$6,800	50
\$6,800-\$8,200	102
\$8,200-\$9,600	102
\$9,600-\$10,900	108
\$10,900-\$12,300	92
\$12,300-\$16,400	172
\$16,400-\$20,500	132
\$20,500-\$24,600	92
Over \$24,600	116
Not stated	224
Total households (excluding private boarding houses)	1570

From the above, 22% of households have an annual income over \$16,400.

APPENDIX 3QUEENSLAND FISH BOARD DATA FOR YEAR ENDED 30 APRIL 1979

The data presented below shows the quantities (and values in some cases) of finned fish, fish fillets and other seafoods received by the Queensland Fish Board depots and agency at Bundaberg, Gladstone, Rockhampton, Rosslyn Bay and Yeppoon, for the year ended 30 April 1979. The data have been extracted from published Queensland Fish Board statistics.

TABLE 1

Table showing the quantities of Seafoods other than Finned Fish received by the Queensland Fish Board for the year ended 30 April 1979:

Variety		Bundaberg	Gladstone	Rock-hampton	Rossllyn Bay	Yeppoon
Prawns						
weight	kg	44,746	23,336	16,737	65,417	15,141
value	\$	174,310.89	81,522.68	70,197.46	225,323.00	60,194.16
Mud Crabs						
bodies		2,169	23,836	13,081	782	2,666
value	\$	6,228.36	76,192.77	43,633.48	1,809.05	7,371.69
Sand Crabs						
bodies		12,754	2,754	1,804	13,738	2,073
value	\$	11,874.83	2,858.20	1,596.09	15,675.36	2,505.56
Squid						
weight	kg	1,232	219	79	98	59
value	\$	1,439.61	261.80	112.78	120.30	75.52
Moreton Bay Lobsters						
weight	kg	10,479	8,272	229	19,076	1,820
value	\$	27,895.12	19,934.13	980.35	38,794.40	4,747.38
Sand Crab Meat						
weight	kg	421	701	101	240	98
value	\$	2,688.22	5,901.61	1,037.95	1,125.16	541.00
Mud Crab Meat						
weight	kg	...	111	157	...	...
value	\$	...	835.50	1,587.31	...	...
Lobster Meat						
weight	kg	46	...	20	...	...
value	\$	285.05	...	108.00	...	...
Oysters						
bottles		2,190	...	2,707	...	169
value	\$	2,028.36	...	2,856.30	...	254.05
Oysters						
bags		...	...	...	...	...
value	\$	...	...	...	...	...
Scallops						
weight	kg	255,073	50,407	672	50,771	2,531
value	\$	673,038.66	150,365.80	2,895.20	101,921.72	10,992.80
Crayfish						
weight	kg	19	...	...	...	...
value	\$	63.20	...	...	...	...
Crayfish Meat						
weight	kg	...	...	...	...	...
value	\$	...	...	...	...	...

TABLE 2

Table showing the quantities of Finned Fish received by the Queensland Fish Board for the year ended 30 April 1979 :

Variety	Bundaberg kg.	Gladstone kg.	Rockham- pton kg.	Rosslyn Bay kg.	Yeppoon kg.
Barramundi	3,073	7,147	8,671	282	5,714
Bream	3,570	576	100	6	168
Bream (Black)	216	...	...	...	109
Cod	3,773	1,283	172	28	713
Dart	993	17	81	...	74
Emperor	3,980	4,038	74	3	358
Flathead	3,146	287	354	...	755
Gar	935	149	3	...	265
John Dory	140	...	...	...	2
Jew	995	821	1,381	...	5,034
King	2,508	96	50	...	1,941
Mackerel	51,731	5,916	2,278	15	8,379
School Mackerel	3,238	14	...	...	1,652
Morwong	...	57	51	...	2
Mullet	66,658	4,036	8,055	...	2,903
Nanygai	374	20	4	...	42
Parrot	3,081	1,594	17	...	71
Pike	317	7	...	...	87
Ray	1,664	2,342	230	...	964
Salmon	6,595	2,128	10,195	74	6,791
Sampson	111	...	...	...	...
Shark	2,748	192	176	...	105
Snapper	1,643	210	23	...	133
Squire	661	48	...	...	...
Sweetlip	7,118	19,731	354	3	631
Tailor	738	11	50	...	15
Trevalli	3,172	32	156	...	2,596
Coral Trout	2,610	7,986	51	1	104
Trumpeter	611	...	...	...	1
Tuna	89	7	...	...	55
Whiting	1,518	1,485	6	...	29
Yellow Tail	799	13	4	...	...
Mixed Fish	6,844	753	791	3	1,203
Other Species	11,196	3,867	1,575	182	1,567
TOTAL	196,845	64,863	34,902	597	42,463

TABLE 3

Table showing total quantities of Fish Fillets received by the Queensland Fish Board for the year ended 30 April 1979 :

Variety	Bundaberg kg.	Gladstone kg.	Rockham- pton kg.	Rosslyn Bay kg.	Yeppoon kg.
Barramundi	700	1,428	4,237	24	500
Bream	12	129	381	6	...
Bream (Black)	...	...	...	..	...
Cod	14	296	303	19	18
Dart	7	...	10	2	...
Emperor	...	710	142	..	...
Flathead	14	139	281	6	...
Gar	...	...	...	..	...
John Dory	...	...	...	..	...
Jew	284	280	138	17	125
King	...	66	7	..	1,440
Mackerel	716	3,152	3,278	38	2,716
School Mackerel	26	9	...	..	275
Morwong	...	...	...	..	...
Mullet	1,131	1,770	1,778	77	484
Nanygai	...	...	3	..	...
Parrot	7	49	28	..	...
Pike	...	75	15	..	84
Ray	...	14	16	..	3
Salmon	619	3,125	9,965	499	1,447
Sampson	6	105	...	..	...
Shark	747	948	501	4	2
Snapper	14	...	358	..	...
Squire	...	...	...	..	...
Sweetlip	143	3,241	331	..	183
Tailor	14	...	111	..	...
Trevalli	63	64	273	46	140
Coral Trout	241	2,299	457	..	2,251
Trumpeter	...	1	...	..	...
Tuna	...	6	...	..	81
Whiting	1,036	8	139	..	...
Yellow Tail	...	...	...	..	...
Mixed Fish	115	55	353	46	170
Other Species	107	1,665	841	68	300
TOTAL	6,016	19,634	23,946	852	10,219

APPENDIX 4

THE BLACK MARKET

A recent report which *inter alia*, undertook an "investigation into the structure of the Queensland Fishing Industry"¹ reported: "It is not possible to precisely quantify the extent of the 'black market'".² This undoubtedly is correct. Nevertheless, another report prepared by the same author and others³, enables an approximation of the "black market" to be derived. The calculations made by those authors are presented here as they appear to be the best estimates available at the time of writing. In passing, it should be mentioned that better estimates might be able to be derived in the future as a result of further research by the Institute of Applied Social Research and Dr S D Bandaranaike (James Cook University of North Queensland).⁴

The approximate quantification of the Queensland "black market" was based on the fin fish consumption figures for Brisbane, on the basis that relevant information was not available for other Queensland areas. Nevertheless, research by Dr Bandranaike on patterns of seafood consumption in Townsville (Australian Fisheries, June 1978) published at the same time as the study previously referred to, could have marginally assisted in ascertaining if Brisbane's consumption was in fact representative of Queensland consumption.

The studies reported annual per capita consumption of fish for Brisbane to be 8.02 kg.⁵ Of that quantity, 3.68 kg was imported from either interstate or overseas.⁶ This left 4.34 kg as the annual per capita consumption of Queensland caught fin fish. Of that quantity of 4.34 kg,

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- 1 P.A. Consulting Services Pty Ltd. Review of the Role and Function of the Queensland Fish Board in the Queensland Seafood Industry, Draft Report, no date.
 - 2 Ibid, p. 9.
 - 3 P.A. Consulting Services, Melbourne and Fisheries Division, Dept. of Primary Industry, Canberra, Fish and Seafood Consumption in Australia: A Consumer Survey, 1976-1977, A.G.P.S. Canberra, 1978.
 - 4 Bandaranaike has undertaken seafood consumption research in selected north and central Queensland cities, including Mt. Isa. Her research in Rockhampton, which would be of particular interest for the study of the Capricornia Section, is not yet published.
 - 5 P.A. Consulting Services and Department of Primary Industry, 1978, op. cit. p. 10.
 - 6 P.A. Consulting Services, no date, p. 9.

it was reported that 1.15 kg was either self-caught or a gift.⁷ The basis of this calculation is not made clear. (However, in the other study it was reported that 33.2% of fresh fish eaten was either self-caught or a gift.⁸) Therefore, 3.19 kg/head per annum was purchased from the Queensland fishing industry. It was reported that 1.20 kg of that quantity was "declared as production".⁹ Again, the basis of this calculation is not made clear. The study therefore found that 1.99 kg/head/annum was attributable to "black market" purchases.

Those estimates can be converted into ratios and percentages. The "black market" is approximately 166% of the declared production (legally sold catch). The self-caught/gift component is approximately 96% of declared production, and approximately 36% of the sold catch (declared plus "black market").

Working the figures another way, declared production is approximately 28% of all Queensland caught fish consumed; the self-caught/gift component is approximately 26%; and the "black market" is approximately 46%. That is, the declared production and self-caught/gift components are each just over $\frac{1}{4}$ and the "black market" just under $\frac{1}{2}$.

To what extent can those reported findings be extrapolated for the purposes of analysing the Capricornia Section fishery? That depends on whether or not 720 Brisbane households (the size of the sample) are representative of the total population consuming Reef fish, and on the accuracy of the self-caught/gift estimate.

7 Ibid, p. 10.

8 P.A. Consulting Services and Department of Primary Industry, Table 38, p. 37.

9 P.A. Consulting Services, no date, p. 10.

APPENDIX 5
QUESTIONNAIRE FORMS

1

AMATEUR FISHING SURVEY

CONDUCTED BY

THE INSTITUTE OF APPLIED SOCIAL RESEARCH - GRIFFITH UNIVERSITY

The first two questions concern your boat specifications.

Q.1 WHAT IS THE LENGTH (METRES) OF YOUR BOAT?

_____ m

Q.2 WHAT IS THE TOTAL HORSEPOWER OF YOUR BOAT
ENGINE(S)?

_____ hp

The next two questions deal with the amount of time you spend fishing in the Capricornia Section of the Great Barrier Reef. For a definition of the Capricornia Section please see the attached map.

Q.3 OF ALL THE FISHING YOU HAVE DONE IN THE LAST 12 MONTHS,
THINK ABOUT THE AMOUNT OF TIME YOU SPENT FISHING IN THE
CAPRICORNIA SECTION AND THE AMOUNT OF YOUR FISHING TIME
SPENT OUTSIDE THE CAPRICORNIA SECTION. WHAT PERCENTAGE
OF YOUR TIME WAS SPENT IN:

THE CAPRICORNIA SECTION

FOR EXAMPLE: 30

OTHER PLACES

70

100%

100%

Q.4 HOW MANY FISHING TRIPS DID YOU MAKE TO THE CAPRICORNIA SECTION
IN THE LAST 12 MONTHS?

_____ FISHING TRIPS

Q.5 PLEASE MARK WITH AN "X" ON THE ATTACHED MAP, THE AREA(S) IN THE CAPRICORNIA SECTION YOU
FISH MOST.

In this series of questions, we would like to ask you about some of the costs you incur in your fishing activities.

Q.6 IN WHAT YEAR DID YOU PURCHASE YOUR BOAT? 19 _____

Q.7 IN WHAT TOWN WAS IT BOUGHT? _____

Q.8 WHAT WAS THE PURCHASE PRICE?
(INCLUDING ANY EXTRAS SUCH AS AN ECHO SOUNDER) \$ _____

Q.9 SINCE PURCHASING THE BOAT HAVE YOU BOUGHT ANY NEW EQUIPMENT OR REPLACED OLD EQUIPMENT?

Please fill in the year and town and the cost of each expenditure.

	YEAR	TOWN	COST
MOTOR(S)	19 _____	_____	\$ _____
ECHO SOUNDER	19 _____	_____	\$ _____
RADIO	19 _____	_____	\$ _____
REFRIGERATION UNIT	19 _____	_____	\$ _____
OTHER (SPECIFY)	19 _____	_____	\$ _____

For the following list of items please indicate your approximate ANNUAL EXPENDITURE and, where appropriate the town where you purchased most of these items:

Q.10 FISHING GEAR MADE OF METAL. FOR EXAMPLE - CABLES, LURES, SINKERS, ETC.

\$ _____

Q.11 CITY OR TOWN

Q.12 FISHING GEAR NOT MADE OF METAL. FOR EXAMPLE - RODS, NETS, LINES, LIFE JACKETS ETC.

\$ _____

Q.13 CITY OR TOWN

3

Q.14 REPAIRS AND MAINTENANCE TO BOAT IN LAST 12 MONTHS
(EXCLUDING REPAIRS DONE BY YOURSELF)

\$ _____

Q.15 CITY OR TOWN _____

Q.16 BOAT FUEL FOR ALL FISHING TRIPS IN LAST 12 MONTHS

\$ _____

Q.17 CITY OR TOWN _____

Q.18 INSURANCE AND LICENCE FEES

\$ _____

The following questions relate to car and boat fuel expenses on your LAST TRIP to the Capricornia Section.

Q.19 HOW MANY KILOMETRES RETURN TRIP DID YOU TRAVEL BY ROAD AS PART
OF YOUR LAST FISHING TRIP TO THE CAPRICORNIA SECTION? _____ km

Q.20 HOW MUCH DID THIS ROAD TRANSPORT COST YOU IN VEHICLE
PETROL EXPENSES? \$ _____

Q.21 HOW MANY KILOMETRES RETURN TRIP DID YOU TRAVEL BY SEA AS PART OF
YOUR LAST FISHING TRIP TO THE CAPRICORNIA SECTION? _____ km

Q.22 HOW MUCH DID THIS SEA TRANSPORT COST YOU IN BOAT
FUEL EXPENSES? \$ _____

Q.23 IN THE LAST 12 MONTHS, HAVE YOU SOLD ANY OF THE
FISH WHICH YOU HAVE CAUGHT?

PLEASE TICK THE APPROPRIATE BOX

YES ☐ → go to Q.24
NO ☐

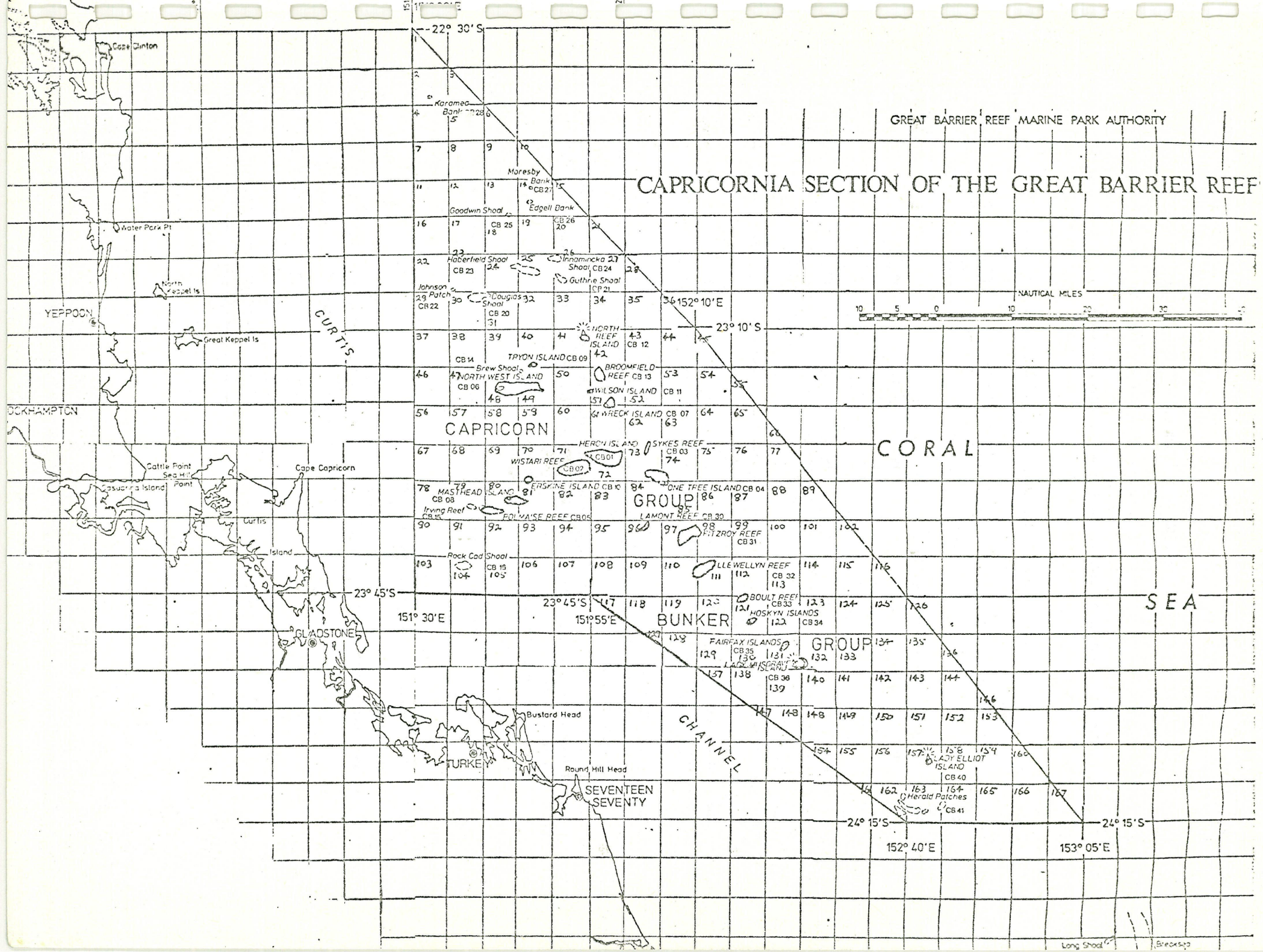
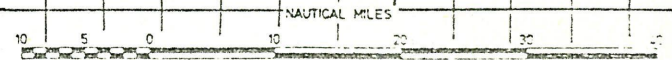
Q.24 ON YOUR LAST TRIP TO THE CAPRICORNIA SECTION, WHAT WAS THE
VALUE OF ANY FISH YOU SOLD?

\$ _____

Q.25 TO WHOM DID YOU SELL THESE FISH?
For example, fish board, hotels, restaurants, friends.

GREAT BARRIER REEF MARINE PARK AUTHORITY

CAPRICORNIA SECTION OF THE GREAT BARRIER REEF



COMMERCIAL FISHING SURVEY

CONDUCTED BY

THE INSTITUTE OF APPLIED SOCIAL RESEARCH - GRIFFITH UNIVERSITY

The first six questions concern your fishing vessel(s). Please fill in a column for each registered commercial fishing vessel you own.

	<div style="border: 1px solid black; padding: 2px;">A</div>	<div style="border: 1px solid black; padding: 2px;">B</div>	<div style="border: 1px solid black; padding: 2px;">C</div>	<div style="border: 1px solid black; padding: 2px;">D</div>
Q.1 WHAT IS THE LENGTH (METRES) OF YOUR BOAT(S)?	_____m	_____m	_____m	_____m
Q.2 IN WHAT YEAR WAS YOUR FISHING BOAT(S) BUILT?	19__	19__	19__	19__
Q.3 IN WHAT YEAR DID <u>YOU</u> PURCHASE OR BUILD THIS BOAT?	19__	19__	19__	19__
Q.4 IF <u>YOU</u> BOUGHT THE BOAT(S) ALREADY BUILT, IN WHAT TOWN WAS IT PURCHASED?	_____	_____	_____	_____
Q.5 IF YOU BUILT THE BOAT(S), IN WHAT TOWN DID YOU PURCHASE <u>MOST</u> OF THE MATERIALS?	_____	_____	_____	_____
Q.6 WHAT IS THE REPLACEMENT VALUE OF YOUR BOAT(S) INCLUDING ANY OF THE FOLLOWING ITEMS YOU MAY HAVE?	\$ _____	\$ _____	\$ _____	\$ _____

(Auxilliary engine(s), Alternator(s), Compressor(s), Refrigeration, Echo Sounder(s), R.D.F., Radio Transceiver(s), Automatic Pilot(s), Trawl Winch, Anchor Winch, Hydraulic Steering, Auxilliary Boat(s), Outboard Motor(s).

(EXCLUDING FISHING GEAR WHICH IS ACCOUNTED FOR IN QUESTIONS 13 AND 15.)

In this series of questions we would like to ask you about the type of fishing you undertake and the returns to you from fishing.

Q.7 IN WHAT AREA(S) DO YOU DO MOST OF YOUR FISHING?

FOR EXAMPLE:

SWAIN REEFS, CURTIS CHANNEL

Q.8 WHAT TYPE OF FISHING DO YOU MAINLY UNDERTAKE?
(TICK ONE BOX)

<input type="checkbox"/>	PRAWN TRAWLING
<input type="checkbox"/>	SCALLOP TRAWLING
<input type="checkbox"/>	PELAGIC FISHING _____ for example, open water fish
<input type="checkbox"/>	DEMERSAL FISHING _____ for example, reef fish
<input type="checkbox"/>	OTHER (specify) _____

Q.9 WHAT WAS YOUR APPROXIMATE GROSS INCOME (i.e., BEFORE TAX) GAINED FROM THE SALE OF YOUR TOTAL SEAFOOD CATCH IN THE 1978/79 FINANCIAL YEAR (JULY 1ST 1978 TO JUNE 30TH 1979).

\$ _____

Q.10 DO YOU EVER FISH IN THE CAPRICORNIA SECTION? SEE ATTACHED MAP.
(TICK ONE BOX)

YES	<input type="checkbox"/>	GO TO QUESTION 11
NO	<input type="checkbox"/>	GO TO QUESTION 13

Q.11 WHAT PERCENTAGE OF YOUR CATCH FROM THE CAPRICORNIA SECTION IS MADE UP OF THE FOLLOWING SEAFOOD TYPES:

SCALLOPS _____
 PRAWNS _____
 DEMERSAL _____
 PELAGIC _____
 100 PERCENT

FOR EXAMPLE:	SCALLOPS	0
	PRAWNS	0
	DEMERSAL	20
	PELAGIC	80
		100 PERCENT

Q.12 WHAT WAS THE APPROXIMATE GROSS INCOME (i.e., BEFORE TAX) GAINED FROM THE SALE OF SEAFOOD YOU CAUGHT IN THE CAPRICORNIA SECTION FOR THE 1978/79 FINANCIAL YEAR?

\$ _____

With the remaining questions we would like to gather information on the expenses you incur in relation to your fishing activities.

FOR THE FOLLOWING LIST OF ITEMS PLEASE INDICATE YOUR APPROXIMATE ANNUAL EXPENDITURE AND, WHERE APPROPRIATE, THE TOWN WHERE YOU PURCHASED THE GREATER PART OF THESE ITEMS.

Q.13 FISHING GEAR MADE OF METAL. FOR EXAMPLE CABLES, LURES, SINKERS ETC.

\$ _____

Q.14 CITY OR TOWN _____

Q.15 FISHING GEAR NOT MADE OF METAL, FOR EXAMPLE, ROPE, NETS, LINES, LIFE JACKETS ETC.

\$ _____

Q.16 CITY OR TOWN _____

Q.17 FOOD FOR CREW AND SKIPPER?

\$ _____

Q.18 CITY OR TOWN _____

Q.19 FUEL FOR ALL FISHING TRIPS?

\$ _____

Q.20 CITY OR TOWN _____

Q.21 REPAIRS AND MAINTENANCE TO FISHING VESSELS(S) AND GEAR.

\$ _____

Q.22 CITY OR TOWN _____

Q.23 LOAN REPAYMENTS, INSURANCE, LICENCE FEES

\$ _____

Q.24 WAGES AND SALARIES TO SKIPPER AND CREW

\$ _____

Q.25 WHAT IS THE NUMBER OF EMPLOYEES INCLUDING THE SKIPPER WHO WORKS:

No.

LESS THAN 3 MONTHS ANNUALLY _____

3 TO 6 MONTHS ANNUALLY _____

6 TO 9 MONTHS ANNUALLY _____

9 TO 12 MONTHS ANNUALLY _____

12 MONTHS ANNUALLY _____

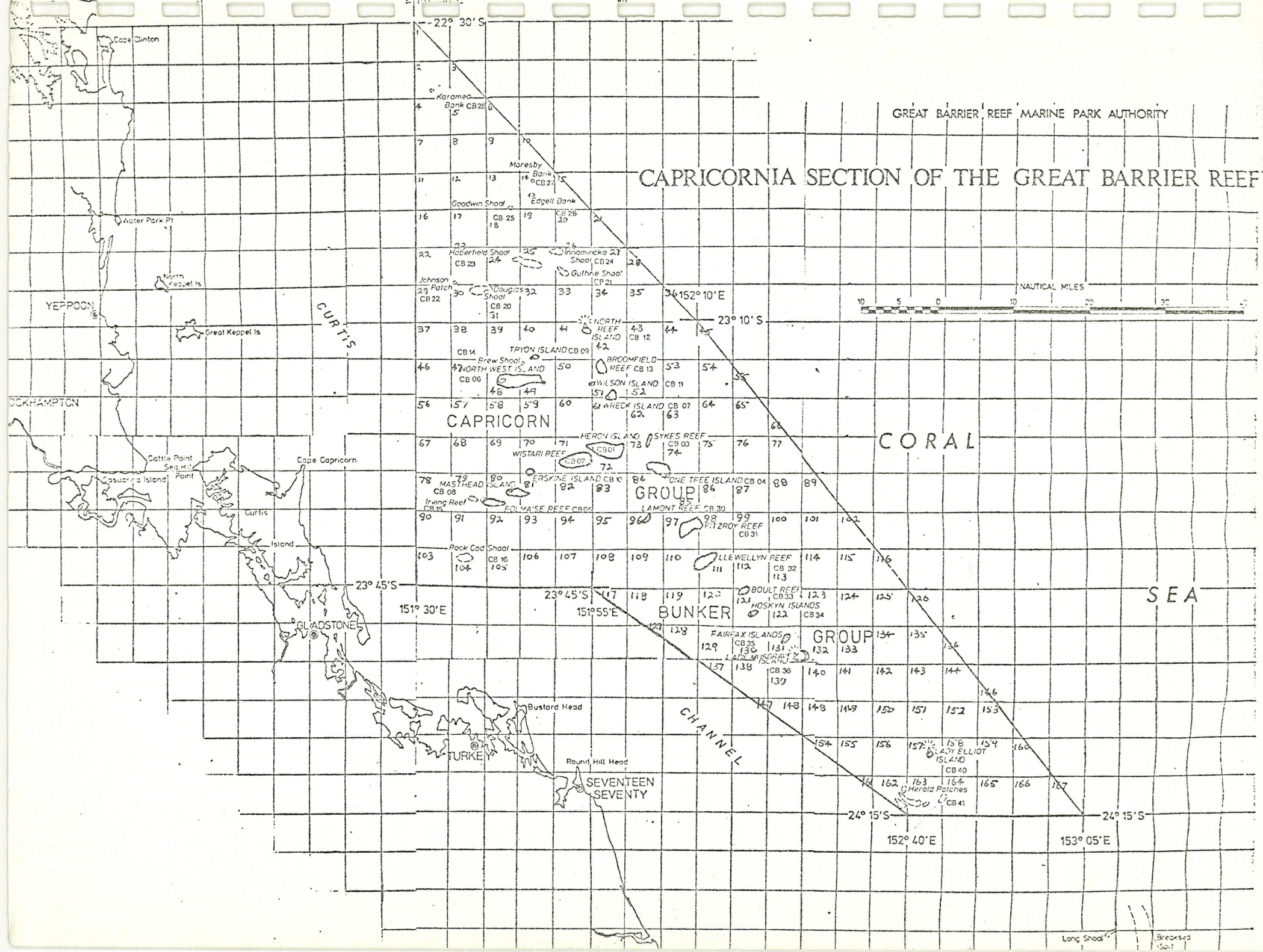
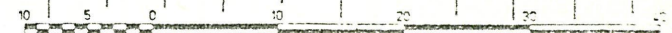
Q.26 WHERE DO YOU SELL YOUR SEAFOOD CATCH?

PLEASE LIST ALL IMPORTANT OUTLETS - For example, FISH BOARD, BUNDABERG
COMMERCIAL WHOLESALER, GLADSTONE
OTHER OUTLETS

GREAT BARRIER REEF MARINE PARK AUTHORITY

CAPRICORNIA SECTION OF THE GREAT BARRIER REEF

NAUTICAL MILES



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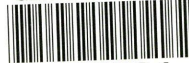
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Economic Characteris
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Capricornia Section

~~SC 2826~~

D. Benzaken	6/92
Jim Higgs	18/2/94
D. Benzaken	20/10/94
A. Peachey	9/11/96
Amis	4/4/97

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