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## FISHING INDUSTRY RESEARCH TRUST ACCOUNT

TITLE OF PROPOSAL/PROJECT: \_\_\_\_\_

CONSUMPTION PATTERNS OF FISH AND SHELLFISH IN THE MORETON  
REGION

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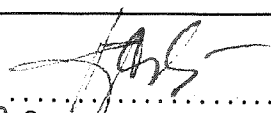
### FUNDS SOUGHT/GRANTED

YEAR	SOUGHT	GRANTED
<u>1982/83</u>	_____	<u>\$ 12,794</u>
<u>1983/84</u>	_____	<u>\$ 5,534</u>
_____	_____	_____
_____	_____	_____

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CONSUMPTION PATTERNS OF FISH AND  
SHELLFISH IN THE MORETON REGION

by

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June 1984

## CONTENTS

1.0	INTRODUCTION	7
	Rationale and Objectives	7
	Role of the Consumer in Marketing	8
	Methodology	9
	- The population surveyed	9
	- Sample selection	11
	- Sampling procedure	11
	- Terminology	13
	- Questionnaire design	14
	Demographic - Socio Economic Background	19
	- Population	19
	- Age	21
	- Household characteristics	22
	- Income	24
	- ethnicity and religion	25
2.0	CONSUMPTION CHARACTERISTICS	28
	Forms of Seafood Consumption	28
	Consumption Frequencies	31
	- Consumption per month	31
	- Consumption and religion	33
	- Consumption and income	38
	Weight of an Average Serving of Seafood	42
	Annual Per Capita Consumption	45
	Species Consumed	49
	- Species consumed or purchased by form	49
	- Species consumed at takeaways and restaurants	55
	- Favourite species	58
	- Most popular species: Moreton Region compared with other centres	60
	- Species consumed and socio-economic features	64
	- Species caught	73
	Household Characteristics of Serving Seafood	74
	- Day of the week when seafood served	74
	- Meals at which seafood served	76
	Ciguatera	77

3.0	PURCHASING PATTERNS	80
	Source of Supply	80
	- Source of supply in Moreton Region	80
	- Source of supply: Moreton Region compared with other centres	80
	Purchasing and Preparation Preferences	85
	- Purchasing preference - fresh fish	85
	- Method of preparation	85
	Reasons for non-consumption	87
	- Non- consumption of all seafood	87
	- Non-consumption of various forms of seafood	87
	- Reasons for non-consumption: Moreton Region compared with other centres	89
	Complaints	91
	- Consumer complaints in the Moreton Region	91
	- Complaints: Moreton Region compared with other centres	94
4.0	RECREATIONAL FISHING	95
5.0	IMPLICATIONS FOR THE FISHING INDUSTRY	98
	- Population	99
	- Income	99
	- Price	100
	- Potential for Increased Consumption	100
	- Range of Seafood Eaten	101
	- Purchase and Preparation	103
	- Reasons for Non-Consumption and Complaints	105
	- Implications	105
6.0	REFERENCES	108
7.0	APPENDICES	110
	I Socio-Economic Categories	110
	II Cross-tabulations	112

#### ACKNOWLEDGEMENT

The majority of funding for the study was provided by the Fishing Industry Research Committee. The authors wish to express their appreciation for this support. Additional funding was provided by the Institute of Applied Social Research, Griffith University and appreciation is expressed for this assistance.

TABLES

1.1	Intercensal growth in population (1976-1981) for shires in surveyed region	21
1.2	Age structure in survey region and Queensland	22
1.3	Household composition in surveyed region and Queensland	23
1.4	Number in household	23
1.5	Household income	24
1.6	Ethnic origin	26
1.7	Religious denomination	27
2.1	Percentage Households Consuming any form of seafood - regional centres	28
2.2	Percentage households consuming any form of seafood - capital cities	29
2.3	Consumption of Seafood by form	30
2.4	Frequency of consumption of all forms of seafood (at home and outside home), poultry and meat	32
2.5	Forms of seafood, poultry and meat consumed, by number of days per month for all religious groups	34
2.6	Percentage of households consuming different forms of seafood in each income group	39
2.7	Average servings of different forms of seafood	43
2.8	Annual per capita consumption	46
2.9	Annual per capita consumption of each form of seafood for capital cities	48
2.10	Species of fresh seafood consumed at home	50
2.11	Frozen seafood purchased for home consumption	51
2.12	Smoked seafood purchased for home consumption	53
2.13	Canned seafood purchased for home consumption	54
2.14	Species/types of seafood purchased at takeaway outlets	55
2.15	Species/types of seafood eaten in restaurants	57
2.16	Favourite seafood of consumers	59
2.17	Popularity of seafood species/types in various centres	61-2
2.18	Most popular species of fresh seafood consumed by different income groups	65
2.19	Most popular species of fresh seafood consumed by different ethnic groups	66
2.20	Most popular species of frozen seafood consumed by different income groups	67

2.21	Most popular frozen species eaten by different ethnic groups	68
2.22	Most popular species of smoked seafood consumed by different income groups	70
2.23	Most popular species of smoked seafood consumed by different ethnic groups	71
2.24	Most popular species of canned seafood consumed by different income groups	72
2.25	Most popular species of canned seafood consumed by different ethnic groups	73
2.26	Species caught/harvested	74
2.27	Days on which different seafood is eaten	75
2.28	Meals at which seafood is eaten	76
3.1	Source of supply of seafood in the Moreton Region	81
3.2	Sources of fresh, frozen, smoked, and canned seafood supplies: Moreton region compared with other centres	82-3
3.3	Form of fresh seafood purchased	85
3.4	Method of preparing seafood	86
3.5	Reasons for non-consumption of seafood	87
3.6	Reasons for non-consumption of various forms of seafood	88
3.7	Reasons for non-consumption of different forms of seafood - comparison among different Queensland centres	90-1
3.8	Percentage of consumers complaining about seafood purchased	92
3.9	Complaints regarding seafood purchased	93
3.10	Complaints regarding different forms of seafood in Moreton Region and Darwin	94

#### FIGURES

1.1	Location of the Moreton Region	10
1.2	Population growth pattern in the Moreton Region 1976-1981	20

## 1.0 INTRODUCTION

### Rationale and Objectives

Research into seafood consumption is very essential to facilitate the efficient functioning of the marketing system, and in the long run, will benefit the entire fishing industry.

Apart from the consumption surveys of the Australian capital cities, (Department of Primary Industry and PA Consulting Services, 1978) Darwin and other regional centres in Queensland, (Bandaranaike 1981, 1984), very little research has been conducted in this field. Therefore, the extension of this research to the Moreton Region should yield valuable data for non-metropolitan areas. The Moreton Region is defined below.

Information gathered in this research on levels of seafood consumption, households involved in amateur fishing, sources of purchase, eating habits, opinions and attitudes, together with the socio-economic background of the population will be of immediate benefit to the marketing sector to plan the distribution of the produce and also at the same time meet consumer demand.

The report presents the results of the survey of seafood (fish and shellfish) consumption patterns in the Moreton Region. Specifically the objectives addressed in the report are as follows:

- (i) to discover seafood (fish and shellfish) consumption per head;
- (ii) to analyse variations in seafood consumption patterns within the Moreton Region and compare these with that of the capital city and other centres;
- (iii) to examine the differences in seafood purchasing habits and relate them to socio-economic variables of the population;
- (iv) to investigate the reasons for the relatively low seafood consumption levels;
- (v) to study the influence of specific socio-economic variables on seafood consumption;
- (vi) to identify varying attitudes towards seafood consumption;
- (vii) to find the role played by amateur fishing households.



### Role of the Consumer in Marketing

The development of effective marketing strategies is based upon an understanding of the consumer and his behaviour. This research attempts to understand consumer behaviour with reference to seafood consumption with a view to developing suitable marketing strategies.

Consumer behaviour has been defined as the "acts of individuals directly involved in obtaining and using economic goods and services (in this instance, seafood products) including the decision processes that precede and determine these acts" (Engel et al, 1968). Therefore, in this report analysis of consumer behaviour includes what people consume, where, how often and under what conditions these goods and services are consumed.

It is important to note that there is a subtle difference between the consumer, the buyer and the decision maker. The decision maker is the individual who makes the decision with reference to the items to be purchased. He is not necessarily the consumer or the buyer. At the same time the consumer of a given product and the person making the purchase are often two different people. In many instances the purchase is made for a household (the sampling unit in this survey), and the buyer or the decision maker are only one of those who will share in its use. In order to differentiate between these individuals, this research has a specific question directed to the respondent regarding the individual responsible for decision making in the purchase of seafood. The interaction between the consumer, the buyer, and the decision maker determines the particular produce which is chosen. In this research the "household" was selected as the sampling unit in order to include the influences of the total family (or the group) on the behaviour of the buyer.

This survey deals with a micromarketing problem. The data presented should assist in guiding how marketing bodies and the fishing industry should react to consumer demand and how the distribution of seafood could be made more efficient. Data presented in this report will be of great importance to fishermen, the seafood marketers and the fishing industry as a whole. The marketing management strategies suggested in the last chapter should benefit both the consumer and marketing bodies.

## Methodology

### The population surveyed

This report presents the results of a survey of fish and shellfish consumption in the Moreton Region of Queensland. The Moreton Region is defined, for present purposes, as the amalgamation of the Moreton Statistical Division and the Brisbane Statistical Division excluding the City of Brisbane. The southern boundary of the region is the Queensland/New South Wales border and the northern boundary is the northern boundary of the Noosa Shire. The western boundary is such that the region encompasses the shires of Beaudesert, Boonah, Caboolture, Esk, Gatton, Kilcoy and Laidley. This means that within the region are localities which are commonly referred to as parts of Brisbane and the important cities of Ipswich, Logan, the Gold Coast and Redcliffe as well as the "coastal" shires between the border and Noosa. The 1981 census shows that the population of this area was 671,592 persons. Between the 1976 census and the 1981, the population in the region increased by approximately 38.57 percent. Figure 1.1 shows the location of the Moreton Region.

The area surveyed was chosen for two reasons. Firstly, its relative importance in terms of the population of Queensland: the region contains just under one-third of the Queensland population (in fact, 29.26 percent). Secondly, the area was selected because it would complement previous similar studies undertaken in most other major population centres in the state, and therefore make for a reasonably comprehensive cover of seafood consumption in Queensland. Previous surveys have been done for Bowen, Cairns, Charters Towers, Hughenden, Mareeba, Mt Isa, Rockhampton, Townsville (Bandaranaike, 1977, 1978a, 1978b, 1978c, and Bandaranaike and Hampton, 1979), Brisbane (PA Consulting Services and Commonwealth Department of Primary Industries, 1978) and Darwin (Bandaranaike, 1984). The previous survey of Brisbane households was confined to the Brisbane Statistical Division, excluding parts of the shires of Albert, Beaudesert, Caboolture, Moreton and Pine Rivers and all of the shire of Redland, which areas are covered by the present survey. These previous surveys accounted for 44.79 percent of the Queensland population (as at the 1976 census).

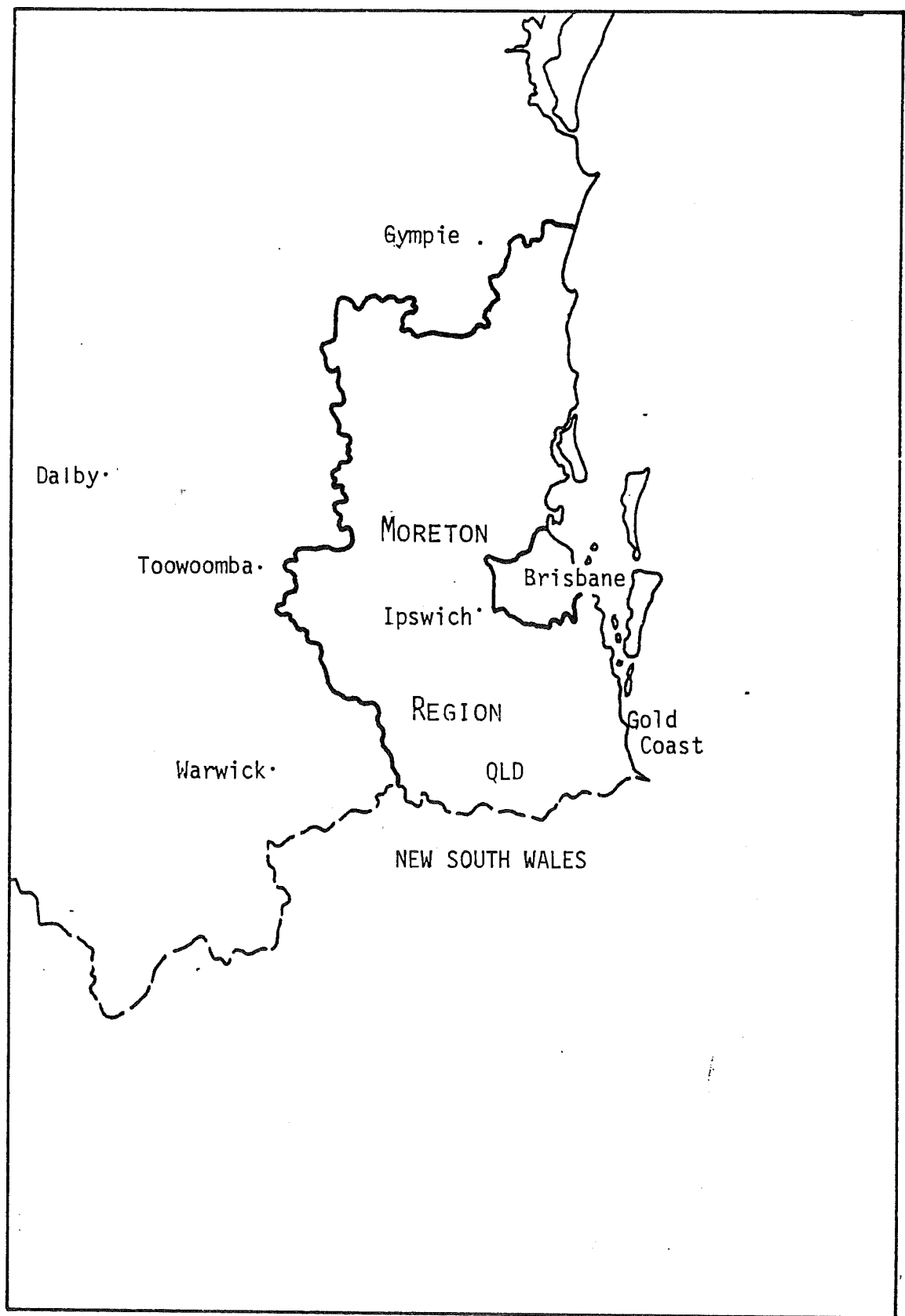


FIGURE 1.1 LOCATION OF THE MORETON REGION.

### Sample selection

The *household* was selected as the sampling unit since the decision making process and the act of consumption is more meaningfully measured within a household as opposed to a particular individual. A 'household' was defined as a residence where one or more persons shared food supplies. In total 1500 households were surveyed out of a possible 203,298 households in the Moreton Region (as defined above.) This represents 0.7 percent of all households in the region as compared with the survey by PA Consulting Services and Commonwealth Department of Primary Industries (1978) which surveyed 0.3 percent of all households in the defined population.

The particular households were established using a procedure developed with the co-operation of the Australian Bureau of Statistics. The sampling frame consisted of the total number of private dwelling units in the selected census districts within the region. The region was stratified into eight strata, containing a total of 90 census districts.

The dwellings sampled were chosen by randomly selecting a starting point within each census district and then proceeding along a predestined route, surveying every "k" th dwelling, where "k" is a given skip interval. The random starting point was chosen with the aid of a superimposed grid, with grid co-ordinates selected at random. The predestined route involved moving in an anticlockwise direction around a block, sampling each "k" th dwelling, then proceeding to the nearest house on the nearest (unsampled) block within the census district.

### Sampling procedure

The survey was undertaken over a one year period, commencing in November 1982. Interviewing was organised into four periods: November-December 1982, January-February 1983, May-July 1983 and September to November 1983. The interviews were conducted over four periods of the year in order to account for any seasonal variations in the catch of fresh fish and different consumption patterns. An initial form of the questionnaire was tested in a pilot survey of approximately 100 households in various parts of the region.

Interviewers were instructed to make up to three calls at varying times of the day and on different days of the week. If after the third call no contact

was made with the respondent, the household located immediately to the right of the one selected was used as a replacement. The same principle was applied in the case of a non-response.

Interviews were conducted with the person responsible for the purchase of seafood or had knowledge regarding the purchase and or preparation of seafood in the household. Only persons who had lived in the Moreton Region for a period of more than six months were interviewed. It was felt that within a period of six months a person would usually be expected to establish his routine of household purchasing patterns.

In a small number of ethnic households some difficulty in interpretation was experienced, this being partly overcome with the aid of children as interpreters. Problems arise in assigning a single category for 'religion' and 'ethnic origin' to a household as opposed to an individual. However, in many cases little difficulty was encountered as generally respondents were willing to volunteer additional information facilitating accurate classification.

Where problems arose with respect to religion, decisions were based initially on adults only. Where Christian and non-Christian religions were present and where the predominance of one faith could not be established from information supplied by the respondent or the religion of children did not give a clear indication of religious direction, the household was classed as 'mixed'. Similarly, in households where the adults were split between 'Catholic' and 'all other Christian' the religion of the children was used as an indicator.

Assessment of ethnicity was based on adults only. Where different ethnic backgrounds (i.e. other than Australian) occurred between or among adults these were classed as mixed. In cases where adults of Australian and other ethnic backgrounds occurred an attempt to define 'head' of household by conversation with the respondent was made. For the purposes of the survey 'head' of household refers to the person having most influence on the way in which seafood was purchased and/or cooked. In this respect the question 'Does ethnic background influence the way in which seafood is purchased and or eaten?' provided useful additional information.

## Terminology

Some variation is evident amongst surveys regarding the specific use of terms such as 'fish' 'shellfish' and 'seafood'. For example, some surveys use the term 'seafood' and 'shellfish' synonymously. Definition of terminology used in the questionnaire and in the ensuing discussion follows:

*Seafood:* The most general term encompassing all of the fresh and saltwater organisms served as food for human consumption.

*Fish:* Subgroup of seafood including all of the vertebrate cartilaginous and non-cartilaginous fresh and saltwater organisms served for human consumption, viz bony 'fin' fish, sharks, rays, eels etc.

*Shellfish:* Subgroup of seafood including all of the non-vertebrate marine organisms, particularly molluscs and crustaceans, viz lobster, prawns, oysters, squid etc.

Each of the above terms was classified according to the form of purchase. Definitions relating to form follow:

*Fresh and Frozen Unpackaged Seafood:* This term covers 'wet' forms of seafood. The seafood may be frozen but is unpackaged. It includes seafood caught or received as gifts from friends or relatives. In the ensuing report the term 'fresh' is used for this form.

*Frozen Pre-Packaged:* All frozen seafood in cardboard or similar cartons and requiring continuous refrigeration. The term 'frozen' is used in this report for this form.

*Smoked, Kippered, Cured, Dried:* The terms are self explanatory except that any canned seafood in these forms is not included. the term 'smoked' is used as an inclusive term in the text.

*Canned:* Any seafood in cans or bottles. Processed foods ostensibly containing major amounts of seafood may be included (e.g. fish rissole mix).

Many questions in the survey refer to 'species' of seafoods. In effect species in a zoological sense clearly cannot be used, and in the context of the

survey 'species' refers to the common (perceived) name. This may lead to some confusion where the same or similar names refer to different (biological) species (e.g. Jewfish or Dhufish). This problem is likely to occur where there is change in the fishing vernacular over geographical regions and where marketing and retail outlets use a degree of latitude in naming the product. In this respect the terms 'cod' (as a takeaway species) and 'barramundi' (primarily a restaurant line) are examples of a single name possibly referring to several different species of fish.

Where possible ambiguity was overcome by careful questioning by the interviewer who made use of printed species lists as an aid. Some discrepancies were also overcome at the editing stage.

The survey reports information regarding species based on consumers' responses regarding the 'species' (common names) they consume. As such the degree to which a common name may actually refer to a number of zoological species cannot be accurately assessed in the present study.

#### Questionnaire design

The questionnaire was designed to analyse consumer behaviour and purchasing patterns relating to fish and shellfish consumption. The data collected via this questionnaire was comparable to other seafood consumption data collected in North and Centre Queensland, and Australian capital cities, including Darwin. There is some difference amongst the various reports regarding the terminology used. Aspects of terminology have been discussed in the previous section.

In administering the questionnaire, the period of recall was confined to the 'past six months' since it was felt that a longer period of recall could cause greater error in judgment. The survey covered all aspects of consumption irrespective of the source of seafood; that is, whether seafood was directly purchased from a retail or wholesale outlet, whether it was a gift or received from another, or whether it was from their own catch. All these instances were considered 'consumer households' for the purpose of the survey. Further, it must be noted that 'household consumption' in this research refers exclusively to human consumption as against consumption of seafood by household pets.

The questionnaire was divided into six parts and an introduction. In the introduction information was sought on consumers and non-consumers of all forms

of seafood. Parts I to IV dealt with the different forms of seafood. For each form of seafood, the following information was recorded:-

- reasons for non-consumption of a particular form of seafood
- major species consumed within a household
- day of the week seafood was eaten
- meal at which was consumed
- source(s) of purchase
- weight of an average serving of seafood
- complaints of consumer households.

Respondents indicated several reasons for non-consumption of either seafood in general or specific types. These can be broadly grouped into nine categories as follows:-

- (i) those who prefer only fresh seafood (usually fishing households)
- (ii) poor packaging and presentation
- (iii) poor quality and taste
- (iv) high price
- (v) unavailability of species or particular forms of seafood
- (vi) suspect product - false labelling, contamination, poisoning etc.
- (vii) preference of other forms of seafood - i.e. 'fresh' in preference to 'smoked' etc.
- (viii) prefer meat - either owing to dietary and medical reasons or owing to a total dislike of seafood
- (ix) other (lack of knowledge in preparing seafood, not tasted the product at all, no particular reason etc.).

This question relating to reasons for non-consumption, gave valuable information regarding the existing limitations and the possible ways of improving the seafood market in the future.

Source of purchase or acquisition of the different forms of seafood were identified, ranging from the supermarket, speciality fish shop, neighbourhood store, friends and relatives, mobile van or the delicatessen. This question gave useful information regarding the supply characteristics of seafood in the Moreton Region. It identified problems of store location and accessibility of the product.



Information on the weight of an average serving of fish and shellfish within a household together with the monthly consumption frequency were used to calculate the per capita consumption of seafood.

Of particular concern was the ability of respondents to estimate the weight of seafood consumed. To assist in overcoming this problem visual aids (e.g. can sizes) were used in the situation where the respondent was unsure. Particularly with the consumption of fresh fish, where purchases (or catches) were given in terms of fillets, whole fish, or pieces of fish, portion sizes were converted to weight by ratios based on information provided by marketing and retail outlets. Respondents were also asked the day of the week and the meals at which seafood was served.

Since the research was designed to assist in improving the marketing of seafood, a question was asked regarding the general level of satisfaction in the purchase of seafood products. Owing to the multiplicity of replies, the responses were grouped into six categories as follows:-

- (i) poor packaging and presentation
- (ii) inferior quality, taste and smell
- (iii) high price
- (iv) unavailability
- (v) suspect product
- (vi) other (e.g. store location)

Recreational fishing was considered an important aspect of seafood consumption, particularly in the Moreton Region. Therefore in Part I of the questionnaire characteristics pertaining to the fishing activity of the household was recorded. Questions were asked with reference to the number of members in a household engaged in recreational fishing, length (in days) and frequency of those fishing trips, average catch per trip, location of fishing activity, species caught, reasons for fishing and fishing experience. In addition, each household was requested to supply information on the value of fishing gear (including boats) and fishing costs.

Since there is no official record of amateur fishing activity these data will be of use in any future management of recreational fishing.

Part V of the questionnaire examined general consumption characteristics including various attitudes to consumption. It was necessary to find out how

many people within the household did not consume seafood, since this affected the calculation of per capita consumption. The preparation of seafood was regarded as another important aspect affecting consumption, and for this, information was gathered on different methods of cooking seafood at home. Frequency of consumption (per month) of different forms of seafood, together with other competing food products such as poultry and meat, was also recorded in this section.

In order to facilitate future planning, it was found necessary to find out the favourite seafood of the household. A maximum of two species only was recorded in this question. Often there was a difference between the favourite seafood of the household and that which was most frequently consumed by the household, the discrepancy being a result of unavailability, high price, and the prestige factor attached to some species. For example, some householders claimed they consumed prawns or crabs on a regular basis, when in actual fact their frequency of consumptions of these species was relatively low, but it was "prestigious" to state that one consumed these species on a regular basis.

Another question included to test the market potential for seafood was the willingness of the consumer household to try new and non traditional species. Here, only the general attitude of the household was recorded and not the individual species desired.

Since seafood is also consumed outside the home, consumption at restaurants and takeaway outlets was recorded. The latter category included fish and chip shops, snack bars, takeaway Chinese food shops and any other fast food retail outlet. A seafood meal eaten at a club or hotel was classified as a restaurant meal. Information pertaining to species consumed and frequency of consumption at these places were noted.

Owing to the recent reportings of ciguatera poisoning it was necessary to find out via the survey, whether the households actually knew what was meant specifically by the term "ciguatera" or whether it was a vague term in people's minds and thus only a perceived problem. The effect and the fear of ciguatera poisoning, on consumption patterns was analysed.

Finally, Part VI dealt with demographic and socio-economic variables as listed below:

- (i) Household composition
- (ii) Number of persons per household
- (iii) Number of persons employed per household
- (iv) Household income
- (v) Religion
- (vi) Ethnic origin

Data were recorded for each individual member of the household and then aggregated as a "household" characteristic. For example, in the variable "household composition" data were gathered in the form of age and sex for each individual member of the household. This information was used to place each household in one of the six categories identified in Table I, Appendix I. This variable was thus used to determine the stage in the life cycle, for each household.

The net income of each individual in the household was recorded in terms of a class interval. The median incomes of these classes were added for all members of the household to yield total household income, as indicated in Table II Appendix I.

Religious groups varied widely, as indicated in Table III, of Appendix I. Six major categories were identified. The variable ethnic origin refers to the country of origin of the respondent/household and not his/her nationality. Certain identification problems were encountered in measuring this variable. There were multiplicity of ethnic groups, especially when mixed marriages etc. were considered. Therefore, for convenience of analysis nine major ethnic groupings were identified as listed in Table IV of Appendix I.

### Demographic - Socio Economic Background

Demographic and socio-economic features of the population have an important influence on consumption patterns, potential demand and marketing strategies. The following section presents a general outline of characteristics of the surveyed region. For purpose of discussion the surveyed region is often divided into its component statistical divisions. The Moreton Region (surveyed) consists of the Moreton Statistical Division plus the Brisbane Statistical Division minus the City of Brisbane subdivision.

#### Population

Population of the region sampled was 671,592 at the 1981 census, which figure represents 29.3% of the total Queensland population. The population is comparable with that of Brisbane City (689,378) and was 20% of Sydney's and 24% of Melbourne's population at the same time (A.B.S. 1983a). (Australian Bureau of Statistics is abbreviated in the text as A.B.S. for conciseness but is referenced in full).

The region presents an interesting growth pattern which is summarized in figure 1.2. Between the intercensal period 1976-81 the surveyed region increased in population by 38.6% whilst at the same time Brisbane City showed a decline of 1.1% (A.B.S. 1983a). The figures indicate the broad regional variation in population growth, with the Moreton Statistical Division showing the greatest propensity to increase. However, finer definition of growth within the region would be required for accurate assessment of consumer demand and planning marketing strategy. Table 1.1 shows population growth in the intercensal period 1976-81 for the cities and shires which make up the surveyed region. Broadly speaking development in the south east has occurred in concentric rings around Brisbane and Ipswich Cities (both of which have slight negative growth) and around coastal nuclei. The greatest growth has occurred in the coastal shires and Moreton Shire (refer Figure 1.2). From the point of view of consumption demand and marketing, identification of the nuclei of development within shires would be a necessary finer level of resolution. For example, whilst Moreton Shire showed an intercensal growth in population of 58.0% the urban centre Rosewood within the shire showed a 2.6% decline as development had occurred closer to Ipswich City.

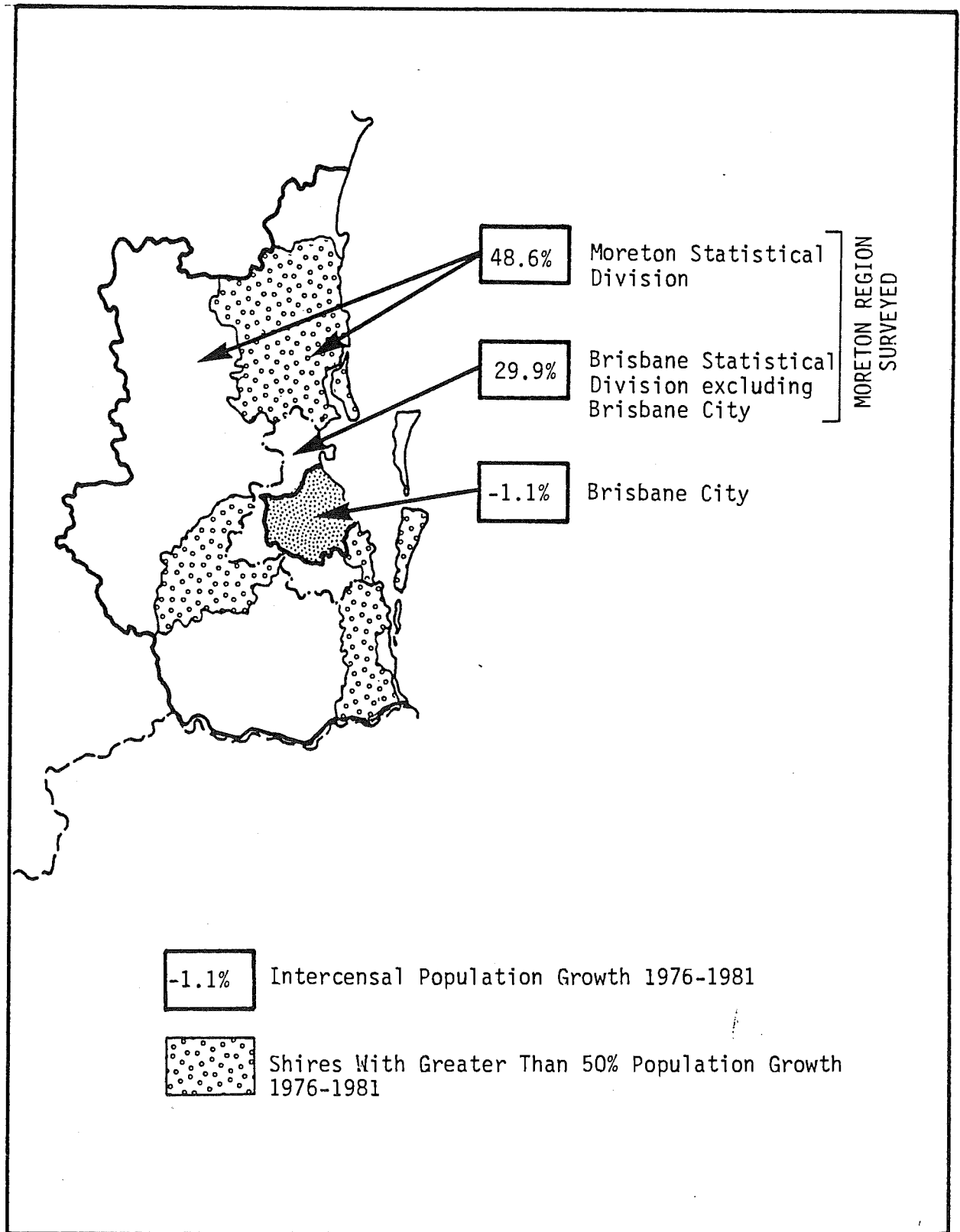


FIGURE 1.2 POPULATION GROWTH PATTERN IN THE MORETON REGION 1976-1981.

TABLE 1.1: INTERCENSAL GROWTH IN POPULATION (1976-1981) FOR SHIRES IN THE SURVEYED REGION

CITY/SHIRE	% GROWTH
Albert	126.1
Beaudesert	43.7
Boonah	-2.1
Caboolture	68.2
Esk	35.5
Gatton	35.5
Kilcoy	-1.7
Laidley	16.0
Landsborough	74.9
Maroochy	51.5
Moreton	58.2
Noosa	38.9
Pine Rivers	28.7
Redland	54.4
Gold Coast (City)	24.6
Ipswich (City)	-1.4
Logan (City)	49.1
Redcliffe (City)	8.1

Source: A.B.S. (1983b).

#### Age

The age structure for the region and Queensland is tabulated in Table 1.2. The groupings have been condensed from census data to show major groups only.

There is little variation between the surveyed region and the Queensland average. The age group responsible for population growth is usually the one between 15 and 35 years of age. In the region this represents 32.3% of the

TABLE 1.2: AGE STRUCTURE IN SURVEY REGION AND QUEENSLAND

AGE	BALANCE OF BRISBANE DIVISION	MORETON DIVISION	MORETON REGION (A.B.S.)	QLD
0-4	10.7	6.9	8.8	7.9
5-9	11.3	8.3	9.8	8.9
10-14	9.9	8.7	9.3	9.1
15-34	34.9	29.7	32.3	33.9
35-64	26.4	32.9	29.6	30.4
65+	6.8	13.6	10.2	9.7

Source: A.B.S. 1983b,

population. Marketing innovation is often most acceptable to the younger portion of the population. Over 60% of the population are less than 35 years of age. Potential for increased consumption would seem possible.

Variation within the surveyed region is shown in Table 1.2 also. The balance of the Brisbane Statistical Division shows fewer persons in older generations (33.2%, above 34 years of age) and more in the youngest groups (22.0%, less than 10 years of age) when compared with the Moreton Statistical Division (46.5% and 15.2% respectively). The former represents the most recently settled and established 'concentric' zone around Brisbane City and exhibits the characteristic of high fertility and single family dwellings, found by Timms (1971). Similar development occurs around nuclei in the Moreton Statistical Division but the figures are modified by a large long-established rural area and by the propensity for retired people to settle in coastal resort areas.

#### Household characteristics

The composition of households is shown in table 1.3 in broadly summarized form.

TABLE 1.3: HOUSEHOLD COMPOSITION IN SURVEYED REGION AND QUEENSLAND

COMPOSITION	MORETON REGION (A.B.S.)	PRESENT SURVEY	QUEENSLAND
Adults with children	45.7	48.9	42.3
Adult(s) only	54.4	50.1	57.6

Source: Other than present survey - A.B.S. 1982 1983b.

Both Australian Bureau of Statistic's figures for the surveyed region and the actual survey results show a higher proportion of households with children than for Queensland as a whole. The survey results may be slightly higher because of the greater likelihood of adults without children to be out on the three occasions on which interviewers were required to call. Also the Australian Bureau of Statistic's figures do not include non-family members.

Another important indicator of volume of consumption and per capita consumption is the actual number in the household. The survey results are shown in Table 1.4.

TABLE 1.4: NUMBER IN HOUSEHOLD

No of Persons	Survey Results(%)
1	9.3
2	31.6
3	17.3
4	21.1
5	14.4
6+	6.2



Almost 85% of households had between 2 and 5 persons (inclusive), almost half had 2 to 3 people and six percent had 6 or more persons. Average household size of the survey was 3.1 persons, closely corresponding to the 1981 census average of 3.3 for the same region (A.B.S. 1983a).

#### Income

The purchasing power of the community is reflected in employment and income characteristics.

Details of household income are presented in Table 1.5.

TABLE 1.5: HOUSEHOLD INCOME

Income*	Balance of Brisbane Division	Moreton Division	Present Survey Results
Less than 8001	21.3	30.1	23.7
8001 - 12000	16.1	17.5	16.5
12001 - 18000	24.7	20.3	22.1
18001 - 26000	22.7	17.6	24.6
More than 26000	15.0	14.5	13.1

Source: Other than present survey A.B.S. (1982 1983b).

\* Calculations not including 'not stated' category.

Almost 38% of incomes were above \$18,000. The Australian Bureau of Statistic's figures for the two parts of the surveyed region show the Moreton Division to have fewer in the higher income groups (above \$18,000) and more in the lowest income group (less than \$8,001) as compared with the Balance of the Brisbane Division. This would be consistent with a greater pensioner component in the Moreton Division, a feature already suggested by the figures on the age distribution in that Division. The Moreton Division has a slightly higher unemployment level. Such variation may have an effect on marketing strategies.

As well as absolute level of income, an important variable is the actual proportion of income spent on seafood. Only general data are available from a

survey conducted in 1975/76. (A.B.S. 1979). In Queensland 20% of the average weekly expenditure was spent on food whilst a quarter of this (5.2% of the total weekly expenditure) was spent on meat and fish. The relative amounts spend on meat and fish were not canvassed in the survey.

#### Ethnicity and religion

Overseas born members of the population may retain the consumption characteristics of their homeland which may influence the way in which seafood is purchased and/or prepared. The ethnic population in the survey was small and hence would have little influence on the consumption patterns of the local population. The table 1.6 shows the breakdown of ethnic groups within the region. The survey reveals a higher ethnic population than that suggested by the Australian Bureau of Statistics census figures. The former did not specify that the respondent had to be born overseas. Further, the present classification was made on a household basis such that the children of overseas parents were regarded in that ethnic group. The group from the United Kingdom is largest but this group is unlikely to differ markedly from Australian born consumers in their purchasing and preparation methods. Groups most likely to differ in consumption characteristics and comprise a distinct market segment are the smallest. Only 26% of consumers from ethnic groups responded that their ethnic background influenced the way in which seafood was purchased or prepared.

TABLE 1.6: ETHNIC ORIGIN

Birthplace	Moreton Region (A.B.S.)*	Survey Results
United Kingdom	8.8	12.4
Adriatic/Middle East	.5	.6
European	2.8	4.3
Asian	.7	.9
New Zealand	2.8	2.4
Other	1.3	3.3
TOTAL	16.9	23.9

\*Source: A.B.S. 1982.

Traditionally religious beliefs have had an influence on seafood consumption patterns of certain consumer groups, particularly the Catholic community. However, currently this influence is only marginal with some Catholics substituting seafood for meat on Fridays. The religious diversity of the community is shown in table 1.7. The Christian groups (Catholic and other Christian) dominate whilst the proportion of Catholics in the sampled region is less than the average for Queensland.

TABLE 1.7: RELIGIOUS DENOMINATION

Religion	Moreton Region (A.B.S.)	Present Survey Results	Queensland
Catholic	20.4	19.8	23.6
Other Christian	55.3	57.5	51.4
Non Christian	.4	2.4	.5
No Religion	11.0	8.4	11.5
Other (mixed household, not stated)	12.8	11.7	13.0

## 2.0 CONSUMPTION CHARACTERISTICS

### Forms of Seafood Consumption

Nearly ninety-two percent (91.7%) of all households surveyed in the Moreton Region consumed some form of seafood. This percentage is relatively high when compared with the area immediately adjacent to the Moreton Region, the Brisbane Statistical Division where 86.1 percent of households consume seafood. It must be noted that the Capital cities survey (excluding Darwin) was carried out in 1978. However, if a 5 percent rate of increase was assumed over the five year period, still the Moreton Region would have a higher rate of consumption. The higher consumption rate of the former, could possibly be attributed to a greater propensity for coastal households to undertake recreational fishing.

The general popularity of seafood in Queensland is supported by the high rates of consumption in some of the other regional centres like Bowen (98%), Cairns (92%) and Townsville (91%) - Table 2.1. Table 2.2 gives the percentage of households consuming some form of seafood. It is evident that the northern most capital, Darwin, has one of the highest rates of consumption in all Australian cities.

TABLE 2.1: PERCENTAGE HOUSEHOLDS CONSUMING ANY FORM OF SEAFOOD - REGIONAL CENTRES

LOCATION	PERCENT
Moreton	91.7
Brisbane	86.1
Bowen	98
Cairns	92
Charters Towers	86
Hughenden	82
Mareeba	100
Mount Isa	90
Townsville	91

Source: Brisbane (PA Consulting Services and Commonwealth Department of Primary Industries 1978), other towns (Bandaranaike, 1983).

TABLE 2.2: PERCENTAGE HOUSEHOLDS CONSUMING ANY FORM OF SEAFOOD - CAPITAL CITIES

LOCATION	PERCENT
Adelaide	81.3
Brisbane	86.1
Canberra	84.5
Darwin	95.8
Hobart	85.6
Melbourne	81.2
Perth	79.5
Sydney	82.2

Source: Darwin (Bandaranaike, 1983), other capital cities.

Consumption of seafood varies widely among the different forms as illustrated in Table 2.3. Among the regional centres of Queensland whilst half the centres have a higher percentage of households consuming fresh seafood (Moreton, Mareeba, Mount Isa, Rockhampton, Townsville) the other half, have a higher consumption ratio in canned seafood (Bowen, Cairns, Charters Towers, Hughenden, Mackay). However, in most instances the differences in the percentage households consuming fresh and canned seafood is very small. Amongst most towns, frozen pre-packaged seafood would be the next most popular followed by smoked/cured/dried seafood. It may be noted that there are a few exceptions such as Cairns (Table 2.3) where smoked fish consumption was marginally greater than that of frozen seafoods. The overall trend would be true of most Australian towns.

Within the Moreton region the percentage of households consuming the different forms of seafood was well within the average rates of consumption for these forms at other regional centres. Whilst the percentage of households consuming fresh seafood in the Moreton region (77.6%) was similar to that of Cairns and Bowen (76%), the consumption of frozen pre-packaged seafood (41.1%) was similar to Mackay (40%) or Townsville (42%) and canned seafood (72.4%) was consumed by a similar percentage of households at Mackay (73%).

TABLE 2.3: CONSUMPTION OF SEAFOOD BY FORM

LOCATION	PERCENTAGE OF HOUSEHOLDS			
	Fresh (%)	Frozen (pre-packaged) (%)	Smoked (%)	Canned (%)
Moreton	77.6	41.1	26.6	72.4
Bowen	76	32	28	78
Cairns	76	39	40	79
Charters Towers	66	42	26	69
Hughenden	68	62	20	75
Mackay	71	40	30	73
Mareeba	92	31	11	74
Mount Isa	70	51	21	65
Rockhampton	81	47	23	77
Townsville	97	42	32	87
Darwin	90	41	25	80

Source: For other than the Moreton Region - Bandaranaike, 1981, 1983.

There is no doubt that the demand for fresh seafood in preference to other forms, will always remain high in Australia. In fact it has been reported in the United States that the consumption levels of canned seafood are decreasing (Australian Fisheries, August, 1983). Consumers are becoming more aware of fresh quality food and where possible will reduce the consumption of equivalent canned or frozen foods. On the other hand changing life styles may support pre-packaged products in both fresh and frozen forms, mainly from the point of view of convenience and ease of handling. In the Moreton Region, the data showed a strong demand for fresh seafood, yet the percentage consuming this form was not as high as some of the more northern regional centres such as Rockhampton and Townsville. It is the opinion of the researchers that this demand will increase in the future, to at least 90 percent of the households consuming fresh seafood

by the year 2000. In a resource rich area such as the Moreton Region with the aid of correct marketing management practices this target should not be difficult. Some of these management techniques are discussed in the last chapter.

#### Consumption Frequencies

This section discusses frequencies of seafood consumption, such as the number of days seafood is consumed, the weight (in grams) of an average serving of seafood at home, and the annual per capita consumption of different forms of seafood. Information on consumption frequencies enables seafood marketers to plan ahead their supplies of seafood to the market in an attempt to satisfy consumer demand.

##### Consumption per month

The consumption frequencies for the different forms of seafood, meat and poultry consumed at home together with consumption outside the home are given in Table 2.4. It is apparent from this table that the average consumption of seafood, (at home) per month was approximately one to two days in all forms of fish and fresh shellfish. In the other forms of shellfish (frozen, smoked, canned) the average household consumption frequency decreased to less than once per month. In the case of poultry the average monthly consumption (3-4 days) was not much higher than most forms of seafood, but in the case of meat the average frequency of consumption per month, was much higher (15-20 days). For meals eaten outside the home, the average frequency of consumption at restaurants was less than once per month, for takeaway outlets it was one to two times per month.



TABLE 2.4: FREQUENCY OF CONSUMPTION OF ALL FORMS OF SEAFOOD (AT HOME AND OUTSIDE HOME), POULTRY AND MEAT:  
PERCENTAGE CONSUMERS

Number of Days per Month	Percentage Consumers In Each Form											
	Fresh Fish	Frozen PP Fish	Smoked Fish	Canned Fish	Fresh Shellfish	Frozen Shellfish	Smoked Shellfish	Canned Shellfish	Poultry	Meat	Takeaway	Restaurants
< 1	11.8	21.6	33.4	16.0	32.5	46.4	58.8	44.5	3.0	0.5	35.7	56.8
1-2	38.1	47.4	54.6	44.2	48.8	42.9	23.5	41.6	22.1	1.3	50.3	35.1
3-4	32.3	22.5	9.2	28.3	13.4	8.3	14.7	11.6	46.5	2.9	11.7	5.7
5-6	5.8	3.4	0.8	4.3	2.7	1.2	0.0	0.6	8.6	0.7	1.2	0.6
7-10	8.2	3.2	1.1	4.8	1.4	1.2	0.0	0.0	15.2	6.3	0.8	0.8
11-14	1.7	0.7	0.0	1.2	0.6	0.0	2.9	0.6	2.7	10.3	0.1	0.1
15-20	1.6	0.4	0.3	0.7	0.3	0.0	0.0	0.6	1.2	36.7	0.6	0.6
21-25	0.3	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.2	19.5	0.1	0.1
26-30	0.1	0.4	0.0	0.3	0.2	0.0	0.0	0.6	0.4	19.8	0.3	0.1
> 30	0.2	0.2	0.6	0.2	0.2	0.0	0.0	0.0	0.1	1.9	0.1	0.0

The relationship between the number of days per month seafood was consumed and selected socio-economic variables are examined below. The variables selected are religion, ethnicity and income.

#### Consumption and Religion

Among the different forms of seafood, more than 90 percent of the consumers of all religious groups had a frequency of four or fewer days of consumptions of all forms except fresh fish and canned fish (Table 2.5), that is, only 10 percent or less of the consumers had a frequency of consumption of more than four days per month. As may be seen from the table the individual percentages varied for each form. For example, whilst smoked fish was consumed four or fewer days per month by 100 percent of the consumers of that form of fish, frozen fish was consumed by only 91.5 percent of the consumers at the same frequency. Fresh fish and canned fish on the otherhand had more than 15 percent of the consumers with a consumption frequency of more than four days and up to a maximum of 30 days or more. In contrast, poultry was consumed by more than 28 percent of the consumers of that form for more than four days per month. In the case of meat the percentage of consumers at this same frequency was as high as 96 percent. Further, in the case of meat consumption 88.9 percent of the consumers had a frequency of more than 11 days and up to 30 days or more. The equivalent percentage for poultry was 4.6 percent, 3.2 percent for canned fish and 3.0 percent for fresh fish.

The modal frequency of consumption for all forms of seafood, except frozen shellfish and smoked shellfish was 1 to 2 days per month. For frozen and smoked shellfish it was less than once a month. Whilst the modal frequency of consumption for poultry was slightly higher than for seafood (3-4 days per month), that of meat (15-20 days per month) was much higher than all other forms (Table 2.5). It is interesting to note that in Darwin too the modal frequency of consumption for meat was 15-20 times: the only difference being in Darwin the modal group comprised 48.6 percent (Bandaranaike, 1983) and in the Moreton region it was 37.7 percent. The modal frequencies of consumption for poultry (3-4 days per month), and all forms of seafood were similar to that of Darwin. Comparisons have been made with Darwin because this survey was conducted during approximately the same period of time as the Moreton Region survey.

TABLE 2.5: FORMS OF SEAFOOD, POULTRY AND MEAT CONSUMED BY NUMBER OF DAYS PER MONTH FOR ALL RELIGIOUS GROUPS

Number of Days per Month	Percentage Consumers In Each Form									
	Fresh Fish	Frozen PP Fish	Smoked Fish	Canned Fish	Fresh Shellfish	Frozen Shellfish	Smoked Shellfish	Canned Shellfish	Poultry	Meat
< 1	11.8	21.8	33.6	16.3	33.5	45.7	60.0	46.0	2.7	0.5
1-2	38.7	47.2	55.1	43.9	47.7	43.2	28.0	40.1	21.9	1.2
3-4	32.9	22.5	8.5	28.6	14.0	8.6	12.0	10.9	46.7	2.7
5-6	5.9	3.7	0.7	4.3	2.5	1.2	0.0	0.7	8.5	0.4
7-10	7.7	3.5	1.4	4.8	1.2	1.2	0.0	0.0	15.6	6.3
11-14	1.4	0.7	0.0	1.1	0.6	0.0	0.0	0.7	2.9	10.5
15-20	1.3	0.2	0.0	0.6	0.4	0.0	0.0	0.7	1.1	37.7
21-25	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2	19.2
26-30	0.0	0.2	0.0	0.3	0.0	0.0	0.0	0.0	0.3	19.5
> 30	0.1	0.2	0.7	0.1	0.2	0.0	0.0	0.7	0.1	2.0

The hierarchical positioning of the different forms of seafood in these consumer surveys were similar to a large extent.

Individual variations within the religious groups for each form, are given in Tables A1 to A10 in Appendix II. It is evident from these tables that there is very little variation among the different religious groups when considering the number of days per month seafood was consumed. This conclusion also was reached in the Darwin survey. The sub-group 'Other Christians' had higher frequencies of consumption than other groups in almost all forms of seafood. This spread could possibly be a result of the larger representative sample (63.4%) of this sub-group. Likewise, the 'Greek Orthodox' and 'Non-Christian' sub-groups were too small to justify any conclusion regarding their consumption patterns.

#### Consumption and Ethnicity

The relationship between ethnic groups and consumption frequencies per month are given in Tables A11 to A20, Appendix II. Even though the numbers sampled in some of the minor ethnic groups are small, a more distinct pattern of consumption emerges than when religion was considered as an attribute affecting seafood consumption. The Australian sub-group appears to have some of the highest frequencies of consumption (number of days per month) in most forms of seafood. The same is reflected in meat and poultry consumption. Owing to the larger representative sample, the Australian sub-group appears to have higher consumption rates in all forms of food, analysed in this report. However, as the detailed analysis that follows indicate, the actual consumption rates of the Australian consumers are not as high as some of the other ethnic groups.

Approximately 80 percent (79.9%) of the Australian consumers and 71.1 percent of the British consumers ate meat more than fifteen times per month. Yet, even though the European and Asian ethnic groups do not have consumers in the highest consumption frequency (ie. 30 days or more), 80.6 percent of European and 90.0 percent of the Asian consumers ate meat during 15 days or more (up to a maximum of 30 days) per month (Table A11).

In poultry consumption, even though the Asian and Adriatic households sampled were small (owing to the relatively smaller numbers in the population of the Moreton Region), 66.6 percent and 44.4 percent respectively, had consumers eating poultry five or more times and up to a maximum of 30 days per month

(Table A12). The equivalent percentages for the British and Australian groups were only 30.6 and 27.0 respectively, thus establishing the fact that poultry consumption was more popular among the Asian and Mediteranean ethnic groups.

Fresh fish was consumed on a greater number of days per month by Asian households, followed by Adriatic households. Thirty percent of Asian consumers and 22.2 percent of Adriatic consumers ate fresh fish on an average of 7 or more days per month, up to a maximum of 30 or more days. The frequency of the British consumers for this same frequency range was only half that of the Asian sub-group. Even though a small number of Australians sampled ate fresh fish more than 26 times per month, overall only 10.6 percent of this sub-group had a consumption frequency of 7 days or more; that is, a third of the Asian consumers (Table A13).

The total number of households consuming frozen pre-packaged fish with a frequency of 15 or more days per month was much less than in fresh fish. However, the British sub-group had 8.8 percent consuming frozen pre-packaged fish on 15 or more days per month, up to a maximum of 30 or more days. The European sub-group on the otherhand had 10.7 percent consuming this form between 7 to 10 days per month (Table A14).

Overall the consumption frequencies of smoked fish were even lower than in frozen fish (Table A15). Even though the Adriatic households sampled were few, 25.0 percent of these households ate smoked fish between 7 to 10 days per month. Between five and six percent (5.4%) of the British households consumed this form of seafood between 7 to 20 days per month and 0.8 percent of the Australian consumers ate smoked fish on an average of more than 30 days per month. This is not unusual if the species included in this research under the sub-group 'smoked fish' are examined.

Canned fish, being one of the more popular form of seafood, was consumed by 16.7 percent of the Americans sampled, with a frequency of 11 to 14 days per month. Over 15 percent (15.3%) of the Europeans ate canned fish with an average frequency of 7 to 20 days per month. It is interesting to note that in the small number of Aboriginal household sampled, 33.3 percent of these consumed canned fish between 7 to 10 days per month (Table A16).

Approximately 17 percent (16.7%) of the Adriatic consumers ate fresh shellfish on an average frequency of 11 to 14 days per month. For this same

range in days, the Europeans, the next highest, comprised only 3.4 percent. Under three percent (2.7%) 2.7 of the Australian consumers had a frequency of between 15 and 30 days or more. The Asian sub-group, which had a substantial proportion of its consumers eating fresh fish with very high frequencies (Table A13), had much lower frequencies of consumption in fresh shellfish (Table A17).

As with frozen pre-packaged fish, in frozen pre-packaged shellfish consumption the British sub-group had some of the higher frequencies of consumption. In fact, 12.6 percent of the British consumers ate frozen pre-packaged shellfish on an average of 3 to 6 days per month. Between 11 and 12 percent (11.5%) of the Australian consumers ate this form on an average of 3 to 10 days per month. Despite the small sample, the New Zealand sub-group had 25.0 percent of its consumers having a frequency of 3 to 4 days per month (Table A18).

In smoked shellfish consumption 50.0 percent of the European consumers had a frequency of more than 3 days per month and 25.0 percent of the British and 5.3 percent of the Australians had the same frequency, up to a maximum of 14 days per month (Table A19).

The American sub-group sampled appear to have some of the higher consumption frequencies in canned shellfish as was the case in canned fish. Twenty-five percent of the American consumers had a frequency of 15 to 20 days per month in the consumption of canned shellfish. The next highest were the British sub-group with a frequency of 26 to 30 days among 3.8 percent of its consumers (Table A20).

Thus it can be seen from the above analysis that even though there was a very high preference for fresh fish among all ethnic groups, individual ethnic groups preferred some forms of seafood to others. Whilst the British had a distinct preference for frozen pre-packaged fish and shellfish, they also favoured the consumption of smoked fish and shellfish and had a somewhat lower preference for canned seafood. In contrast the American sub-group showed a distinct favour towards canned seafoods. The Asian consumers had a clear preference for fresh fish over all the other forms of seafood. The Adriatic sub-group likewise had a very high preference for fresh seafood and a somewhat lower, but a definite preference for smoked fish. The New Zealanders indicated a preference for frozen pre-packaged shellfish and a lesser preference for canned fish. It was dif-

difficult to locate a specific preference for the Australian and European ethnic sub-groups.

#### Consumption and Income

When considering the various forms of seafood consumed by different income groups, it is obvious that the individual species consumed within each form is relevant in the analysis of preferences. For example, while 100.0 percent of those sampled in income group \$45,001 plus, consumed smoked cod, only 59.8 percent of those in the income group less than \$8,000 consumed smoked cod.

This section is concerned more with the difference proportions of seafood consumed within each income group rather than species, which is dealt with elsewhere. Table 2.6 summarises the proportion of households in each income group consuming a particular form of seafood. It must be noted when interpreting the table, that those income groups with a higher representative sample (eg. \$18,001 - 26,000) appear to have larger percentages of households consuming all forms of food. However, this weighting due to a larger sample was not true of all income groups. As for example, in smoked shellfish, income groups less than \$8,000 and \$26,001 - \$45,000 had 20.0 percent each consuming this same form, whilst income group \$12,001 - \$18,000 (second highest sample proportion) had only 16.7 percent consuming this form.

TABLE 2.6: PERCENTAGE OF HOUSEHOLDS CONSUMING DIFFERENT FORMS OF SEAFOOD IN EACH INCOME GROUP

FORM	(1) <\$8,000	(2) \$8'-12,000	(3) \$12'-18,000	(4) \$18'-26,000	(5) \$26'-45,000	(6) >\$45,000
Fresh Fish	20.3	17.1	21.8	26.8	12.4	1.6
Frozen Fish	16.8	13.9	27.0	27.7	12.8	1.8
Smoked Fish	25.0	14.7	19.9	26.0	12.7	1.7
Canned Fish	19.7	15.4	22.9	26.6	13.4	2.0
Fresh Shellfish	13.9	16.7	22.3	30.6	14.5	2.0
Frozen Shellfish	11.5	16.7	12.8	34.6	21.8	2.6
Smoked Shellfish	20.0	3.3	16.7	40.0	20.0	0.0
Canned Shellfish	12.8	17.4	16.8	35.6	14.8	2.7
Poultry	21.4	15.9	22.6	26.2	11.9	2.0
Meat	21.5	16.1	22.8	25.8	11.7	2.0

N.B. These are calculated as percentages of total consumers in each form of seafood, and not of each income given i.e. Row total = 100.0%.

Table 2.6 illustrates some very interesting variations in consumption between and among different income groups. Among the different income groups the range between the lowest and highest percentage consumers in each form was approximately 14.0 percent, except in the last two income levels (i.e. \$26,001 - \$45,000 and more than \$45,000) where the range was approximately 10 percent and 1 percent respectively. This clearly indicates that among the higher income groups the preferences for different forms of seafood, poultry and meat was less marked.

Even though the frequency of consumption of poultry and meat was found to be higher than that of all forms of seafood (Table 2.4), the proportion of households consuming these forms (Table 2.6) was much lower, particularly in those households with an income of more than \$18,001. In contrast, the



frequency of consumption of frozen shellfish and smoked shellfish was low, but used more widely among a larger percentage of consumers within select income groups. For example, frozen shellfish was the most widely distributed form of seafood consumed among three income groups - viz \$8,001 - \$12,000; \$26,001 - \$45,000 and more than \$45,000. Smoked shellfish was consumed widely among two income groups - viz: \$18,001 - \$26,000 and \$26,001 to \$45,000.

Within each income group there was very little variation in the percentage households consuming poultry and meat. Significant variations however, were noted between different forms of seafood.

In the lowest income group (less than \$8,000), smoked fish was consumed by a larger section of this group (25.0 percent) than even poultry (21.4 percent) or meat (21.5 percent). In reality, the frequency of consumption (number of days per month, Table 2.4) was fairly low in the serving of smoked fish among these households, yet, the incidence of consumption, among this income group, was in fresh fish (20.3 percent), smoked fish (20.0 percent) and canned fish (19.7 percent). It should be noted that particularly the consumptions of smoked seafoods among consumer households belonging to this income group (<\$8,000) was relatively high when compared with other income groups. Whilst smoked cod was consumed by 59.8 percent of these households, smoked oysters were consumed by 7.3 percent - these being the most popular species.

Those households with an income of between \$8,001 and \$12,000 had a more even distribution of consumption among the different forms, (a range of 17.4 percent to 13.9 percent) except in the case of smoked shellfish (3.3 percent). In this income group shellfish appear to have a marginally higher incidence of consumption than fish, with the exception of fresh fish.

In the next income group, (\$12,001 - \$18,000) frozen fish was consumed by more than a quarter of the households in this sub-group. This was followed by canned fish, fresh shellfish and fish, all of which were consumed by approximately 22 percent of the household. Unlike in the previous sub-group the consumption of shellfish was relatively low.

The next three income groups, those households with an income of more than \$18,000, had a somewhat similar pattern of consumption. Forms of shellfish were more popular than forms of fish. For example, in income group \$26,001 -

\$45,000, 21.9 percent of households consumed frozen pre-packaged shellfish, and only 12.8 consumed frozen pre-packaged fish. This difference may be attributed to the price factor.

The relationship between the number of days different forms of seafood, poultry and meat are consumed together with varying income groups is presented in Tables A21 to A28 in Appendix II.

Twenty percent of households in the highest group (> \$45,000) ate fresh fish on seven or more days per month. In contrast, in the lowest income group (< \$8,000) only 8.0 percent ate fresh fish on seven or more days per month (Table A21). This pattern is even more marked in the case of fresh shellfish consumption. The percentage of households consuming seven or more times per month increased with increasing income (Table A22). One point three percent of households in the lowest income group (< \$8,000) and 9.1 percent in the highest income group (> \$45,000) had this same frequency.

On the other hand, in the consumption of frozen pre-packaged fish the pattern was reversed (Table A23); 7.9 percent of the lowest income group (<\$8,000) ate this form on seven or more days per month, whilst only 3.4 percent of these with an income of between \$26,001 and \$45,000 had the same consumption frequency. (Income group > \$45,000 cannot be considered in this analysis since the sample is too small). In frozen pre-packaged shellfish, only 1.3 percent consumed this form on seven or more days per month. All these consumers belong to the sub-group \$26,001 to \$45,000 (Table A24).

In smoked fish consumption, the lowest and highest income sub-groups had no consumers eating it more than three to four days per month. Three point four percent of income group \$12,001 to \$18,000 had a monthly frequency of consumption seven or more times. The other sub-groups had between 2.3 and 2.7 percent in this category (Table A25). In smoked shellfish consumption 33.0 percent of those in the highest income group and 16.7 percent in the lowest income group consumed this form between 3 and 4 days per month, and 8.3 percent of those in income group \$26,001 to \$45,000 consumed this form between 11 and 14 days per month (Table A26). Thus there appears to be a preference for smoked shellfish among the higher income groups and for smoked fish among the lower income groups. This difference could be a result of the differences in species consumed by the individual sub-groups.

In canned fish, consumption frequencies of seven or more days per month are found mainly among the higher income sub-groups of \$26,001 - \$45,000 (10.1 percent) and the more than \$45,000 (18.8 percent) sub-group. Whilst amongst the other sub-groups this same frequency was supported by only 6 to 7 percent of the households (Table A27). In contrast, with canned shellfish consumption, 100.0 percent of the households in the two income groups (\$26,001 - \$45,000 and > \$45,000) had a consumption frequency of 4 or fewer days per month. Some of the higher incidence of consumption was found in the lower income groups of \$8,001 - \$12,000 and \$12,001 to \$18,000. The lowest income group had one of the lowest frequencies of consumption in canned shellfish consumption - that is 100.0 percent of the consumers in the latter income group had a consumption of 2 or fewer days per month (Table A28).

Thus summarising the effects of household income on consumption frequency, it is evident that there were variations in consumption patterns between and within the income sub-groups. However, except in the case of fresh shellfish and frozen pre-packaged fish, in the other forms of seafood there was hardly a consistent pattern in the effect of income on the frequency of consumption. In the consumption of fresh shellfish a clearer pattern of increased consumption with increasing income was illustrated and an inverse relationship with frozen pre-packaged fish. A more detailed analysis of the effect of individual species with regard to retail prices, would probably be more revealing in its effects on income sub-groups.

#### Weight of an Average Serving of Seafood

This section analyses the average quantity of seafood consumed (in grams) per head, within individual consumer households. This quantity was derived by recording the average quantity of seafood (for each form) served in a household and dividing this by the total number of consumers in that household. These statistics were later used in the calculation of the annual per capita consumption of different forms of seafood.

Table 2.7 illustrates that on the average servings of fresh seafood (fish and shellfish) and smoked fish were 101 to 200 grams, whilst all other forms had a lower frequency of 1-100 grams per meal. The highest percentage value in a given category will be referred to as the 'modal frequency'; that is, in fresh fish the modal frequency was 101-200 grams. These modal frequencies are

compared with the modal frequencies in the Darwin household and with the average servings of other capital cities in terms of grams served per meal.

TABLE 2.7 AVERAGE SERVINGS OF DIFFERENT FORMS OF SEAFOOD, PERCENTAGE CONSUMERS

Grams	Fresh Fish	Fresh Shellfish	Frozen Fish	Frozen Shellfish	Smoked Fish	Smoked Shellfish	Canned Fish	Canned Shellfish
1 - 100	17.8	13.3	58.5	45.8	23.8	65.6	54.9	83.8
101 - 200	38.1	38.6	26.5	31.9	38.9	15.6	34.6	9.1
201 - 300	24.2	25.8	10.0	13.9	23.6	6.3	9.2	2.6
301 - 400	10.4	13.0	3.0	6.9	7.4	3.1	0.6	1.3
401 - 500	6.8	10.6	1.2	0.0	5.8	3.1	0.5	0.6
501 - 750	1.1	2.2	0.4	1.4	0.3	3.1	0.2	0.6
> 750	1.1	1.6	0.4	0.0	0.3	3.1	0.0	1.9

In fresh fish consumption, the modal frequency in Darwin was higher, where more than a quarter (27.2 percent) of the households consumed between 201 and 300 grams per meal. However, in the other capital cities the average serving of fresh fish was 168 grams, which falls within the same modal frequency (101 - 200 grams) as the Moreton Region.

In the Moreton Region, in fresh fish consumption, less than half the households had a consumption frequency higher than the modal frequency. That is, only 43.6 percent of the consumers of fresh fish ate more than 200 grams per meal.

In contrast, 53.3 percent of the consumers had average servings of fresh shellfish above the modal frequency for that sub-group, establishing thus, the greater popularity of fresh shellfish when served as a meal even though the monthly consumption frequency of this form was lower than that of fresh fish. The average servings of fresh shellfish in the Moreton Region were very similar to that of Darwin. In the latter, 33.4 percent households (compared with Moreton's 33.5 percent) served 101 - 200 grams and 44.6 percent households

(compared with Moreton's 46.8 percent) served between 1 - 200 grams of fresh shellfish for a meal. The comparable weight of an average serving in the capital cities was 152 grams, thus being very similar to that of Moreton and Darwin.

Frozen pre-packaged fish and shellfish were served in smaller quantities than fresh seafood, the modal frequency being 1 - 100 grams. However, as in the case of Darwin more than a quarter (26.5 percent) of the households (Darwin 29.7 percent) served 101 - 200 grams of frozen pre-packaged fish and approximately a third (31.9 percent) served 101 - 200 grams of frozen pre-packaged shellfish per meal (Darwin 32.6 percent). In both these localities even though the monthly consumption frequencies were lower for frozen pre-packaged fish than for shellfish, the total quantities served for a meal in the former are higher. In the capital cities survey, the comparable weights were 155 grams for pre-packaged frozen fish and 89 grams for fish fingers; these two items were considered together under frozen pre-packaged fish in the Moreton and Darwin surveys. Yet, even if an average value was taken for the former, it is still higher (falls within the 101 - 200 grams range) than in Moreton or Darwin. In frozen pre-packaged shellfish the capital cities had a similar average serving (86 grams) to that of the other two localities.

The Moreton Region had exceptionally high average servings of smoked shellfish. The modal frequency was between 101 - 200 grams for 38.9 percent of the consumers. This rate is fairly high when considering the modal frequency in Darwin which was only 1 - 100 grams among 38.8 percent of the consumers. However the other capital cities recorded 120 grams as their average serving. The average servings of smoked shellfish were much the same both in Moreton and Darwin, where the modal frequency was between 1 and 100 grams. A marginally higher percentage of consumers in Moreton had higher servings (more than 100 grams) than Darwin. No comparable figure is available for the capital cities servings.

Although canned fish was popular in the Moreton Region and had a monthly consumption frequency equal to that of fresh fish, the quantity served per meal was relatively low; the modal frequency being between 1 and 100 grams. This feature once again was common to Darwin where two thirds of the consumers had a modal frequency of 1 - 100 grams and the other capital cities where the average serving was 68 grams.

In the Moreton Region as much as 83.8 percent of the consumers of canned shellfish served 1-100 grams per meal. In Darwin the comparable percentage was 92.7 percent and in the other Capital Cities the average weight was 38 grams. This is not surprising since the average size of cans of shellfish available in the market are smaller than that of canned fish.

Thus among the different forms of seafood, weight of an average serving varied between 1 and greater than 750 grams. Some of the higher weights recorded in fresh fish and shellfish are possibly a result of these forms being cooked whole - i.e. bake or steam whole fish, curried prawns (usually cooked with the shells). In contrast, the pre-packaged frozen, canned or bottled seafoods are usually filleted or processed prior to packaging and marketing. Therefore it is not uncommon to find relatively higher weights recorded in the average servings of fresh fish and shellfish.

#### Annual Per Capita Consumption

Annual per capita consumption rates are important indicators of the popularity of different forms of seafood in a particular location. Also the demand for these products can be measured against the availability of local supplies. These statistics also give some indication as to the relative positioning of the Moreton region's consumption within Australia and also on an international scale.

In the calculation of the annual per capita consumption, all seafood purchased commercially, received as gifts and caught personally were taken into account.

Table 2.8 gives the annual per capita consumption of fish and shellfish of different forms. These consumption rates when compared with those of other capital cities, excluding Darwin (Table 2.8) illustrate the greater popularity of seafood in the Moreton region. In 1976-77, the annual per capita consumption rate at Brisbane was 10.36kg. Since then, there has been approximately a 30 percent increase in seafood consumption within the Moreton region. Further, this increase has been mainly in the consumption of different forms of fish (+36.4%) as against shellfish consumption (+7.69%).

Within the Moreton region, as is true of all capital cities surveyed, per capita consumption of frozen pre-packaged

Table 2.8: ANNUAL PER CAPITA CONSUMPTION

Form	Per Capita Consumption (Kg's)
Fresh Fish	6.98
Fresh Shellfish	2.38
Frozen Fish	1.29
Frozen Shellfish	0.07
Smoked fish	0.70
Smoked Shellfish	0.03
Canned Fish	1.97
Canned Shellfish	0.04
TOTAL	13.46

shellfish, canned and smoked shellfish are relatively low. Whilst frozen pre-packaged fish, canned and smoked fish have moderate rates of consumption (between 1 and 2 kg per head), fresh shellfish (2.38 kg) and fresh fish (6.98 kg) have the highest per capita rates of consumption. Thus the hierarchical placings of the different forms of seafood in the Moreton region, although not identical with all state capital cities, was similar in the four most popular forms of seafood - i.e. fresh fish and shellfish, canned fish and frozen pre-packaged fish.

The annual per capita consumption of fresh fish in the Moreton region in 1983 was twice as much as that of Brisbane in 1976/77 (Table 2.8 & 2.9). These high rates of per capita consumption are supported by the monthly consumption frequencies and the weight of an average serving of seafood, discussed in the previous sections. As in Darwin in the Moreton region per capita consumption of fresh shellfish was the second highest. Here too, the Moreton consumption was more than double that of the Brisbane consumption. Note that in all other state capitals, canned fish had the second highest per capita consumption, after fresh fish.

In per capita consumption among the different forms of fish, canned fish had the smallest increase between the period 1976 (Brisbane Survey) and 1983 (Moreton Survey) - 0.44 kg. This was so, even with canned shellfish, where there was a difference of only 0.01 kg between the two time periods concerned. Thus it may be concluded for the Moreton region that, over the past few years

whilst the popularity of fresh seafoods and frozen pre-packaged fish have increased greatly, there is no significant increase in per capita consumption of other forms of seafood. It should be noted that the notable difference is the case of fresh seafood, on the one hand, could be a real difference resulting from various underlying demand and supply factors. On the otherhand, the negative difference could be an underestimation resulting from disparities in assessing fresh seafood consumption, via contribution from non-commercial sources such as amateur fishing households. Much of the development in the Moreton Region has occurred around coastal nuclei with recreational fishing a feature of the lifestyle of many residents of such centres.



Table 2.9: Annual Per Capita Consumption of Each Form of Seafood for Capital Cities

	TOTAL (kg)	SYDNEY (kg)	MELBOURNE (kg)	PERTH (kg)	BRISBANE (kg)	ADELAIDE (kg)	CANBERRA (kg)	HOBART (kg)	DARWIN (kg)
FISH (At home)									
Fresh	2.90	3.16	2.71	2.70	3.49	2.49	1.80	2.50	11.30
Frozen pre-packaged	0.96	1.03	1.01	0.90	0.71	0.90	0.91	0.67	0.90
Tinned fish	1.82	1.99	1.68	1.64	1.53	2.26	1.83	0.73	1.90
Smoked fish	<u>0.28</u>	<u>0.32</u>	<u>0.23</u>	<u>0.35</u>	<u>0.26</u>	<u>0.31</u>	<u>0.25</u>	<u>0.28</u>	<u>0.40</u>
Sub-total	5.96	6.50	5.63	5.59	5.99	5.96	4.79	4.18	14.50
Cooked from takeaway outlets	1.10	1.06	1.26	1.04	1.10	0.96	0.59	0.92	-
Eaten outside the home	0.74	0.79	0.77	0.67	0.93	0.44	0.50	0.45	-
TOTAL FISH	7.80	8.35	7.66	7.30	8.02	6.36	5.88	5.55	14.50
SHELLFISH(at home)									
Fresh	0.80	0.93	0.46	1.37	0.97	0.75	0.38	0.69	5.90
Frozen pre-packaged	0.09	0.13	0.06	0.07	0.02	0.13	0.07	0.09	0.20
Tinned	0.12	0.12	0.16	0.08	0.05	0.09	0.12	0.04	0.30
Smoked fish	<u>0.02</u>	<u>0.01</u>	<u>0.03</u>	<u>0.01</u>	<u>0.04</u>	<u>0.03</u>	<u>0.05</u>	-	<u>0.02</u>
Sub-total	1.03	1.19	0.71	1.53	1.08	1.00	0.62	0.82	6.42
Cooked from takeaway outlets	0.54	0.96	0.20	0.37	0.61	0.12	0.55	0.31	-
Eaten outside the home	0.70	1.19	0.37	0.34	0.65	0.21	0.97	0.47	-
TOTAL SHELLFISH	2.27	3.34	1.28	2.24	2.34	1.33	2.14	1.60	6.42
TOTAL FISH AND SHELLFISH	10.07	11.69	8.94	9.54	10.36	7.69	8.02	7.15	20.92

Sources: Department of Primary Industry, Canberra 1978 for all cities except Darwin, for Darwin, Bandaranaike 1983.  
(NB Some of categories have been modified slightly from the original table, in order to conform to the current survey data)

Species Consumed

Species consumed or purchased by form

For each form of seafood respondents were asked to nominate the major species of seafood eaten. Multiple choices were recorded, for example several respondents listed fifteen species of fresh fish consumed. Names were recorded according to respondents' answers and thereby a long list of possible species was generated (over 50 for fresh seafood). Problems of nomenclature have been mentioned previously and these should be kept in mind when considering common names. The results are presented in tabular form, separated into convenient groups for purposes of discussion. In all tables, frequencies are given as a percentage of consumers of the particular form of seafood.

The major species of seafood consumed at home are listed in Table 2.10. Five groups have been delineated in the table:

Group I	more than 50% of consumers
Group II	20 - 49.9% of consumers
Group III	10 - 19.9% of consumers
Group IV	5 - 9.9% of consumers
Group V	less than 5% of consumers

Over 50% of consumers listed prawns as a major species consumed despite its status as a more expensive seafood. However, its presence at the top of the table indicates its popularity but not necessarily its frequency of consumption. Most popular fish species amongst consumers were whiting, bream, flathead, mullet, sea perch and tailor with most popular shellfish being prawns, mud crabs, sand crabs, oysters and scallops. Fish species were eaten more frequently than shellfish species by more than 20% of consumers (Group II). The popularity of sea perch (Group II) represents the success of a carefully presented imported product whilst the popularity of other species in group II reflects supply characteristics in the southeast of the state. Groups III and IV probably represent species with potential for increased consumption but in general are restricted by price (eg. barramundi) or, occasionally, availability (eg. tailor is a seasonal species, barramundi is not local). Those species in Group V were eaten by fewer than 5% of consumers and represent a diverse range of seafood. Many species in this group would have potential for increased consumption.

Table 2.10: Species of fresh Seafood Consumed at Home

Category	Species	% of consumers (n = 1113)
Group I	Prawns	54.3
Group II	Whiting	39.3
	Bream	37.3
	Flathead	23.6
	Mullet	21.6
	Sea Perch	21.5
	Mud Crab	20.8
Group III	Sand Crab	19.9
	Tailor	17.4
	Cod	16.1
	Snapper	13.9
	Oysters	13.0
	Scallops	10.8
Group IV	Flounder	7.5
	Barramundi	7.2
	Coral Trout	7.0
	Moreton Bay Bugs	6.8
	Pearl Pearch	6.6
	Lobster	6.3
Group V	Spanner Crabs	4.9
	Flake (shark)	4.8
	Reef Fish	4.1
	Squid	3.7
	Sweetlip	3.5
	School Mackerel	3.1
	Jewfish (Dhufish)	2.0
	Crayfish	2.3
	Black Bream	1.7
	Emperor	1.7
	Spanish Mackerel	1.7
	Dart	1.5
	John Dory	1.3
	Trevally	1.3
	Squire	1.3
	Sole	1.2
	Gar	1.1
	Others *	

\* Other less than 1% - barracuda, butterflyfish, catfish, nannagai, parrot, queenfishs, salmon, stringray, tuna, yellowbelly, yellowtail, maori wrasse, moses perch, dees sea fish, eel, kingfish, octopus, mussels, and no particular species.

However, many are also not readily available locally (eg. yellowbelly) or not generally accepted as suitable to the Australian palate (eg. octopus, squid, catfish).

Overall, consumers selected from a wide range of species, thus illustrating a wide choice available and considerable potential for diversification in the Moreton Region. This potential is highlighted by the consumption of only four species on average by consuming households. However, over three quarters of the species listed were eaten by fewer than 10% of consumers. Increased consumption and diversification may well depend on addressing the reasons for non-consumption and complaints discussed in the following sections.

Table 2.11 lists the frozen seafood products consumed. Four groups have been identified:-

Table 2.11: Frozen Seafood Purchased for Home Consumption

Category	Species/ Type of seafood	% of consumers (n= 605)
Group I	Fish fingers	76.7
Group II	Cod	13.6
Group III	Sea Shantys	9.8
	Crab Sticks	7.9
	Fish Cakes	6.9
	Fish in breadcrumbs	6.6
	Prawns	6.1
	Whiting	6.0
	Scallops	5.1
Group IV	Fishburgers	4.8
	Sea Bream	4.6
	Prawn Cutlets	4.5
	Fish Sticks	2.6
	Sea Perch	2.5
	Seafood Bites	1.8
	Rainbow Trout	1.0
	Seafood Crepes	1.0
	Others*	

\*Others less than 1% - seafood crab rolls, plaice, lobster, sea sides, fish rissoles.

Group I	more than 75% of consumers
Group II	more than 10% of consumers
Group III	5 - 9.9% of consumers
Group IV	less than 5% of consumers

The extreme popularity of fishfingers as a frozen food is highlighted in the table. Of the ten most popular frozen seafood five are not immediately identifiable in terms of species content from the labelling.

Apart from fishfingers, cod (Group II) was the only frozen species eaten by more than 10% of consumers. Identifiable species in Group III - prawns, whiting, scallops - were much less popular as frozen seafood items than as fresh seafood items in terms of the percentage of households who consume them. More than half the products mentioned by consumers were eaten by less than 5% of the respondents. On average, consumers purchased only 1.7 different types of frozen seafoods.

Table 2.12 shows the kinds of smoked, kippered, cured and dried seafoods purchased, ranked in order of household preference. Smoked cod was clearly the most popular smoked seafood. In general consumers did not appear to have a wide selection range as on average only 1.4 responses were recorded per consumer and the great majority of species/types were eaten by less than 5% of consumers. Many of the additional species included as 'other' represent isolated cases of individuals smoking some of their own catch. Comments made to interviewers suggested unfamiliarity with certain products by many consumers. This applied particularly to 'Bombay Duck', 'sprats' and to a lesser extent 'rollmops'.

Table 2.12: Smoked Seafood Purchased for Home Consumption

Species/type of seafood	% of consumers (n = 384)
Cod	65.4
Haddock	22.1
Herring	11.5
Oysters	9.4
Mussels	4.4
Kippers	4.4
Rollmops	3.9
Salmon	2.7
Mackerel	2.6
Eel	2.1
Tailor	1.6
Flounder	1.3
Others*	

\*Other less than 1% - mullet, "Bombay Duck", whiting, shark, snapper, sprats.

Table 2.13 lists percentage of consumers purchasing various forms of canned seafood. Four groups have been delineated:-

Group I        more than 70% of consumers  
Group II       40-50% of consumers  
Group III      5-20% of consumers  
Group IV       less than 5% of consumers

Table 2.13: Canned Seafoods Purchased for Home Consumption

Category	Species/type seafood	% of consumers n = 1064
Group I	Salmon	72.6
Group II	Tuna	49.7
	Sardines	46.4
Group III	Oysters	15.5
	Herrings	7.8
	Crabs	7.7
	Mussels	5.7
	Prawns	5.6
Group IV	Kippers	4.5
	Mackerel	3.8
	Anchovy	3.3
	Pilchards	2.9
	Others*	

\*Others less than 1% - baby clams, Frelish, fish cutlets, shrimp, snoek.

Canned seafood purchases were dominated by the popularity of canned salmon, it being purchased by almost three quarters of consumers. Groups I and II clearly accounted for much of the canned seafood purchased and it is interesting to note that these species are all fish. Group III had lower popularity (less than 20%) and was dominated by shellfish. Half of the canned species were consumed by fewer than 5% of consumers and overall the range of species chosen was fewer than for all other forms. However, on average consumers chose 2.3 different types of canned seafood which is higher than for smoked or frozen seafoods and may indicate a greater willingness to accept seafood presented in cans in favour of the other forms mentioned. Convenience is also an important factor.

### Species Consumed at takeaways and restaurants

The main types of seafood purchased at takeaways are listed in table 2.14. Seventeen percent of consumers purchased unspecified fish (e.g. 'fish and chips') which would undoubtedly boost other species if the types were known. For example 'hake' appears low on the list but the actual sales of hake at a wholesale level might suggest this species often sells as fish when unspecified by the customer. Alternatively the problems surrounding nomenclature would apply to some extent. For example 'cod' or 'barramundi' may in fact represent more than one species.

Table 2.14: Species/types of Seafood Purchased at Takeaway Outlets

Species/type of seafood	% of consumers (n = 723)
Cod	27.9
Seafood unspecified	17.1
Sea Perch	12.3
Prawns	11.7
Whiting	11.4
Mullet	7.3
Flake	6.1
Bream	6.1
Barramundi	4.3
Snapper	4.0
Tailor	4.0
Perch	3.7
Scallops	3.3
Chinese	2.6
Flounder	1.9
Coral Trout	1.4
Flathead	1.3
Oysters	1.0
Others*	

\*Others less than 1% - barracuda, black bream, john dory, sweetlip, Hake, Moreton Bay bugs, mud crab, sand crab, lobster, squid, crayfish, shrimp, fish sticks, prawn cutlets, sea shantys, crab sticks, mussels.

Some resemblance of species order between takeaway and fresh seafood consumed at home might be expected, based on the palatability of the particular species to consumers. Some discrepancies did occur, however, most notable being cod



which was the most 'consumed' of the takeaway species of fish. Sea perch was also ahead of whiting, the most popular fish eaten at home. Caution must be drawn however from the fact that a full range of species are not always available at takeaways and that many consumers buy 'fish unspecified' at takeaways. Prawns are the most popular shellfish at both home and takeaway outlets but other shellfish do not appear popular as takeaway items. A wide range of species were purchased from takeaways but 77% of these were purchased by fewer than 5% of consumers.

Of species eaten in restaurants (Table 2.15) it is understandable that the more expensive seafood lines were included as main types eaten (e.g. prawns, barramundi, lobster). The overall popularity of prawns as a seafood is shown by its position at the top of the table. 'Fish of the day' and 'fisherman's basket' appear in the list and probably represents a number of species which, if identified, may elevate their position in the table. For example coral trout or Snapper are species which may often be the 'fish of the day' in restaurants. The wide range of species reported illustrates the willingness of consumers to accept different seafoods in a restaurant situation. That 74% of the species listed were consumed by less than 5% of consumers may suggest a potential for increased exposure of consumers in restaurants to these species.

Table 2.15: Species/types of Seafood Eaten in Restaurant

Species/type of seafood	% of consumers (n = 846)
Prawns	24.7
Barramundi	22.2
Fisherman's Basket	14.6
Oysters	12.2
Lobster	11.2
Fish of the day	9.2
Crab	6.3
Seafood Cocktail	6.2
Scallops	5.3
Coral Trout	5.2
Snapper	4.0
Reef Fish	3.3
Sea Perch	2.8
Bream	2.7
Cod	1.9
Bugs	1.4
Crayfish	1.3
Flounder	1.2
Squid	1.2
Other*	

\*Others less than 1% - barracuda, butterflyfish, emperor, flathead, jewfish, john dory, mullet, sole, tailor, travally, tuna, mackerel, squire, deep sea fish, rainbow trout, smoked shrimp, smoked salmon.

### Favourite species

The type or species of seafood consumed does not necessarily reflect a consumer's preferred or favourite product. There are a number of reasons why this could be the case: for example, unavailability of the preferred species (in the local area), the relative price, and the prestige factor attached to some species such as crabs and lobster. Table 2.16 ranks the favourite seafood of all consumers. The types or species represented as favourite species showed a strong preference by consumers for products which are fresh seafoods. Of the wide range of 63 species given by consumers only six (9.5%) were frozen, seven (11.1%) were smoked and five (7.9%) were canned seafoods. Each consumer was allowed to nominate two species as favourite species. Table 2.16 illustrates the great diversity of opinion regarding favourite species as only eight species (12.7%) were the favourite of more than 5% of consumers. The overall popularity of prawns as a seafood in the Moreton Region is confirmed. Whiting, bream, sea perch and mullet were favourite fish species which also appear high on the list of fresh fish eaten. It is interesting that the imported frozen (and thawed) sea perch is high on the list of favourite species. Comments made to interviewers by consumers suggested that appearance of this fish (white and fresh appearance) made it popular.

Table 2.16: Favourite Seafood of Consumers

Species/Type of Seafood	% of Consumers (N = 1288)
Prawns	27.5
Crabs	15.0
Whiting	15.0
Bream	8.6
Sea Perch	8.5
Barramundi	7.2
Cod	6.8
Flathead	5.4
Mullet	5.0
Tailor	5.0
Snapper	4.5
Oysters	4.4
No particular species	4.3
Lobster	3.0
Coral Trout	2.7
Scallops	2.7
Perch	2.6
Flounder	1.5
Moreton Bay Bugs	1.4
Flake	1.3
Mackerel	1.3
Reef Fish	1.3
Canned Salmon	1.3
Crayfish	1.1
Sweetlip	1.0
Other*	

\*Others less than 1% - barracuda, black bream, butterflyfish, dart, emperor, gar, jewfish, john dory, nannagai, parrot, salmon, trevally, yellowbelly, squire, hake, deep sea fish, venus tusk fish, squid, mussels, shrimp, fishfingers, fish sticks, flounder, prawns, prawn cutlets, sea shantys, smoked cod, smoked flounder, smoked haddock, smoked shrimp, smoked eel, smoked mackerel.

Most popular species: Moreton Region compared with other centres

A comparison of popular species/types of seafood amongst major Queensland centres and Darwin is presented in Table 2.17. The seafoods are ranked according to the percentage of total sample households in which they are consumed. As such they do not necessarily represent frequency or quantity of consumption.

Of fresh seafood, barramundi very highly ranked throughout the comparison but of interest is its absence (from the top five) in the Moreton Region. The species list for the Moreton Region strongly reflects local product, a trend which is not necessarily consistent in other centres. Throughout the centres prawns are confirmed as the most popular shellfish. Crab appears in all but three centres but is much less popular than prawns. The absence of crab from the top five species in the present study may be partly due to the study's separate treatment of sand and mud crabs.

Fish fingers are universally popular as a frozen seafood line and are clearly ahead of other frozen foods. Fish cakes appear consistently but at lower percentage. Some centres register whiting as a popular species. There is some suggestion that this frozen line is not the same species as the fresh fish commonly referred to as whiting. A species of 'whiting' imported from Scotland and Ireland is, in fact, a different biological species. Some confusion between sea perch and whiting is also evident.

For both smoked and canned seafoods there is general consistency of species/types amongst the various centres. For both forms, fish are more popular than shellfish. Cod, herring and haddock are popular and smoked fish and salmon, tuna and sardines are the most popular canned fish overall.

Table 2.17: Popularity of Seafood Species/Types in various centres. Ranking Based on Percentage of Total Households in which Species/Type Is Served.

Centre	Fresh Seafood (%)	Frozen Seafood (%)	Smoked Seafood (%)	Canned Seafood (%)
Moreton Region	Prawns (42) Whiting (30) Bream (29) Flathead (18) Mullet (17)	Fish fingers (32) Cod (6) Sea Shantys (4) Crab Sticks (3) Fish Cakes (3)	Cod (17) Haddock (6) Herring (3) Oysters (2)	Salmon (53) Tuna (50) Sardine (46) Oyster (16) Herring (6)
Rockhampton	Prawns (63) Barramundi (57) Crab (46) Sweetlip (37) Oysters (28)	Fish Fingers (46) Whiting (14) Cod (5)	Cod (12) Haddock (10)	Salmon (54) Sardine (47) Tuna (44) Herring (22) Oyster (13)
Bowen	Prawns (60) Mackerel (52) Barramundi (48) Crab (48) Whiting (42)	Fish Fingers (28) Whiting (10) Fish Cakes (8) Prawns (4) Scallops (4)	Haddock (22) Cod (6) Kippers (4)	Salmon (62) Sardine (56) Tuna (50) Herring (30) Oyster (12)
Townsville	Barramundi (54) Prawns (50) Mackerel (38) Coral Trout (38) Crabs (37)	n.a.	n.a.	n.a.
Cairns	Barramundi (61) Coral Trout (54) Prawns (39) Crab (32) Mackerel (30)	Fish Fingers (25) Fish Cakes (13) Coral Trout (11) Whiting (7)	Coral Trout (18) Haddock (13) Herring (9) Flounder (5)	Salmon (61) Sardine (50) Tuna (42) Herring (25) Oyster (21)
Mareeba	Barramundi (67) Mackerel (46) Coral Trout (41) Prawns (21) Salmon (18)	Fish Fingers (21) Whiting (8) Fish Cakes (5)	Cod (3) Haddock (3) Herring (3)	Tuna (54) Sardine (49) Salmon (46) Herring (15)

continued over....

Table 2.17: Popularity of Seafood Species/Types in various centres. Ranking Based on Percentage Continued of Total Households in which Species/Type is Served.

Centre	Fresh Seafood (%)	Frozen Seafood (%)	Smoked Seafood (%)	Canned Seafood (%)
Charters Towers	Barramundi (48)	Fish Fingers (35)	Haddock (18)	Salmon (44)
	Bream (16)	Cod (6)	Cod (9)	Sardine (36)
	Mackerel (14)	Fish Cakes (5)		Tuna (24)
	Jaw Fish (13)	Whiting (5)		Herring (15)
	Prawns (7)			
Hughenden	Barramundi (65)	Fish Fingers (53)	Haddock (18)	Sardine (67)
	Prawns (32)	Fish Cakes (22)	Cod (5)	Salmon (50)
	Crab (22)	Whiting (20)		Whiting (48)
	Yellowbelly (17)	Flounder (8)		Herring (32)
	Whiting (12)	Prawns (5)		Oyster (20)
Mt Isa	Barramundi (65)	Fish Fingers (41)	Herring (12)	Salmon (43)
	Prawns (36)	Fish Cakes (20)	Haddock (12)	Tuna (43)
	Oysters (23)	Cod (15)	Sprats (6)	Sardine (35)
	Coral Trout (16)	Prawns (12)	Cod (5)	Oyster (28)
	Crab (16)	Whiting (5)		Anchovy (12)
Darwin	Barramundi	Fish Fingers	Cod	Tuna
	Prawns	Scallops	Haddock	Salmon
	Snapper	Prawn Cutlets	Herring	Sardine
	Crabs	Fish Cakes	Salmon	Oyster
	Bugs	Whiting	Mussels	Anchovy

Source: Other than present survey; Bandaranaike 1981, 1983.

The PA Consulting Services and Commonwealth Department of Primary Industries Survey (1978) presents species popularity in Australian capital cities. Since these results are based on the percentage of consumption occasions they are not comparable with the present results in percentage terms and do not appear in Table 2.17. However, general trends do emerge for comparison.

For all capital cities the most commonly eaten fresh fish species were bream, snapper, flathead, whiting and flounder, three of which emerge in the top five species in the present study. Regional variation shows a difference between capitals with bream most popular at Sydney and Canberra, snapper at Perth, whiting at Melbourne and Adelaide, flathead at Hobart and mullet at Brisbane. In the present study 22% of consumers ate mullet, putting it the fourth fish species eaten at home behind whiting, bream and flathead. The 1978 survey (The PA Consulting Services and Commonwealth Department of Primary Industries) shows prawns to be by far the most commonly eaten shellfish - agreeing with the present results.

Results of the present survey regarding takeaway and restaurant consumption generally agree with those of the PA Consulting Services and Commonwealth Department of Primary Industries (1978). At restaurants, the 1978 survey notes a high proportion of 'don't know's' with regard to fish species. This corresponds with the unspecified nature of the responses given in the present survey - eg. "fisherman's basket", "fish of the day". Apart from this barramundi dominated fish purchases and prawns dominated shellfish purchases in Brisbane in the 1978 survey which corresponds with the present results.

At takeaway outlets prawns are the most often consumed shellfish in both Brisbane and the Moreton Region. Although both surveys note the problems of accurate identification of fish purchased at takeaway outlets there is general agreement between the results. Cod is the most consumed fish whilst a large proportion of consumers fall into the 'don't know' or 'fish unspecified' categories.



Species consumed and socio-economic features

Household consumption characteristics have been linked to various socio-economic characteristics. Income and ethnic background in particular have been shown to give interesting relationships with species consumed (Bandaranaike, 1983). Although a large sample size has been analysed in the present study, the numbers in some ethnic groups have been too small to indicate definite results. For example, only two Aboriginal households were identified in the survey, and other small groups such as Adriatics and Asians quite probably have distinctive consumption patterns. These patterns could only be accurately assessed by survey of the specific groups. Given this limitation, results for significant ethnic groups have been included.

(i) Fresh seafood

The most popular species of *fresh seafood* consumed by different income and ethnic groups are listed in Tables 2.18 and 2.19.

Prawns, whiting and bream were popular across all income groups and strongly reflect local product availability. However, the consumption of prawns consistently increases with income - not surprisingly given its status as a more expensive seafood item. For the lowest income group whiting was consumed in as many households as prawns. Other more expensive shellfish, crabs and oysters appear in the list as income increases also. Mullet was a less expensive fish eaten in more than 20% of the two lower income groups. Whiting and bream were consumed by 35-45% of households regardless of income.

The propensity for Australians to restrict themselves to a species range based on the most popular and available species is illustrated in Table 2.19. As the largest group, Australians would seem to be the most likely target group for marketing of a wider species range. The table is interesting in that prawns are not popular consumption items in European households, fish species being preferred. In British and European households the imported species sea perch was consumed by more than 25% of households. Although only a small group, there appeared to be a propensity for more New Zealand households to incorporate shellfish as consumption items. Prawns are particularly popular in New Zealand households.

Table 2.18: Most Popular Species of Fresh Seafood Consumed by Different Income Groups

Income	Species	% Consumer Households
Less than \$8001 (N = 178)	Prawns	43.8
	Whiting	43.8
	Bream	37.1
	Flathead	24.2
	Mullet	21.3
\$8001 - \$12000 (N = 151)	Prawns	54.3
	Whiting	39.7
	Bream	35.8
	Flathead	28.5
	Mullet	27.8
\$12001 - \$18000 (N = 204)	Prawns	55.9
	Whiting	41.7
	Bream	40.2
	Flathead	24.5
	Crabs (sand)	24.5
\$18000 - \$26000 (N = 252)	Prawns	60.7
	Bream	37.3
	Whiting	36.9
	Sea Perch	27.4
	Crab (mud)	25.4
More than \$26000 (N = 140)	Prawns	61.5
	Whiting	37.1
	Bream	35.0
	Crab (sand)	22.8
	Oysters	21.4

(ii) Frozen seafood

The most popular species of *frozen seafood* consumed by different income and ethnic groups have been listed in Tables 2.20 and 2.21.

Fishfingers were popular with all income groups, being consumed in 70-80% of all consumer households. Other species were consumed in less than 16% of households and no clear relationships emerge. "Sea shantys" and cod were the only other products appearing in all groups. There was some suggestion that the consumption of cod may increase with higher income.

Table 2.19: Most Popular Species of Fresh Seafood Consumed by Different Ethnic Groups

Ethnic Group	Species	% Consumer Households
Australian (N = 803)	Prawns	53.3
	Whiting	39.7
	Bream	38.7
	Flathead	25.8
	Mullet	22.8
New Zealand (N = 24)	Prawns	79.2
	Snapper	45.8
	Oysters	37.5
	Scallops	25.0
	Mud Crabs	25.0
British (N = 128)	Prawns	53.9
	Whiting	36.7
	Bream	31.3
	Sea Perch	28.9
	Cod	24.2
European (N = 53)	Bream	37.7
	Whiting	34.0
	Sea Perch	32.1
	Cod	26.4
	Mullet	26.0

Table 2.20: Most Popular Species of Frozen Seafood Consumed by Different Income Groups

Income	Species	% Consumer Households
Less than \$8001 (N = 87)	Fishfingers	72.4
	Fishcakes	12.6
	Fish Unknown	11.5
	Cod	9.2
	Sea Shantys	8.0
\$8001 - \$12000 (N = 70)	Fishfingers	80.0
	Fishburgers	11.4
	Cod	11.4
	Fishcakes )	
	Prawns )	
	Scallops )	7.1
	Sea Bream )	
	Sea Shantys )	
\$12001 - \$18000 (N = 132)	Fishfingers	80.3
	Cod	14.4
	Sea Shantys	10.6
	Crab Sticks	9.1
	Fish Unknown	7.6
\$18000 - \$26000 (N = 138)	Fishfingers	76.8
	Cod	15.2
	Whiting	10.1
	Sea Shantys	8.7
	Prawns	7.2
More than \$26000 (N = 140)	Fishfingers	71.2
	Sea Shantys	16.4
	Crab Sticks	16.4
	Cod	12.3
	Fishcakes	9.6

British households found fishfingers less popular than the other groups and to some extent this was compensated for by the popularity of cod. In terms of percentage of households consuming items other than fishfingers British and European households appeared to be slightly more adventurous than Australian households.

Table 2.21: Most Popular Frozen Species Eaten by Different Ethnic Groups

Ethnic Group	Species	% Consumer Households
Australian (N = 401)	Fishfingers	78.8
	Cod	10.5
	Sea Shantys	10.0
	Fish Unknown <sup>+</sup>	6.5
	Crab Sticks	6.2
British (N = 96)	Fishfingers	63.5
	Cod	29.2
	Fishcakes	12.5
	Sea Bream	12.5
	Sea Shantys	10.4
European (N = 32)	Fishfingers	84.4
	Crab Sticks	15.6
	Cod	12.5
	Whiting	12.5
	Fishburgers	9.4

<sup>+</sup> For example, fish in breadcrumbs.

### (iii) Smoked seafoods

Most popular *smoked seafoods* consumed by different income and ethnic groups are listed in Tables 2.22 and 2.23.

Cod was popular with all income groups but interestingly less so with the lowest and highest income groups. Both of these groups had a higher percentage of households consuming haddock. There appears to be no apparent reasons for this trend. The percentage of households consuming more expensive items (oyster, smoked salmon) was higher for higher income groups.

The popularity of smoked cod amongst European consumers was much lower than for Australians and also differs considerably from the British. A high percentage of Australian households ate cod and a quarter consumed haddock. However, as with other forms there appeared to be less innovation by Australians in consuming other species as indicated by lower percentages for all but the most popular species. The consumption of rollmops in almost 30% of European households indicated the strong cultural influence on consumption patterns. Such items as rollmops, kippers, "Bombay Duck", etc. are not part of the traditional Australian palate and some potential for education of this large section of the population towards a wider species range may be indicated.

(iv) Canned seafoods

Most popular *canned seafoods* consumed by different income and ethnic groups are listed in tables 2.24 and 2.25.

Salmon was most popular in all income groups, without consistent variation. Sardines and tuna were also eaten between 30-60% of households with some suggestion of wider consumption in the highest income group. There is a suggested trend for (the more expensive) shellfish to be consumed by the higher income groups in terms of the number of shellfish occurring in the favourite list and the percentage of households in which the shellfish are consumed.

Salmon, tuna and sardines were popular with all ethnic groups. Apart from the lower British figure for sardines (36.6%) these canned seafoods were eaten by more than 45% of households. With only two exceptions (sardines and tuna for British groups) the Australian group showed fewer households willing to consume products other than the most popular (salmon). This appears to be a trend throughout for all forms.

Table 2.22: Most Popular Species of Smoked Seafood Consumed by Different Income Groups

Income	Species	% Consumer Households
Less than \$8001 (N = 82)	Cod	59.8
	Haddock	34.1
	Herring	9.9
	Oysters	7.3
	Kippers	6.1
\$8001 - \$12000 (N = 47)	Cod	76.6
	Haddock	17.0
	Herring	8.5
	Kippers	6.4
	Rollmops	4.3
\$12001 - \$18000 (N = 62)	Cod	69.4
	Haddock	17.7
	Herring	8.1
	Oysters	8.1
	Salmon	4.8
\$18000 - \$26000 (N = 84)	Cod	65.5
	Oysters	15.5
	Herring	14.3
	Haddock	10.7
	Salmon	9.5
More than \$26000 (N = 44)	Cod	59.1
	Haddock	25.0
	Oysters	13.6
	Herring	11.4
	Rollmops	4.5
	Kippers	4.5

Table 2.23: Most Popular Species of Smoked Seafood Consumed by Different Ethnic Groups

Ethnic Group	Species	% Consumer Households
Australian (N = 257)	Cod	71.2
	Haddock	24.9
	Oysters	8.6
	Herring	6.2
	Mussels	3.1
British (N = 55)	Cod	58.2
	Haddock	29.1
	Herring	20.0
	Kippers	16.4
	Oysters	7.3
	Mussels	7.3
European (N = 24)	Herrings	45.8
	Rollmops	29.2
	Oysters	25.0
	Mackerel	25.0
	Cod	16.7
New Zealand (N = 11)	*	-
Adriatic (N = 4)	*	-
Asian (N = 3)	*	-

\* Sample size too small to give reliable results.



Table 2.24: Most Popular Species of Canned Seafood Consumed by Different Income Groups

Income	Species	% Consumer Households
Less than \$8001 (N = 174)	Salmon	74.7
	Sardines	47.1
	Tuna	33.3
	Herring	10.3
	Crabs	6.9
\$8001 - \$12000 (N = 137)	Salmon	67.9
	Sardines	54.0
	Tuna	47.4
	Oysters	16.1
	Herring	8.0
\$12001 - \$18000 (N = 199)	Salmon	74.4
	Tuna	49.2
	Sardines	39.7
	Oysters	13.1
	Crabs	8.0
\$18000 - \$26000 (N = 233)	Salmon	70.4
	Tuna	54.4
	Sardines	41.2
	Oysters	21.9
	Mussels	9.9
More than \$26000 (N = 128)	Salmon	74.2
	Sardines	57.8
	Tuna	51.6
	Oyster	19.5
	Crabs	11.7

Table 2.25: Most Popular Species of Canned Seafood Consumed by Different Ethnic Groups

Ethnic Group	Species	% Consumer Households
Australian (N = 758)	Salmon	72.0
	Tuna	47.2
	Sardines	45.9
	Oysters	14.6
	Crabs	7.0
New Zealand (N = 23)	Salmon	73.9
	Sardines	56.5
	Tuna	52.2
	Oysters	17.4
	Herring	13.0
British (N = 131)	Salmon	75.6
	Tuna	46.6
	Sardines	36.6
	Oysters	15.3
	Crabs	13.0
European (N = 55)	Salmon	61.8
	Sardines	56.4
	Tuna	54.5
	Herring	23.6
	Oysters	18.2
Adriatic (N = 8)	*	-
Asian (N = 9)	*	-

\* Sample size too small to give reliable results.

#### Species caught

Species which are caught for home consumption or distribution to friends/relatives are listed in Table 2.26. It is not surprising that a good deal of correspondence exists between those high on the caught list below with those high on the list of fresh seafood consumed. Differences occur where species cannot be harvested or are difficult to harvest by amateur fishermen (eg. sea perch, prawns). A wide range of species caught is reported but only nine species are caught by more than 5% of fishing households. Whiting and

bream are caught by more than sixty percent of recreational fishermen in the Moreton Region.

Table 2.26 Species Caught/Harvested

Species	% of consumers who go fishing (n= 553)
Bream	67.3
Whiting	61.3
Flathead	42.1
Tailor	21.3
Mud Crab	13.7
Sand Crab	12.3
Mullet	6.0
Snapper/Mackerel	5.8 (each)
Cod/Parrot	4.3 (each)
Sweetlip	4.8
Trevally	3.6
Jewfish	3.3
Dart	3.2
Catfish	3.1
Perch	2.9
Prawns	2.7
Black Bream	2.5
Reef Fish	2.4
Coral Trout	2.2
Sole/Emperor	1.8 (each)
Squire	1.6
Flounder/Yellow Tail	1.4
Shark	1.3
Yellowbelly/Crabs/	
Lobster	1.1 (each)
Others*	

\*Others less than 1% - barracuda, barramundi, butterfish, gar, john dory, queenfish, salmon, stingray, tuna, moses perch, venus tusk fish, eel, Moreton Bay bugs, oysters, crayfish.

#### Household Characteristics of Serving Seafood

##### Days of the week when seafood was served

An attempt was made in the survey to identify seafood eating habits on a daily basis, in households. A majority of the households (78% - 91%) stated they had "No Preference" as indicated in the Table below.

Table:2.27 Days on which different seafood is eaten (Percentage of Households)

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday	No Preference
Fresh Fish	0.8	1.2	1.3	2.5	11.2	6.2	4.3	78.7
Fresh Shellfish	0.0	0.5	0.4	1.4	5.6	9.6	6.4	80.5
Frozen Seafood	0.7	1.3	0.8	1.8	6.1	4.6	2.8	87.0
Smoked Seafood	0.3	0.8	1.3	0.5	5.6	2.3	2.0	90.0
Canned Seafood	0.7	0.7	0.7	0.9	3.5	4.0	3.7	90.6

This characteristic was true of the Darwin Seafood Consumption Survey as well - i.e. between 76 percent (fresh shellfish) and 86 percent (smoked/dried fish) of the households were unable to recall the day of the week each form of seafood was served (Bandaranaike, 1983).

However, of those households that stated a preference, a distinct pattern of serving seafood on Fridays and the weekend was apparent. In the Moreton region, Friday was generally more popular than the week-end particularly in fresh, frozen pre-packaged and smoked seafoods. On the other hand in Darwin, Saturday and Sunday were more popular days of serving seafood at home, reflecting different life styles in the two regions concerned (ibid).

In the Moreton region the greatest variation among the days of the week was found in fresh fish and shellfish consumption. While 11.2 percent of the households consumed fresh fish on Fridays, a further 10.5 percent consumed it on Saturday and Sunday. In fresh shellfish consumption, 16.0 percent of the households ate this form on Saturday and Sunday and a further 5.6 percent on Friday.

Approximately six percent of the households consumed frozen pre-packaged and smoked seafood on Fridays. Canned seafood consumption was marginally higher on Saturdays than the rest of the week. In reality, there was not much variation between Friday, Saturday and Sunday, amongst the latter three forms of seafood.

All forms of seafood had a very low incidence of consumption from Monday through to Thursday. These results are very similar to trends exhibited in Darwin and the other capital cities of Australia. For instance, according to the capital cities survey, Friday was the day when fish was served most often and Saturday/Sunday for shellfish (PA Consulting Services and Commonwealth Department of Primary Industries, 1978).

The relationship between day of the week when seafood was served and religion was also analysed. On the whole there was no significant difference among the different religious groups. Yet, among the catholic households the frequency of serving seafood on a Friday was marginally higher to that of serving on a Saturday/Sunday, when compared with the other religious groups. This can be attributed to the traditional catholic habit of serving fish instead of meat on a Friday.

#### Meals at which seafood was served

It can be seen from Table 2.28 that the rate of recall of the respondents was much higher than when asked to respond on the day of the week when seafood was eaten at home.

Table:2.28 Meals at which seafood is eaten (Percentage of Households)

	Breakfast	Midday	Evening	No Preference
Fresh Fish	2.0	6.6	83.1	9.7
Fresh Shellfish	0.6	17.3	68.0	15.2
Frozen Seafood	5.6	10.5	74.8	12.9
Smoked Seafood	13.6	16.1	61.4	15.3
Canned Seafood	3.2	57.7	34.1	15.3

With the exception of canned seafood, all other forms were consumed largely as an evening meal. Fresh fish (83.1%) and frozen pre-packaged seafood (74.8%) had the highest percentage of households serving these forms as an evening meal. Canned seafood had the lowest incidence (34.1%) of being served as an evening

meal. On the other hand more than half or 57.7 percent households consumed canned seafood as a midday meal. The latter feature could be attributed to the popularity of using canned seafood (mainly fish) as a lunch time snack in sandwiches.

At breakfast time, smoked seafood was the most popular, 13.6 percent of households eating this form. The next most popular form of seafood at breakfast time was frozen pre-packaged seafood (mainly fish fingers) where 5.6 percent of the households consumed it.

Similar trends were reported both in Darwin and the capital cities survey. In the capital cities, fish was eaten mainly at the evening meal on more than half the occasions when it was served. On 39 percent of the occasions fish was served at midday and only 5 percent of the occasions at breakfast. Canned fish was eaten mainly at the midday meal, smoked fish (14%) and fish fingers (9%) were served at breakfast on a number of occasions, as in Darwin and the Moreton region. Shellfish too was consumed mainly at the evening meal in the capital cities, as a lunch time meal on about a quarter of the occasions and hardly ever at breakfast (op. cit). Thus overall the characteristics of serving seafood at particular meals were broadly similar throughout Australia.

#### Ciguatera

Owing to the occasional reportings of ciguatera poisoning, it was felt necessary to find out what proportion of the consumer population were aware of this incidence and also to what extent it had affected their seafood consumption habits. The relative insignificance of the occurrence of ciguatera in the Moreton region is substantiated by the fact that more than half the consumer population (56.5%) had never heard of the term before! In addition a further 13.5 percent gave an erroneous identification of the term. Of the latter group 10.2 percent identified ciguatera as some kind of food poisoning or a disease in fish, 2.4 percent identified it as a disease, 0.7 percent had heard of the term but did not know what it actually meant and a further 0.2 percent said it was food poisoning in oysters. Only 30.1 percent of the consumers were able to identify ciguatera as food poisoning from the consumption of reef fish or mackerel.

In order to assess the degree of awareness of ciguatera among different sub-groups of the population, cross-tabulations were carried out with certain socio-economic variables - i.e. ethnicity, income, fishing and non-fishing households.

The identification of the term ciguatera with different ethnic groups illustrated that with the exception of the Australian, European and Asian sub-groups, in other sub-groups, approximately two-thirds had never heard of the term. Among the Europeans and Asians the proportion that said they had never heard of ciguatera was much higher than in the other ethnic sub-groups i.e. 71% and 88.9% respectively. In contrast, a relatively smaller proportion of the Australians (53.3%) stated they had never heard of it, so indicating the greater awareness of the problem among this latter sub-group. In addition,, approximately a third of the Australian, and a third each of the Aboriginal, Island, New Guinea sub-group and the Adriatic sub-group were able to identify ciguatera correctly. The latter feature can probably be explained with reference to the greater participation of these three sub-groups in amateur fishing activity. Whilst only 15-20 percent each of the New Zealand, European and American sub-groups were able to identify ciguatera correctly, none of the Asians identified it correctly. Among the Asians, whilst the majority had not even heard of it, above a tenth identified it as a disease or some kind of poisoning in fish. Even though the Asians do consume Mackerel and Reef fish, they usually purchase the smaller size fish which is more suitable to their type of cooking. Hence the incidence or even the knowledge of ciguatera among this sub-group would be relatively low.

Approximately a tenth in each of the sub-groups Australian, New Zealander and European identified ciguatera as some form of food-poisoning.

Identification of ciguatera with different income sub-groups illustrated that approximately two thirds in each of the sub-groups less than \$2,000 (61.3%) and \$2 - 4,000 (62.0%) stated they had never heard of it. A slightly lower proportion - approximately 50 percent - in each of the higher income sub-groups stated the same view. Above a third of each of the income groups' above \$4,000 were able to identify ciguatera as reef fish or mackerel poisoning and a tenth each of all income sub-groups said it was some kind of food poisoning. Thus, overall no distinct pattern was visible between the correct

identification of ciguatera and its relationship to a particular income sub-group or sub-groups.

Whilst only a third (34.4%) of the fishing households were able to identify ciguatera precisely just over a fourth (26.4%) of the non-fishing households were also able to identify it correctly. Thus even among the majority of fishing households there was no clear perception of ciguatera. About a tenth in both sub-groups stated it as being more generally a food poisoning.

Of the independent explanatory variables looked at, ethnicity appears to be the more satisfactory variable in explaining the variation in the identification of the term ciguatera.

A further question was posed to those who had heard of ciguatera and identified it in some form (i.e. 45.5% of consumers) correctly or otherwise. A quarter (25.3%) of this sub-group stated that the awareness of ciguatera had affected their seafood eating habits. In general the reaction was caution over buying select species of fish such as Mackerel and Reef fish together with a general apprehension of any large size fish.

Those who had contracted the disease, initially appeared to have either decreased or completely stopped fish consumption and then gradually returned to normal consumption. Therefore it can be concluded from the overall remarks that the incidence of ciguatera poisoning is very low among the Moreton region population and that the general awareness of it has not significantly affected the seafood eating habits of the same population. In the future it is very unlikely that this will be a major limitation to seafood consumption, particularly in the light of more recent research being conducted in this field.



### 3.0 PURCHASING PATTERNS

#### Source of Supply

##### Source of supply in Moreton Region

Patterns of consumption may be influenced by availability of seafood from various sources of supply. Consumers were asked to nominate where they usually obtain their seafood supplies. The popularity of the various sources is shown in Table 3.1. For fresh seafood not all supplies are purchased as many consumers either catch their own or are given seafood by friends or relatives.

For fresh seafood the fish shop is the most popular source of supply whilst in frozen, smoked and canned seafoods the chain supermarket is clearly the most popular. The 'other' category for fresh seafood is significant (20.5%) and includes various minor sources - fish and chip shop (6.4%) commercial fish market (4.2%) private supplier/wholesaler (2.5%) fisherman's co-operative (2.7%) commercial fisherman (2.4%) delicatessan (1.5%) and Queensland Fish Board (1.3%). The relative unpopularity of the latter is noteworthy.

Consumers showed a tendency to use only one source of supply particularly for frozen, canned and smoked seafoods. On average 1.5 sources of supply were used by consumers of fresh seafood.

##### Source of supply: Moreton Region compared with other centres

General trends in source of supply are presented in table 3.2. The availability and efficiency of the various types of outlet will make for some differences amongst centres. Thus Mount Isa and Charters Towers which have large amounts of seafood brought in by private suppliers do not have the fish shop as the major source of fresh fish as do other centres. The table shows a greater useage of the fish shop by consumers of fresh fish in the Moreton Region as compared to Brisbane city consumers and a comparable reduction in the amount of fish obtained from friends, relatives or caught by the consumer. Whether this represents a change in preference of source in the south east of the state or a real difference between Brisbane and the surrounding region cannot be

Table 3.1 Source of Supply of Seafood in the Moreton Region

Source	Fresh (%)*	Frozen (%)*	Smoked (%)*	Canned (%)*
Own Catch	34.1	-	-	-
Friends/Relatives	19.6	-	0.5	-
Chain supermarket	17.6	82.8	62.5	85.3
Local store	5.0	13.7	15.7	15.5
Fish shop	46.3	5.0	14.7	-
Fish van	7.0	-	-	-
Delicatessan	1.5	-	10.5	-
Other	20.5	1.0	2.4	.4

\* Percentage of consumers who purchase/obtain the particular form. Since some respondents have multiple sources of supply, totals may exceed 100%.

determined. Further, patterns of consumption in Brisbane may have altered since the 1978 survey.

The importance of the chain supermarket as a source of seafood is confirmed by the table. The percentage useage of this source for frozen canned and smoked seafoods are very high at all centres whilst as a source of fresh seafood the supermarkets lose popularity to fish shops and supplies from friends, relatives or own catches. In the Moreton Region a not insignificant portion of consumers purchase their frozen (14%), smoked (16%) and canned (16%) seafood from the local (neighbourhood) store.

Table 3.2 Sources of Fresh, Frozen, Smoked and Canned Seafood Supplies. Moreton Region compared with other Queensland Centres

		Super Market	Hotel/ Pub	Fish Shop	Delicatessen	Fish Board	Friends, Relatives, Self	Fisherman	Private Supplier	Neighbourhood Store	Mobile Unit	Fish Market	Other
MORETON REGION	Fresh	18		46	2	1	54	2	4	5	7	4	9
	Frozen	83		5	-	-	-	-	-	14	-	-	1
	Smoked	63		15	11	-	1	-	-	16	-	-	2
	Canned	85		-	-	-	-	-	-	16	-	-	1
BRISBANE	Fresh			36			33					6	25
TOWNSVILLE	Fresh	19	3	40	3	11	15	3	4	-	-	-	1
	Frozen	91	-	1	-	5	-	-	-	-	-	-	1
	Smoked	82	-	1	16	-	-	-	-	-	-	-	1
	Canned	96	-	-	2	-	-	-	-	2	-	-	-
CAIRNS	Fresh	27	2	33	6	12	24	1	2	-	1	5	-
	Frozen	91	-	5	5	-	-	-	-	-	-	-	-
	Smoked	79	-	1	24	-	-	-	-	-	-	-	-
	Canned	87	-	-	3	-	-	-	-	13	-	-	-
ROCKHAMPTON	Fresh	7	2	64	-	29	16	1	3	-	1	-	-
	Frozen	93	-	1	-	5	-	-	-	-	-	-	-
	Smoked	89	-	7	4	1	-	-	-	-	-	-	-
	Canned	97	-	-	1	-	-	-	-	6	-	-	-
BOWEN	Fresh	5	3	55	-	13	8	13	3	-	-	-	-
	Frozen	75	-	25	-	19	-	-	-	-	-	-	-
	Smoked	86	-	7	21	-	-	-	-	-	-	-	-
	Canned	97	-	-	-	-	-	-	-	8	-	-	-

Table 3.2 Continued

		Super Market	Hotel/ Pub	Fish Shop	Delicatessen	Fish Board	Friends, Relatives, Self	Fisherman	Private Supplier	Neighbourhood Store	Mobile Unit	Fish Market	Other
MT ISA	Fresh	25	7	27	3	1	2	1	35	-	-	-	7
	Frozen	88	-	-	1	-	-	-	-	-	-	-	10
	Smoked	40	-	3	57	-	-	-	-	19	-	-	-
	Canned	77	-	-	4	-	-	-	-	-	-	-	-
CHARTERS TOWERS	Fresh	9	12	47	-	6	12	5	24	-	-	-	2
	Frozen	93	-	-	-	2	-	-	-	-	-	-	7
	Smoked	100	-	-	-	-	-	-	-	4	-	-	-
	Canned	94	-	-	-	-	-	-	-	-	-	-	-
HUGHENDEN	Fresh	29	2	19	-	2	41	27	2	-	2	-	5
	Frozen	92	-	3	-	-	-	-	-	-	-	-	3
	Smoked	100	-	-	-	-	-	-	-	-	-	-	-
	Canned	100	-	-	-	-	-	-	-	-	-	-	-
MAREEBA	Fresh	26	-	32	-	5	5	5	8	-	16	-	3
	Frozen	100	-	-	-	-	-	-	-	-	-	-	-
	Smoked	100	-	-	-	-	-	-	-	10	-	-	-
	Canned	90	-	-	-	-	-	-	-	-	-	-	-

Source: For other than Moreton Region, Bandaranalke In Hundloe (In press); Department of Primary Industries and PA Consulting Services (1978).

\* Figures represent percentage of consuming households who purchase/obtain seafood from the particular source..

Since some respondents have multiple sources of supply, totals may exceed 100%.

#### Source of supply and socio-economic features

It is not possible to draw definite conclusions from the socio-economic information since only small numbers of individuals are involved in some categories. Some possible conclusions are discussed.

For fresh seafood the percentage of each income group who catch their own supplies increases consistently as income increases: less than \$8000 (26%), more than \$26000 (47%). This may reflect the increasing ability of higher income earners to travel and in particular to own boats. Whilst only a small percentage of low income earners (less than \$12000 per annum) purchased fresh seafood from the local store, this represented over 44% of all consumers using the local store. Access to transport for this group may be a contributing factor. Other ethnic groups record a higher percentage of consumers using the fish shop as a source of fresh seafood than do Australian consumers. This is particularly true of Asian, New Zealand and Adriatic ethnic groups.

With regard to frozen seafood, similar results are suggested as for fresh seafood. The percentage of respondents who purchased frozen food from chain supermarkets increases with income: less than \$8000 (76%), more than \$26000 (89%), whilst the reverse situation is suggested for purchases from local stores. Again access to transport may be a possible explanation.

For smoked seafood there does not appear to be any defined relationship between income and source of purchase. There is some suggestion that significantly lower percentages of Adriatic and European groups favour the chain store, a difference which appears to be compensated for by an increase in delicatessen purchases.

No clear relationships based on income, occupation or ethnic background emerge from the results with regard to canned seafood.

Purchasing and Preparation Preferences

Purchasing preference - fresh fish

A clear pattern emerged when consumers of fresh seafood were asked to state the desired form in which they preferred to buy fresh fish. Consumers were given the opportunity to state a second or third preference if desired. Results are summarized in Table 3.3.

Table 3.3: Form of Fresh Seafood Preferred

Form	1st Preference	2nd Preference	3rd Preference
Fillets	82.2	26.5	15.4
Whole	13.7	63.9	7.7
Gutted	1.5	5.2	69.2
Headless	.3	3.2	7.7
Cutlets	.3	1.3	-
No Preference	2.0	-	-
	(N = 949)	(N = 155)	(N = 13)

The pattern shows a clear preference for fillets, followed by whole fish and gutted fish. Of note is the reluctance of fresh consumers to offer a second or third preference.

Method of preparation

As indicated in Table 3.4 frying is clearly the most popular method of preparing fish, followed by grilling and baking. This trend is repeated at other centres although the table reports combined fish and shellfish (seafood) for other centres.

Table 3.4: Method of Preparing Seafood

Centre*	Fry	Bake	Grill	Straight	Boil	Other <sup>+</sup>
Moreton Region (Fish)	71	17	31	7	13	7
Moreton Region (Shellfish)	14	-	-	75	18	8
Brisbane	33	3	6	39	3	15
Townsville	-	25	-	20	6	4
Cairns	67	27	53	17	10	7
Rockhampton	79	16	38	5	8	-
Bowen	86	43	49	22	18	-
Mount Isa	80	40	39	55	9	11
Charters Towers	77	16	34	7	8	6
Hughenden	73	14	50	2	2	2
Mareeba	78	10	49	8	8	13

\* All Centres except Brisbane, percentage of households using a particular cooking method. Brisbane is percentage of occasions fish and shellfish served at home.

<sup>+</sup> Curries, Mornay etc.

Since shellfish are usually purchased in a cooked form it is consumed direct or 'straight' by three quarters of consumers (Table 3.4). Eighteen percent report that they boil their shellfish. In effect actual consumption of shellfish prepared in this way is probably in the 'straight' form when consumed. For example, mud crab may be purchased cooked (boiled) or purchased fresh and boiled at home but either way eaten straight.

Unfortunately the percentage of consumers in particular ethnic or religious groups was too small to indicate statistical relationships when considering different methods of purchase and preparation. Of those who responded to the question 'Does ethnic background affect the way in which seafood is cooked or eaten?' twenty-six percent responded that it did. Comments made to interviewers and trends shown in the results, suggest that this was most likely true for Asian groups who were more likely to eat seafood as one of several dishes at a meal and to purchase whole fish so as to ascertain its freshness.

However, overall there appears little willingness shown by most consumers to experiment with a variety of methods of preparation.

Reasons for non-consumption

Non consumption of all seafood

The 8.3 percent of the respondents who did not consume any seafood were asked to give reasons for non-consumption. These reasons were classified into five groups, the results being presented in Table 3.5.

The preference of meat and other products accounts for a large proportion (67%) of non consumption. Eighty-two percent of respondents who gave high price as a reason for non-consumption were in the \$12000 or less income bracket.

Table 3.5: Reasons for Non-Consumption of Seafood

Reason	% of non-consumers (n = 117)
Don't like it, certain members don't eat it	66.7
Price too high	21.4
Product not fresh	14.5
No particular reason	6.8
Other*	1.7

\* Other includes religious, medical

Non-consumption of various forms of seafood

The various reasons for non-consumption of the different forms of seafood have been classified into nine groups and presented in Table 3.6. A preference for meat or other products was the major reason for non-consumption in all cases except frozen, which was nevertheless very high in this category. A preference for fresh was a major reason for non-consumption of frozen, smoked and canned seafoods. Unfortunately many respondents were not able to identify a particular reason(s) for non consumption.



Table 3.6: Reasons for Non-consumption of the Various Forms of Seafood

Reason	FRESH % (n=180)	FROZEN % (n=696)	SMOKED % (n=874)	CANNED % (n=251)
Prefer meat and/or other products	34.4	28.0	41.2	34.7
No particular reason	23.3	15.2	28.8	22.7
Prefer fresh/catch enough	-	33.9	13.2	21.1
Poor quality/fear poisoning	20.6	27.0	8.5	12.0
Price too high	17.8	4.9	2.9	5.6
Not sure how to prepare/don't like preparing	7.8	-	-	-
Poor packaging and presentation	2.8	4.3	2.3	3.2
Unavailability of species/product required	6.1	0.6	1.8	-
Other +	3.3	1.0	7.1	8.4

- \* Percentage of consumers who do not purchase/eat the particular form. Since some respondents have multiple reasons for non-consumption, totals will exceed 100%
- + Other includes: Never tried it, product not Australian, religious or medical.

Poor quality, fear of poisoning or contamination was an important reason for non-consumption of fresh and frozen seafood. It is interesting that price was a much more important reason for non consumption of fresh seafood than for other forms. In this case 57% of consumers in this category were in the \$12,000 or less income category. For fresh seafood, it is interesting to note a lack of knowledge in preparation and an actual distaste for handling this form of seafood - a feature which has implications for public education regarding seafood. This too, helps explain a marked preference for filleted fresh fish shown by fresh seafood consumers, as discussed previously.

Reasons for non-consumption: Moreton Region compared with other centres

A comparison among various Queensland centres with regard to reasons for non-consumption is presented in table 3.7. Overall the most consistent statewide feature for all forms of seafood is the 'dislike' category. This category includes preference for meat and/or other products, dietary reasons etc. The 'other' category accounts for a high percentage of consumers. It is apparent that a significant number of these are recreational fishermen who catch their own supplies; or for consumers in the frozen, smoked and canned categories, prefer fresh fish. For example, in the Darwin survey (Bandaranaike, 1983) 80% of non-consumers of frozen, 44% of non-consumers of smoked and 100% of non-consumers of canned seafoods caught their own or preferred fresh seafood. For the Moreton Region between 15% and 29% of respondents had no particular reason for non-consumption; these percentages are included in the 'other' category.

Consistent patterns for other categories of the table are not clear. For example, poor quality of fresh and frozen seafoods was cited by over 20% of respondents in the Moreton Region as a reason for non-consumption. This feature is not repeated for fresh fish in other centres (12% at Hughenden is the highest) but for frozen fish is notable at three centres (Mareeba 24%, Bowen 18%, Charters Towers 14%). For smoked fish poor quality as a reasons for non-consumption is high by comparison. High price of fresh fish is a significant reason in the Moreton Region, a feature which is repeated for Townsville and Mount Isa. However, for other forms high price is generally less important. The exceptional case is Townsville where 92% of respondents cited high price of frozen seafood as a reason for non-consumption. This variation highlights the difficulties of making statewide conclusions and the need to consider local influences on purchaser decision making.

Table 3.7 Reasons for Non-Consumption of Different forms of Seafood -  
Comparison Among Different Centres in Queensland

		High Price* %	Poor Availability* %	Low Quality* %	Dislike* %	Other* %
MORETON REGION	Fresh	18	6	21	34	37
	Frozen	5	1	27	28	54
	Smoked	3	2	9	41	51
	Canned	6	-	12	35	55
TOWNSVILLE	Fresh	19	6	11	41	24
	Frozen	92	-	5	59	27
	Smoked	8	1	1	65	25
	Canned	6	-	-	74	21
CAIRNS	Fresh	-	-	-	16	84
	Frozen	6	1	9	67	37
	Smoked	2	2	3	66	27
	Canned	5	-	-	83	12
ROCKHAMPTON	Fresh	-	-	-	7	93
	Frozen	5	-	6	83	15
	Smoked	3	1	2	70	27
	Canned	10	-	-	82	11
BOWEN	Fresh	9	-	-	18	73
	Frozen	3	-	18	36	42
	Smoked	3	3	-	66	29
	Canned	10	-	-	50	50
MT ISA	Fresh	19	6	6	3	56
	Frozen	11	-	7	97	14
	Smoked	11	-	1	75	19
	Canned	7	-	-	59	40

		High Price*	Poor Availability*	Low Quality*	Dislike*	Other*
		%	%	%	%	%
CHARTERS TOWERS	Fresh	6	6	-	50	50
	Frozen	7	2	14	66	28
	Smoked	3	5	-	70	19
	Canned	18	-	-	65	24
HUGHENDEN	Fresh	-	25	12	25	38
	Frozen	-	-	8	83	17
	Smoked	-	-	-	-	100
	Canned	-	-	-	100	-
MAREEBA	Fresh	-	-	-	-	100
	Frozen	7	-	24	58	27
	Smoked	5	-	3	58	39
	Canned	10	-	-	40	50
DARWIN	Fresh	2	-	-	42	52
	Frozen	2	-	9	3	107
	Smoked	3	2	31	2	73
	Canned	4	2	-	-	121

\* Percentage of consumers who do not purchase the particular form. Since some respondents have multiple reasons for non-consumption, totals may exceed 100%.

+ Includes: recreational fishermen who catch own supplies; respondents with no particular reason; poor packaging and presentation.

### Complaints

#### Consumer complaints in the Moreton Region

Consumers of the various forms of seafood were invited to make complaints about the particular form. Complaints were classified under seven headings for fresh seafood, and five headings for other forms.

Table 3.8 shows the percentage of purchasers of each form of seafood who made complaints. Most complaints concerned fresh and frozen seafood but overall fewer than thirty percent of people complained about any particular form.

Actual complaints are recorded in table 3.9. These are expressed as a percentage of those respondents who complained. Some consistency within the table is evident. Clearly quality is the main concern of consumers, it being the major complaint for all except fresh seafood. However, for fresh seafood the major complaint relates to the freshness of the seafood and as such may be considered as an addition to the 'poor quality' category. Similarly many consumers, responded that they suspected the product ('Suspect Product') which may be seen to reinforce the general complaint about seafood quality for all forms. The price of the product also occurs consistently as a consumer complaint, particularly with regard to fresh seafood. An interesting complaint by a few consumers of canned seafood was their concern with the product being of overseas origin.

Table 3.8: Percentage of Consumers Complaining About Seafood Purchased

FORM	% of CONSUMERS WHO COMPLAINED (n)
FRESH	29.4 (307)
FROZEN	25.3 (151)
SMOKED	10.6 (41)
CANNED	11.2 (118)

Table 3.9: Complaints Regarding Seafood Purchased

	FRESH		FROZEN		SMOKED		CANNED	
	%*	Rank	%	Rank	%	Rank	%	Rank
Poor quality	22.0	3	86.3	1	60.0	1	41.2	1
Price too high	40.1	1	11.0	2	27.0	2	16.0	3
Not genuinely fresh	32.9	2	-	-	-	-	-	-
Don't like bones	6.6	5	-	-	-	-	-	-
Suspect product	14.5	4	8.9	3	5.0	4	28.2	2
Unavailability	5.6	6	4.1	4	12.5	3	2.3	6
Poor packaging and presentation	3.6	7	3.4	5	2.5	5	6.8	4
Product not Australian	-	-	-	-	-	-	5.9	5

\* Sample includes only those consumers who had complaints about a particular form.

Complaints: Moreton Region compared with other centres

The only comparable data regarding complaints about the various forms of seafood available are from the recent Darwin survey by Bandaranaike (1983). Table 3.10 presents a comparison between Moreton Region and Darwin.

Table 3.10: Complaints Regarding Different Forms of Seafood in Moreton Region and Darwin

CENTRE		COMPLAINT					
		Poor Quality %	Price too High %	Unavailability %	Poor packaging and presentation %	Suspect product %	Other %
MORETON REGION	Fresh	61	40	6	4	15	-
	Frozen	86	11	4	4	9	-
	Smoked	60	27	13	3	5	-
	Canned	41	16	2	7	28	6
DARWIN	Fresh	33	66	8	11	7	1
	Frozen	81	14	1	6	16	-
	Smoked	67	26	22	7	-	-
	Canned	41	37	11	3	24	-

\*Percentage of consumers who made complaints. Totals may be greater than 100% as multiple responses were possible.

Poor quality (includes such comments as "not genuinely fresh", "too many bones") is consistently cited as a complaint at both centres. This is particularly true of frozen seafoods. Only for fresh seafood at Darwin does poor quality not represent the highest percentage of consumers, it being second to high price. Overall most complaints fall into the 'poor quality' and 'price to high' categories. Outside of these complaints there is a consistent suspicion of canned seafood at both centres. Reports of contaminated seafood in tins which appear in the media from time to time may partly account for this suspicion. Whilst at both centres less than 38% of consumers had complaints (and for some forms much fewer) there are important implications for increasing seafood consumption to be drawn from these findings.

#### 4.0 RECREATIONAL FISHING

Recreational fishermen have an impact on the fishing industry in two respects: firstly as consumers of fishing equipment and secondly as suppliers of seafood products for private distribution. The latter has some impact on household seafood consumption and is of interest in the present survey.

The relevant points from the survey results are listed below. (Information on species caught is listed previously).

- . Forty percent of households had at least one member make a fishing trip in the last year. In at least 70% of these households one or two members were involved.
- . Most fishermen reported relaxation or recreation as reasons for fishing trips (77%), but a small percentage fished specifically to obtain food (9.6%).
- . Ninety-five percent of fishing households catch seafood for home consumption (5% do not eat any of their catch) whilst 39% of fishing households distribute some or all their catch to friends or relatives.
- . Sixty-one percent of fresh seafood consumers reported catching or receiving from friends or relatives 10% or less of their fresh seafood supplies whilst at the other end of the scale 17% obtained more than 90% in this manner.

Additional information was sought on average size of catch and average number of trips per year to ascertain total contribution of recreational fishermen to the seafood 'market'. However, some potential for non-sampling error arises in the collection of such data.

In estimating the average catch size several factors confound the respondent's ability to estimate accurately: firstly averaging over a long period of time when catch size may vary considerably from trip to trip, secondly averaging by the respondent who may not be the person in the household responsible for the catch; and, thirdly the problem of estimation of weight of catch where no formal weighing has been involved. There is also confusion in some cases where holiday periods are considered as one fishing trip in which



case towards longer length of fishing trip, reduced number of trips and increased average catch per trip is possible. This is particularly true where a household makes only one fishing trip per year for an extended period.

Given these limitations the following results must be regarded as based on respondents' perception of their fishing situation and as only a general indicator of actual fishing situation.

On average 16.5 fishing trips per year were made by the principal fisherman in the household. However, 25% of fishermen make only one to two trips per year whilst almost 75% of fisherman make less than the average. The proportion of retired persons in coastal areas would contribute to the large number of trips made by some individuals. The average length of a fishing trip by the principal fisherman in the household was 1.6 days. However 82% of fishermen made one day trips only. The average is influenced by the few respondents who made holiday trips for longer periods.

As stated previously, several factors affect the estimation of the average weight of catch. Overall an average catch of 5.3 kilograms per trip for all fishermen is obtained. However, this figure is artificially skewed by the small number of individuals who catch large amounts of fish on reef trips usually only once per year. If catches above 50 kilograms are excluded the average drops to 4.4 kilograms per trip. Another consideration is that 33% of fishermen reported catches of 1 kg or less per trip; a further 9% reported going fishing but catching nothing, whilst 91% reported catches of 10 kilograms or less per trip. The average catch for this 91% of fishermen was 2.7 kilograms per trip.

Given the variation inherent in the data the estimation of an average annual catch per fishing household could be misleading.

Whilst the figures may be general there are some implications for consumption of commercial fresh seafoods. With forty percent of households having a member(s) making an average of 16 fishing trips per year and 39% of these households also distributing seafood to friends or relatives some impact on commercial outlets must ensue. Given the popularity of fishing as a recreational activity in the community (almost 14% of fishing respondents owned a boat) and the perceived high price and poor quality of fresh seafood by many consumers, it is not unlikely that consumption of self caught seafood will

increase. From a marketing perspective the most logical approach would be to increase overall consumption by fresh seafood consumers by considering complaints they may have.

## 5.0 IMPLICATIONS FOR THE FISHING INDUSTRY

Aggregate demand for seafood in general and any particular seafood is affected by various factors. In a sound economic sense these are: the population level, the level of disposable income, the price of the product, the price of substitute products, the price of complementary products and tastes or preferences. All those variables, except the population level, also affect individual demand.

The relationship between these variables and the level of consumption can be explained as follows. All other variables held constant, an increase in the population of the Moreton Region would result in an increase in the amount of seafood purchased. An increase in the average level of disposable income, all other variables remaining constant, would lead to an increase in the purchase of seafood. An increase in the price of seafood, all other variables remaining constant, would lead to a decrease in purchases, while a decrease in price would have the converse affect. In a similar fashion, changes in the price of substitute or complementary goods would alter the quantity of seafood purchased. A change in preferences would alter purchasing patterns of seafoods in general or particular species.

Most of these variables are beyond the control of influence of the fishing industry. Only the price of seafoods and consumer preferences can be subject to deliberate action by the industry. The price of seafoods is determined by the interaction of demand and supply. Supply is ultimately limited by the productivity of the marine environment, but economic factors, in particular the market price of the product and the input costs of fishing, will also determine the quantity supplied.

The fishing industry's main avenue for increasing the quantity of seafood consumed is by influencing preferences. This is a marketing problem and most attention will be paid to this issue below. Prior to that, some general comments are made about the other variables.

### Population

A clear pattern of population growth is shown on a broad regional scale. The intercensal period 1976-81 shows a 38.6% population increase. Given the nature of development within the region, it is not unreasonable to expect population increase to continue into the next century.

The demand for seafood products will be influenced by the dynamic and spatial aspects of population growth within the region. Population growth is not and will not be uniform within the region. Development to date has occurred around nuclei (e.g. Brisbane City, Ipswich City, Gold and North Coast centres) and the general pattern of such development is in concentric rings around these nuclei. The age group most responsible for population growth - that between 15 and 35 years of age - is associated with this development.

These growth areas need to be accurately identified, but as well anticipated growth areas need to be defined for future planning. For example, Moreton Shire has shown considerable population growth due to development adjacent to Ipswich City. The adjacent shire, Boonah (currently experiencing negative growth), is presently predominately rural but is likely to increase in population as development spreads. Conversely, it is reasonable to assume that growth rates in shires with presently large rates of population growth such as Albert (126% intercensal growth) will decrease and stabilize as the area becomes fully developed. The careful consideration of these population dynamics to avoid over or under supply of product or service is one implication for the industry.

Regional variations in population growth should be monitored by seafood retailers when deciding on where to locate retail outlets.

### Income

Changes in disposable income have an influence on the consumption of most commodities. For "normal" goods demand increases as income increases. However, at higher income level a smaller proportion of total income is spent on the purchase of "necessities" and the purchase of "luxury" items increases. Within the broad category of seafood these are both "luxury" and "non-luxury" species. Any significant changes in household disposable income in the Moreton Region should be monitored by seafood wholesalers and retailers.

Economic growth and decreased unemployment will increase the consumption of seafoods. The recent indications of some improvement in these variables suggests that demand in most, if not all, types of seafood will grow at a rate at least proportional to these changes.

With increased employment opportunities the participation rate is likely to alter with additional household members entering the workforce. This has implications for the type of food demanded. "Convenience foods" become more important for households in which all the adult members are the workforce. There is also an increased prosperity to eat in restaurants. These factors warrant consideration in the type of seafood product put on the market.

#### Price

Other than for seasonal variations there are presently no indications that the price of most seafoods will alter significantly in the short term. This means that there is little likelihood that aggregate consumption of seafoods will alter due to the influence of price.

The price of the closest substitution to seafood, meat and poultry, is an important variable influencing demand for the former. The probabilities of price changes for these commodities has not been assessed for this study, and hence predictions are not made. Nevertheless, the fishing industry should monitor real price changes of competing foods and take advantage of any significant increases by advertising the resulting advantages of consuming more seafood.

#### Potential for Increased Consumption

The discussion on demographic and socio-economic variables has indicated the Moreton Region to be an area of dynamic growth. With almost a third of the State's population there appears considerable potential in the Region for an increase in both the gross and per capita consumption of seafood.

The survey showed over eight percent of the population (approximately 55,700 persons at the 1981 census) to eat no seafood at all. Of the remainder not all consume all forms of seafood. Non-consumers of the various forms were as follows: fresh seafood 22.4% of household (approximately 150,400 persons), frozen seafood 41.1% (395,500 persons), smoked 73.4% (492,900 persons), and

canned seafood (185,400 persons). The numbers of persons given are approximate at the 1981 census. Given subsequent and projected population growth this represents a sizeable potential market.

Apart from introducing new consumers to seafood products, there is the possibility of increasing the per capita consumption of existing consumers. Considerable potential is indicated here in terms of the frequency of consumption of seafood. The discussion has shown this frequency to be low compared with substitute products. Whereas seafood is eaten on average 1-2 days per month, poultry is eaten 3-4 days per month and meat 15-20 days per month.

Should increased consumption be an aim of the fishing industry in general then marketing will need to consider those variables discussed in the report which determine consumption patterns. These areas of concern and their implications are discussed below.

#### Range of Seafood Eaten

Overall a large number of species were consumed at home (e.g. over 50 fresh seafood species). However, of significance is the trend for consumers to be extremely restricted in the total number of species consumed. The greatest average number of species consumed was for fresh seafood but even for this form consumers choose only four species on average. In addition, consumers exhibit an extremely narrow diversity of species in their selection of seafood. For example, of the large number of fresh seafood species consumed, over three quarters were eaten by fewer than 10% of consumers.

Whilst it is clear that some species are not always available (seasonal; difficult to catch; difficult to store, not local), local species are more likely to be available, and some species are excluded by consumers because of price, there would still appear to be considerable potential for increased consumption of a greater number of species. Supply and marketing decisions must be directed to, in the first instance, the most popular species for each form of seafood to ensure supply of acceptable product to consumers. However, increased home consumption would be facilitated by introducing new species of product to the market if they were available, but more importantly by widening the selection of existing species and products demanded by the consumer. To achieve this it is necessary to address the reasons for non-consumption,

complaints consumers have regarding the existing situation and to raise the consumer's awareness of seafood species with particular regard to purchasing and preparation methods.

Consumers of takeaway species exhibit a similar narrow range of species consumed. To some extent the range which retailers choose to stock and the price are influencing factors. However, there appears to be a lack of discrimination by consumers in specifying the species, with many consumers not specifying any species when buying takeaway cooked fish. As a result much overseas frozen fish is sold at takeaway outlets to the detriment of the local fishing industry. That takeaway seafood is eaten on average only 1-2 days per month would suggest that substitute forms of takeaways (chicken, meat hamburgers) are faring much more successfully. The implications of this are as before, the need to address the reasons for non-consumption, complaints and means of increasing consumer awareness of seafood products. In addition it would appear that sophisticated promotion of seafood products in the manner in which take-away chicken and meat have been presented may be one avenue of increasing consumption.

Poor presentation or quality and price are not usually major factors in consumer selection when eating at restaurants, nevertheless, the narrow range shown by consumers in home consumption is carried into restaurant consumption. This may be due to a lack of consumer knowledge of seafood products, cultural bias against certain types of seafood (e.g. octopus) and the prestige attached to certain 'classic' seafood dishes. It would appear that there is considerable potential for many restaurants to not only offer dishes using a variety of seafood species but to increase the overall number of seafood dishes on their menus. Whilst increasing public awareness of seafood would help restaurateurs achieve this, restaurants themselves can act as a useful point of education for the increasing number of consumers who go to restaurants, into accepting innovative methods in seafood selection and preparation.

The favourite species nominated by consumers clearly indicates consumer preference for fresh seafood. Of 63 species or products nominated as favourites, only six were frozen, seven smoked and five canned. Further, the frequency of consumption is higher for fresh seafood than for other forms and almost 78% of households consumed fresh seafood. A reason for non-consumption

of other forms of seafood by many consumers was a preference for fresh fish. Obviously a major target for marketing is the fresh seafood market. However, that 72% of households consumed canned seafoods and 41% consumed frozen pre-packaged seafoods indicates these forms meet the requirements of many consumers. The lifestyle of many households is based on two adults in the workforce with a subsequent need for convenient forms of food.

#### Purchase and Preparation

When purchasing fresh fish consumers showed a distinct preference for fish in the filleted form. Of note was the reluctance to offer a preference other than the filleted form. Fillets are a convenient form in terms of time saved during preparation, but the lack of any preference for other forms suggests there may be some lack of knowledge on the part of consumers in selecting and preparing a wide range of fresh seafood for cooking. Most consumers cooked fresh fish by frying or grilling and most shellfish was eaten straight (i.e. boiled). Numbers using other methods were notably small.

Overall there appears little willingness to experiment with a variety of methods of selection and preparation. There are two major implications of this finding for the marketing of seafood.

Firstly, the strong preference for fillets must be catered for. Education of the public in innovative methods of preparation of dishes using this form may increase consumption. Here too, the control of quality of the product is naturally important. Secondly, there may be some potential to increase consumption through education of the consumer in terms of experimenting with innovative dishes requiring a variety of preparation methods, forms of seafood and species of seafood.

The results show ethnic groups within the Moreton Region to be small but there is some suggestion that such groups may suffer because of their methods of preparation and selection. The small size of these groups makes catering to specific needs not feasible on a regional planning basis unless concentrations of such groups in certain areas are easily defined. However as has happened with other forms of ethnic cooking (e.g. pizza), these groups have initiated the necessary entrepreneurial skills to provide group needs and indeed continue on



to educate the Australian population in new cooking methods. The requirements of ethnic groups are best met by broadening the Australian consumers' repertoire through education which incorporates the contribution of other ethnic groups.

A greater demand for a variety of species and forms of seafood would offer a challenge to the Australian fishing industry to supply suitable local product rather than overseas imports.

#### Source of Supply

The survey results show that in the majority of cases fresh seafood is purchased from the specialist fish shop, self caught, or obtained from friends or relatives. For other forms the chain supermarket accounts for most purchases. This may not however reflect consumer preference so much as availability or price. For example fresh fish is not available at present in a large number of supermarkets. Should this situation change and fresh fish is marketed in supermarkets along the same lines as meat and poultry, consumers may change their source of supply and possibly increase consumption.

There are three main options for supply to the majority of consumers. The fresh fish section in the supermarket, the fresh fish shop as a tenant in the supermarket complex, and the fish shop as part of the small local suburban shopping centre. The pattern of demographic change discussed earlier suggests that a place exists for each of these types. Of importance is the need for uniformity of quality and uniformity and competitiveness of price. It is likely that either sources of supply will account for major market portions in the future although a significant number of consumers at present use these other sources.

An ironic aspect of the economics of food supply is that those in the lowest income groups have reduced access to the cheaper commodities. In the present survey there was a suggestion that lower income groups make greater use of the local store for seafood supplies (particularly canned) possibly because of their reduced access to transport. The price of canned and frozen seafoods are considerably higher in the local store compared with the supermarket. Also a lower percentage of low income group consumers catch their own supplies. The costs involved in regular recreational fishing, particularly if boating is involved, are such that they would prohibit many lower income households from

this activity. The unemployed and pensioner segments of the population would account for a large portion of this group. In areas of high concentration of such consumers there is a case for marketing in the form of the local fish shop or fish van, with a range of forms of seafood with emphasis on bargain price products which result from peak season catches.

#### Reasons for Non-Consumption and Complaints

One method of increasing seafood consumption is to introduce new consumers to the product. The earlier discussion has shown a large potential market segment in this respect. Addressing the reasons for non-consumption of this segment should be a major thrust of seafood marketing. Some reasons cannot be directly addressed. High price was stated consistently as a reason for non-consumption. If seafood is to compete with meat and poultry products it must be competitive in this respect. It would appear that more could be done to advertise the fact that some seafoods are relatively inexpensive compared to other sources of nutrition. Other major comments by non-consumers were that they preferred meat or they felt quality was not of a sufficiently high standard.

Apart from the issue of price, two strategies would help overcome consumer reticence. Clearly, the appeal and actual quality of the product in terms of freshness and presentation could be improved in many areas. Secondly, considerable education of the consumer is necessary to present seafood as a nutritious, tasty alternative to meat and poultry. Education in selection and preparation of seafood is part of this process.

Maintaining existing consumers and increasing their consumption would be enhanced by considering their complaints. The survey showed price and seafood quality to be major areas of complaint. The strategies outlined in the previous paragraph would help address these.

#### Implications

The chapter has outlined some general results of the survey as they relate to various factors affecting seafood demand. Four major areas of concern for the marketing of seafood emerge from the discussion. These are briefly summarized below:

- (i) PRICE: Unless deliberate action by the industry is taken to make seafood competitive with meat and poultry products it is unlikely that consumption of seafood will increase as a substitute for these products. Cheaper seafoods must, however, maintain integrity as quality products. Little may be possible in this regard, in the short term at least, as price is determined by availability of the resource at any point in time and the costs of fishing. In the long term, more sophisticated management of fisheries and technological change could improve the economics of fishing and lower the price to the consumer. The price elasticity of demand is obviously going to determine whether or not the fishing industry would gain any income increases from increased supply.
- (ii) QUALITY: Surveillance to maintain quality is essential to foster consumer confidence in the product. The appearance of (and actual) freshness and careful presentation and handling are necessary for seafood to be competitive with meat and poultry products. Naturally the need for control of quality applies to the marketing outlet as well as the product itself. The use of terminology in relation to species naming needs to be standardised to eliminate the misnaming of species.
- (iii) MARKETING
- OUTLETS: Demographic trends in the Region indicate the need for careful planning to meet the needs of existing populations and to cater for the short and long term future demand. There is potential for a variety of sources of supply to the consumer. What is important is to maintain quality uniformly across this range and to enhance the overall image of the source of supply. The sale of local (Australian) product should be emphasized at all outlets and in all forms of seafood.
- (iv) EDUCATION: There appears to be considerable potential for public education about seafood products. Firstly, this should

highlight the nutritional and taste aspects of seafood as a substitute for meat and poultry and secondly it should improve consumer knowledge of how to select and prepare a variety of forms and species of seafoods. Keeping the public informed of species in plentiful supply and species with reduced prices at particular times is an important part of this education. As well as public education and awareness there appears to be a need to educate those at the retail level in the preparation, presentation and handling of seafood to improve the public image of the marketing outlet and the seafood product.

The discussion has deliberately avoided suggesting specific methods of carrying out major recommendations. Such methods are often the areas of specialist groups such as the advertising or media agencies under the direction of the appropriate management authority.

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7.0 APPENDICES

I Socio Economic Categories

II Cross tabulations

APPENDIX I

Socio Economic Categories

Table I Household Composition

1. SINGLE ADULT
2. ADULT COUPLE
3. ADULT COUPLE WITH ONE, TWO CHILDREN
4. GROUP OF ADULTS
5. ADULT COUPLE WITH TWO PLUS CHILDREN
6. MIXTURE OF ADULTS AND CHILDREN

Table II Income

1. LESS THAN \$8,000
2. \$8,001 - \$12,000
3. \$12,001 - \$18,000
4. \$18,001 - \$26,000
5. \$26,001 - \$45,000
6. \$45,000 PLUS

Table III Religion

1. CATHOLIC
2. OTHER CHRISTIAN
3. NON CHRISTIAN
4. GREEK/RUSSIAN ORTHODOX
5. JEWISH
6. OTHER (No Religion)

Table IV    Ethnicity

1.    AUSTRALIAN
2.    ABORIGINAL, ISLANDER, NEW GUINEA
3.    NEW ZEALAND
4.    BRITISH
5.    ADRIATIC
6.    EUROPEAN
7.    ASIAN
8.    AMERICAN



APPENDIX II  
Cross Tabulations

TABLE A1 Occasions Per Month *Fresh Fish* Consumed BY Religion  
(Percentage Occasions)

RELIG- ION	CATHOLIC	OTHER CHRISTIAN	NON- CHRISTIAN	GREEK/ RUSSIAN ORTHODOX	OTHER*
OCCASIONS					
<1	10.5	11.9	0.0	14.3	21.1
1,2	38.6	38.5	50.0	42.9	42.1
3,4	38.6	31.5	0.0	28.6	21.1
5,6	4.8	6.3	0.0	14.3	5.3
7-10	5.7	8.2	50.0	0.0	10.5
11-14	0.4	1.8	0.0	0.0	0.0
15-20	1.3	1.3	0.0	0.0	0.0
21-25	0.0	0.3	0.0	0.0	0.0
26-30	0.0	0.0	0.0	0.0	0.0
30 PLUS	0.0	0.1	0.0	0.0	0.0
N	228	670	2	7	19

\*OTHER- no religion, not stated.

TABLE A2 Occasions Per Month *Frozen Fish* Consumed BY Religion  
(Percentage Occasions)

RELIG- ION	CATHOLIC	OTHER CHRISTIAN	NON- CHRISTIAN	GREEK/ RUSSIAN ORTHODOX	OTHER*
OCCASIONS					
<1	25.8	20.4	0.0	0.0	28.6
1,2	45.0	47.9	100.0	0.0	57.1
3,4	22.5	22.3	0.0	100.0	14.3
5,6	2.5	4.3	0.0	0.0	0.0
7-10	2.5	4.0	0.0	0.0	0.0
11-14	1.7	0.3	0.0	0.0	0.0
15-20	0.0	0.3	0.0	0.0	0.0
21-25	0.0	0.0	0.0	0.0	0.0
26-30	0.0	0.3	0.0	0.0	0.0
30 PLUS	0.0	0.3	0.0	0.0	0.0
N	120	328	1	2	7

\*OTHER- no religion, not stated.

TABLE A3 Occasions Per Month *Smoked Fish*  
(Percentage Occasions)

Consumed BY Religion

RELIG- ION OCCASIONS	CATHOLIC	OTHER CHRISTIAN	NON- CHRISTIAN	GREEK/ RUSSIAN ORTHODOX	OTHER*
<1	35.2	32.6	-	2.1	2.1
1,2	55.6	55.2	-	60.0	33.3
3,4	7.4	9.0	-	0.0	0.0
5,6	0.0	0.9	-	0.0	0.0
7-10	0.0	0.0	-	0.0	0.0
11-14	0.0	0.0	-	0.0	0.0
15-20	0.0	0.0	-	0.0	0.0
21-25	0.0	0.0	-	0.0	0.0
26-30	0.0	0.0	-	0.0	0.0
30 PLUS	0.0	0.9	-	0.0	0.0
N	54	221	0	5	3

\*OTHER- no religion, not stated.

TABLE A4 Occasions Per Month *Canned Fish*  
(Percentage Occasions)

Consumed BY Religion

RELIG- ION OCCASIONS	CATHOLIC	OTHER CHRISTIAN	NON- CHRISTIAN	GREEK/ RUSSIAN ORTHODOX	OTHER*
<1	14.8	16.9	50.0	0.0	12.5
1,2	44.5	44.2	50.0	20.0	31.3
3,4	29.2	28.2	0.0	20.0	31.3
5,6	4.3	3.9	0.0	20.0	12.5
7-10	5.3	4.6	0.0	20.0	0.0
11-14	1.4	0.9	0.0	20.0	0.0
15-20	0.5	0.7	0.0	0.0	0.0
21-25	0.0	0.2	0.0	0.0	0.0
26-30	0.0	0.4	0.0	0.0	0.0
30 PLUS	0.0	0.2	0.0	0.0	0.0
N	209	568	2	5	16

\*OTHER- no religion, not stated.

TABLE A5 Occasions Per Month *Fresh Shellfish* Consumed BY Religion  
(Percentage Occasions)

RELIG- ION OCCASIONS	CATHOLIC	OTHER CHRISTIAN	NON- CHRISTIAN	GREEK/ RUSSIAN ORTHODOX	OTHER*
<1	31.4	34.8	-	20.0	20.0
1,2	52.1	45.4	-	60.0	60.0
3,4	12.1	15.0	-	0.0	10.0
5,6	2.1	2.8	-	0.0	0.0
7-10	0.7	1.1	-	0.0	10.0
11-14	0.7	0.3	-	20.0	0.0
15-20	0.7	0.3	-	0.0	0.0
21-25	0.0	0.0	-	0.0	0.0
26-30	0.0	0.0	-	0.0	0.0
30 PLUS	0.0	0.3	-	0.0	0.0
N	140	359	0	5	10

\*OTHER- no religion, not stated.

TABLE A6 Occasions Per Month *Frozen Shellfish* Consumed BY Religion  
(Percentage Occasions)

RELIG- ION OCCASIONS	CATHOLIC	OTHER CHRISTIAN	NON- CHRISTIAN	GREEK/ RUSSIAN ORTHODOX	OTHER*
<1	54.5	47.2	-	0.0	-
1,2	36.4	41.5	-	100.0	-
3,4	9.1	7.5	-	0.0	-
5,6	0.0	1.9	-	0.0	-
7-10	0.0	0.0	-	0.0	-
11-14	0.0	0.0	-	0.0	-
15-20	0.0	0.0	-	0.0	-
21-25	0.0	0.0	-	0.0	-
26-30	0.0	0.0	-	0.0	-
30 PLUS	0.0	0.0	-	0.0	-
N	11	53	0	1	0

\*OTHER- no religion, not stated.

TABLE A7 Occasions Per Month *Smoked Shellfish* Consumed BY Religion  
(Percentage Occasions)

RELIG- ION OCCASIONS	CATHOLIC	OTHER CHRISTIAN	NON- CHRISTIAN	GREEK/ RUSSIAN ORTHODOX	OTHER*
<1	60.0	61.1	100.0	0.0	-
1,2	0.0	33.3	0.0	100.0	-
3,4	40.0	5.6	0.0	0.0	-
5,6	↑	↑	↑	↑	
7-10	↑	↑	↑	↑	
11-14	↑	↑	↑	↑	
15-20	0.0	0.0	0.0	0.0	-
21-25	↓	↓	↓	↓	
26-30	↓	↓	↓	↓	
30 PLUS	↓	↓	↓	↓	
N	5	18	1	1	0

\*OTHER- no religion, not stated.

TABLE A8 Occasions Per Month *Canned Shellfish* Consumed BY Religion  
(Percentage Occasions)

RELIG- ION OCCASIONS	CATHOLIC	OTHER CHRISTIAN	NON- CHRISTIAN	GREEK/ RUSSIAN ORTHODOX	OTHER*
<1	37.2	52.2	-	0.0	0.0
1,2	41.9	37.6	-	100.0	100.0
3,4	20.9	6.9	-	0.0	0.0
5,6	0.0	1.1	-	0.0	0.0
7-10	0.0	0.0	-	0.0	0.0
11-14	0.0	1.1	-	0.0	0.0
15-20	0.0	1.1	-	0.0	0.0
21-25	0.0	0.0	-	0.0	0.0
26-30	0.0	1.1	-	0.0	0.0
30 PLUS	0.0	0.0	-	0.0	0.0
N	43	90	0	1	3

\*OTHER- no religion, not stated.

TABLE A9 Occasions Per Month *Poultry* Consumed BY Religion  
(Percentage Occasions)

RELIG- ION OCCASIONS	CATHOLIC	OTHER CHRISTIAN	NON- CHRISTIAN	GREEK/ RUSSIAN ORTHODOX	OTHER*
<1	2.7	2.8	0.0	0.0	0.0
1,2	23.0	21.7	100.0	14.3	9.5
3,4	47.7	46.3	0.0	57.1	52.4
5,6	9.8	8.1	0.0	0.0	14.3
7-10	13.3	16.5	0.0	0.0	19.0
11-14	2.7	2.8	0.0	28.6	0.0
15-20	0.8	1.1	0.0	0.0	4.8
21-25	0.0	0.3	0.0	0.0	0.0
26-30	0.0	0.4	0.0	0.0	0.0
30 PLUS	0.0	0.1	0.0	0.0	0.0
N	256	756	2	7	21

\*OTHER- no religion, not stated.

TABLE A10 Occasions Per Month *Meat* Consumed BY Religion  
(Percentage Occasions)

RELIG- ION OCCASIONS	CATHOLIC	OTHER CHRISTIAN	NON- CHRISTIAN	GREEK/ RUSSIAN ORTHODOX	OTHER*
<1	0.4	0.5	0.0	0.0	0.0
1,2	0.8	1.3	50.0	0.0	0.0
3,4	2.0	2.9	0.0	0.0	4.8
5,6	0.8	0.1	0.0	0.0	4.8
7-10	3.9	7.1	0.0	0.0	9.5
11-14	11.0	10.4	0.0	14.3	4.8
15-20	42.5	36.3	0.0	14.3	42.9
21-25	13.8	21.4	0.0	28.6	4.8
26-30	23.6	17.5	50.0	42.9	28.6
30 PLUS	1.2	2.4	0.0	0.0	0.0
N	254	758	2	7	21

\*OTHER- no religion, not stated.

TABLE A11 Occasions Per Month *Meat*  
(Percentage Occasions)

Consumed BY Ethnicity

ETHNIC - ITY	AUSTRALIAN	ABORIGINAL ISLANDER	NEW ZEALAND	BRITISH	ADRIATIC	EUROPEAN	ASIAN	AMERICAN
OCCASIONS								
1	0.5	0.0	0.0	1.3	0.0	0.0	0.0	0.0
1,2	1.0	0.0	3.4	1.9	12.5	1.5	0.0	0.0
3,4	2.2	0.0	17.2	3.9	12.5	1.5	0.0	0.0
5,6	0.8	0.0	0.0	1.3	0.0	0.0	0.0	0.0
7-10	6.2	33.3	3.4	6.5	12.5	7.5	0.0	0.0
11-14	9.5	33.3	13.8	14.2	0.0	9.0	10.0	50.0
15-20	35.5	0.0	34.5	39.4	37.5	41.8	40.0	33.3
21-25	20.2	33.3	17.2	16.8	25.0	19.4	0.0	0.0
26-30	22.0	0.0	10.3	12.3	0.0	19.4	50.0	16.7
30 PLUS	2.2	0.0	0.0	2.6	0.0	0.0	0.0	0.0
N	926	3	29	155	8	67	10	6

TABLE A12 Occasions Per Month *Poultry*  
(Percentage Occasions)

Consumed BY Ethnicity

ETHNIC - ITY	AUSTRALIAN	ABORIGINAL ISLANDER	NEW ZEALAND	BRITISH	ADRIATIC	EUROPEAN	ASIAN	AMERICAN
OCCASIONS								
1	3.2	0.0	0.0	3.1	0.0	6.2	0.0	0.0
1,2	22.8	0.0	34.5	23.3	22.2	18.5	22.2	16.7
3,4	46.9	33.3	34.5	42.8	33.3	53.8	11.1	50.0
5,6	8.1	0.0	6.9	11.9	0.0	6.2	33.3	0.0
7-10	14.5	33.3	17.2	17.0	22.2	12.3	22.2	33.3
11-14	2.9	33.3	6.9	0.6	11.1	3.1	0.0	0.0
15-20	1.0	0.0	0.0	0.6	0.0	0.0	11.1	0.0
21-25	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26-30	0.4	0.0	0.0	0.0	11.1	0.0	0.0	0.0
30 PLUS	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0
N	925	3	29	159	9	65	9	6

TABLE A13 Occasions Per Month *Fresh Fish*  
(Percentage Occasions)

Consumed BY Ethnicity

ETHNIC - ITY OCCASIONS	AUSTRALIAN	ABORIGINAL ISLANDER	NEW ZEALAND	BRITISH	ADRIATIC	EUROPEAN	ASIAN	AMERICAN
1	13.0	0.0	7.7	6.0	0.0	8.8	0.0	20.0
1,2	39.4	50.0	34.6	36.1	22.2	43.9	50.0	40.0
3,4	31.1	50.0	42.3	36.8	44.4	31.6	20.0	20.0
5,6	5.8	0.0	3.8	6.0	11.1	7.0	0.0	20.0
7-10	6.6	0.0	11.5	12.0	22.2	5.3	20.0	0.0
11-14	2.1	0.0	0.0	0.8	0.0	1.8	0.0	0.0
15-20	1.6	0.0	0.0	0.8	0.0	1.8	10.0	0.0
21-25	0.1	0.0	0.0	0.8	0.0	0.0	0.0	0.0
26-30	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30 PLUS	0.1	0.0	0.0	0.8	0.0	0.0	0.0	0.0
N	814	2	26	133	9	57	10	5

TABLE A14 Occasions Per Month *Frozen Fish*  
(Percentage Occasions)

Consumed BY Ethnicity

ETHNIC - ITY OCCASIONS	AUSTRALIAN	ABORIGINAL ISLANDER	NEW ZEALAND	BRITISH	ADRIATIC	EUROPEAN	ASIAN	AMERICAN
1	22.3	0.0	17.6	17.4	33.3	25.0	16.7	0.0
1,2	49.6	50.0	47.1	42.4	16.7	42.9	66.7	80.0
3,4	21.8	50.0	17.6	23.9	50.0	21.4	16.7	0.0
5,6	2.2	0.0	11.8	7.6	0.0	0.0	0.0	0.0
7-10	3.0	0.0	5.9	3.3	0.0	10.7	0.0	0.0
11-14	0.5	0.0	0.0	1.1	0.0	0.0	0.0	20.0
15-20	0.3	0.0	0.0	1.1	0.0	0.0	0.0	0.0
21-25	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26-30	0.0	0.0	0.0	2.2	0.0	0.0	0.0	0.0
30 PLUS	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0
N	367	2	17	92	6	28	6	5

TABLE A15 Occasions Per Month *Smoked Fish*  
(Percentage Occasions)

Consumed BY Ethnicity

ETHNIC - ITY OCCASIONS	AUSTRALIAN	ABORIGINAL ISLANDER	NEW ZEALAND	BRITISH	ADRIATIC	EUROPEAN	ASIAN	AMERICAN
1	34.0	0.0	37.5	30.9	25.0	40.0	50.0	
1,2	54.8	0.0	62.5	52.7	50.0	50.0	50.0	
3,4	9.5	100.0	0.0	9.1	0.0	10.0	0.0	
5,6	0.8	0.0	0.0	1.8	0.0	0.0	0.0	
7-10	0.0	0.0	0.0	3.6	25.0	0.0	0.0	
11-14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
15-20	0.0	0.0	0.0	1.8	0.0	0.0	0.0	
21-25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
26-30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
30 PLUS	0.8	0.0	0.0	0.0	0.0	0.0	0.0	
N	241	1	8	55	4	20	2	

TABLE A16 Occasions Per Month *Canned Fish*  
(Percentage Occasions)

Consumed BY Ethnicity

ETHNIC - ITY OCCASIONS	AUSTRALIAN	ABORIGINAL ISLANDER	NEW ZEALAND	BRITISH	ADRIATIC	EUROPEAN	ASIAN	AMERICAN
1	16.1	0.0	4.5	13.7	25.0	17.3	42.9	0.0
1,2	46.0	66.7	50.0	42.7	12.5	28.8	28.6	66.7
3,4	29.0	0.0	18.2	27.4	25.0	28.8	14.3	0.0
5,6	2.8	0.0	13.6	6.5	37.5	9.6	14.3	16.7
7-10	3.8	33.3	13.6	5.6	0.0	11.5	0.0	0.0
11-14	1.0	0.0	0.0	2.4	0.0	1.9	0.0	16.7
15-20	0.7	0.0	0.0	0.0	0.0	1.9	0.0	0.0
21-25	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26-30	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30 PLUS	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0
N	704	3	22	124	8	52	7	6



TABLE A17 Occasions Per Month *Fresh Shellfish* Consumed BY Ethnicity  
(Percentage Occasions)

ETHNIC - ITY OCCASIONS	AUSTRALIAN	ABORIGINAL ISLANDER	NEW ZEALAND	BRITISH	ADRIATIC	EUROPEAN	ASIAN	AMERICAN
1	32.4	0.0	47.1	40.9	16.7	41.4	20.0	0.0
1,2	48.7	100.0	35.3	43.9	50.0	41.4	60.0	0.0
3,4	13.6	0.0	11.8	10.6	16.7	13.8	20.0	100.0
5,6	2.5	0.0	5.9	3.0	0.0	0.0	0.0	0.0
7-10	1.7	0.0	0.0	1.5	0.0	0.0	0.0	0.0
11-14	0.4	0.0	0.0	0.0	16.7	3.4	0.0	0.0
15-20	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21-25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26-30	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30 PLUS	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N	472	2	17	66	6	29	5	1

TABLE A18 Occasions Per Month *Frozen Shellfish* Consumed BY Ethnicity  
(Percentage Occasions)

ETHNIC - ITY OCCASIONS	AUSTRALIAN	ABORIGINAL ISLANDER	NEW ZEALAND	BRITISH	ADRIATIC	EUROPEAN	ASIAN	AMERICAN
1	50.0	-	0.0	43.8	-	50.0	100.0	0.0
1,2	38.5	-	75.0	43.8	-	50.0	0.0	100.0
3,4	9.6	-	25.0	6.3	-	0.0	0.0	0.0
5,6	0.0	-	0.0	6.3	-	0.0	0.0	0.0
7-10	1.9	-	0.0	0.0	-	0.0	0.0	0.0
11-14	↑	-	↑	↑	-	↑	↑	↑
15-20	↑	-	↑	↑	-	↑	↑	↑
21-25	0.0	-	0.0	0.0	-	0.0	0.0	0.0
26-30	↓	-	↓	↓	-	↓	↓	↓
30 PLUS	↓	-	↓	↓	-	↓	↓	↓
N	52	0	4	0	16	6	1	2

TABLE A19 Occasions Per Month *Smoked Shellfish* Consumed BY Ethnicity  
(Percentage Occasions)

ETHNIC - ITY	AUSTRALIAN	ABORIGINAL ISLANDER	NEW ZEALAND	BRITISH	ADRIATIC	EUROPEAN	ASIAN	AMERICAN
OCCASIONS								
1	63.2	-	0.0	50.0	-	33.3	100.0	-
1,2	31.6	-	0.0	25.0	-	16.7	0.0	-
3,4	5.3	-	100.0	0.0	-	50.0	0.0	-
5,6	0.0	-	0.0	0.0	-	0.0	0.0	-
7-10	0.0	-	0.0	0.0	-	0.0	0.0	-
11-14	0.0	-	0.0	25.0	-	0.0	0.0	-
15-20	↑	-	↑	↑	-	↑	↑	-
21-25	0.0	-	0.0	0.0	-	0.0	0.0	-
26-30	↓	-	↓	↓	-	↓	↓	-
30 PLUS	↓	-	↓	↓	-	↓	↓	-
N	19	0	1	4	0	6	1	0

TABLE A20 Occasions Per Month *Canned Shellfish* Consumed BY Ethnicity  
(Percentage Occasions)

ETHNIC - ITY	AUSTRALIAN	ABORIGINAL ISLANDER	NEW ZEALAND	BRITISH	ADRIATIC	EUROPEAN	ASIAN	AMERICAN
OCCASIONS								
1	49.6	0.0	25.0	42.3	0.0	25.0	66.7	25.0
1,2	36.5	0.0	50.0	42.3	100.0	62.5	33.3	50.0
3,4	12.2	100.0	25.0	11.5	0.0	12.5	0.0	0.0
5,6	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7-10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11-14	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15-20	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.0
21-25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26-30	0.0	0.0	0.0	3.8	0.0	0.0	0.0	0.0
30 PLUS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N	115	1	4	26	4	8	3	4

TABLE A21 Occasions Per Month *Fresh fish*  
(Percentage Occasions)

Consumed BY Income

INCOME OCCASIONS	LESS THAN \$8000	\$8001 TO \$12000	\$12001 TO \$18000	\$18001 TO \$26000	\$26001 TO \$45000	MORE THAN \$45000
1	15.0	9.6	12.5	10.2	7.0	6.7
1,2	37.4	38.2	42.0	38.6	41.2	26.7
3,4	33.7	33.8	29.5	31.3	31.6	46.7
5,6	5.9	4.5	4.5	6.5	7.9	0.0
7-10	5.3	9.6	8.5	9.8	7.0	13.0
11-14	1.1	1.9	1.5	2.0	1.8	0.0
15-20	1.1	1.9	0.5	1.6	2.6	6.7
21-25	0.0	0.0	1.0	0.0	0.9	0.0
26-30	0.0	0.0	0.0	0.0	0.0	0.0
30 PLUS	0.5	0.6	0.0	0.0	0.0	0.0
N	187	157	200	246	114	15

TABLE A22 Occasions Per Month *Fresh Shellfish* Consumed BY Income  
(Percentage Occasions)

INCOME OCCASIONS	LESS THAN \$8000	\$8001 TO \$12000	\$12001 TO \$18000	\$18001 TO \$26000	\$26001 TO \$45000	MORE THAN \$45000
1	46.1	35.2	34.4	25.1	24.1	45.5
1,2	43.3	50.5	48.4	50.3	53.2	36.4
3,4	6.6	11.0	13.9	16.8	12.7	9.1
5,6	2.6	3.3	1.6	3.0	5.1	0.0
7-10	1.3	0.0	0.0	1.8	5.1	9.1
11-14	0.0	0.0	0.8	1.2	0.0	0.0
15-20	0.0	0.0	0.8	0.6	0.0	0.0
21-25	0.0	0.0	0.0	0.0	0.0	0.0
26-30	0.0	0.0	0.0	0.6	0.0	0.0
30 PLUS	0.0	0.0	0.0	0.2	0.0	0.0
N	76	91	122	167	79	11

TABLE A23 Occasions Per Month *Frozen Fish*  
(Percentage Occasions)

Consumed BY Income

INCOME OCCASIONS	LESS THAN \$8000	\$8001 TO \$12000	\$12001 TO \$18000	\$18001 TO \$26000	\$26001 TO \$45000	MORE THAN \$45000
1	22.4	17.5	25.4	21.6	19.0	25.0
1,2	43.4	50.8	42.6	50.4	53.4	50.0
3,4	23.7	25.4	23.0	20.8	22.4	0.0
5,6	2.6	1.6	4.9	2.4	1.7	12.5
7-10	6.6	3.2	1.6	3.2	3.4	0.0
11-14	0.0	0.0	0.8	0.8	0.0	12.5
15-20	0.0	1.6	0.0	0.0	0.0	0.0
21-25	0.0	0.0	0.8	0.0	0.0	0.0
26-30	0.0	0.0	0.8	0.8	0.0	0.0
30 PLUS	1.3	0.0	0.0	0.0	0.0	0.0
N	76	63	122	125	58	8

TABLE A24 Occasions Per Month *Frozen Shellfish* Consumed BY Income  
(Percentage Occasions)

INCOME OCCASIONS	LESS THAN \$8000	\$8001 TO \$12000	\$12001 TO \$18000	\$18001 TO \$26000	\$26001 TO \$45000	MORE THAN \$45000
1	77.8	53.8	60.0	44.4	23.5	50.0
1,2	22.2	30.8	30.0	40.7	64.7	50.0
3,4	0.0	15.4	10.0	11.1	5.9	0.0
5,6	0.0	0.0	0.0	3.7	0.0	0.0
7-10	0.0	0.0	0.0	0.0	5.9	0.0
11-14	↑	↑	↑	↑	↑	↑
15-20	↑	↑	↑	↑	↑	↑
21-25	0.0	0.0	0.0	0.0	0.0	0.0
26-30	↓	↓	↓	↓	↓	↓
30 PLUS	↓	↓	↓	↓	↓	↓
N	9	13	10	27	17	2

TABLE A25 Occasions Per Month *Smoked Fish*  
(Percentage Occasions)

Consumed BY Income

INCOME OCCASIONS	LESS THAN \$8000	\$8001 TO \$12000	\$12001 TO \$18000	\$18001 TO \$26000	\$26001 TO \$45000	MORE THAN \$45000
1	39.7	34.9	31.0	31.6	21.6	20.0
1,2	50.7	48.8	58.6	57.9	70.3	60.0
3,4	9.6	11.6	6.9	6.6	5.4	20.0
5,6	0.0	2.3	0.0	1.3	0.0	0.0
7-10	0.0	0.0	3.4	1.3	0.0	0.0
11-14	0.0	0.0	0.0	0.0	0.0	0.0
15-20	0.0	0.0	0.0	0.0	2.7	0.0
21-25	0.0	0.0	0.0	0.0	0.0	0.0
26-30	0.0	0.0	0.0	0.0	0.0	0.0
30 PLUS	0.0	2.3	0.0	1.3	0.0	0.0
N	73	43	58	76	37	5

TABLE A26 Occasions Per Month *Smoked Shellfish* Consumed BY Income  
(Percentage Occasions)

INCOME OCCASIONS	LESS THAN \$8000	\$8001 TO \$12000	\$12001 TO \$18000	\$18001 TO \$26000	\$26001 TO \$45000	MORE THAN \$45000
1	50.0	100.0	100.0	50.0	33.3	-
1,2	33.3	0.0	0.0	25.0	33.3	-
3,4	16.7	0.0	0.0	16.7	33.3	-
5,6	0.0	0.0	0.0	0.0	0.0	-
7-10	0.0	0.0	0.0	0.0	0.0	-
11-14	0.0	0.0	0.0	8.3	0.0	-
15-20	↑	↑	↑	↑	↑	-
21-25	0.0	0.0	0.0	0.0	0.0	-
26-30	↓	↓	↓	↓	↓	-
30 PLUS	↓	↓	↓	↓	↓	-
N	6	1	5	12	6	0

Consumption Patterns of Fish and Shellfish in the Moreton  
Region (1982/22)

Objective:

To carry out a survey of seafood consumption patterns and attitudes in the Moreton region, which encompasses the Gold Coast and Maroochydore and comprises the largest regional population in Queensland outside Brisbane.

Organisations:

James Cook University  
and  
Griffith University

Supervisors:

Dr S.D. Bandaranaike  
Lecturer,  
Department of Geography,  
James Cook University,  
TOWNSVILLE QLD 4810  
and

Mr T.J. Hundloe,  
Lecturer,  
School of Australian Environmental Studies,  
Griffith University,  
NATHAN QLD 4111

Grant:

1982/83	Total
\$12,794	\$12,794

TABLE A27 Occasions Per Month *Canned Fish* Consumed BY Income  
(Percentage Occasions)

INCOME OCCASIONS	LESS THAN \$8000	\$8001 TO \$12000	\$12001 TO \$18000	\$18001 TO \$26000	\$26001 TO \$45000	MORE THAN \$45000
1	20.8	14.5	17.3	12.6	13.9	0.0
1,2	40.3	47.6	42.7	45.6	41.7	50.0
3,4	30.2	26.6	30.3	30.7	25.9	31.3
5,6	1.9	4.8	3.8	5.1	8.3	0.0
7-10	5.7	3.2	3.8	3.7	6.5	0.0
11-14	0.6	1.6	1.6	0.9	0.9	12.5
15-20	0.0	0.8	0.0	1.4	0.9	0.0
21-25	0.0	0.0	0.5	0.0	0.0	0.0
26-30	0.0	0.8	0.0	0.0	0.9	6.3
30 PLUS	0.6	0.0	0.0	0.0	0.9	0.0
N	159	124	185	215	108	16

TABLE A28 Occasions Per Month *Canned Shellfish* Consumed BY Income  
(Percentage Occasions)

INCOME OCCASIONS	LESS THAN \$8000	\$8001 TO \$12000	\$12001 TO \$18000	\$18001 TO \$26000	\$26001 TO \$45000	MORE THAN \$45000
1	63.2	38.5	48.0	39.6	54.5	25.0
1,2	36.8	42.3	40.0	43.4	40.9	25.0
3,4	0.0	11.5	8.0	15.1	4.5	50.0
5,6	0.0	3.8	0.0	0.0	0.0	0.0
7-10	0.0	0.0	0.0	0.0	0.0	0.0
11-14	0.0	0.0	0.0	1.9	0.0	0.0
15-20	0.0	3.8	0.0	0.0	0.0	0.0
21-25	0.0	0.0	0.0	0.0	0.0	0.0
26-30	0.0	0.0	4.0	0.0	0.0	0.0
30 PLUS	0.0	0.0	0.0	0.0	0.0	0.0
N	19	26	25	53	22	4