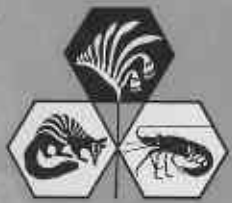


36/1978



DEPARTMENT OF  
FISHERIES AND WILDLIFE  
WESTERN AUSTRALIA



# REPORT NO 36

Published by the Director of Fisheries and Wildlife, Perth,  
under the authority of the Hon. Minister for Fisheries and Wildlife

## Utilization of the Bunbury and Geographe Bay Marine Resource by Professional and Amateur Fishermen

BY

MICHAEL H. WALKER

1978

PERTH  
WESTERN AUSTRALIA

055212

R E P O R T

NO. 36

UTILIZATION OF THE BUNBURY AND GEOGRAPHE BAY  
MARINE RESOURCE BY PROFESSIONAL AND AMATEUR FISHERMEN

BY

MICHAEL H. WALKER

WESTERN AUSTRALIAN MARINE RESEARCH LABORATORIES,  
DEPARTMENT OF FISHERIES AND WILDLIFE,  
P.O. BOX 20, NORTH BEACH,  
WESTERN AUSTRALIA, 6020, AUSTRALIA.

## CONTENTS

	Page
ABSTRACT	5
I INTRODUCTION	6
II PROFESSIONAL UTILIZATION	7
1. Operational details and opinions of professional fishermen of Bunbury and Geographe Bay.	7
2. Geographe Bay fish production years 1966/67 to 1974/75.	11
3. Fish production of the Bunbury marine area years 1966/67 to 1974/75.	19
4. Geographe Bay and Bunbury marine area fish production 1975/76.	21
5. Professional usage and value of the Geographe Bay and the Bunbury marine area based on 5 mile statistical blocks for the period December 1975 to April 1977.	23
III AMATEUR UTILIZATION	26
1. Opinions of amateur fishermen with regard to usage of the Bunbury marine area and Geographe Bay generally.	27
A. Metropolitan Angling Clubs via the Australian Anglers Association W.A. Branch.	27
B. Bunbury Angling Club.	27
C. Bunbury Power Boat Club.	27
D. Individual Bunbury Anglers, Boat Fishermen and Divers.	28
2. Usage of the Bunbury marine area by amateur anglers, boat fishermen and amateur divers.	28
A. Amateur anglers.	28
B. Amateur boat fishermen.	29
C. Amateur divers.	30
IV SUMMARY	30
V ACKNOWLEDGEMENTS	31

TABLES

	Page
1. Details of individual fisherman's activities.	32
2. Fish production - Geographe Bay by location (Block 3315), (landed weights in kg) 1966/67 to 1974/75.	35
3. Mean value of Geographe Bay commercial species.	38
4. Fish production - Bunbury by location 1966/67 to 1974/75 (landed weights in kg).	39
5. Mean value of Bunbury marine area commercial species.	42
6. Fish production Geographe Bay and Bunbury marine area 1975/76 by species in kg landed weight and value to fishermen.	43
7. Summary of some professional catches made in the Bunbury marine area and Geographe Bay for period December 1975 to April 1977.	44
8. Summaries of some professional catches made in the Bunbury marine area and Geographe Bay for the period December 1975 to April 1977 grouped into 3 areas.	45
9. Amateur angling catch and effort data for the Bunbury marine area.	46
10. Amateur boat fishermen catch and effort data for the Bunbury marine area.	47
11. Bunbury Power Boat Club field day catch and effort data.	48
12. Amateur divers - diving details, observations, etc., for the Bunbury marine area.	49

## FIGURES

	Page
1. Water movements within Geographe Bay according to professional fishermen who fish the area.	52
2. Commercial blocks and areas of Geographe Bay and Bunbury.	53
3. Bunbury and Geographe Bay professional catches in the interval December 1975 - April 1977.	Inside back cover
4. Amateur fishing locations in the Bunbury area.	54

## APPENDICES

1. Interview questions - Geographe Bay professional fishermen.	55
2a. Instructions for the completion of Geographe Bay weekly fishing log sheets.	57
2b. Geographe Bay weekly fishing log sheet.	58
3. Block location map Bunbury and Geographe Bay.	59
4a. Instructions for the completion of amateur fisherman's log sheets.	60
4b. Amateur fisherman's log sheet.	61
5. Common names of fish used by amateur fishermen reconciled, where possible, with scientific names.	62

UTILIZATION OF THE BUNBURY AND GEOGRAPHE BAY MARINE  
RESOURCE BY PROFESSIONAL AND AMATEUR FISHERMEN

Michael H. Walker  
Western Australian Marine Research Laboratories  
Department of Fisheries and Wildlife  
P.O. Box 20, North Beach, Western Australia, 6020

ABSTRACT

*Utilization of the Bunbury and Geographe Bay marine resource by professional and amateur fishermen was investigated by personal interview, distribution and analysis of research log sheets, and examination of commercial statistics for the area, published by the Australian Bureau of Statistics.*

*Total professional production for the years 1966/67 - 1974/75 for Geographe Bay varied between 225517 and 1218049 Kg (mean 497175) with a mean annual value to fishermen of \$427708. Production for the Bunbury marine area varied between 157666 and 333810 Kg (mean 226526) with a mean value to fishermen of \$311008. For the 1975/76 season the total production was 468070 Kg for Geographe Bay and 404118 Kg for Bunbury at respective values of \$364693 and \$326149. A total catch value per fishing day of \$5320 was calculated for the entire area.*

*The Bunbury marine area provides Bunbury residents with popular recreational outlets such as angling from the shore and boats, and diving.*

*The most important marine species for the Geographe Bay/Bunbury marine area are : rock lobsters, Westralian jewfish, sharks, pilchard, Australian salmon and herring, mullet , whiting and tailor.*

# I INTRODUCTION

The study described in this report was one of several undertaken by the Fisheries Research Branch of the W.A. Department of Fisheries and Wildlife as part of a programme to evaluate and predict the consequences of the ocean discharge of effluent waste from the Laporte titanium dioxide factory at Bunbury, Western Australia. The multidisciplinary programme, which was sponsored and supervised by the Laporte Effluent Committee, was designed to examine the various options for disposal of the waste. This report considers the utilization of the marine resource by professional and amateur fishermen. A report on the evaluation and inventory of the marine resources is the subject of another report (in preparation).

This report treats professional and amateur fishermen separately because of their basically different usage of the area.

Information on the professional and amateur fisheries of Geographe Bay and the Bunbury marine area was obtained from a variety of sources.

- (i) Interviews conducted with local professional and amateur fishermen.
- (ii) Area statistics published by the Australian Bureau of Statistics.
- (iii) Research log sheets completed by Bunbury and Geographe Bay professional and amateur fishermen.
- (iv) Field day results of the Bunbury Power Boat Club.

Professional utilization has therefore been considered in terms of: the operational details and opinions of Bunbury and Geographe Bay professional fishermen; Geographe Bay fish production years 1966/67 to 1974/75; fish production of the Bunbury marine area 1966/67 to 1974/75; Geographe Bay and Bunbury marine area fish production 1975/76; and the professional usage and value in dollars of Geographe Bay and the Bunbury marine area according to 5 mile blocks for the period December 1975 - April 1977.

Amateur utilization has been considered in terms of: operational details and opinions of amateur fishermen with regard to the Bunbury marine area and Geographe Bay generally; usage of the Bunbury marine area by amateur anglers; usage of the Bunbury marine area by amateur boat fishermen; and usage of the Bunbury marine area by amateur divers.

## II PROFESSIONAL UTILIZATION

### 1. OPERATIONAL DETAILS AND OPINIONS OF PROFESSIONAL FISHERMEN OF BUNBURY AND GEOGRAPHE BAY.

Nineteen professional fishermen who fish or have fished the Geographe Bay area from Cape Naturaliste to the Bouvard Reefs (Figure 1) were interviewed in the latter part of 1975 by Mr. Jim Seabrook an officer of the Department of Fisheries and Wildlife (now a professional fisherman). The fishermen were questioned on the details of their current and past operations within the Geographe Bay area and on their knowledge and opinions concerning environmental matters and Geographe Bay generally (Appendix 1).

The answers and opinions concerning the questions asked are summarized below. As interviews were conducted in strict confidence an attempt has been made not to disclose confidential details concerning operations of specific fishermen.

#### Questions and Answers

Questions 1, 2 and 3 concern Geographe Bay and other areas, while questions 4 to 14 concern Geographe Bay only. Although nineteen fishermen were interviewed, the number answering a particular question varied from question to question. The reasons for this were either that fishermen were not prepared to answer some questions because of the private nature of such questions or that some questions were not appropriate to them as they: had semi-retired from the industry; did not fish inside Geographe Bay; no longer owned a boat, etc.

- (1) Length of Boat - Of the seventeen fishermen interviewed and who fish Geographe Bay, two operated boats 15-20 ft in length; 3 @ 21-25 ft; 5 @ 26-30 ft; 6 @ 31-45 ft and 1 @ greater than 45 ft in length.
- (2) Port of Operation - Thirteen of the nineteen interviewed gave Busselton as port of operation and six gave Bunbury.
- (3) Operational Area of Fishing - Six fishermen gave their operational area as Geographe Bay only, ten as both inside and outside Geographe Bay, and two as outside only i.e. west coast.

An attempt was made to determine for those fishermen who fished both inside and outside Geographe Bay what proportion of their time (effort) was spent inside Geographe Bay. There was no real answer to this question as this depended upon a variety of factors which varied from year to year such as weather, abundance of fish species inside and outside Geographe Bay and competition with other professionals and with amateur boat fishermen. Some fishermen commented that amateurs were increasing in numbers each year and were becoming more sophisticated with regard to their boats and equipment.



- (4) Fishing Method - Three fishermen used a single method only, two of these were rock lobster fishermen and the other a part time fisherman. Twelve fishermen used a variety of methods. The extent to which they did this depended upon the success of their main method(s), weather, time of year etc.

The numbers of fishermen using a particular method were :-

Beach seining	7	Purse seining	2
Shark netting	6	Ring netting	2
Handlining	5	Trolling	1
Lobster potting	4	Diving	1
Mesh netting	4		

- (5) Annual Catch in weight in 1974/75\* - Annual catches given for Geographe Bay ranged from 500 Kg to 62000 Kg. The total catch for thirteen fishermen was 234613 Kg with a mean of 18047 Kg.
- (6) Annual Catch in Value in 1974/75\* - Gross incomes given by fishermen derived from fishing in Geographe Bay varied from \$1500 to \$30000. The mean income for nine fishermen who answered this question was \$10,944.
- (7) Comparison of 1974/75 Season with Previous Seasons - There was a variety of opinion amongst fishermen concerning the position of the 1974/75 season and the previous one. Some thought the season was much poorer blaming the weather, and over exploitation of fish, other considered the season to be average and others better than recent previous seasons. It was obvious from the replies given that of the fishermen interviewed, success varied considerably from fisherman to fisherman as did their intentions with regard to the amount or proportion of income they desired from fishing, i.e. some were semi retired, some part time working at other jobs and some fully professional in the area and outside it.
- (8) Important Species of the Area - Fishermen reported that their most important species from Geographe Bay were shark, Australian salmon, rock lobster, Australian herring and Westralian jewfish.
- (9) Individual Fishery Details - Table 1 shows details of the operations of 15 Bunbury and Busselton fishermen according to some of the questions asked of their fishing activities and summarized below. (Question 9 sought to identify catches not necessarily confined to Geographe Bay.

\* Some underestimation of catches appears to be prevalent both verbally and on commercial returns.

- (i) Species in order of importance - the most important species were as given above (see question 8).
- (ii) Method of fishing - beach seining was the most important method followed by set netting, pot fishing, hand lining, long lining and drop netting.
- (iii) No. of fishing units - as given in Table 1. Answers given to this question and to (1) and (2) above showed that many fishermen operated with a variety of gear and fishing methods in order to catch several species.
- (iv) Length of season - the majority of fishermen operated from October to May removing their boats from the water for the winter months. A few fishermen operated all year round.
- (v) Most important months of season - the most important months of operation were the summer months of December, January and February.
- (vi) Important fishing areas - in terms of locality, depth and bottom type. This depended upon the species fished for and the fishing methods used (Table 1).
- (vii) Quantity caught last year - i.e. 1974/75. Catches varied according to fishing method from 108,000 Kg to 500 Kg (Table 1).
- (viii) Value of catch last year - varied according to fisherman from \$2,000 to \$30,000 with a mean value for eleven fishermen who were prepared to answer this question \$9,855. This information, because of its confidential nature, is not summarised in Table 1.
- (ix) Comparison with previous seasons - nine fishermen considered catches to be generally declining, four fishermen considered them to be stable and one fisherman for catches to be improving. The older more experienced fishermen were generally of the opinion that catches were declining in Geographe Bay and blamed tourist activities such as vehicles on beaches, increased power boat traffic etc.
- (x) Why the choice of fishing as an occupation - answers were varied to this question such as economic necessity, personal preference as a life style, good remuneration for effort as a business and family fishing tradition.

- (xi) Have the habits of fish changed - some fishermen considered that habits of fish had changed and as mentioned in 9(ix) blamed tourist usage of the area; others considered habits to be unchanged. Some fishermen considered that the reduction in shark numbers due to fishing was responsible for changes in fish behaviour because sharks used to head pelagic fish into the shallow waters of Geographe Bay. Some fishermen stated that some areas, in particular the 8-9 fathom ledges within Geographe Bay, were dying off.
- (xii) Current marketing situation - fishermen overall considered the marketing situation to be quite good and stable. Many fishermen have their own local clientele whom they supply regularly and most do some selling from home, some fishermen disposing of most of their catch in this way.
- (10) What future is there for fish not yet being fished or only lightly exploited - fishermen considered that the pilchard fishery had a good potential in the Geographe Bay area and some had gone to considerable effort and expense gearing up for the 1975/76 season. Some fishermen were pessimistic about the ability of industry to process the anticipated catch of pilchard. Whitebait and squid were acknowledged as being under exploited. However, at the time of the interview no fisherman expressed interest in gearing up to catch these species.
- (11) Do you intend to change your fishing emphasis? If so to what and why? - some shark fishermen considered that they may have to change their emphasis because of mercury problems associated with shark. Most considered that the most likely diversification would be into fishing for pilchards. Some fishermen had geared up to catch pilchard and others were waiting to see if this fishery proved to be viable before moving into it. Generally there was a feeling amongst fishermen that they would have to diversify into fisheries for other species in the future and that this was likely to be the pilchard fishery which they regarded as having the greatest potential.
- (12) Observations of distressed and dead fish in Geographe Bay - Fishermen reported five instances of dead fish within Geographe Bay; two following blasting operations from Geophysical surveys conducted in the area; two in the Vasse and Wonnerup estuaries in summer which appeared to result from plankton blooms and subsequent deoxygenation of the water; and oriental bonito washed up on a beach north of Bunbury.

- (13) Reports of discoloured water in Geographe Bay - Fishermen reported discoloured water from three areas within the vicinity of Geographe Bay. The first area of discolouration reported was from Bunbury northwards, occasionally as far as Cape Bouvard a distance of 60 Km. The main area of concentration was the coastal strip, up to three Km from shore, between Bunbury and Lake Preston a distance of 40 Km. Fishermen considered the origin of discoloured water to be from the Laporte Titanium Dioxide Plant, initially from their effluent disposal pipe which was formerly out into the sea, and lately from effluent leaking into the sea from the disposal site in adjacent sand hills. The second area of discolouration reported was the beachfront area at Wonnerup. Fishermen did not have much information upon this area or opinion as to the origin of the discolouration other than it may be local pollution via drains. The third area of discolouration mentioned by fishermen was the area from Quindalup to Cape Naturaliste. They reported white water from Quindalup westward from about 0.4 Km from shore extending out to 6-8 fathom contour. They were concerned about this white water as fish tend to skirt this area making their capture difficult. Fishermen had no opinions as to the origin of this water.
- (14) Comments upon water movements within Geographe Bay - reports on water movements were reasonably consistent amongst fishermen. They are summarised generally in Figure 1.

## 2. GEOGRAPHE BAY FISH PRODUCTION YEARS 1966/67 TO 1974/75

The total fish production of Geographe Bay has varied between 225,517 Kg and 1,218,049 Kg for the years 1966/67 to 1974/75 with an overall mean production of 497,175 Kg (Table 2). This amounted to between 1.3 and 6.1% of the total W.A. fish production.

Catch figures for Geographe Bay commercial block No. 3315 (shaded in Figure 2) were taken from statistics compiled by the Australian Bureau of Statistics from commercial fisherman's monthly returns. Block No. 3315 extends from latitude 32-33 degrees south and includes from Cape Naturaliste to eighteen miles north of Bunbury (Figure 2).

A breakdown of the catch into species is shown in Table 2, which gives all catches in Kg landed weight. Catches have also been expressed in terms of their contribution to both the State and the Geographe Bay total for each species. Mean values were calculated for each species for these nine years and were multiplied by an average price for each species

to give an idea of average (mean) production in terms of dollars in 1977 (Table 3). Average prices represent returns to fishermen once freight and selling commission has been deducted. They were obtained from the Perth Metropolitan Markets or were determined roughly by the author.

The total mean production for Geographe Bay was calculated to be \$427,708 based on 1977 prices (Table 3). Overall this gives a reasonable estimate of present fish production in Geographe Bay, with the exception of the catch of Australian salmon which has declined considerably since 1967/68 (the Australian salmon catch for 1976/77 would be about 53,000 Kg valued at \$15,000), and bait species such as pilchard, blue and sandy sprats, catches of which have increased considerably since 1974 due to development of good markets for these species. Catches of bait species since 1974 compensate for the decline in salmon catches and in many cases were made by fishermen who also fished for salmon. Major income earning species for Geographe Bay are (Table 3) in order of economic importance :- rock lobsters \$173,463, Australian salmon, Westralian jewfish \$55,741, shark \$53,660, Australian herring \$10,283, western sand whiting \$8,340, sea mullet \$7,809, King George whiting \$6,050, yellow eye mullet \$5,333, samson fish \$4,065, crabs \$3,781, pilchard \$2,211, trevally \$1,962, snapper \$1,725, groper \$1,630, tailor \$1,573, short finned pike \$1,514, cobbler \$1,210 and other species which contribute less than \$1,000 annually on an individual basis.

The following comments can be made on the catches of the different species (Table 2) arranged in importance according to weight for the 1974/75 season :-

#### Australian salmon *Arripis trutta esper* Whitley

The annual catch for this species has varied between 64,298 and 1,072,846 Kg accounting for 28.5% to 88.1% (mean 52.8%) of the Geographe Bay total, and from 4.3% to 22.5% (mean 11.5%) of the State's total for this species. Peak catches were obtained for this species in 1967/68. Catches for the past two seasons 1975/76 and 1976/77 of 55,000 and 53,000 Kg respectively, have been the poorest on record for this area. The fishery for Australian salmon species is by limited entry and operates using beach seines. Fish are cleaned in Busselton and bodies canned in Perth, heads are used as rock lobster bait.

#### Australian herring *Arripis georgianus* (Cuvier and Valenciennes)

The annual catch of this species has varied between 4,078 and 41,536 Kg accounting for 1.0% to 10.5% (mean 4.6%) of the Geographe Bay total, and from 0.4% to 6.1% (mean 3.4%) of the

State's total for this species. The catch for Australian herring in recent years has become more important because of the decline in salmon catches and high demand for it as rock lobster bait. Herring are caught in Geographe Bay by salmon fishermen with beach seines and by others with ring and mesh nets. Salmon fishermen usually sell their herring catches for rock lobster bait while other fishermen market them for human consumption or bait through the Perth Metropolitan Market.

Pilchard *Sardinops neopilchardus* (Steindachner)

The annual catch of this species has varied between 468 and 33,516 Kg accounting for 0.1% to 8.5% (mean 2.1%) of the Geographe Bay total, and from 0.2% to 5.5% (mean 2.4%) of the State's total for this species. Catches have increased in recent years because of the interest in this species for bait, particularly for angling, and as a future canning proposition. At present four boats are concentrating on catching pilchard throughout the year using purse seines, and two Busselton processing establishments are buying their catch. There is a high demand for this species, which usually exceeds the supply, as bait for both angling purposes and the rock lobster fishery. It is anticipated that this fishery will become one of the most important for the Geographe Bay area in the future.

Western rock lobster *Panulirus cygnus* George

The annual rock lobster catch has varied between 17,018 and 74,318 Kg accounting for 1.5% to 17.3% (mean 8.8%) of the Geographe Bay total, and from 0.2% to 0.9% (mean 0.5%) of the State's total for this species. Catches of this species have been at a reasonable level, i.e. greater than 17,000 Kg over recent years. The high prices paid for the rock lobster catch and the few boats fishing for them in the area undoubtedly have made this fishery, although it accounts for only a small part of the State's total, a lucrative one. It is unlikely, however, to sustain more than the 6-8 boats holding rock lobster concessions and fishing for them at present.

Shark, numerous species

Major species caught: bronze whaler *Carcharhinus obscurus* (Le Sueur), whiskery *Furgaleus ventralis* (Whitley), and gummy *Mustelus antarcticus* Gunther.

The annual shark catch for Geographe Bay has varied between 20,611 Kg and 92,390 Kg accounting for 5.2% to 17.2% (mean 11.2%) of the Geographe Bay total and from 3.7% to 20.0% (mean 12.1%) of the State's total catch. This fishery operates using predominantly set nets, although set and hand lines are also used. It is an important fishery for the area and supports about ten full time shark fishermen.

Fishermen operating from Busselton often devote a large proportion of their effort to the west coast area from Cape Naturaliste to Cowaramup, i.e. outside Geographe Bay.

Sea mullet *Mugil cephalus* Linnaeus

The annual catch of this species has been between 2,021 and 20,448 Kg accounting for 0.2% to 5.2% (mean 2.8%) of the Geographe Bay total, and from 0.7% to 3.4% (mean 2.3%) of the State's total catch. The catch of sea mullet has been higher in recent years than in the past. This species is caught professionally with beach seines, ring and mesh nets. It is marketed in Perth for human consumption or as bait.

Western sand whiting (Yellow finned) *Sillago schomburgkii* Peters

The annual catch of this species has been between 1,319 and 14,689 Kg accounting for 0.2% - 3.7% (mean 1.9%) of the Geographe Bay total, and from 0.6% to 9.0% (mean 4.2%) of the State's total. The catch has fluctuated between 6,000 and 14,000 Kg. It is caught professionally with handlines, ring nets and beach seines. It is marketed in Perth for human consumption.

Yellow eye mullet *Aldrichetta forsteri* (Cuvier and Valenciennes)

The annual catch of this species has been between 5,367 and 26,479 accounting for 1.0% to 6.7% (mean 3.3%) of the Geographe Bay total, and from 1.5% to 10.4% (mean 4.5%) of the State's total. The catch for this species attained 25,000 - 27,000 Kg in 1970/71 and 1971/72 but since then has returned to previous levels of between 6,000 and 4,000 Kg. No ready explanation is available for this marked drop in catch. This species is caught with beach seines, ring nets and mesh nets and marketed via the Perth Metropolitan Markets for bait or human consumption.

Westralian jewfish *Glaucosoma hebraicum* Richardson

The annual catch of this species has been between 10,263 and 23,736 Kg accounting for 1.5% to 6.2% (mean 3.9%) of the Geographe Bay total, and from 8.8% to 23.1% (mean 14.4%) of the State's total catch of this species. This fishery operates using mainly handlines although jewfish are also caught in shark mesh nets and on set lines. It is an important fishery with annual landings being between 10,000 and 23,000 Kg especially because jewfish commands a very high market price (the highest paid for any scale fish). Overall this fishery maintains a high proportion (around 17%) of the State's total catch. Most commercial catches are taken between November - January. This fishery provides several fishermen in the Geographe Bay area with the major part of their annual income.

### King George whiting *Sillago punctata* Cuvier and Valenciennes

The annual catch for this species has been between 484 and 9,738 Kg accounting for 0.1% to 2.5% (mean 0.8%) of the Geographe Bay total, and from 0.8% to 17.1% (mean 6.4%) of the State's total for this species. This species is caught with ring nets, beach seines and handlines. It is largely marketed through the Perth Metropolitan Markets. The annual catch in recent years has been between 2,000 and 5,000 Kg. The high percentage of the State's total caught in 1974/75 was due to a lower catch than usual for this species elsewhere in Western Australia.

### Crabs *Portunus pelagicus* (Linnaeus)

The annual crab catch was between 488 and 12,734 Kg accounting for 0.1% to 3.2% (mean 1.1%) of the Geographe Bay total, and from 0.9% to 20.7% (mean 8.4%) of the State's total. Crabs are caught commercially with drop, tangle or scoop nets, they are marketed locally through the Perth Metropolitan Markets. Except for a poor season in 1971/72, the catch is usually about 3,000 - 7,000 Kg. Large catches are taken in Leschanault Estuary\*, but these are not included in Geographe Bay figures.

### Samson fish *Seriola hippos* Gunther

The annual catch of this species was between 3,350 and 8,471 Kg which amounted to between 6.9% and 23.8% (mean 12.4%) of the State's total. It is caught with handlines and in shark nets and is marketed via the Perth Metropolitan Markets. The catch usually 3,000 - 6,000 Kg accounts for a reasonable proportion of the State's total. It is also known as sea kingfish.

### Cobbler *Cnidogobius macrocephalus* Cuvier and Valenciennes

The annual catch for this species for the Geographe Bay area in recent years was up to 2,414 Kg, 7.7% of the State's total. It is basically an estuarine species with occasional catches being made with handlines and set lines at sea. It has a high market acceptance and is mostly sold via the Perth Metropolitan Markets.

### Snapper *Chrysophrys unicolor* Quoy and Gaimard

The annual catch for this species varies between 623 and 5,473 Kg accounting for 0.2% to 2.2% (mean 0.6%) of the State's total catch for this species. Catches are made with set lines, handlines and in shark nets. It has a higher market acceptance both locally and through the Perth Markets.

\* Leschenault Estuary, although it is a true estuary, is usually labelled Leschenault Inlet on maps.



Tailor *Pomatomus saltator* (Linnaeus)

The annual tailor catch for Geographe Bay varied between 449 and 3,830 Kg accounting for 1.0% to 6.6% (mean 4.5%) of the State's total. It is caught in ring and mesh nets mostly around March and April and has high acceptance as a food fish on the Metropolitan Markets.

Short finned pike *Australusza novaehollandiae* (Gunther)

The annual Geographe Bay catch of pike was between 1,610 and 3,861 Kg between 21.9% and 49.8% (mean 38.9%) of the State's total for that species. It is a highly marketable species being caught seasonally in November by trolling or with handlines mostly in the southern Geographe Bay area. The annual catch represents a high proportion of the State's total.

Blue groper *Achoerodus gouldii* (Richardson)

The annual catch was between 665 and 3,167 Kg, 2.3% to 19.5% (mean 10.1%) of the State's total. It is caught with handlines and in shark nets and is marketed via the Perth Metropolitan Markets.

Southern sea garfish *Hyporhamphus melanochir* (Valenciennes)

The annual catch of this species up to 1,200 Kg represents a low proportion of the State's total. It is largely taken with ring nets.

Mulloway *Sciaena antarctica* Castelnau

Annual catches of this species of up to 1,700 Kg, totalling as much as 14% of the total W.A. catch of this species are made in Geographe Bay with ring and mesh nets. This species can be marketed in Perth through the Metropolitan Markets. The market, however, can absorb only a limited amount of this week by week and it thus is often flooded, resulting in a low price for this species.

Other elasmobranchs - many species

Although some other elasmobranchs are common, e.g. southern fiddler sharks, blue spotted eagle rays, smooth stingrays, etc., they are seldom caught and marketed as there is little demand for them.

Leather jackets - many species

Although leather jackets are abundant throughout Geographe Bay on weedy and rock bottom, they are seldom marketed as most species of them only attain a small size. The largest species present, the six spined leather jacket, is occasionally caught in shark nets and marketed.

Queen snapper *Nemadactylus valenciensi* (Whitley)

Annual catches of up to 400 Kg are made in Geographe Bay. They are caught with handlines and in shark nets and are readily marketed in Perth through the Metropolitan Markets.

Trevally *Caranx georgianus* (Cuvier and Valenciennes)

The annual catch of trevally has been between 1,610 and 4,913 Kg, 6.1% to 34.6% (mean 13.9%) of the State's total. They are caught with handlines, mesh nets, ring nets and beach seines and are readily marketed as a food fish.

The following species represent species of which usually only minor catches are made

Flounder - several species

Main species *Pseudorhombus jenynsii* (Bleeker). Caught in ring nets and beach seines. Usually small. Large specimens marketed occasionally. Annual catch up to 127 Kg.

Southern rock cod *Physiculus barbatus* Gunther

Caught with handlines. The distribution of this species is mainly throughout south eastern Australia and it is uncommon in W.A. waters. Annual catch up to 383 Kg.

Scaly mackerel *Ambygaster postera* Whitley

Only encountered occasionally as usually distributed further north. Caught with ring nets and beach seines for bait. Annual catch up to 6,724 Kg.

Southern blue fin tuna *Thunnus maccoyii* Castelnau

Usually encountered in deeper water beyond Geographe Bay sometimes the smaller ones come closer to shore when migrating past in November-March. Caught on troll lines or polled. Annual catch up to 170 Kg.

Oriental bonito *Sarda orientalis* (Temminck and Schlegel)

Trolled usually in ones and twos throughout Geographe Bay. Reasonably abundant particularly in the area outside Bunbury. Highly marketable obtaining a good price. Annual catch to date very small 16-20 Kgs. This can undoubtedly be expanded. This species is assessed as being one of the few not fully exploited species in Geographe Bay.

Blue mackerel *Scomber australasicus* Cuvier and Valenciennes

Present sometimes, of little commercial interest to date. Caught with ring nets and handlines and used as bait. Large schools of this species have been observed and this species is assessed as having some potential for further exploitation.

Spanish mackerel *Scomberomorus commerson* (Lacépède)

Northern in distribution occasionally trolled in Geographe Bay. Annual catch up to 112 Kg.

Yellow tail kingfish *Seriola grandis* Castelnau

Trolled or ring netted. Annual catch up to 1,248 Kg. Used for rock lobster bait. Large schools of small ones are occasionally observed close in to shore.

Tarwhine *Rhabdosargus sarba* (Forsskal)

Usually a solitary species in the marine habitat, caught with handlines or in beach seines. Annual catch up to 214 Kg highly marketable as a food fish.

Sweep *Scorpiis georgianus* Cuvier and Valenciennes

An abundant fish around reefs. Caught with handlines. Of little commercial value.

Cod *Epinephalus* species

Numerous species. Sometimes caught on handlines or in shark nets. Marketable.

Parrot fish

Numerous species. Abundant but as usually small not marketed. Caught on handlines over rocky reefs.

Buffalo bream *Kyphosus sydneyanus* (Gunther)

Abundant but of little commercial value. Caught with ring nets, mesh nets and beach seines and occasionally marketed for rock lobster bait. In 1969/70 16,610 Kg were caught in Geographe Bay, this amounted to 61.2% of the total catch for Western Australia.

Flathead numerous species

Caught in beach seines or with handlines. Not an abundant species the annual catch being about 40 Kg. Catch statistics are listed under dusky flathead, *Platycephalus fuscus* Cuvier and Valenciennes this species is rare in southern Western Australian waters and such statistics are probably referable to four flathead species :- *Platycephalus bassensis* Cuvier and Valenciennes; *P. haackei* Steindachner; *P. laevigatus* Cuvier and Valenciennes; and *Thysanophrys cirronasus* (Richardson).

### Red fish - numerous species

Red fish are occasionally caught with handlines and in shark nets in Geographe Bay. The name red fish is probably applicable to two species in the area : *Trachichthodes gerrardi* (Gunther) - red snapper or Bight red fish; and *Centroberyx affinis* (Gunther) nannygai or redfish. Both species inhabit deeper water.

### Prawns *Penaeus latisulcatus* Kisinouye

Prawns are not of commercial importance in Geographe Bay today. Commercial catches of prawns were made in 1967/68 (999 Kg) and in 1971/72 (1,211 Kg). The possibility exists that commercial prawn catches could be made at sea, however, there is little interest in doing this at present. Amateurs and some professionals make reasonable catches in Leschenault Estuary and it is therefore possible that the above records came from an estuary not the sea.

### Abalone *Haliotis roei* (Gray)

In 1971/72 4,219 Kg, 1.7% of the State's total catch, was made in Geographe Bay. Since then the area has not been worked commercially for abalone.

### Squid *Sepioteuthis* sp.

Catches of up to 145 Kg have been made in Geographe Bay using handlines at night and in trawls. Squid appear to be abundant throughout Geographe Bay and a fishery for them would appear to have good potential. The main problem to such a fishery would be that of catching, as this species does not appear to be readily taken on jigs like other squid species. An alternative method such as mid water trawling at night might therefore need to be developed.

## 3 FISH PRODUCTION OF THE BUNBURY MARINE AREA YEARS 1966/67 TO 1974/75

Catch statistics are not compiled by the Australian Bureau of Statistics for Bunbury as a fishing location as they are for Geographe Bay block 3315 (Figure 2). They are, however, compiled for Bunbury as a port of landing, as they are also for Eagle Bay, Quindalup and Busselton and for Mandurah.

Bunbury statistics by port of landing would thus include catches made in Leschenault Estuary and the marine area outside Bunbury (Figure 2) as well as some catches made in southern Geographe Bay and south of Mandurah which are landed in Bunbury. Fortunately ABS statistics also record catches for Leschenault Estuary by location block 9503 so that if Leschenault figures are subtracted from Bunbury by port some idea of catches made in the marine environment outside Bunbury can be obtained (Table 4). Most of the catches making up Bunbury by location statistics (Table 3) would have come from blocks 2920, 2919, 2820, 2819, 2720, 2719, 2620 and 2619 (Figure 2) with as mentioned some catches from southern Geographe Bay from blocks 3019, 3018, 3017, 2918 and 2917 and southern Mandurah from blocks 2419, 2420, 2519 and 2520 being landed at Bunbury - such a situation would not eventuate very often so that a consideration of Bunbury by location for the years 1966/67 to 1974/75 (Table 4) is meaningful.

As can be seen from Figure 1, the Geographe Bay commercial block by location block 3315 includes six of the eight blocks attributable to Bunbury. There would therefore be considerable overlap and repetition of fish species statistics given for Geographe Bay (Table 2) and previously discussed in terms of species caught, quantities of each species caught and catching and marketing methods for each species. These statistics for the Bunbury area (Table 4) are therefore only summarized and are not discussed in detail.

The total annual production of all fish species for the Bunbury marine area for the years 1966/67 - 1974/75 was between 157,666 and 333,810 Kg with a mean annual production for these years of 226,526 Kg (Table 4). This accounted for from 0.9 to 1.8% of the state's total catch with a mean value of 1.3%.

The most consistent major commercial species in the Bunbury area (see Figure 2) for the years 1966 to 1974/75 were: Australian salmon, shark, rock lobsters and Westralian jewfish. All showed fluctuations in catch presumably due to changes in abundance rather than to changes in effort directed towards catching these species. Of these four species jewfish catches were the most consistent accounting for usually between 10% and 20% of the total fish production for the area.

Catches of other species such as mullet, whiting, pilchards, crabs, snapper, tailor, cobbler etc. seldom took on the importance of the above. However, with the possible exception of rock lobsters most fishermen do not specialize in catching a single marine species or in using a single method but rather operate using several methods and catching many species. The reason for this is not choice but economics, for most fishermen cannot obtain their income requirements from catching one or more species using a single method. In such a situation fishing effort is

never consistent from year to year towards any one of a number of species and depends upon abundance of fish, current prices, weather and the activities of other professional and amateur fishermen in the area. Catches of such species thus do not necessarily reflect abundance of the species concerned but depend upon a variety of factors e.g. in years of good shark catches shark fishermen concentrate their activities catching sharks but in poor years may devote considerable effort towards handlining or beach seining, etc., for other species. Thus minor species take on an importance to professional fishermen when considered over a number of years.

As from Geographe Bay mean values were calculated for all fish species for the nine seasons 1966/67 to 1974/75 and were multiplied by an average price for each species to give an idea of average (mean) production for the area in terms 1977 dollars (Table 5). Average prices represent returns to fishermen once freight and selling commission has been deducted. They were obtained from the Perth Metropolitan Markets or were determined roughly by the author.

The value of the annual total mean production for the Bunbury area (see Figure 2) was calculated to be around \$311,000 (Table 5). This compares with a value of \$427,730 for the Geographe Bay statistical block 3315 (Table 3).

### 3. GEOGRAPHE BAY AND BUNBURY MARINE AREA FISH PRODUCTION 1975/76.

The Australian Bureau of Statistics radically redesigned both its monthly professional fisherman's return in 1974 and its programmes for processing such returns. The redesigned forms were introduced in 1975 and the new processing system put into operation for the 1975/76 financial year. Because of these changes it was considered necessary to treat statistics before and after the change as separate entities rather than combine them in any way.

Fish production for Geographe Bay and the Bunbury marine area for the years 1966/67 to 1974/75 have already been considered in some detail both in terms of the marine species and seasons involved. Total catches were considered in terms of landed weights in Kg (Tables 2 and 4) and in value in dollars to the fishermen (Tables 3 and 5). Fish production statistics for 1975/76 were taken from ABS preliminary figures and grouped according to species for Geographe Bay and the Bunbury area by location (Table 6). The statistics for the Bunbury marine area by location were obtained by subtracting Leschenault Estuary landings by location from Bunbury landings by port as before. Net values of catches in dollars were derived as outlined previously.

In the 1975/76 financial year the total marine production for Geographe Bay was 468,070 Kg or 2.1% of the State's total marine production, with a total value of \$364,693 to the fishermen (Table 6). The catch of fish species was 434,748 Kg or 5.6% of the State's production of fish species (Table 6).

The most important species caught in Geographe Bay during 1975/76 (Table 6) were :-

	<u>Landed weight</u>	<u>% Geographe Bay</u>	<u>% of States Total</u>	<u>Net value to F'men</u>
Rock lobsters	30,680 Kg	6.6%	0.4%	\$147,264
Pilchard	25,045 Kg	53.5%	25.9%	\$ 75,135
Westralian jewfish	9,495 Kg	2.0%	7.1%	\$ 31,334
Shark	28,297 Kg	6.1%	6.5%	\$ 28,297
Australian herring	45,628 Kg	9.8%	7.1%	\$ 22,814
Sea mullet	15,473 Kg	3.9%	2.6%	\$ 11,605
Tailor	12,816 Kg	2.7%	18.7%	\$ 9,612
Australian salmon	28,973 Kg	6.2%	2.6%	\$ 8,112
Yellow eye mullet	18,316 Kg	3.9%	2.6%	\$ 7,326
Western sand whiting	4,408 Kg	0.9%	2.8%	\$ 4,849
King George whiting	1,958 Kg	0.4%	5.6%	\$ 3,916

As explained previously as the collection, coding and programming systems had been changed between 1974/75 and 1975/76 comparisons between catches recorded before and after the change need to be made with caution. However, the 1975/76 total marine catch would appear to be lower in terms of weight and value the mean catch value calculated for the previous nine seasons (Tables 4 and 6).

There would appear to have been slightly reduced catches of rock lobsters, shark and Westralian jewfish compared with mean catch values for the previous nine seasons and a very poor Australian salmon catch. Departmental records show the 1975/76 salmon catch for Geographe Bay was about 55,000 Kg compared with about 120,000 Kg for the previous season i.e. it being down by about 54%. ABS figures for Australian salmon appear therefore to be incorrect probably due to inaccurate locality coding. Slightly improved catches of sea mullet, Australian herring and tailor appear to have occurred in 1975/76. A large improvement in catch of pilchard occurred due to the commencement of purse seining for this species in 1975/76. The majority of the pilchard catch was processed in Busselton for the amateur bait market.

The total marine production for the Bunbury marine area by location for 1975/76 was 404,118 Kg, 1.9% of the State's total marine production at a total value of \$326,149 to the fishermen (Table 6). The total catch of fish species was 371,984 Kg, 4.8% of the State's total production of fish species (Table 6).

The most important species caught in the Bunbury marine area during 1975/76 (Table 6) were:-

	<u>Landed weight</u>	<u>% of Bunbury total</u>	<u>% of State's total</u>	<u>Net value to F'men</u>
Rock lobsters	27,987	6.9%	0.3%	\$134,338
Pilchard	222,871	55.2%	23.1%	\$ 66,861
Westralian jewfish	14,789	3.7%	11.1%	\$ 48,804
Shark	16,436	4.1%	3.8%	\$ 16,436
Australian salmon	51,597	12.8%	4.6%	\$ 14,447
Australian herring	21,536	5.3%	3.4%	\$ 10,768
Sea mullet	11,804	2.9%	1.7%	\$ 8,853
Tailor	11,246	2.8%	16.4%	\$ 8,435
Yellow eye mullet	14,436	3.6%	2.1%	\$ 5,774

The 1975/76 Bunbury marine area catch, on the basis of these statistics, would appear to have showed a major improvement on that of the previous season. However, as outlined previously changes in the collection, coding and processing of ABS commercial fisheries statistics occurred during that time and improvements in some catches could be due to the changes applying to these statistics. The salmon and pilchard catches which are made predominantly in the vicinity of Bunkers Bay near Cape Naturaliste, as they are not applicable to any one port in the area (except in Busselton), appear to have been coded for Bunbury rather than Busselton and therefore these catches as given, are much higher than would have occurred in the Bunbury area. Catches of both these species are processed at Busselton, which relies almost entirely on these species, showing little interest in others. Thus because of coding problems associated with the change over of statistical systems and the obvious coding of catches made out of the defined Bunbury area (Figure 2), it is not possible to make further comparisons between seasons for the Bunbury area. This situation would not have arisen with coding Geographe Bay catches by location.

##### 5. PROFESSIONAL USAGE AND VALUE OF THE GEOGRAPHE BAY AND THE BUNBURY MARINE AREA BASED ON 5 MILE STATISTICAL BLOCKS FOR THE PERIOD DECEMBER 1975 TO APRIL 1977.

Professional fishermen complete monthly returns for the Australian Bureau of Statistics (ABS) recording their catches according to ten mile square blocks (Figure 2). As outlined previously these catches are grouped in ABS processing programmes for Geographe Bay by location commercial block 3315 (Figure 2), a forty mile by forty mile block, and for port of landing. Monthly and yearly summaries are produced by ABS, however, there is often up to an eighteen month delay before a summary for a particular month or year is available.



For the purpose of this study additional information was required representing fishing activities within smaller areas than covered by commercial fisheries statistics. A weekly research log sheet was therefore issued to all professional fishermen who fish the Geographe Bay and Bunbury marine area (Appendix 2a and 2b) together with a map of the area (Appendix 3). Professional fishermen were asked to complete log sheets when they fished in the area covered by the map (Appendix 3) and to record their catches in quarter blocks, five miles square, in order to provide information concerning specific areas which may be potentially at risk from any effluent discharged into the sea.

Catches recorded by fishermen completing weekly log sheets for the period December 1975 to April 1977 were grouped according to quarter block and species in terms of landed weight and number (Figure 3). Approximate market prices paid to fishermen were obtained from fishermen and the total value of each quarter (i.e. five mile square) calculated (TV) (Figure 3). The total values for each block (i.e. ten mile square) were calculated from quarter block values and the number of fishermen fishing in each block and the number of days spent in the block by all fishermen computed for the entire Geographe Bay and Bunbury marine area (Figure 3 and Table 7). Totals for each ten mile block were summarized for the total area (Table 7) and subdivided into Mandurah, Bunbury and Geographe Bay (Table 8) in terms of the value of total catches made, total days spent fishing and total catch value per day.

Total values given in Tables 7 and 8 represent the catches only of those fishermen who completed log sheets. In order to provide a more realistic figure it is therefore necessary to make an adjustment according to the total number of fishermen involved. This can be most readily achieved by calculating average daily catch values for use with total number of days fished. The total catch value per fishing day for the Bunbury/Geographe Bay area was found to be \$5,320, i.e. for any fishing day the total catch for all fishermen for the entire area was \$5,320 (Table 7). As not all professional fishermen completed log sheets the total catch value figure (\$89,370) is well below 1975/76 total catch figures obtained from ABS fisheries statistics i.e. Geographe Bay \$364,693 and Bunbury marine area \$326,149. ABS figures do not cover the same entire area as the total catch figure (Figure 2). The total catch value per fishing day \$5,320 for the Bunbury/Geographe Bay area, however, probably represents a reasonable estimate of the daily production for the area i.e. 100 days production for all fishermen for the area would yield \$532,000. Catch figures quoted both from weekly log sheets and ABS monthly professional fishermen returns are considered by professional fishermen to be

underestimates, for they commonly admit to underestimating catches on such returns. For the purpose of this study figures are taken to be accurate to within 10-20% and are considered, inaccuracies aside, to ably demonstrate the commercial importance of the area in terms of professional fishing activities.

A breakdown of the Bunbury/Geographe Bay area into ten mile square blocks reveals the importance of particular statistical blocks (Table 7 and Figure 3). In terms of total value alone the best blocks were:- the lower Geographe Bay/Cape Naturaliste block 3017 (\$17,434); the Mandurah block 2420 (\$16,359); the outer Bunbury block 2618 (\$14,082); the lower Mandurah block 2520 (\$9,465); and the outer Bunbury blocks 2817 (\$7,347) and 2617 (\$7,340). In terms of the total catch value per day the best blocks were :- the block just south of Mandurah 2420 (\$962); the outer Bunbury blocks 2618 (\$640), and 2817 (\$565); the Bunbury blocks 2519 (\$371) and 2619 (\$350); the Geographe Bay block 2918 (\$340); the lower Manduray block 2520 (\$296); the outer Bunbury block 2518 (\$260); the Bunbury blocks 2819 (\$163) and 2619 (\$163); the outer Bunbury block 2718 (\$140); the Bunbury block 2820 (\$103); and the outer Geographe Bay block 2915 (\$102).

Differences in the order of importance of blocks between total catch values to total catch values per day are because of the different usage of blocks in terms of the effort involved, the intended species to be caught and the fishing method employed. The lower Geographe Bay block, despite being the most important block in terms of value because of the fishing effort employed in this block (228 fishing days), has a low catch per day \$77 (Table 7). In comparison the Geographe Bay blocks 2918 and 2915 and Bunbury block 2718 produced good catch per fishing day values but poor overall catch values (Table 7), as they are not often fished. To obtain the best impression of the value of particular blocks it is therefore necessary to consider both total catch values and total catch values per day.

The most important blocks within the considered area were the lower Geographe Bay/Cape Naturaliste block, the inshore blocks south of Mandurah and some of the blocks 10-40 miles out to sea from Bunbury. As mentioned, usage of blocks in terms of effort and fishing method and the species caught from the area is variable.

The Geographe Bay/Cape Naturaliste block produces a variety of fish species in good quantities most of the catch being sold locally or via the Metropolitan Markets. The area is fished by several fishermen using mainly ring nets,

mesh nets and handlines. Some fishermen spot daily for fish, weather permitting, thus their level of effort for their catch is high (Table 7, Figure 3) when compared to other areas where this does not occur. Generally the income they derive from this area could be said to be adequate for their particular needs. Fishermen considered the catch recorded (Table 7, Figure 3) for this area was underestimated.

The blocks south of Mandurah are productive in terms of total value and total value per day (Table 7, Figure 3). The area produces some good catches of rock lobsters which command high prices per Kg compared to other marine species. The area is fished basically by rock lobster fishermen from Mandurah and Bunbury, who may also set some shark net.

The Bunbury block 10-40 miles from shore produces good catches of sharks, Westralian jewfish and some catches of other fish such as grouper, sea kingfish, queen snapper and some rock lobsters (Table 7, Figure 3).

Only the number of days spent within a certain block were considered. Although some information concerning the number of fishermen using a certain block was available (Table 7, Figure 3), catch per man values were not calculated as a fuller response to weekly log sheets was obtained from fishermen fishing northern areas because of their closer proximity to the possible site of effluent disposal than from southern fishermen. Likewise comparisons by broad geographical areas (Table 8) are avoided as they reflect this also. Total catch rates per fishing day of :- \$2,043 were obtained for the Mandurah area; \$2,518 for Bunbury and \$2,062 for Geographe Bay (Table 8).

### III AMATEUR UTILIZATION

Little information was available on the usage of the marine area thirty miles north, south and out to sea from Bunbury by amateur groups. Special research log sheets (Appendix 4a and 4b) were distributed in the Bunbury area, amateur angling and boating clubs canvassed and individual amateur fishermen interviewed in order to attempt to document amateur usage of the area.

There was widely expressed concern over any disposal of effluent into the sea and its possible effects on fish and other marine life. However, this report will be confined to specific comments on the fish available to amateurs and amateur usage of the area.

1 OPINIONS OF AMATEUR FISHERMEN WITH REGARD TO  
USAGE OF THE BUNBURY MARINE AREA AND GEOGRAPHE  
BAY GENERALLY.

A. METROPOLITAN ANGLING CLUBS VIA THE AUSTRALIAN  
ANGLERS ASSOCIATION W.A. BRANCH.

Metropolitan anglers do not generally fish the Bunbury marine area choosing to fish areas north, between Myalup and Mandurah and south between the mouth of the Capel (Peppermint Grove) and Cape Naturaliste (Figure 2 and 3) and the lower west coast region between Cape Naturaliste and Cape Leeuwin. Angling Association competition records for localities such as Preston Beach suggested that catches from the areas north of Bunbury, i.e. Myalup to Mandurah have declined over the past ten years.

B. BUNBURY ANGLING CLUB

The Bunbury Angling Club conducts most of its fishing competition venues south of Capel especially on the lower west coast from Cape Naturaliste to Cape Leeuwin. Individual members of the club, however, regularly fish (angle) in the area of interest catching tailor, herring, whiting, silver bream, Australian salmon (in season), skipjack, flathead, snapper, cobbler, shark, mulloway and species of reef fish such as parrot fish.

C. BUNBURY POWER BOAT CLUB

The Bunbury Power Boat Club conducts fishing competitions once or twice a month during the summer months. As club competitions are based upon a time interval of 0730 - 1640 hrs with the weigh-in occurring at 1630 hrs, less than nine hours fishing time is available, so a considerable amount of club competition fishing occurs within the Bunbury marine area. On non competition days the club operates a voluntary sea rescue unit involving radio contact with small boats. The club considered the Bunbury marine area to be very important in terms of the recreational activity it supports.

D. INDIVIDUAL BUNBURY ANGLERS, BOAT FISHERMEN  
AND DIVERS

This group considered the area from Preston Beach to Capel River to be most important to them in terms of their recreational activity. Shore anglers can always be found throughout this area. Inshore reef areas were popular with owners of small craft who made great use of such areas whenever the weather was suitable at weekends. Divers likewise find such reef areas good for their sport.

2 USAGE OF THE BUNBURY MARINE AREA BY AMATEUR ANGLERS  
BOAT FISHERMEN AND AMATEUR DIVERS.

Information on the activities of amateur anglers, boat fishermen and divers in the Bunbury marine area was obtained from completed amateur fishermen's log sheets (Appendix 4a and 4b) for the interval 7.12.75 - 25.4.77. In addition the Bunbury Power Boat Club made available their field day competition records from 15.2.75 - 3.4.77 which contained added useful information on the activities of boat fishermen in the Bunbury marine area. Information provided was in the form of catches made in weight and or number, species caught, fishing or diving location and fishing time (effort). Species names quoted by amateur fishermen have been reconciled where possible, with scientific names and the most commonly used common names (Appendix 5).

A. AMATEUR ANGLERS

Amateur angling catch and effort data for the Bunbury marine area was summarised from amateur fishermen's log sheets filled in by three amateur anglers (Table 9). The most popular fishing locations in the Bunbury area were: Bunbury breakwater, Bunbury back beach, Bunbury cut (near where the estuary enters the sea) and Clifton Street rocks (as on Figure 3). Anglers were observed in these locations and at others at all times of day when visited, except when the sea was rough. They basically angled with large baits and hooks for tailor, Australian salmon (in season) and mulloway. When small baits and hooks were used Australian herring were often caught. Anglers usually spent between one and two hours angling at any location.

## B. AMATEUR BOAT FISHERMEN

Amateur boat fishermen catch and effort was summarised from completed log sheets filled in by four amateur boat fishermen (Table 10). The most popular locations for them within the Bunbury marine area were out from Binningup, out from Peppermint Grove beach and SW-SSW of Bunbury (Figure 3). Amateur boat fishing trips were usually whole day or half day affairs i.e. 2-7 hours. The most common species caught were: whiting, Australian herring, parrot fish, flathead and jewfish. Shark, gurnard, snapper, skippy, sergeant baker, blue devil, fiddler shark, shovel nose shark and Port Jackson shark were also caught.

Bunbury Power Boat Club field day records were summarised (Table 11) to provide catch and effort data. Participants in field days may fish anywhere but between the hours of 0730-1630 hours. Time spent travelling to fishing locations reduces fishing time, thus most field day participants fish out to sea from Bunbury, probably in the deeper water greater than 100 ft in depth, rather than travel by road to other locations north and south then launch their boats. Basically jewfish and shark are caught (Table 11) along with snapper, sea kingfish, skipjack, bonito, Australian herring, parrot fish, whiting, flathead, sergeant baker, and harlequin. Catch rates per boat ranged from 0.9 - 10.9 kg with a mean value for thirteen competition days of 6 kg, and from 0.5 - 2.3 kg per person. Usually between ten and thirty boats participated in field days which are held on Sundays weather permitting during summer. For the thirteen competition trips held in the interval 15.2.75 - 3.4.77, a total of 1389.6 kg of fish were caught composed of: 675.6 kg (118) jewfish, 425.4 (126) shark, 58.4 kg (15) snapper, 44.5 kg (6) sea kingfish, 16.1 kg skippy, 6.6 kg bonito, 77.0 kg of assorted small fish, and 86.0 kg of fish, the species of which was not recorded. An idea of the equivalent value of the catch to amateur fishermen can be obtained by applying market prices received by professional fishermen minus freight and selling commission involved as given previously. This gives a total value of \$2,821.60. However, the retail value, which would almost double this figure would be more realistic for amateurs who would have to pay retail prices for fish if they wanted to buy them and could not catch them themselves.

### C. AMATEUR DIVERS

Amateur diving activities were summarised from amateur log sheets filled in by six amateur divers, together with their observations of the diving conditions, bottom type, and fish and marine life observed. Amateur divers can be seen to be active in the Bunbury area especially off Binningup (Figure 3). Amateur divers catch rock lobsters by hand and spear some fish. A summary of their observations on diving conditions and species seen is given in Table 12 and may provide a useful baseline for observing any future changes in conditions in the area.

## IV SUMMARY OF PROFESSIONAL AND AMATEUR UTILIZATION OF THE BUNBURY AND GEOGRAPHE BAY MARINE RESOURCE.

Total production for the years 1966/67 - 1974/75 for Geographe Bay varied between 225,517 and 1,218,049 kg with an overall mean production of 497,175 kg, which is 2.7% of the total W.A. production, with a value to professional fishermen of \$427,708. The total production for the same interval for Bunbury varied between 157,666 and 333,810 kg with an overall mean production of 226,526 kg which is 1.3% of the State's production, with a value of \$311,008.

For the 1975/76 season the total Geographe Bay marine production was 468,070 kg, 2.1% of the State's total marine production, at a total value to the fishermen of \$364,693. The total Bunbury marine production for the 1975/76 season was 404,118 kg, 1.9% of the State's total at a total value of \$326,149.

The major income earning species for the Bunbury/Geographe Bay marine area were: rock lobsters, pilchard, Australian salmon and herring, Westralian jewfish, shark, sea mullet, tailor, yellow eye mullet, and western and King George whiting.

The Bunbury/Geographe Bay marine area professional fishery is predominantly a multispecies, multimethod fishery. The reason for this is economic for, with the exception of one or two rock lobster fishermen, in order to make a reasonable living, fishermen have to use a variety of fishing methods directed at a variety of species. Thus some species not mentioned above, such as pike, crabs, etc. of which annual catches are not large, are important in terms of the yearly operations of some fishermen, for they may provide some income at times of the year when

other species are not available. Hence all species and fishing methods are important to the professional fishery and the loss of one method or one species may affect the economic operations of fishermen in the area.

Using weekly log sheets completed by professional fishermen the total catch value per average fishing day for the Bunbury/Geographe Bay marine area was found to be \$5,320. The most important statistical blocks within this area were: the lower Geographe Bay/Cape Naturaliste block; the inshore blocks south of Mandurah; and some blocks 10-40 miles out to sea from Bunbury. Other blocks were of lesser importance but were still vital to the operations of professionals within the area. Usage of such blocks in terms of effort, fishing method and species caught was variable.

Amateurs who are mostly local residents from Bunbury, spend many hours in the Bunbury marine area angling from the shore and from boats, and diving. Their return for their effort at present would appear to be adequate for their needs and provides them with useful recreation.

The most important fish species for amateurs were: Westralian jewfish, sharks, rock lobsters, mulloway, Australian salmon and herring, parrot fish, whiting and flathead.

Undoubtedly better fishing and diving results for amateurs can be obtained farther south in Geographe Bay and on the lower west coast between Cape Leeuwin and Cape Naturaliste but to reach such areas a car journey is necessary.

Amateurs were extremely vocal and uniform in their opinions as to the value of the area to them in terms of recreational activities and pointed out that this area provided by far the most popular recreational outlet for Bunbury people, even when compared to sport and other activities.

### III ACKNOWLEDGEMENTS

I would like to thank all professional and amateur fishermen who completed log sheets and freely gave details of their personal operations and activities. The co-operation of the Bunbury Angling Club, the Australian Anglers Association, W.A. Branch and the Bunbury Power Boat Club is acknowledged.

Mr. Jim Seabrook formerly of the Department of Fisheries and Wildlife interviewed professional fishermen and reported upon their views. Mr. Stuart Blight ably assisted in many aspects of the preparation of this report and drafted the figures.

Dr. D.A. Hancock is thanked for his advice in preparation of this report and criticism of the manuscript.



TABLE 1 DETAILS OF INDIVIDUAL FISHERMAN'S ACTIVITY WITHIN GEOGRAPHE BAY

Fisherman	a	b	c	d	e
Major Species	Herring	Shark Jewfish	Shark Jewfish	Salmon Herring Others	Salmon Herring Crabs
Fishing Method(s)	Beach seining	Set nets Handlines	Set net	Handlines Beach seining	Drop nets Beach seining
No. of Fishing Units	1 net	1 100 m net 4 hooks	1 400 m net	Beach seines 3 hooks	1 seine 40 drop nets
Season	Dec-Feb	Oct-May	Sept-Apr	All year	Oct-Mar
Most Important Months	Dec-Feb	Nov-Jan	Dec-Apr	Mar-Apr	Jan-Mar
Fishing Where: Areas	Wonnerup	Dunborough to Canal Rocks	Naturaliste Rf to Busselton	Geographe Bay	Toby's Inlet to Busselton
Depth:	2 fathom	18-21 fathom	13 fathom	8-21 fathom	
Bottom:	sand, weed	reef, gravel	sand, gravel	sand,reef, gravel	sand,weed, reef
Catch last year	500 Kg	8 000 Kg	2 500 Kg	50 000 Kg	650 Kg

TABLE 1 (cont'd)

Fisherman	f	g	h	i	j
Major Species	Rock Lobster Shark Jewfish	Pilchard Salmon Herring Others	Rock Lobster Shark	Shark	Tailor Herring Mullet Others
Fishing Method(s)	Long line, pots Set nets Hand lines	Ring netting	Pots Set nets	Set nets Longline	Beach seining Set nets
No. of Fishing Units	70 pots 700m set net	4 nets	59 pots 300 m set net	1 100 m set net 1 500 m longline	1 net
Season	Sept-May	All Year	All year	Sept-Mar	Oct-May
Most Important Months	Dec-Feb	Jan-Mar	Dec-Feb	Nov-Jan	Jan-Feb
Fishing Where: Areas	Naturaliste rf area	Inshore Geographe Bay area	Binningup to Bouvards	Busseton to Bouvards	Lake Preston to Cape Bouvard
Depth:	20-24 fathom		8-22 fathoms	8-12 fathoms	
Bottom:	rock, gravel kelp	Sand, weed	Rock, gravel	Reef, gravel	
Catch last year	4 000 Kg	70 000 Kg	5 000 Kg	24 000 Kg	4 000 Kg

TABLE 1 (cont'd)

Fisherman	k	l	m	n	o
Major Species	Herring pike Salmon Others	Rock Lobster Jewfish Snapper Shark	Rock Lobster Shark Jewfish	Crabs	Salmon Herring
Fishing Method(s)	Set nets Purse s. Handlines	Pots Set nets Handlines	Pots Set nets Handlines	Drop nets	Beach s.
No. of Fishing Units	4 nets 2 hooks	75 pots 2 hooks	72 pots 950 m set net 4 hooks	40 drop nets	4 salmon nets 1 herring net
Season	Aug-May	Nov-Aug	Nov-Dec	All year	All year
Most Important Months	Sept-Jan	Dec-Feb	July-Aug	Dec-Apr	Mar-May
Fishing Where:	Quindalup	Naturalist Rf.	Bouvarde	Busseton	Geographe Bay
Areas	0-4 fathoms	20-21 fathoms	3-7 fathoms	0-2 fathoms	0-3 fathoms
Depth:	Sand, weed, rock	Reef, gravel	Limestone, kelp, reef	Sand	Sand
Bottom:					
Catch last year	3 000 Kg	2 500 Kg	13 000 Kg	11 000 Kg	108 000 Kg

S. = seining.

TABLE 2 FISH PRODUCTION - GEOGRAPHE BAY BY LOCATION (BLOCK 3315) (LANDED WEIGHTS IN KG) 1966/1967 TO 1974/1975.

SPECIES	66/67			67/68			68/69		
	% of State	% of Geographie	% of State	% of State	% of Geographie	% of State	% of State	% of Geographie	
Flounder							21	8.4	-
Southern Rock Cod	468	0.4	0.1	1 192	0.6	0.1	1 447	1.3	0.4
Pilchard									
Scaly Mackerel							109	-	-
Southern Tuna Bluefin									
Bonito									
Spanish Mackerel	114	0.2	-	2 021	0.7	0.2	7 413	2.4	1.9
Sea Mullet	3 285	0.7	0.6	5 854	1.8	0.5	6 148	2.4	1.6
Yellow Eye Mullet	5 367	1.5	1.0	2 466	39.7	0.2	3 037	38.1	0.8
Short Finned Pike	2 963	45.6	0.6	2 774	12.7	0.2	1 610	7.7	0.4
Trevally	3 848	13.3	0.7	934	2.6	0.1	1 426	3.9	0.4
Tailor	2 808	4.6	0.5						
Yellowtail Kingfish									
Samson Fish	6 464	12.3	1.2	8 471	23.8	0.7	7 277	15.9	1.9
Tarwhine	26	2.2	-				80	2.5	-
Australian Salmon	341 761	8.2	65.4	1 072 846	22.5	88.1	160 444	6.3	41.7
Australian Herring	19 737	6.1	3.8	17 233	5.1	1.4	24 577	4.0	6.4
Snapper	623	0.2	0.1	5 473	2.2	0.4	988	0.7	0.3
Queen Snapper	323	9.6	0.1	314	13.0	-	222	10.5	0.1
Mulloway	492	6.0	0.1	1 564	13.5	0.1	1 680	14.1	0.4
Western Sand Whiting	1 319	0.6	0.3	2 773	1.3	0.2	5 367	3.8	1.4
King George Whiting	885	4.5	0.2	1 294	5.0	0.1	1 015	3.0	0.3
Sweep	17	1.3	-	8	0.8	-			
Cod	277	1.7	0.1	302	1.9	-	470	2.7	0.1
Groper	1 280	9.8	0.3	1 446	11.1	0.1	1 862	19.5	0.5
Parrot Fish									
Westralian Jewfish	17 122	13.4	3.3	17 995	17.3	1.5	23 736	23.1	6.2
Buffalo Bream									
Dusky Flathead	9	0.1	-	5	0.1	-	37	0.5	-
Shark	75 356	20.0	14.4	50 199	15.6	4.1	63 174	18.3	16.4
Other Elasmobranchs	10	0.2	-				40	0.5	-
Leather Jacket	24	0.2	-	30	0.3	-	15	0.3	-
Redfish				139	100.0	-	41	100.0	-
Sea Garfish	56	0.2	-	8	-	-	184	1.1	-
Cobbler	299	0.3	0.1	8	-	-	142	0.2	-
Prawns				999	0.1	0.1			
Rock Lobsters	35 288	0.4	6.8	18 208	0.2	1.5	66 703	0.8	17.3
Crabs	2 041	4.7	0.4	3 493	11.2	0.3	5 745	20.7	1.5
Abalone									
Squid							145	2.6	-
TOTAL ALL FISH	484 931	6.7	92.8	1 195 349	1.3	98.1	312 562	2.5	81.1
TOTAL ALL SPECIES	522 260	2.9	-	1 218 049	6.1	-	385 155	2.4	-

TABLE 2 (cont'd)

SPECIES	69/70		70/71		71/72	
	% of State	% of Geographie	% of State	% of Geographie	% of State	% of Geographie
Flounder					40	14.6
Southern Rock Cod			183	26.5	71	16.0
Pilchard	1 963	1.5	363	0.2	6 222	4.4
Scaly Mackerel		0.5			1 605	5.4
Southern Tuna Bluefin Bonito						
Spanish Mackerel					18	0.1
Sea Mullet	10 182	2.9	5 553	1.8	13 872	3.0
Yellow Eye Mullet	18 390	5.3	25 230	8.3	26 479	10.4
Short Finned Pike	3 861	48.9	1 504	26.5	2 669	49.8
Trevally	4 913	23.9	3 846	34.6	2 348	17.2
Tailor	3 830	7.6	449	1.0	2 426	5.4
Yellowtail Kingfish			1 248	24.8	255	6.3
Samson Fish	3 350	7.4	6 450	23.1	4 128	9.6
Tarwhine	214	5.5	6	0.4	58	2.8
Australian Salmon	233 097	10.9	265 965	16.2	229 912	13.1
Australian Herring	7 131	1.2	32 269	4.4	4 078	0.4
Snapper	678	0.3	1 579	0.8	999	0.5
Queen Snapper	304	7.6	278	6.9	182	3.5
Mulloway	142	2.4	104	1.2	82	1.4
Western Sand Whiting	4 647	2.4	12 397	8.0	14 689	9.0
King George Whiting	484	0.8	1 729	1.0	9 738	13.0
Sweep	22	1.1	6	0.7	23	2.6
Cod	108	0.3	96	0.5	63	0.3
Groper	1 838	12.3	2 190	9.0	1 403	5.5
Parrot Fish	10	14.3	34	37.1		
Westralian Jewfish	14 640	10.7	21 231	16.1	11 925	14.1
Buffalo Bream	16 610	61.2	268	1.1		
Dusky Flathead	31	0.5	10	0.1	40	0.5
Shark	54 033	14.4	60 580	12.9	27 758	5.5
Other Elasmobranchs						
Leather Jacket					9	0.1
Redfish	92	0.5	29	0.1	20	12.0
Sea Garfish	49	0.1	282	0.2	442	1.8
Cobbler					2 379	1.3
Prawns					1 211	-
Rock Lobsters	30 982	0.5	74 318	0.9	22 877	0.3
Crabs	3 039	9.8	7 711	15.9	488	0.9
Abalone					4 219	1.7
Squid					34	0.2
TOTAL ALL FISH	380 619	6.7	443 879	7.9	363 933	6.0
TOTAL ALL SPECIES	414 640	2.5	525 908	2.8	392 762	2.3

TABLE 2 (cont'd)

SPECIES	72/73		73/74		74/75	
	% of State	% of Geographie	% of State	% of Geographie	% of State	% of Geographie
Flounder	127	9.8	50	12.0		
Southern Rock Cod	383	41.8	44	2.2	59	6.9
Pilchard	11 182	5.5	9 990	2.7	33 516	5.2
Scally Mackerel	6 724	2.2				8.5
Southern Tuna Bluefin			83	-	170	-
Bonito			18	0.5	16	0.4
Spanish Mackerel						
Sea Mullet	10 537	2.2	20 448	3.4	20 397	3.4
Yellow Eye Mullet	13 948	5.1	6 452	2.6	12 126	3.0
Short Finned Pike	2 150	43.6	1 610	36.3	2 448	21.9
Trevally	1 460	9.2	1 271	6.1		0.6
Tailor	2 730	5.6	2 574	6.6	1 698	3.1
Yellowtail Kingfish	1 169	6.0	812	5.8		0.4
Samson Fish	3 433	6.9	5 476	7.6	3 734	4.6
Tarwhine	66	2.4		1.4	146	2.1
Australian Salmon	64 298	4.3	150 998	10.2	188 161	11.6
Australian Herring	6 114	0.5	32 422	3.4	41 536	5.2
Snapper	1 924	0.6	1 426	0.4	1 831	0.4
Queen Snapper	201	1.9	355	2.7	274	2.3
Mulloway			319	1.6	461	3.7
Western Sand Whiting	6 296	3.2	6 212	3.1	14 533	6.4
King George Whiting	4 018	9.6	2 187	3.6	5 875	17.1
Sweep			10	1.4	43	4.1
Cod	42	0.2	448	1.2	90	0.3
Groper	665	2.3	3 157	7.8	833	2.0
Parrot Fish			11	100.0		
Westralian Jewfish	10 263	9.6	23 596	16.5	11 528	8.8
Buffalo Bream			303	3.5		2.9
Dusky Flathead	41	0.3			15	0.1
Shark	38 841	6.1	92 390	12.1	20 611	3.7
Other Blasmobranchs	205	3.2	1 320	31.3	429	11.7
Leather Jacket	87	0.2	128	0.5	274	1.4
Redfish			34	3.9		0.1
Sea Garfish	1 211	6.0			744	2.6
Cobbler	538	0.2	2 414	7.7	1 956	0.9
Prawns						0.5
Rock Lobsters	33 693	0.5	17 018	0.3	26 158	0.3
Crabs	3 143	3.2	12 734	11.6	4 153	5.9
Abalone						1.1
Squid	28	0.2	34	0.2	129	1.1
TOTAL ALL FISH	188 653	2.7	366 558	5.3	363 504	5.0
				92.5		92.3
TOTAL ALL SPECIES	225 517	1.3	396 344	2.4	393 944	2.0

TABLE 3 - MEAN VALUE OF GEOGRAPHE BAY COMMERCIAL SPECIES.

Species	Price Kg in cents	Mean Catch in Kg	Mean Value in \$
Australian salmon	28	300 831	84 233
Shark	100	53 660	53 660
Rock lobsters	480	36 138	173 463
Westralian jewfish	330	16 893	55 747
Yellow eye mullet	40	13 333	5 333
Australian herring	50	20 566	10 283
Sea mullet	75	10 412	7 809
Western sand whiting	110	7 581	8 340
Pilchard	30	7 371	2 211
Samson fish	75	5 420	4 065
Crabs	80	4 727	3 781
King George whiting	200	3 025	6 050
Short finned pike	60	2 523	1 514
Trevally	80	2 452	1 962
Tailor	75	2 097	1 573
Buffalo bream	22	1 909	420
Snapper	100	1 725	1 725
Groper	100	1 630	1 630
Cobbler	135	896	1 210
Scaly mackerel	25*	925	231
Mulloway	50	538	269
Abalone	140*	469	656
Yellowtail kingfish	50	387	194
Sea garfish	60	307	184
Queen snapper	60	273	164
Prawns	200	245	490
Other elasmobranchs	40	222	89
Cod	90	211	190
Southern rock cod	70*	82	57
Tarwhine	70	66	46
Leather jackets	100	63	63
Squid	40	41	16
Southern blue fin tuna	50	40	20
Redfish	80	26	23
Flounder	90	26	23
Dusky flathead	40	21	8
Spanish mackerel	75*	14	11
Sweep	22*	14	3
Parrot fish	40	6	2
Oriental bonito	50	4	2
T O T A L			\$427 708

\* Estimate of price, other prices obtained from Perth Metropolitan Markets, May 1977.

TABLE 4. FISH PRODUCTION - BUNBURY BY LOCATION 1966/67 TO 1974/75 (Landed weights in Kg)

Species	66/67		67/68		68/69	
	% of State	% of Bunbury	% of State	% of Bunbury	% of State	% of Bunbury
Flounder						
Southern Rock Cod	468	0.4	940	0.5	21	8.4
Pilchard					459	0.4
Scaly Mackerel						
Southern Tuna Bluefin						
Bonito	292	0.5				
Spanish Mackerel	1 763	0.4	6		6 222	2.0
Sea Mullet	5 210	1.5	3 337	1.0	11 518	4.0
Yellow Eye Mullet						
Short Finned Pike	553	1.9			641	3.1
Trevally	31	0.1			976	2.7
Tailor						
Yellowtail Kingfish	3 976	7.6	1 016	2.9	1 087	2.4
Samson Fish						
Tarwhine						
Australian Salmon	88 912	2.1	142 073	3.0	121 768	4.8
Australian Herring			289	0.1	3 286	0.6
Snapper	284	0.1	4 257	1.7	126	0.1
Queen Snapper	53	1.6			5	0.2
Mulloway	166	2.0			69	0.6
Western Sand Whiting	29		1 654	0.8	3 757	2.7
King George Whiting	76	0.4			56	0.2
Sweep						
Cod	33	0.2	17	0.1		
Groper	391	3.0	181	1.4	117	1.2
Parrot Fish						
Westralian Jewfish						
Buffalo Bream	22 730	17.7	24 149	23.2	25 034	24.4
Dusky Flathead						
Shark	70 767	18.7	54 022	16.8	37	0.5
Other Elasmobranchs	52	0.9			38 142	11.0
Leather Jacket						
Redfish	5				117	0.7
Sea Garfish	241	0.3			139	0.2
Cobbler						
Prawns	26 307	0.3	10 900	0.1	51 647	0.6
Rock Lobsters	616	1.4	678	2.2	4 768	17.2
Crabs						
Abalone						
Squid						
TOTAL ALL FISH	196 032	2.7	231 941	2.6	213 577	3.8
TOTAL ALL SPECIES	222 955	1.3	243 519	1.2	269 992	1.7



TABLE 4 (cont'd)

Species	69/70		70/71		71/72	
	% of State	% of Bunbury	% of State	% of Bunbury	% of State	% of Bunbury
Flounder	1 587	0.8	17		40	
Southern Rock Cod			2.5		14.6	
Pilchard			0.1		2.9	
Scaly Mackerel				0.1	4.4	4.0
Southern Tuna Bluefin Bonito					0.1	
Spanish Mackerel	9 405	5.0	4 895	2.2	17 604	3.9
Sea Mullet	16 421	8.6	24 831	11.2	25 402	10.0
Yellow Eye Mullet	618	0.3	41		1 103	0.7
Short Finned Pike	3 706	2.0	332	0.2	1 301	0.8
Trevally	2 609	1.4	170	0.1	2 038	1.3
Tailor			435	0.2	226	0.1
Yellowtail Kingfish	1 213	0.6	399	0.2	675	0.4
Samson Fish	112	0.1			24	
Tarwhine	31 128	16.3	54 409	24.4	3 690	2.3
Australian Salmon	1 217	0.6	6 377	2.9	1 460	0.9
Australian Herring	534	0.3	452	0.2	1 857	1.2
Snapper	13				42	
Queen Snapper	101	0.1			204	0.1
Mulloway	4 069	2.1	11 456	5.1	24 049	15.3
Western Sand Whiting			1 007	0.5	9 286	5.9
King George Whiting					34	
Sweep					46	
Cod	18	0.1			0.2	
Groper	619	4.1	69		1 065	0.7
Parrot Fish						
Westralian Jewfish	31 483	23.0	24 685	11.1	13 909	16.5
Buffalo Bream	16 611	61.2	268	0.1	3 201	14.1
Dusky Flathead	31	0.5	10		43	0.4
Shark	30 923	8.3	18 212	8.2	20 502	4.1
Other Elasmobranchs						
Leather Jacket					476	0.3
Redfish			5		15	
Sea Garfish			29		574	0.4
Cobbler	49		298	0.1	2 628	1.4
Prawns					141	0.1
Rock Lobsters	27 652	0.4	66 899	30.0	15 788	10.0
Crabs	9 974	32.1	7 711	3.5	161	0.1
Abalone					3 638	2.3
Squid					182	0.1
TOTAL ALL FISH	152 467	80.2	148 669	66.6	137 756	87.4
TOTAL ALL SPECIES	190 093	1.2	223 279		157 666	0.9

TABLE 4 (cont'd)

Species	72/73			73/74			74/75		
	% of State	% of Bunbury	% of State	% of State	% of Bunbury	% of State	% of State	% of Bunbury	
Flounder	127	9.8	0.1	50	12.0	-	11	-	
Southern Rock Cod				5	0.2	-	27	1.3	
Pilchard	11 182	5.5	5.8	5 125	1.4	2.5	856	4.3	
Scaly Mackerel							158	-	
Southern Tuna Bluefin				14	-	-	6	0.1	
Bonito				13	0.3	-		0.1	
Spanish Mackerel									
Sea Mullet	9 755	2.0	5.1	19 664	3.3	9.5	17 039	2.8	
Yellow Eye Mullet	13 650	5.0	7.1	5 196	2.1	2.5	13 410	3.3	
Short Finned Pike	24	0.5	-	962	21.7	0.5			
Trevally	391	2.5	0.2	418	2.0	0.2	132	0.7	
Tailor	1 316	2.7	0.7	2 330	5.9	1.1	1 870	3.4	
Yellowtail Kingfish	208	1.1	0.1	13	0.1	-			
Samson Fish	1 583	3.2	0.8	2 744	3.8	1.3	722	9.9	
Tarwhine									
Australian Salmon	55 136	3.2	28.8	43 248	2.9	21.0	143 801	8.9	
Australian Herring	7 204	0.6	3.8	9 377	1.0	4.5	43 240	5.5	
Snapper	805	0.3	0.4	823	0.2	0.4	3 414	0.8	
Queen Snapper				564	4.3	0.3	153	1.3	
Mulloway				1 807	8.8	0.9	771	6.2	
Western Sand Whiting	5 876	3.0	3.1	5 773	2.9	2.8	13 179	5.8	
King George Whiting	3 491	8.4	1.8	1 465	2.4	0.7	5 470	15.9	
Sweep									
Cod	104	0.4	0.1	32	0.1	-			
Groper	1 063	3.6	0.6	1 355	3.3	0.7	342	0.9	
Parrot Fish				11	100.0	0.2			
Westralian Jewfish	14 810	13.8	7.7	16 284	11.4	7.9	11 931	9.1	
Buffalo Bream				303	3.5	0.2			
Dusky Flathead	41	0.3	-				15	0.1	
Shark	36 292	5.7	18.9	66 877	8.7	32.4	20 561	3.7	
Other Elasmobranchs	205	3.2	0.1	1 320	31.3	0.6	429	11.7	
Leather Jacket	61	0.2	-	82	0.3	-	274	1.4	
Redfish									
Sea Garfish	845	4.2	0.4	41	0.1	-	745	2.6	
Cobbler	536	0.2	0.3	2 415	0.7	1.2	1 955	0.9	
Prawns									
Rock Lobsters	23 842	0.3	12.4	14 350	0.2	7.0	25 169	0.3	
Crabs	2 946	3.0	1.5	3 173	2.9	1.5	419	0.6	
Abalone							738	0.3	
Squid	93	0.5	-						
TOTAL ALL FISH	164 705	2.4	86.0	188 311	2.7	91.5	307 484	4.3	
TOTAL SPECIES	191 586	1.1	-	205 834	1.3	-	333 810	1.8	

TABLE 5 - MEAN VALUE OF BUNBURY MARINE ARFA COMMERCIAL SPECIES

Species	Price Kg in cents	Mean Catch in Kg	Mean Value in \$
Australian salmon	28	76 018	21 285
Shark	100	39 589	39 589
Rock lobsters	480	29 173	140 030
Westralian jewfish	330	20 557	67 839
Yellow eye mullet	40	13 219	5 288
Sea mullet	75	9 595	7 196
Australian herring	50	8 050	4 025
Western sand whiting	110	7 760	8 536
Pilchard	30	6 012	1 804
Crabs	80	3 383	2 706
King George whiting	200	2 317	4 634
Buffalo bream	22	2 265	498
Samson fish	75	1 491	1 118
Snapper	100	1 395	1 395
Tailor	75	1 260	945
Cobbler	135	918	1 239
Trevally	80	830	664
Groper	100	578	578
Abalone	140*	486	681
Mulloway	50	346	173
Short finned pike	60	305	183
Sea garfish	60	262	157
Other elasmobranchs	40	223	89
Leather jacket	100	99	99
Yellowtail kingfish	50	98	49
Queen snapper	60	92	55
Spanish mackerel	75*	32	24
Squid	40	31	12
Cod	90	28	25
Flounder	90	26	23
Dusky flathead	40	20	8
Southern bluefin tuna	40	19	8
Prawns	200	16	32
Tarwhine	70	15	11
Southern rock cod	70*	5	4
Sweep	22*	4	1
Scaly mackerel	25*	3	1
Oriental bonito	50	2	1
Red fish	80	2	2
Parrot fish	40	1	1

T O T A L

\$311 008

\* Estimate of price, other prices obtained from Perth Metropolitan Markets, May 1977.

TABLE 6

## FISH PRODUCTION GEOGRAPHIC BAY AND BUNBURY MARINE AREA 1975/76 BY SPECIES IN KG LANDED WEIGHT AND VALUE TO FISHERMEN

SPECIES	GEOGRAPHIC BY LOCATION			BUNBURY BY LOCATION			Price cents per Kg	% of Bunbury	Value in \$ Geographie	Value in \$ Bunbury
	% of State	% of Geographie	% of State	% of Bunbury	% of Geographie					
Southern rock cod	99	11.9	23	2.8	70*	69	16			
Pilchard	250 451	25.9	222 871	23.1	30	75 135	66 861			
Southern bluefin tuna	194	-	194	-	50	97	97			
Bonito	49	0.3	60	0.4	50	25	30			
Spanish mackerel	177	0.2	23	-	75*	133	17			
Sea mullet	15 473	2.3	11 804	1.7	75*	11 605	8 853			
Yellow eye mullet	18 316	2.6	14 436	2.1	40	7 326	5 774			
Short finned pike	4 781	17.5	3	-	60	2 869	2			
Tailor	12 816	18.7	11 246	16.4	75	9 612	8 435			
Yellow tail kingfish	3 026	5.6	632	1.2	50	1 513	316			
Samson fish	437	7.0	147	2.4	75	328	110			
Tarwhine	268	15.4	-	-	70	188	-			
Australian salmon	28 973	2.6	51 597	4.6	28	8 112	14 447			
Australian herring	45 628	7.1	21 536	3.4	50	22 814	10 768			
Snapper	813	0.2	153	-	100	813	153			
Queen snapper	3 453	5.5	55	-	60	2 072	33			
Mulloway	585	1.3	607	1.3	50	293	304			
Western sand whiting	4 408	2.8	2 425	1.5	110	4 849	2 668			
King George whiting	1 958	5.6	833	2.4	200	3 916	1 666			
Cod	72	0.1	18	-	90	65	16			
Groper	743	3.1	112	0.5	100	743	112			
Westralian jewfish	9 495	7.1	14 789	11.1	330	31 334	48 804			
Buffalo bream	2 200	16.9	-	-	22	484	-			
Shark	28 297	6.5	16 436	3.8	100	28 297	16 436			
Other elasmobranchs	109	2.4	109	2.4	40	44	44			
Leather jacket	34	0.1	-	-	100	34	-			
Redfish	18	0.2	-	-	80	14	-			
Cobbler	1 875	0.6	1 875	0.6	135	2 531	2 531			
Rock lobsters	30 680	0.4	27 987	0.3	480	147 264	134 338			
Crabs	2 642	2.1	4 147	3.3	80	2 114	3 318			
Total all fish	434 748	5.6	371 984	4.8	Total Value	Total Value	Total Value			
Total all species	468 070	2.1	404 118	1.9	\$364 693	\$326 149	\$326 149			

\* estimate of price, other prices obtained from Perth Metropolitan Markets, May, 1977.

TABLE 7

SUMMARY OF SOME PROFESSIONAL CATCHES MADE IN THE BUNBURY MARINE AREA AND GEOGRAPHE BAY FOR PERIOD DECEMBER 1975 TO APRIL 1977

<u>BLOCK</u>	<u>ASSIGNED AREA</u>	<u>NO. OF FISHERMEN</u>	<u>NO. OF DAYS SPENT FISHING</u>	<u>TOTAL CATCH VALUE \$</u>	<u>TOTAL CATCH VALUE \$ PER FISHING DAY</u>
2418	MANDURAH	2	4	264	66
2419	"	2	3	158	53
2420	"	3	17	16 359	962
2517	"	1	2	70	35
2518	"	3	11	2 859	260
2519	"	3	14	5 198	371
2520	MANDURAH	2	32	9 465	296
2617	BUNBURY	4	21	7 341	349
2618	"	2	22	14 082	640
2619	"	3	10	1 634	163
2620	"	1	10	627	63
2718	"	1	2	281	140
2719	"	1	3	231	77
2720	"	1	3	231	77
2817	"	2	13	7 347	565
2819	"	1	8	1 354	169
2820	"	1	12	1 233	103
2915	BUNBURY	1	3	307	102
2917	"	1	1	51	51
2918	"	1	1	340	340
2919	"	1	10	767	77
2920	BUNBURY	1	12	1 130	94
3016	"	1	1	82	82
3017	"	2	228	17 434	77
3018	"	1	5	476	95
3019	"	1	4	49	13
TOTALS	GEOGRAPHE BAY		452	\$89 370	\$5 320

TABLE 8

SUMMARIES OF SOME PROFESSIONAL CATCHES MADE IN THE BUNBURY  
MARINE AREA AND GEOGRAPHE BAY FOR INTERVAL DECEMBER 1975  
TO APRIL 1977 GROUPED INTO 3 AREAS

<u>LOCATION</u>	<u>TOTAL DAYS</u>	<u>TOTAL CATCH MADE</u>	<u>TOTAL CATCH MADE PER FISHING DAY FOR ALL BLOCKS WITHIN AREA</u>
MANDURAH	83	\$ 34 372	\$ 2 043
BUNBURY	126	\$ 36 257	\$ 2 518
GEOGRAPHE BAY	314	\$ 31 313	\$ 2 062

TABLE 9

AMATEUR ANGLING CATCH AND EFFORT DATA FOR THE BUNBURY MARINE AREA

<u>DATE</u>	<u>FISHING TIME IN HOURS</u>	<u>LOCALITY</u>	<u>CATCH</u>
26.12.75	1	Clifton Street rocks	4 tailor
27.12.75	1	" " "	7 tailor
29.12.75	1	" " "	5 tailor
02.01.76	1	Bunbury breakwater	7 tailor
12.01.76	1	" "	1 tailor
18.02.76	2	S.side Bunbury cut	12 tailor
19.02.76	2	" " "	2 tailor
26.02.76	1½	" " "	-
07.01.77	1½	Bunbury breakwater	7 tailor at 0.5kg in wt.
09.01.77	1	Clifton Street rocks	3 tailor
10.01.77	2	Bunbury breakwater	9 tailor at 0.5kg in wt.
12.01.77	1	Preston beach	1 tailor
13.01.77	2	Bunbury breakwater	6 tailor at 0.5kg in wt.
18.02.77	1	Bunbury cut	12 tailor at 0.5kg in wt.
19.02.77	1	" "	2 tailor
21.02.77	1	Bunbury back beach	3 mulloway at 0.5kg in wt.
17.03.77	1	Bunbury breakwater	1 mulloway at 6.5kg in wt.
29.03.77	1	" " "	4 salmon at 3.5kg in wt.

TABLE 10

AMATEUR BOAT FISHERMAN CATCH AND EFFORT DATA FOR THE BUNBURY MARINE AREA.

<u>DATE</u>	<u>FISHING TIME IN HOURS</u>	<u>LOCALITY</u>	<u>CATCH</u>
07.12.75	4	SSW Bunbury 102 ft	2 jewfish, 27 parrot fish
12.12.75	3	SW Bunbury 96 ft	3 whiting, 7 flathead, 8 parrot fish, 1 jewfish
21.12.75	4	SW Bunbury 108 ft	4 whiting, 6 flathead 1 Sergeant Baker, 1 blue devil, 1 fiddler shark, 1 gurnard, 14 parrot fish
26.12.75	2	48-60 ft off Maidens	3 whiting, 7 flathead
14.01.76	7	2 mile west of Peppermint	1 parrot fish
14.01.76	7	" " " " "	1 shovel nose shark, 1 Port Jackson shark, 2 parrot fish 1 small skippy
15.01.76	1½	Peppermint grove beach	-
16.01.76	6	1-3/4 mile west of Peppermint	1 Port Jackson shark, 1 parrot fish
16.01.76	6	2 mile west of Peppermint	-
21.01.76	2	Peppermint grove beach	2 parrot fish
21.01.76	2	1½ mile west of Peppermint	2 herring
21.01.76	3	2 mile west of Peppermint	1 herring
21.01.76	3	" " " " "	-
22.01.76	6*	Peppermint grove beach	-
23.01.76	5½	Capel river cut	3 small snapper, 2 medium skippy
23.01.76	5½	" " "	2 herring, 1 sweep, 1 small snapper
26.01.76	2*	1½ mile west of Peppermint	-
22.02.76	3	West Binningup 102 ft	1 small shark, 1 4kg jewfish, 6 parrot fish
07.03.76	5	20 mile SW Bunbury 120 ft	28 parrot fish
21.03.76	3	West of Binningup 108 ft	2 sharks, 9 sand whiting, 3 flathead, 1 gurnard

\* Netting from boat. All others angling from boat.



TABLE 11

## BUNBURY POWER BOAT CLUB FIELD DAY CATCH AND EFFORT DATA

DATE OF COMPLETION OF BOATS PEOPLE	NO. OF BOATS PEOPLE	DATE OF COMPLETION OF BOATS PEOPLE	NO. OF BOATS PEOPLE	SPECIES CAUGHT - WT IN KG (NUMBERS IN BRACKETS)							SPECIES ASSORTED NOT RECORDED	SMALL FISH	TOTAL CATCH IN KG	CATCH RATE IN KG PER BOAT PERSON
				JEWELFISH	SHARK	SNAPPER	SEA KINGFISH	SKIPPY	BONITO	ASSORTED				
15.02.75	14	-	76.9 (12)	22.9 (6)	1.8 (1)	12.5 (1)	12.5 (1)	12.5		25.9		152.5	10.9	
07.12.75	22	-	121.6 (26)	51.9 (15)	4.5 (1)	10.7 (1)					8.1	196.8	9.0	
21.12.75	16	-	42.1 (4)	21.5 (6)						60.1	3.6	127.6	8.0	
04.01.76	14	-	34.5 (6)	11.3 (4)				1.8 (1)	6.6 (1)		0.7	54.9	3.9	
07.03.76	18	-	49.4 (6)	47.9 (17)	8.2 (2)						9.5	115.0	6.4	
21.03.76	17	-	60.1 (13)	56.5 (17)	4.5 (1)			1.8 (2)			1.8	124.7	7.3	
04.04.76	18	-	54.9 (12)	50.3 (17)	20.6 (4)	6.8 (1)					6.6	139.2	7.7	
02.01.77	11	19	4.8 (1)	5.4 (1)								10.2	0.9	
16.01.77	14	24	15.2 (3)	11.8 (5)							4.5	31.5	2.3	
06.02.77	21	50	54.9 (8)	36.3 (9)	4.8 (2)						7.0	103.0	4.9	
13.02.77	30	86	131.5 (19)	23.1 (7)	10.4 (2)						11.3	176.3	5.9	
20.02.77	28	57	26.8 (7)	73.5 (18)	3.6 (2)	6.6 (2)					19.1	129.6	4.6	
03.04.77	10	30	2.9 (1)	12.7 (4)		7.9 (1)					4.8	28.3	2.8	
13 TRIPS	233	-	675.6 (118)	425.4 (126)	58.4 (15)	44.5 (6)	16.1 (3 <sup>+</sup> )	6.6 (1)		86.0	77.0	1389.6	6.0	

\* ASSORTED SMALL FISH INCLUDE: HERRING, SWEEP, PARROT FISH, WHITING, FLATHEAD, SERGEANT BAKER, HARLEQUIN, ETC.

TABLE 12

## AMATEUR DIVERS - DIVING DETAILS, OBSERVATIONS, ETC. FOR THE BUNBURY MARINE AREA

DATE	LOCATION	DIVING CONDITIONS, DIVING OBSERVATIONS ETC.
27.12.75	Off fuel tanks Bunbury in 50 ft	Sighted numerous undersized rock lobsters, 2 dusky morwong, 3 samson fish 1 stingray, 1 cowrie shell laying eggs and numerous small fish. Visibility was good and the reef was alive.
03.01.76	30ft off 5 mile Brook	Visibility was good. There was an abundance of small fish and numerous undersized rock lobsters. Saw 1 baler shell.
09.02.76	60-65 ft 3 miles S of Binningup	Visibility fair. Sighted: a school of skipjack (1kg fish), school of nannygai, carpet shark, leather jacket, spotted rock cod, cuttle fish, rock cod (= parrot fish), John dory, 1 Queen snapper, an abundance of small fish and undersized rock lobsters.
15.02.76	1½ miles S of Binningup 65 ft	Bottom visibility fair (15 ft). On way out sighted two groups of 6 penguins. Lots of coral reef, sponge and weed growth on bottom, all of which looked healthy and clean. Fish sighted: pink snapper, banded sweep, pig fish, rock cod (= parrot fish), stingrays, nannygai 0.75 - 4 kg, 1 gurnard, soldier fish, sergeant baker, moonlighters, old wives, yellow fin whiting, blue devil fish, dusky morwong, magpie morwong, goat fish, numerous small fish, starfish and a group of rock lobsters from very small to one 2kg wt. The large rock lobster taken was soft shelled.
22.02.76	3 mile S of Binningup 60 ft	Bottom visibility good, reef surroundings clear. Not a great abundance of fish seen i.e.: banded sweep, coral cod, parrot fish, old wives, nannygai, cuttle fish. A heavy concentration of rock lobsters observed from 0.75 - 2 kg in wt. Bigger rock lobsters, were well into moult, some already having shed their shells and other well into the process of doing so.
29.02.76	½ mile S of Binningup 54 ft	A beautiful piece of reef with a heavy concentration of reef fish, lots of coral and star fish - visibility fair except for banks of loose suspended weed up to 6 ft from bottom, the reef etc. appeared healthy.

TABLE 12 (cont'd)

			<p>Fish sighted: shovel nosed stingrays, carpet shark, coral cod, rock cod (= parrot fish), pig fish, dusky morwong, magpie morwong, leather jacket, nannygai, goat fish, moonlighters, blue devils, many Sergeant Baker, box fish and yellow tail. A small scattering of rock lobsters including one of the biggest ever seen in the area about 5 kg in wt.</p>
21.03.76	W of Binningup	60 ft	<p>Bottom visibility good except for green slimy weed - the growth of which was thick on the higher level of the reef. <i>This weed appears to become more prevalent every year.</i> The lower levels of the reef and bottom were nice and clean and alive with a variety of fish :- carpet sharks, nannygai, dusky morwong, blue devils, old wives, samson fish, parrot fish, goat fish, rock cod, banded sweep, moonlighters, pig fish dhufish, stingrays, yellow tail, box fish, and cuttle fish. Nine good sized rock lobsters seen.</p>
28.11.76	25-30 ft Beach	Forrest	<p>Bottom visibility fair. Reef clean supporting an abundance of fish life. A very heavy concentration of rock lobsters observed (best seen anywhere in Bunbury area during last 5 years). 90% would have been undersized.</p>
05.12.76	60 ft off Binningup		<p>Visibility good, reef nice and clean with a lot of reef fish and usual banded sweep and leather jackets in attendance. Rock lobsters very scattered but of good size well over legal limit. 3 male and 2 female lobsters taken average size 1.6 kg.</p>
26.12.76	80 ft of Bunbury	10 mile N	<p>Bottom visibility good and clean. Reef alive with small reef fishes: Some small bald chin groper observed (we haven't seen them so far south before). A good concentration of rock lobsters.</p>
02.01.77	25-30 ft off Forrest Beach		<p>A heavy concentration of rock lobsters observed the biggest being under legal size.</p>
08.01.77	3 mile S of Binningup	65 ft	<p>Bottom visibility good reef clean supporting a good abundance of fish including: dhufish, pink snapper and samson fish. A good spread of lobsters, from small ones to big jumbos. 4 males taken from 1.6 to 2.7 kg.</p>

TABLE 12 (cont'd)

15.01.77	5 miles N of Binningup in 80 ft	Bottom visibility good. Reef nice and clean and alive with life. Some knight fish observed first time seen. Rock lobsters scattered and of good size.
29.01.77	6 miles N of Binningup in 60 ft	Bottom visibility poor. A good abundance of reef fish but few rock lobsters.
06.02.77	Off Binningup in 60 ft	Bottom visibility good. Reef clean with a good abundance of reef fish and concentration of rock lobsters of good size.
12.02.77	S of Bunbury in 60 ft	Bottom visibility fair. Reef very poor with a few fish only, no rock lobsters.
09.04.77	Off Binningup in 70 ft	Bottom visibility good. Lots of dead ribbon weed on lower edges of reef. Plenty of fish life and a good scattering of rock lobsters. Beaches de Mer on the sand.
10.04.77	Binningup beach	Visibility good, reef clean, an abundance of reef fish, took 8 sized rock lobsters.
25.04.77	3 miles off Bunbury breakwater 60 ft	Visibility was poor. A poor showing of fish and rock lobsters.

Figure 1: Water movements within Geographe Bay according to professional fishermen who fish the area.

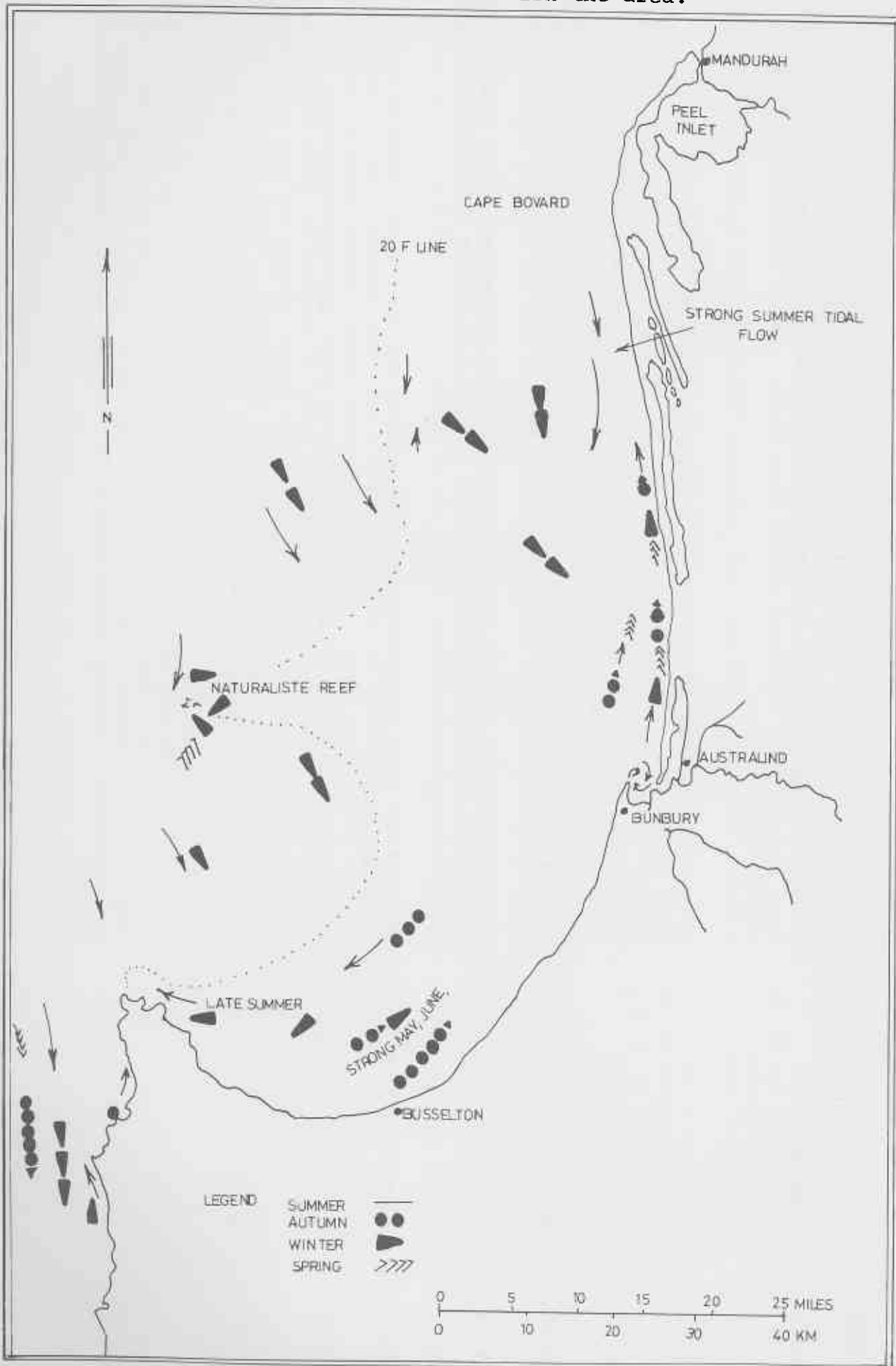


Figure 2: Commercial blocks and areas of Geographe Bay and Bunbury.

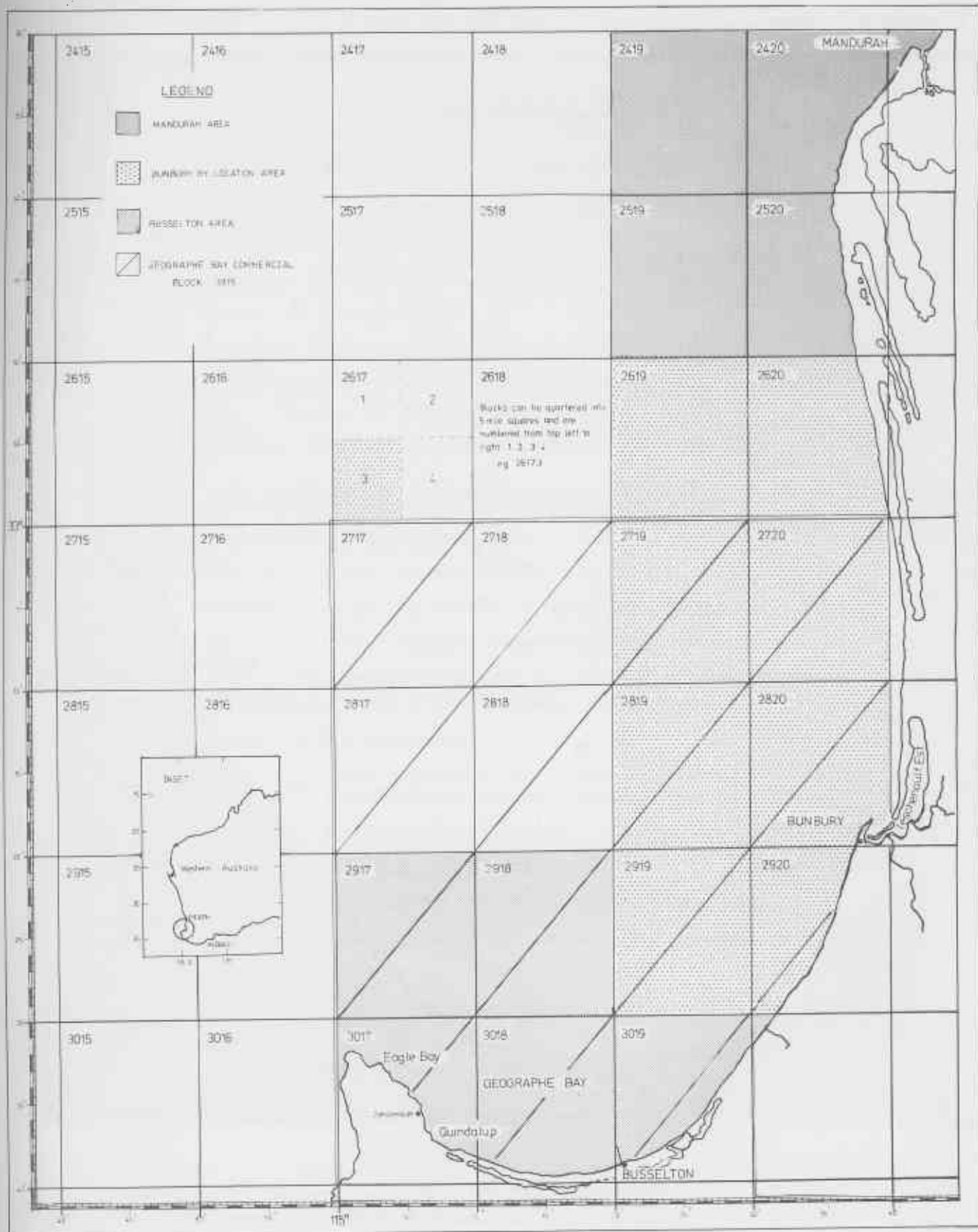
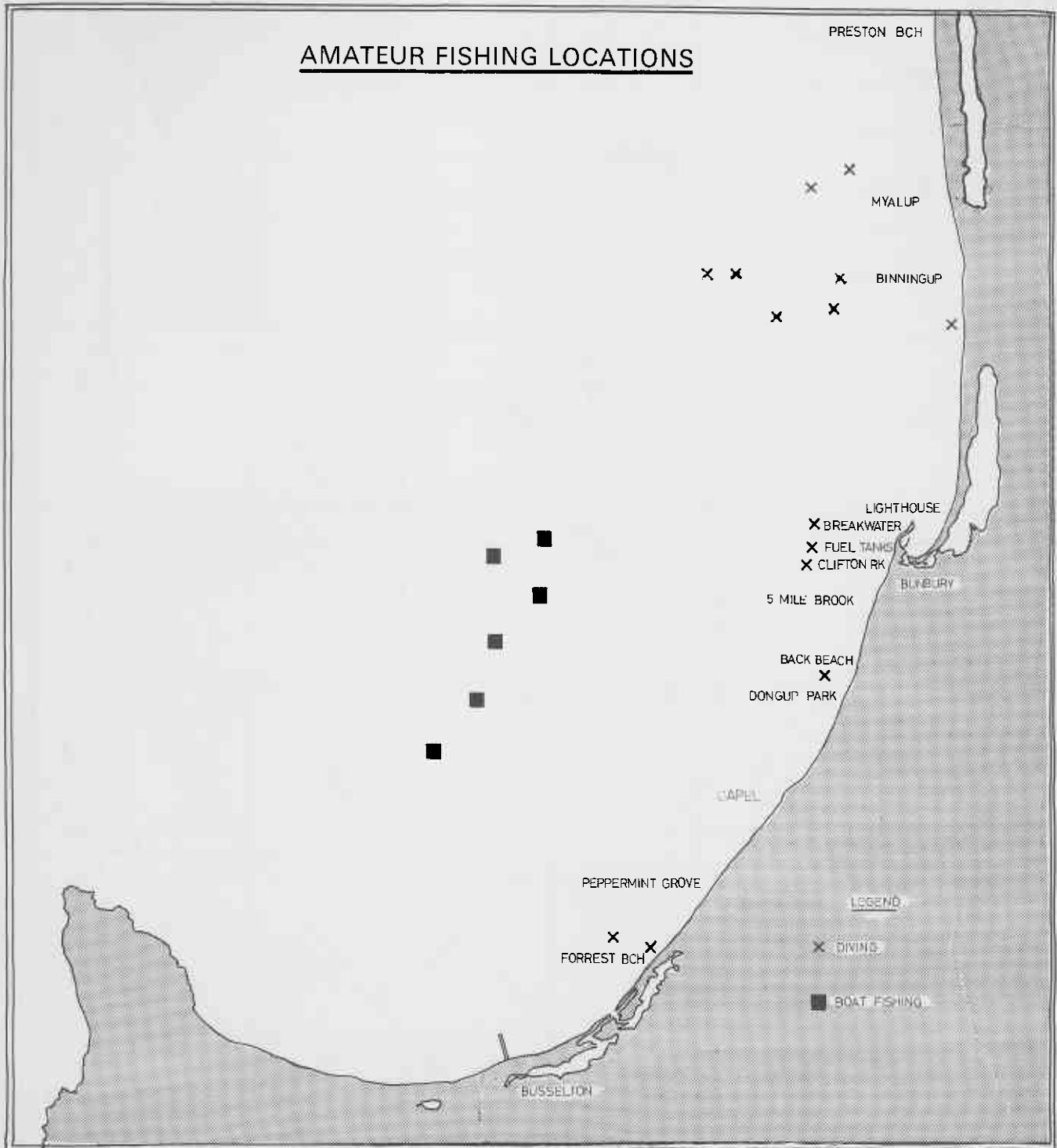


Figure 4: Amateur fishing locations in the Bunbury area.



APPENDIX I

INTERVIEW QUESTIONS - GEOGRAPHE BAY

PROFESSIONAL FISHERMEN

Information required from fishermen exploiting the  
resources of Geographe Bay

N.B. Recorded catches, etc., must be from Geographe Bay only.

1. Length of boat?
2. Port of operation?
3. Do you fish as well outside Geographe Bay?  
i.e. South of Cape Naturaliste  
North of Cape Bouvard  
If so, for what proportion of the year?

Record the following for Geographe Bay only

4. Method(s) of fishing?
5. Annual catch in weight - last full year \*
6. Annual catch in value - last full year
7. Was the year better or worse than average?
8. List the species taken in order of importance,  
preferably as a proportion by weight.
9. Individual fishery.
  - (i) List species in order of importance,  
preferably as proportion by weight.
  - (ii) Method of fishing
  - (iii) Number of fishing units e.g. pots, hooks.
  - (iv) Length of season, naming months.
  - (v) Most important months of season.
  - (vi) Important fishing areas.  
Locality  
Depth  
Type of bottom
  - (vii) Quantity caught last year \*  
Fish caught  
Fish brought home
  - (viii) Value of catch last year.
  - (ix) Are catches improving or getting less?
  - (x) What influenced your choice of fishing?
  - (xi) Have the habits of your fish changed?
  - (xii) What is the marketing situation for your fish?

\*Limits of year, i.e. Jan-Dec or July-June need to be standardised.



APPENDIX 1 (cont'd)

10. What future is there for fish not yet being fished or only lightly exploited?
11. Do you intend to change your emphasis?  
If so why?  
If so to what?
12. Have you ever observed dead, distressed or discoloured fish of  
(a) your species  
(b) any other  
If so, record area and date.  
What do you believe was the cause?  
Did it affect your catching or marketing?
13. Have you ever seen discoloured (red or "white") water in Geographe Bay?  
If so, when and where?  
Which direction was it moving?  
What was its origin?
14. Please comment on the prevailing water movements in Geographe Bay :-  
i.e. winter/summer  
inshore/offshore  
northerly/southerly  
(if possible mark on map).

Other relevant information

INSTRUCTIONS FOR THE COMPLETION OF GEOGRAPHE BAY WEEKLY FISHING LOG SHEETS.INTRODUCTION

Quantities of effluent from the La Porte titanium works are being discharged into Geographe Bay on a trial basis. The Department of Fisheries and Wildlife has agreed to document the fish and fisheries of the area as part of an environmental study designed to investigate the likely consequence of releasing the effluent into the sea. To this end fishermen are being asked, in addition to the normal Monthly Return of Commercial Fisheries Return to complete weekly log sheets of their catches in the area under study, that is with reference to quarter blocks within Geographe Bay from Cape Naturaliste to Cape Bouvard.

YOUR COOPERATION IN COMPLETING THESE LOG SHEETS WOULD BE MUCH APPRECIATED - IT IS CLEARLY IN THE INTERESTS OF EVERY FISHERMAN TO DO SO.

INSTRUCTIONS

Use as a weekly log sheet. If fishing not carried out for day or whole week record "no fishing" with a note explaining the reason.

Record.

Name, Boat name and number on the top of each weekly log sheet and fill in the date and month in the appropriate column.

Fishing area

Give the quarter block (i.e. a 5 mile square) according to the area chart, e.g. 2820.2. If fishing occurs over two quarter blocks indicate e.g. 3017.1 - 2917.3.

Depth

Give depth in fathoms.

Fishing time(s)

Give time period of set, time spent handling etc., to the nearest hour.

Fishing method(s)

Give method, type of gear used and other relevant details.

e.g. number of rock lobster pots  
800 yds shark net, 4 inch mesh.  
3 shots of 500 yds, 2 inch, beach seine.  
longline 1 000 yds, 250 hooks, octopus bait

If more than one fishing method used in a day, record a method and its catch to a line.

Catch: Species - caught: Give type of fish caught (common name), total weight per species and approximate number.

e.g. 2 dhufish (12 kg), 3 bronze whaler (15 kg), 20  
whiskery (100 kg), 1 queen snapper (5 kg).

Remarks

Record anything which may be of interest if insufficient space write on the back of the form.

e.g. Water discoloured red (or white) in block 2917.3.

Completed forms should be returned in the prepaid envelopes provided.

APPENDIX 2b      — GEOGRAPHE      BAY      WEEKLY      FISHING      LOG      SHEET      —

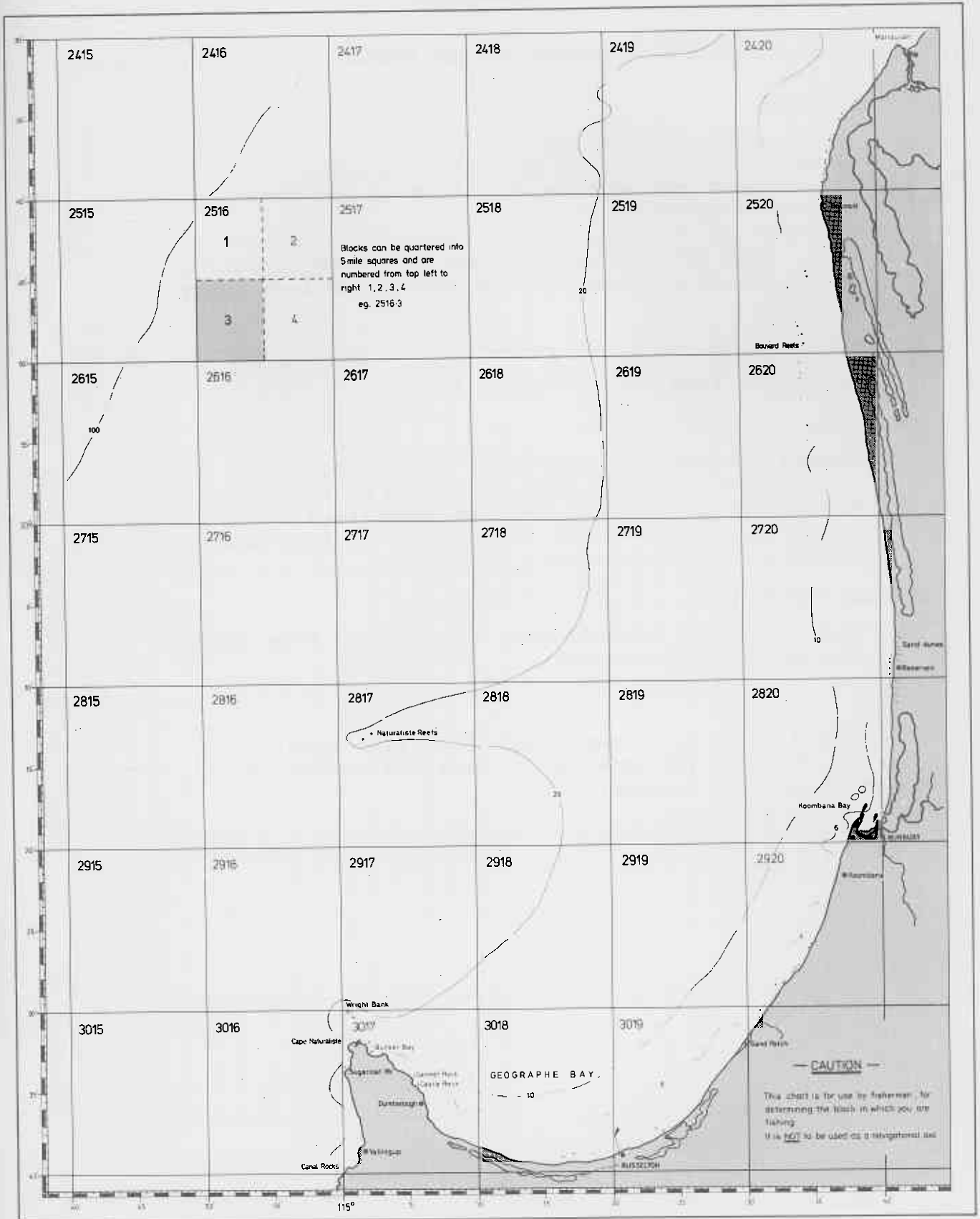
NAME OF FISHERMAN :

BOAT NUMBER :

BOAT NAME :

DATE	AREA FISHED (Block No.)	DEPTH IN FATHOMS	FISHING TIME (Hours)	FISHING METHOD Give details or gear used	SPECIES CAUGHT Give common name approximate number and weight	REMARKS
MON .....						
TUE .....						
WED .....						
THU .....						
FRI .....						
SAT .....						
SUN .....						

# APPENDIX 3



APPENDIX 4a

EXPLANATORY NOTES ON LOG SHEETS

INSTRUCTIONS:

Use one sheet per person.  
Separate daily entries by leaving a line.  
Record name and address at bottom of log sheet before returning.  
Comments on weather, tides, visibility, behaviour of fish, food present in stomachs, breeding condition, etc., may be written on line underneath last entry for day.

FISHING TIME:

Calculate time spent fishing for day.

LOCALITY:

Record locality as accurately as possible e.g. 1 mile west of Windy Hbr.. If two or more localities are fished in a single day use separate line(s) per locality, recording the catch with the appropriate locality.

FISHING METHOD:

Record fishing method used, e.g. angled from shore, angled from a boat, etc..

CATCH:

Record catch in terms of species (fish type).  
Use one line per species. Give the number of each species caught

e.g. 5 herring  
1 salmon



APPENDIX 5

COMMON NAMES OF FISH USED BY AMATEUR FISHERMEN RECONCILED,  
WHERE POSSIBLE, WITH SCIENTIFIC NAMES.

Port Jackson shark	<i>Heterodontus portusjacksoni</i> (Meyer)
Wobbegong/Carpet shark	<i>Orectolobus</i> spp
Shovel nose ray/Shovel nose shark	<i>Aptychotrema vincentiana</i> (Haacke)
Southern fiddler shark/ Fiddler shark	<i>Trygonorhina fasiata</i> Muller and Henle
Stingrays	<i>Dasyatis</i> spp
Eagle ray	<i>Myliobatis australis</i> Macleay
Sergeant Baker	<i>Latropiscus purpurissatus</i> (Richardson)
Cobbler/Catfish	<i>Cnidoglanis macrocephalus</i> (Cuv et Val)*
Knight fish	<i>Cleidopus gloriatus</i> De Vis
John Dory	<i>Zeus faber</i> Linnaeus
Scorpion fish/Soldier fish	<i>Gymnapistes marmoratus</i> (Cuv et Val)
Red rock cod	<i>Ruboralga ergastulorum</i> (Richardson)
Gurnard perch	<i>Neosebastes pandus</i> (Richardson)
Gurnard	<i>Pterygotrigla polyommata</i> (Richardson)
Flathead	<i>Platycephalus</i> spp
Wirrah/Rock cod	<i>Acanthistius serratus</i> (Cuvier)
Harlequin	<i>Otos dentex</i> (Cuv et Val)
Blue devil	<i>Paraplesiops meleagris</i> (Peters)
Westralian jewfish/Dhufish	<i>Glaucosoma hebraicum</i> Richardson
King George V whiting	<i>Sillago punctata</i> Cuv et Val
Yellow finned whiting/ Western sand whiting	<i>Sillago schomburgkii</i> Peters
Silver whiting	<i>Sillago bassensis</i> Cuv et Val
Tailor	<i>Pomatomus saltator</i> (Linnaeus)
Skippy/Skipjack	<i>Caranx georgianus</i> (Cuv et Val)
Samson fish	<i>Seriola hippos</i> Gunther

\* Cuvier and Valenciennes abbreviated (Cuv et Val)

APPENDIX 5 (cont'd)

Yellowtail/Yellowtail scad  
Australian herring/Ruff  
Australian salmon  
Snapper  
  
Tarwhine/Silver bream  
Mulloway/River Kingfish  
Goatfish/Red mullet  
Sea sweep  
Banded sweep  
Moonlighter  
Old wife  
Dusky morwong  
Magpie morwong  
Queen snapper  
Parrot fish/Rock cod  
Oriental bonito/Bonito  
  
Leather jackets  
Boxfish  
Shaw's cowfish/Cowfish  
Western rock lobster/Crayfish

*Trachurus macullochi* Nicols  
*Arripis georgianus* (Cuv et Val)  
*Arripis trutta esper* Whitley  
*Chrysophrys unicolor* Quoyard  
Gaimard  
  
*Rhabdosargus sarba* (Forsskal)  
*Sciaena antarctica* Castelnau  
*Upeneichthys porosus* Cuv et Val  
*Scorpius aequipinnis* Richardson  
*Scorpius georgianus* Cuv et Val  
*Vinculum sexfasciatum* (Richardson)  
*Enoplosus armatus* (White)  
*Dactylophora nigricans* (Richardson)  
*Goniistius gibbosus* (Richardson)  
*Nemadactylus valenciensi* (Whitley)  
*Pseudolabrus* spp.  
*Sarda orientalis* (Temminck and  
Schlegel)  
  
Family Monocanthidae  
*Strophichthys* spp.  
*Aracana aurita*  
*Panulirus cygnus* George