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The Amateur Fishery for the Western Rock Lobster

BY

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FOREWORD

The commercial fishery for western rock lobsters in Western Australia has the highest value of any fishery in Australia, and is currently (1981) valued at some A$60 million. The fishery has been closely managed since 1963 under a system of limited entry, which currently provides for 785 licensed vessels fishing a controlled number of pots. Catches during the three years 1978/79 to 1980/81 have averaged $10\frac{1}{2}$ million kg.

Management measures rely on scientific advice based on data on catch and fishing effort from the commercial fishery, and from biological observations on rock lobsters. However a knowledge of all sources of usage of the stocks is essential to the proper understanding of the dynamics of the fishery on which the formulation of management advice is based.

The study described in this report by Dr Pamela Norton provides for the first time, quantitative information on the amateur fishery for rock lobsters. Research was financed by the Commonwealth Fishing Industry Trust Account.

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THE AMATEUR FISHERY FOR THE WESTERN ROCK LOBSTER

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ABSTRACT

A study of the amateur fishery for the western rock lobster, Panulirus cygnus George, was commenced by the W.A. Marine Research Laboratories in August, 1976, and was concluded in December, 1978. The main aims of this study were to collect and analyse data to give some estimate of the distribution and magnitude of this amateur fishery.

Prior to this survey, the only catch and fishing effort data available was that obtained from the commercial fishery. Data from the amateur fishery were required in order to make a full assessment of the level of exploitation of the stocks. In addition, it was believed that in recent years, increasingly more effort was being put into the fishery by amateurs, as a result of population increases, increases in leisure time, increases in the number of privately owned boats and the rapid increases in the numbers of Amateur Fisherman's Licenses issued.

A preliminary assessment of the fishery was obtained by analysing questionnaires issued with Amateur Fisherman's Licenses (AFLs) for the 1976-77 season. The results suggested that the main areas fished by amateurs were around the towns of Perth and Geraldton. There were two main methods used for catching rock lobsters - by using lobster pots and by diving; pot fishermen outnumbered divers by 4.5 to 1.

The total estimated catch for the 1975-76 season, assuming that all AFL holders who owned pots used them, was 250 000 kg of rock lobster.

Following this, a creel census was undertaken, with fishermen being interviewed along the coast from Augusta to Kalbarri during the 1976-77 and 1977-78 rock lobster fishing seasons. Very few fishermen diving for rock lobsters were encountered during the census, so little was learned about their activities. The creel census yielded valuable information on the catch rates of amateur fishermen using lobster pots; for the 1976-77 season, the estimated catch rate was 0.50 kg per pot lift and for the 1977-78 season, 0.52 kg per pot lift.

Information on the fishing effort of amateur rock lobster fishermen was obtained from data collected on the AFL application form which was introduced for the first time for the 1977-78 year. 26 644 AFLs were issued in 1977-78. 8739 license

holders owned pots, 7158 of whom actually used them during the 1977-78 season. The 7158 license holders who used pots owned a total of 13 457 pots i.e. an average of 1.88 pots each and they worked them for an average of 19.5 days during the season. This generated 262 500 pot lifts for the 1977-78 season. There were also 1587 people who dived for rock lobsters and 177 who took them by other methods. This produced a total effort by amateur fishermen of 262 500 pot lifts, 24 500 occasions on which amateur fishermen dived for rock lobsters, and 1800 occasions on which amateur fishermen caught rock lobsters using other means. Based on these figures, it was estimated that the total catch by amateur rock lobster fishermen for the 1977-78 season was 173 800 kg, which represents 1.6% of the total professional catch for the season.

Application forms for AFLs have been discontinued for the time being. However it would be possible to effectively monitor the fishing effort of amateurs in the rock lobster fishery in future years by reintroducing application forms for AFLs and applying the methodology given in this paper.

I INTRODUCTION

The commercial fishery for the western rock lobster, *Panulirus cygnus* George, is one of the most important single fisheries in Australia and an important export earner (worth $49 million for 1976-77 season, $57 million for 1977-78 season). The western rock lobster is found from the Cape Leeuwin area to North West Cape, and is fished commercially from south of Bunbury to Shark Bay.

The fishery is governed by a complex set of regulations which have been reviewed by Bowen (1971) and which are designed to limit the total fishing effort to acceptable levels and to enforce a legal minimum size. The regulations which govern the amateur fishery are given in Appendix C. It is thus important to constantly monitor the state of the fishery both to ensure that the effort is remaining within the accepted limits and that the regulations are adequately performing their function of maintaining reasonably stable catches. The commercial fishery is monitored annually by staff of the W.A. Marine Research Laboratories (see Morgan and Barker, 1974, 1975, 1976, 1979).

In order to effectively monitor the total fishery, it is necessary to have some knowledge of the nature and extent of the amateur fishery.

It is believed that in recent years increasingly more fishing effort is being put into the fishery by amateurs, because of population increases, increases in leisure time, increases in the number of privately owned boats and the rapid increases in the numbers of Amateur Fisherman's

Licenses issued (see Table 1). This paper endeavours to shed some light on the distribution and magnitude of the amateur rock lobster fishery, which will help towards a better understanding of the status of the combined amateur and professional fishery and which will provide background information for the resolution of the inevitable conflicts between these two groups of fishermen.

II METHODS

The study commenced in August 1976 and continued until December 1978. It incorporated two rock lobster seasons, viz. from 15 November 1976 to 15 August 1977 and from 15 November 1977 to 30 June 1978.*

One Research Officer and one Technical Officer were employed full-time for the study. Three temporary assistants were employed over the 1976-77 Christmas vacation - two for seven weeks and one for three weeks. Two temporary assistants were employed for two weeks over the May 1977 school vacation. Three temporary assistants were employed over the 1977-78 Christmas vacation; one for three months and two for three weeks each. A temporary technical assistant was employed from April 1977 to June 1978 to work in the Geraldton area. For the period April-August 1977, she worked for approximately ten mornings per month, and for the whole of the 1977-78 season, she worked twelve mornings each fortnight. On many occasions additional help was given by technical staff of the W.A. Marine Research Laboratories.

There are two main methods that amateur fishermen use to catch rock lobsters. The first and most common is by using lobster pots. Lobster pots are baited and set on reefs (or on sand at certain times of the year), and are then pulled at a later time, usually the next morning. The second is by diving. Rock lobsters are also caught in many other ways e.g. on a fishing line, using scoop and drop nets, and walking along a reef and picking them up by hand. However, these methods are used much less commonly than the two first mentioned above.

A preliminary assessment of the amateur fishery was obtained by analysing questionnaires issued with Amateur Fisherman's Licenses for the 1976-77 season. This was not continued during the 1977-78 season, but information for that year was obtained from the license application forms which were first introduced for the 1977-78 licensing season.

*Note: The 1977/78 and subsequent seasons were closed 6 weeks earlier than in previous years.

A further assessment was obtained by carrying out a creel census* which was commenced on 15 November 1976 and concluded on 30 June 1978.

The methodology has been grouped, for convenience, under the following headings:-

(i) Questionnaire.

(ii) General creel census 1976-78.

(iii) Creel census of the Geraldton area from April 1977 to June 1978.

(iv) Creel census of selected Perth beaches during the 1977-78 season.

(v) Creel census of other areas of interest.

(vi) Examination of fishermen's log sheets.

(i) Questionnaire:

It was hoped that each person who applied for an Amateur Fisherman's License (AFL) for the 1976-77 season would be asked to fill out a questionnaire at the time and place the license was issued. A sample questionnaire is given in Appendix A.

The questionnaire basically sought information about the fisherman's rock lobster fishing activities during the 1975-76 season (which extended from 15 November 1975 to 15 August 1976). It asked what fishing methods were used; where the fishing methods were used; what time of the season the fishing was done; for an estimate of the number of days spent fishing and for an estimate of the catch.

Two problems however, immediately arose. Firstly, approximately 4,000 licenses for the 1976-77 season had been issued before this study was commenced. These license holders were each sent a questionnaire by post, together with a reply paid envelope and a covering letter, which explained what the survey was about and gave instructions for answering the questions. Secondly, many people apply for a license by post. These people were sent a questionnaire, a covering letter and a reply paid envelope with their licence.

*The creel census method is a technique which has been widely used to obtain information on fishing pressure and harvest of fish for amateur fisheries based on counting and interviewing the fishermen.

Data from the returned questionnaire were tabulated using the Statistical Package for the Social Sciences (S.P.S.S.) programs. The analysis of these data provided information on the proportion and distribution of license holders who fished for rock lobsters during the 1975-76 rock lobster season, the various localities fished and the numbers of fishermen at each locality. The address of each fisherman was used to determine the distribution of license holders. The various areas into which these addresses have been classified were defined using the statistical and local government boundaries given in "Index of Localities in Western Australia as at 31st December, 1973", published by the Australian Bureau of Statistics - see Appendix B. The fishing localities were determined in such a way that information from this study could be easily compared with data obtained from the professional fishery (Figure 1.).

Application for Amateur Fisherman's Licenses 1977-78

It was intended that each person who applied for an Amateur Fisherman's License during the 1977-78 season would be asked by the licensing officer to fill out an application form. This application form replaced the Research Data Slip, introduced in 1971, and for the purposes of the presen survey, asked:

(a) office of issue;

(b) whether the applicant owned lobster pots or not;

(c) whether the applicant held an amateur fisherman's license during the previous season;

(d) if the answer to (c) was "Yes", then the applicant was asked to estimate the number of days spent fishing for rock lobsters during the 1976-77 season by ticking one of the following boxes:

0	days
1-5	days
6-10	days
11-20	days
21-50	days
> 50	days

(ii) General Creel Census 1976-78

Creel censuses have been undertaken in several fisheries to obtain information on the fishing pressure and the harvest of fish. Each creel census must take into account the nature of the fishery under examination, so there are no standard techniques. The general principle,

however, is to take counts of fisherman to enable the total fishing pressure to be estimated, and interview some of the fishermen in order to calculate the mean rate of success. Examples of other creel censuses reviewed include Neuhold and Lu (1957), Johnson and Wroblewski (1962), Moore, Stevens, McErlean and Zion (1973) and Caputi (1976).

The main objectives of the creel census in the present study were to obtain the following estimates where possible for amateur rock lobster fishermen:

(1) The total fishing pressure during the season.

(2) The catch per potlift and the catch per diver during the season.

(3) The total harvest by amateur fishermen.

The census was restricted to the portion of the coastline between Augusta and Kalbarri (Figure 1). During the 1976-77 season, interviews took place in as many areas as possible, in order to obtain a broad estimate of fishing pressure and catches in the total fishery. During the 1977-78 season, interviews were mainly directed towards the Perth and Geraldton areas, which were observed during the 1976-77 season to be by far the most important areas for amateur fishermen.

As many fishermen as possible were interviewed at boat ramps and on beaches, depending on the area. Fishermen at Rottnest Island and Garden Island were inteviewed on roads, boats and in holiday cottages as well as on beaches. In most areas, interviews were commenced at first light and the following information recorded for each interviewee:

(a) number of fishermen in party - divers and pot fishermen were counted separately;

(b) number of pots pulled by party or time spent diving;

(c) catch of rock lobsters;

(d) fishing frequency;

(e) home locality of fishermen.

Binoculars were used extensively throughout the creel census. These were an invaluable aid in estimating what fishermen were actually doing, rather than relying solely on what fishermen said they were doing.

Several favourable articles which appeared in the daily newspapers gave information about the creel census and the survey in general and proved useful in alerting the public to the aims of the study. As well, small articles about the survey were submitted to various amateur fisherman's organisations for publication in their journals.

Calculation of catch per pot lift from Census Data

For each area in which interviews took place during a month, the monthly catch per pot lift is given by

$$\frac{\Sigma \text{ catches of parties giving catch data}}{\Sigma \text{ pots pulled by parties giving catch data}}$$

Calculation of catch per diver per dive

For each area in which interviews took place during a month, the monthly catch per diver per dive is given by

$$\frac{\Sigma \text{ daily catches of divers encountered}}{\Sigma \text{ divers encountered}}$$

Estimation of catch

Most of the catch estimates are of necessity subjective. However, they are based on the interview data obtained for each particular area, and have taken into account information from other sources, most important of which are the local fishermen and the local fishery inspectors. Since the figures presented for the general census take account of all possible catches from an area, they should possibly be regarded as maximum catches rather than precise catch estimates.

(iii) Creel census of the Geraldton area 1977-78

The Geraldton area was selected for a more intensive study for several reasons:-

(a) The co-operative attitude of the fisherman.

(b) Amateur fishing activity throughout the season.

(c) Easy accessibility of the fishermen for interviewing purposes.

Apart from the main objectives of the creel census, other objectives of the census in the Geraldton area were to collect information on:-

(a) The depth of water fished by the amateurs in the Geraldton region.

(b) The size range of the boats used.

(c) The number of fishermen who were new to the fishery.

The basic method of the census was to interview all the fishermen at a particular place during a particular period of the morning. This method was chosen because of its suitability to this fishery in that:-

(1) Most of the fishermen pulling pots left the shore about sunrise to go and pull their pots and usually returned within an hour.

(2) Divers usually operated before the arrival of the "sea breeze" (a prevailing south westerly wind) in the early afternoon.

Areas of operation

Interviews took place at three different beaches in the Geraldton area, where many amateurs launch their boats. These beaches are:-

(a) Town Beach where there is a wooden jetty/ramp which is ideal for launching larger boats. As well, there is a small beach area beside this where several smaller boats can be launched at the one time;

(b) Rundle Park (St. George's Beach) where there is a boat ramp which is not suitable for launching boats larger than 16 ft;

(c) Pages Beach where there is a "natural" boat ramp which disappears during the winter months. Again, it is only suitable for small boats (16 ft or less), or possibly larger boats pulled by a 4-wheel drive vehicle.

These three beaches are marked on the map given in Figure 2.

Most of the fishermen in the Geraldton area fish in Champion Bay, although some pots can usually be seen in Port Grey.

Sampling period

Interviews were carried out over two periods:-

(a) From April 1977 to August 1977, mainly at Town Beach.

(b) From November 1977 to June 1978 (the 1977-78 rock lobster season) at each of the three areas, with an emphasis on Town Beach and Rundle Park towards the end of the season.

The first period, (a), was a test period, and interviews took place about ten mornings per month, chosen randomly. For the second period, (b), the interviewer worked twelve mornings out of fourteen. The mornings on which interviews were to take place and the particular beach at which interviews were to take place were preselected (i.e. interviewing took place regardless of weather conditions).

Interviewing routine

The interviewer would arrive at the beach about half an hour before sunrise, and stay for about four hours. The interviewer noted each boat as it was launched, by recording the boat number (or vehicle registration number if the boat number was missing), the number of fishermen in the boat and the number of pots to be pulled (if any). When the fishermen returned, they were asked about their catches. The following information was also recorded where possible:-

1. length of boat;

2. whether the fishermen had fished at a depth less than or equal to five fathoms;

3. the time spent diving (if applicable);

4. whether the fishermen had a gauge for measuring rock lobsters;

5. whether the boat had an echo sounder;

6. estimated fishing frequency of the fishermen;

7. whether the fishermen had fished previously for rock lobsters.

If the fishermen had not returned by the time the interviewer had finished for the morning, this was recorded. The prevailing weather conditions were also recorded.

Calculation of Fishing Effort

The most important measure of fishing effort in the amateur fishery is the total number of pot lifts, since this is the same measure of fishing effort used in the professional fishery. This measure of effort, however, does not take into account the fishing effort of divers. Since there appears to be far less fishing effort exerted by divers when compared to pot fishermen, the contribution from divers has been ignored in the first instance in the following calculations.

Each area was treated independently in the calculation of fishing effort. For each area, the total fishing effort of those fishermen interviewed and its confidence limits were calculated as follows:-

Let P_i be the mean number of pots pulled per day for the ith month of the season based on the interview days for the month, and let $SE(P_i)$ be its standard error. Let D_i be the number of fishing days in month i. Then the total fishing effort for month i, viz E_i, is given by

$$E_i = D_i P_i$$

The 95% confidence limits for the total fishing effort for month i are then obtained as follows:-

$$E_i \pm t(n-1, 0.95)\ D_i\ SE(P_i)$$

where n = no. of interviewing days for month i; and t(n-1, 0.95) = t value with n-1 degrees of freedom.

Alternative measures of fishing effort in the amateur fishery are the total number of boat days and the total number of fishermen days. Let B_i (or F_i) be the mean number of boats (or fishermen) encountered per day for the ith month of the season based on the interview days for the month, and let $SE(B_i)$ (or $SE(F_i)$) be its standard error. Then the total boat days (or fishermen days) for month i, viz $\mathcal{B}_i$ (or $\mathcal{F}_i$), is given by

$$\mathcal{B}_i = D_i B_i$$

$$(\text{or } \mathcal{F}_i = D_i F_i)$$

The 95% confidence limits for the total fishing effort measured in this way are then obtained as follows:-

$$\mathcal{B}_i \pm t(n-1, 0.95)\ D_i\ SE(B_i)$$

$$(\text{or } \mathcal{F}_i \pm t(n-1, 0.95)\ D_i\ SE(F_i)),$$

where n = no. of interviewing days for month i; and t(n-1, 0.95) = t value with n-1 degrees of freedom.

Calculation of Rate of Success

The rate of success in this amateur fishery is determined by the number of rock lobsters per pot lift. However, the rate of success in the professional fishery is determined by the weight of rock lobster per pot lift. Since it would be impractical to weigh the catches of amateur fishermen, the rates of success of the two fisheries can only be compared provided a conversion from numbers of rock lobsters to weight of rock lobster is possible. For this purpose it will be assumed that one (amateur) rock lobster weighs 0.5 kg.

For each area, the mean catch per pot lift for month i, R_i, is given by:-

$$R_i = \frac{IC_i}{IP_i}$$

where IC_i = mean catch per party interviewed during month i, and IP_i = mean number of pots pulled per party interviewed (and giving catch figures) during month i.

To obtain confidence limits for R_i, an estimate of its sample variance is required. This is given by

$$V(R_i) = R_i^2 \left[\frac{V(IC_i)}{(IC_i^2)} + \frac{V(IP_i)}{(IP_i^2)} - \frac{2\ Cov(IC_i,\ IP_i)}{IC_i\ IP_i}\right]$$

(see Kendall and Stuart, 1969)

where $V(R_i)$ = sample variance of R_i;

$V(IC_i)$ = sample variance of IC_i;

$V(IP_i)$ = sample variance of IP_i;

$Cov(IC_i, IP_i)$ = sample covariance of IC_i and IP_i.

Then 95% confidence limits for R_i are given by

$$R_i \pm t(N-1,\ 0.95)\ SE(R_i)$$

where N = no. of parties interviewed in month i that gave catch data;

$t(N-1,\ 0.95)$ = t-value for N-1 degrees of freedom;

$SE(R_i)$ = standard error of R_i = $(V(R_i))^{\frac{1}{2}}$

Calculation of harvest

For each area, the total monthly catch for those fishermen interviewed, C_i is given by:-

$$C_i = D_i \, P_i \, R_i$$

Before calculating the confidence intervals for C_i in the above formula, an estimate of its sample variance was required. This was obtained using the formula described in Kendall and Stuart (1969). For the above equation, the sample variance of C_i is given by:-

$$V(C_i) = C_i^2 \left[\frac{V(P_i)}{P_i^2} + \frac{V(R_i)}{R_i^2} + \frac{2\,\mathrm{Cov}(P_i, R_i)}{P_i \, R_i}\right]$$

where $V(C_i)$ = sample variance of C_i;

$V(P_i)$ = sample variance of $P_i = \{SE(P_i)\}^2$;

$V(R_i)$ = sample variance of $R_i = \{SE(R_i)\}^2$;

$\mathrm{Cov}(P_i, R_i)$ = sample covariance of P_i and R_i

Then 95% confidence limits for the total catch for month i are given by:-

$$C_i \pm t(M-1, 0.95) \{V(C_i)\}^{\frac{1}{2}}$$

where M = minimum of the number of days interviewing and the number of interviews yielding catch data, and

$t(M-1, 0.95)$ = t value with M-1 degrees of freedom.

(iv) Creel census of selected Perth beaches during the 1977-78 season.

Three beaches around the Perth area were investigated using methods similar to those used in the creel census of the Geraldton area. The main difference was that interviews began before sunrise and did not finish until the early afternoon. The fishermen in the Perth area stagger their departure times, and some stay out to fish afterwards, particularly on weekends. The three beaches to be discussed are the most important for local amateur fishermen:-

(a) Quinns:

Quinns is situated 40 km north of the Perth G.P.O. (Appendix B inset B) and has quite a large population of both retired people and people who commute to Perth (or Wanneroo) daily to work. Boats are launched across the beach from a large bitumenised boat launching area here, put in at the start of each summer, but which is quickly eroded, and by about March is non-existent. Most of the people who fish from here live at Quinns, although a few fishermen travel daily from Wanneroo, Burns Beach and the northern suburbs of Perth.

(b) Whitfords:

This beach, 25 km north of the G.P.O. (Appendix B inset B) is the most important launching area at present for boats north of the river. There is no ramp here, although cars can be driven along a track about halfway to the water. The boats then have to be dragged a considerable distance over sand. (4-wheel drive vehicles can however, drive along the beach and launch boats virtually anywhere.)

(c) Safety Bay:

This beach is 50 km south-west of Perth (Appendix B inset B). It used to be a holiday resort, but now is a suburb of Perth for all practical purposes. There are several excellent boat ramps along this beach.

(v) Creel census of other areas of interest

Some attention was given to other selected areas during the 1977-78 creel census. These areas are considered important in the amateur fishery.

(1) Kalbarri:

This is a very popular holiday resort on the coast 591 km north of Perth (Figure 1). There are good boating facilities along the Murchison River, although access by boat from the river to the sea is at times quite treacherous. Although the amateur fishermen here fish close to the shore, the waters are quite deep (> 5 fathoms).

(2) Rottnest Island:

This is a very popular holiday resort, about 19 km off the coast from Perth (Figure 1). The waters around the island are a paradise for amateur fishermen. There are some amateur rock lobster fishermen who fish from the

land, although most of the rock lobster fishing is done using boats. The land fishermen are very secretive about their activities - perhaps this is due to the fact that their pots are fair game to anyone who spots them.

(3) Mandurah:

This is a rapidly growing town and tourist resort about 75 km south of Perth (Figure 1). Boating facilities are excellent here. The amateur rock lobster fishermen fish the inshore shallow areas along the coast from the estuary to Avalon.

For each of these areas, interviews were conducted in a manner similar to that used in the Geraldton areas, with two exceptions:-

(a) interviewing began before sunrise and continued into the afternoon; and

(b) the interview dates were chosen when accommodation for the interviewers was available, and so interviews occurred on consecutive days.

(vi) Fisherman Log Sheets

Log sheets were issued to some fishermen in most areas for the 1976-77 season. These were originally issued to fishermen who had indicated some interest in the survey when filling out a questionnaire or who had indicated on the questionnaire that they had fished regularly throughout the 1975-76 season. Others were distributed to interested fishermen encountered during the creel census. Log sheets or books for the 1977-78 season were issued to fishermen who had sent in log sheets from the previous season, as well as to interested fishermen encountered during the creel census.

The fishermen were asked to record the date and place of fishing as well as

(a) if using pots - the number and type of pots

- the time of day the pots were lifted

- the type of bait used

- their catch

(b) if diving - the time spent diving

- the depth of water and whether compressed air methods were used for diving

- the catch

The information obtained from these logs are likely to be quite biased. However, the information is useful for identifying periods of inactivity (for example, when the weather is poor) and when the stocks of rock lobsters of legal size in an area are good. These log sheets also provide a useful guide to the sort of catches amateur fishermen can expect.

III RESULTS

(i) Questionnaire:

During the 1976-77 season, there were 3,660 questionnaires received, compared to 22,400 licenses issued (Table 1).

Of these, only 1,112 reported fishing for rock lobsters during the 1975-76 season. The information obtained from the analysis of the questionnaires must be treated cautiously, for several reasons:-

(a) The people who sent in completed questionnaires may not be representative of the total number of license holders. Indeed, 75% of the completed questionnaires were received by the end of November, 1976, whereas only one-third of the AFLs for the 1976-77 season had been issued by then.

(b) For various reasons, the catch may be over- or underestimated for example, due to inaccurate recollection, exaggeration or deliberate misrepresentation.

(c) Since unlicensed amateur rock lobster fishermen have been reported, information obtained only from license holders may not be fully representative.

(d) Different offices of issue of AFLs could give varying amounts of time and effort to getting the questionnaires completed. The greatest proportion (60%) of questionnaires returned to total licenses issued was from the Dongara Office (see Table 2B for further details). Furthermore, fishermen who were not interested in fishing for rock lobsters may not have been requested to complete a questionnaire.

Table 2A gives the distribution of fishermen who returned the questionnaires and who fished for rock lobsters during the 1975-76 season. (Where no address was given on the returned questionnaire, the postcode on the envelope was used to determine the home locality; if there was no postcode or envelope, the home locality was classed UNKNOWN.) Table 2B gives, for each office of issue, the total number of fishermen who completed questionnaires, the total number of research data slips examined during the 1976-77 season, the numbers owning pots and the number of data slips containing no information. Note that for Perth, Fremantle, Geraldton and Mandurah there is a considable difference between the proportion of AFL holders owning pots (see Table 1) and the proportion of AFL holders (in 1976-77) who went fishing for rock lobsters during the 1975-76 season. Part of this difference may be due to new AFL holders. Overall, the percentage of AFL holders owning pots during the 1976-77

season was 50% whereas the percentage of fishermen returning questionnaires who had gone fishing for rock lobsters during 1975-76 was 30%.

Table 3 gives the numbers of fishermen returning questionnaires who used the various methods of fishing for rock lobsters at the different coastal localities. Where more than one area was given for each method of fishing, only the first was considered. From this table, it appears that the two main areas for pot fishermen are around the cities of Perth and Geraldton, while divers, in addition to these areas, prefer the south-west (Augusta-Busselton-Bunbury areas) and the Carnarvon area.

Table 4 gives the numbers of fishermen returning questionnaires who used different methods to fish for rock lobsters during the 1975-76 season, and lists the "other methods" given by amateur fishermen. Fishing for rock lobsters using pots is the most common method. Diving is the only other main alternative.

Tables 5A and 5B give the months and times of the year fished. Clearly November-January is the most popular time for rock lobster fishing.

Table 6 gives the distribution of fishermen returning questionnaires who used pots at the various fishing localities during the 1975-76 season. Note that the majority of people who fished in the Geraldton area came from the Geraldton area, and vice versa, while of the 500 fishermen from the Perth area, 264 fished around the Perth area (i.e. Perth, Rockingham, Rottnest Island and Garden Island fishing localities), while the remainder tended to fish along the coast between Mandurah and Kalbarri.

Table 7 shows the number of days on which fishermen who returned questionnaires lifted their pots during the 1975-76 season. Note that 77% fished for 30 days or less; this covers the holidaymakers as well as the local amateur fishermen in some areas who fish only during the run of "whites"* in November and December. Note that almost half of the fishermen fishing in the Geraldton area fished more than 30 days. The average number of days that fishermen who returned questionnaires lifted their pots was 28.5, with 95% confidence limits of 26 and 31.

Table 8 gives the rock lobster catches reported by fishermen who completed questionnaires while using pots during the 1975-76 season. Note that 73% caught 50 or less rock lobsters. The mean catch was 49.5, with 95% confidence limits of 45 and 54. Assuming all the AFL holders with pots in 1975-76 (viz 8 277 see Table 1) used them, this would amount to a catch of 410 000 rock lobsters, or, assuming the average rock lobster caught by an amateur

*The so-called "whites" fishery begins in the latter half of each November when newly-moulted pale-coloured rock lobsters are fished as they move offshore from shallow reef nursery areas. The "coastal red" fishery continues from January onwards.

fisherman weighs ½ kg, to a catch of 205 000 kg of rock lobster (with 95% confidence limits of 185 000 kg and 225 000 kg).

Table 9 shows the number of pots used by amateur fishermen. 88% of the fishermen used two pots, which is the legal maximum number of pots permitted for each license holder.

Table 10 gives the distribution of divers who returned questionnaires at the various fishing localities. Note that in particular those who lived around the Carnarvon, Shark Bay, Geraldton and south-west areas went diving around the same area. 69% of the people from Perth who went diving did so around the Perth area.

Table 11 gives the numbers of days spent diving during the 1975-76 season by fishermen who returned questionnaires, and Table 12 gives their catches. The average number of days spent diving by each diver during the season was 15, with 95% confidence limits of 13 and 17. The average catch during the season was 45 rock lobsters, with 95% confidence limits of 37 and 53. Based on the ratio of fishermen returning questionnaires who went potting to those that dived, (Table 4), the total number of AFL holders in 1975-76 who dived to catch rock lobsters is about 1 800. Their catch would amount to 82 500 rock lobsters, or 41 300 kg, during the season, with 95% confidence limits of 33 900 kg and 48 600 kg.

Table 13 gives the distribution of fishermen returning questionnaires who used other methods at the various fishing areas while Table 14 gives the numbers of days spent by fishermen who returned questionnaires catching rock lobsters by other methods and Table 15 gives their catches. Obviously the numbers involved here are insignificant compared to the numbers of divers and pot fishermen.

Thus the total catch by amateur rock lobster fishermen during the 1975-76 season was about 250 000 kg which comprised approximately 205 000 kg captured by pots, 40 000 kg caught by diving and an estimated 5 000 kg caught by other methods. This figure relies on the assumption that all fishermen who owned pots used them. However, consideration of Table 2B leads one to believe that perhaps this is not the case, and that the true catch may well be significantly less than 250 000 kg.

Application for Amateur Fisherman's Licenses, 1977-78

26 644 licenses were issued for which 21 410 application forms were received. Table 16 shows the total numbers owning pots, as well as the numbers owning pots who obtained their AFL's from Perth and Fremantle offices combined and from the Geraldton office. From Table 16, an estimated 32.8% of license holders owned rock lobster pots viz. approximately 8,739 persons.

Table 16 also gives the numbers applying for an AFL during the 1977-78 season who had an AFL during the 1976-77 season. Note that over 50% of those applying for an AFL during the 1977-78 season did not have an AFL during the 1976-77 season. From Table 1, however, a much smaller increase in the total number of AFLs issued is apparent. This appears to indicate a large turnover of license holders each year.

Table 17 gives the numbers of days fished during the 1976-77 season by persons applying for an AFL during the 1977-78 season who had an AFL during the 1976-77 season. Of those who did fish, over 75% fished on 20 or less days overall. The figure from the Geraldton office is 50% for 20 or less days, and 80% for 50 or less days.

Comparing the distribution of days fished for rock lobsters in Table 17 with the combined distributions of Tables 7,11 and 14 gave the following result:-

No. of days fishing for rock lobsters	No. of fishermen during the 1975-76 season (from questionnaire)	No. of fishermen during the 1976-77 season (AFL applications)
1-10	*455	1675
11-20	291	831
21-50	239	564
Over 50	127	215

*This figure includes those fishermen who set pots, and whose pots disappeared before they could be pulled for the first time.

The value of chi-square for this 2 x 4 contingency table is 51.54 with three degrees of freedom, indicating that the two distributions are significantly different. Examination of the data above suggest that there is an under representation of holidaymaker fishermen who returned questionnaires in comparison with AFL applications.

An estimate for the mean number of days fished for rock lobsters can be obtained from the AFL applications, using the data in Table 17, and a figure derived from the questionnaire survey, being the mean number of days fished for rock lobsters per season (using pots and by diving) for those who estimated they fished for more than 50 days - viz 104.97 days (and 106.40 days if pot fishermen only are considered).

A figure of 105 days has been used in the following calculation:-

No. of days fished	No. of fishermen (N)	Midpoint of interval of no. of days fished (F)	N x F
1-5	958	3	2874
6-10	717	8	5736
11-20	831	15.5	12880.5
21-50	564	35.5	20022
Over 50	215	105	22575
	3285		64087.5

Then, an estimate of the mean number of days fished for rock lobsters by amateur fishermen in a season is 19.51 (i.e. 64087.5 divided by 3285).

Table 18 gives the numbers of AFL holders during 1977-78 season who had AFLs for 1976-77 season and who own pots.

From these figures, it appears as if there is a "core" of amateurs with pots who fish each year, and probably account for about half the number of fishermen owning pots. In addition, there is a "floating" proportion of fishermen who have pots, obtain an AFL for one season but not the next - these fishermen may possibly not use their pots during the season for which they have their AFL.

(ii) General Creel Census 1976-78

Two possible limitations of the interview technique were:-

(i) The catch was not always observed by the interviewer. It would have been impractical for the interviewer to examine the catch of every fisherman, and as well would have tended to alienate the fishermen.

(ii) The number of pots lifted by each boat was not observed. It is believed that a few fishermen may have had an extra pot or two, and that some pulled other people's pots.

Table 19 and 20 give the catch of rock lobsters per pot lift by amateur fishermen during the 1976-77 and 1977-78 seasons based on the interviews of fishermen at the various localities.

It should be noted that almost half of the catch is taken around the localities of Perth and Geraldton, and that the greatest catches are taken in December to April.

From this creel census, the following general points can be made:-

(a) In most areas there were two types of fishermen - the locals and the holidaymakers. The locals fished throughout the season, while the holidaymakers seemed to be in abundance from Christmas to the middle of February, over the Easter vacation and other long weekends, and over the May school holidays. So in typical "Christmas holiday" resorts such as Jurien and Dongara there were very few amateur fishermen operating for most of the time. In Geraldton, however, very few holidaymakers were interviewed.

(b) The amateur catch was greatly influenced by the run of "whites". Indeed, some "local" fishermen only fish during this period.

(c) Most areas were heavily fished by amateurs over the Christmas holiday period. Except for around Rottnest Island, legal-sized rock lobsters were scarce during this period.

(d) Very few divers were encountered over this period.

(e) Apart from boats around Rottnest and Garden Islands, there was no apparent increase in the number of amateur rock lobster fishermen using pots during the weekend. If anything, local fishermen tended to keep away from the boat ramps at weekends.

(f) Most of the local fishermen began pulling their pots out for the season from the end of March onwards. By the end of May, there were very few fishermen left with pots in the water.

Some investigations were undertaken in selected areas during the closed season, 15 August, 1977 - 15 November, 1977, but revealed virtually no activity.

(iii) Creel Census of the Geraldton Area

(a) 1976-77 rock lobster season

Table 21 gives a summary of the results of the census for this period. The August figures should be treated with caution as they represent some fishermen going out only to bring in pots that have been unattended for many weeks.

The mean number of boats encountered per day varied from 10.73 in April to 3.80 in July; the mean number of fishermen encountered per day varied from 20.73 in April to 6.40 in July, and the mean number of pots pulled per day varied from 38.45 in April to 12.60 in July. These figures reflect the drop in fishing effort as the season progresses. The catch per pot lift (in numbers of rock lobsters) range from a low of 0.66 or roughly 0.33 kg (in April) to 0.85 or 0.43 kg (in May), (August figure excluded), and was generally low in comparison with the catch rates of 0.39 to 1.45 kg per day by professional fishermen in shallow water at Geraldton during 1976-77.

The total number of pot lifts for the fishermen interviewed for each month are given, together with 95% confidence limits where possible; finally an estimate of the monthly catch of the fishermen interviewed in terms of numbers of rock lobsters is given, again with 95% confidence limits where possible.

Table 22 is a summary of the total numbers of boats and fishermen encountered and pots accounted for over this period. Note the diminishing numbers of fishermen encountered each month (from April to July) as the season progresses.

(b) 1977-78 season

Town Beach, Geraldton

Table 23 summarises the results of the census at this beach during the 1977-78 season. The mean number of boats encountered per day varied from 5.00 in June to 26.89 in December. The mean number of fishermen encountered per day varied from 9.00 in June to 50.67 in December. The mean number of pots pulled per day varied from 18.20 in June to 96.89 in December. Note that all the above means for December were more than twice the corresponding means for any of the other months. The mean catch per pot lift (in numbers of rock lobsters) varied from 1.15 in June to 0.47 in January. Note that by far the greatest effort is put into the fishery in December, when the greatest catch also occurs.

Table 24 summarises the total numbers of boats and fishermen encountered during the season, as well as the number of pots accounted for. Note that over 70% of the fishermen who were encountered over the season were encountered by the end of December.

Table 25 gives the size range of boats encountered at Town Beach during the 1977-78 season. More than half were only 14 ft. in length or less. Table 26 summarises the numbers of interviews of pot fishermen and divers throughout the season. Note the large number of local pot fishermen interviews compared to both holiday pot fishermen interviews and diver interviews. Table 27 gives information on the depths fished, the use of echo sounders, the proportion of boats whose occupants were new to the fishery and the number of boats belonging to local fishermen and to holidaymakers.

Rundle Park, Geraldton

Table 28 summarises the results of the census at this beach. The mean number of boats encountered per day varied from 1.90 in June to 17.78 in December. The mean number of fishermen encountered per day varied from 3.10 in June to 36.78 in December. The mean number of pots pulled per day varied from 5.50 in June to 66.67 in December. Note that the greatest effort is put into the fishery during December, and that the number of fishermen decreases sharply from April onwards. The mean catch per pot lift (in numbers of rock lobsters) varied from 0.30 in January to 0.65 in November. This is quite low in comparison with catch rates of professional fishermen and is probably due to many of the fishermen here putting their pots on quite sheltered reefs in shallow water close to the shore.

Table 29 summarises the total numbers of boats and fishermen encountered during the season, as well as the total number of pots accounted for. Note that 63% of the fishermen who were encountered over the season were encountered by the end of December.

Table 30 gives the size range of boats encounterd at Rundle Park during the 1977-78 season. More than half were only 12 ft. or less. Table 31 summarises the numbers of interviews of pot fishermen and divers throughout the season. Note the large number of local pot fishermen interviews and the complete lack of diver interviews.

Table 32 gives information on the depths fished; the use of echo sounders, the proportion of boats whose occupants were new to the fishery and the proportion of boats belonging to local fishermen and to holiday fishermen.

Pages Beach, Geraldton, 1977-78 season

Table 33 summarises the results of the census at this beach. The mean number of boats encountered per day varied from 0.86 in June to 7.22 in December. The mean number of fishermen encountered per day varied from 1.71 in June to 14.56 in December. The mean number of pots pulled per day varied from 3.14 in June to 27.67 in December. Note that all the above means reach their maximum value in December. The mean catch per pot lift (in numbers of rock lobsters) varied from 0.42 in May to 1.29 in November.

Table 34 summarises the total numbers of boats and fishermen encountered during the season, as well as the total number of pots accounted for. 56% of the total number of fishermen encountered were encountered by the end of December.

Table 35 gives the size range of boats encountered at Pages Beach during the 1977-78 season 57% were found to be 12 ft. long or less. Table 36 summarises the numbers of interviews of pot fishermen and divers over the season. Note the large proportion of local pot fishermen interviews.

Of the 49 boats encountered here during the season, two had pots in more than five fathoms, one had an echo sounder, eight had occupants new to the fishery and two contained holidaymakers (Table 37).

Total number of pot lifts and catch

Table 38A summarises the number of pot lifts from each of the three beaches in the Geraldton area for the fishermen interviewed. The greatest number of pot lifts clearly occurs in December; there is a substantial drop in the numbers of pot lifts in January, with numbers increasing slightly until March, and then a decline.

Table 38B summarises the catch from each of the three beaches for the fishermen interviewed. The catches follow the same trend as the number of pot lifts, with the exception that the catch in January is lower than might be expected - this is due to the low catch per pot lift at this time in shallow waters.

Table 39 gives the catch per pot lift for the whole Geraldton area for each month and for the season. Over the season the amateurs in this area recorded a catch per pot lift of 0.71 rock lobsters (or 0.36 kg).

For the creel census of the Geraldton area, the following are points of interest:-

(1) Although there was a small amount of overlap, overall there were 458 fishermen encountered and 887 pots accounted for. This may be compared with the figure of 1 344 fishermen (or 1 393 after adjustment for those giving no information) from the data given in the AFL applications (Table 16). The census therefore only encountered 32.9 % of the potential number of amateur rock lobster fishermen in the area.

(2) The vast majority of the fishermen in this area were local fishermen. Very few holidaymakers were encountered. Very few divers were encountered.

(3) The season reaches its peak activity in December, declines in January and picks up a little in February and March, and then declines as the season continues.

(iv) Creel census of selected Perth beaches during 1977-78 season

(a) Quinns

Table 40 summarises the results of the census at this beach. Clearly, December and January are the two most popular months for fishing in this area. Table 41 summarises the numbers of boats, fishermen and pots encountered here during the season. Note that 68% of the fishermen encountered here were encountered by the end of December, and 85% by the end of January.

Table 42 shows the sizes of the boats encountered here. Of forty-five boats, only four fished in depths greater than 5 fathoms; only four did not have a rock lobster measuring gauge and only three of these boats had an echo sounder. Five had occupants who had never fished before and eight had occupants who were holidaymakers (as against local regular fishermen).

(b) Whitfords

Interviewing at this beach was quite difficult, particularly at weekends. There were usually long queues of vehicles waiting to launch or retrieve boats on the main launching site, and four-wheel drive vehicles would launch and retrieve boats over a wide area of the beach.

Table 43 gives a summary of the census results for the 1977-78 season. The mean number of boats and fishermen encountered per day and pots pulled per day were greatest in March. The catch per pot lift was greatest in December and February-March. Table 44 gives information on the numbers of boats and fishermen encountered and pots accounted for over the season.

Table 45 shows the size range of the boats in the amateur fishery operating from Whitfords. Of these 45 boats, 11 had occupants who were new to the fishery, 5 had occupants who were holidaymakers, and only two had pots set in depths >5 fathoms of water.

Some of the fishermen here seemed to be novices, and know very little about the best times of the season to fish, type of bait to use, etc. Perhaps better education in the form of written information given with licenses would be of value in this. The number of amateur fishermen operating here is expected to build up as the northern suburbs area of Perth develops. Certainly this beach is very well used by boats at weekends.

(c) Safety Bay

It was extremely difficult to interview in this area, as there are many boat ramps to consider (and indeed some fishermen will go out at one and come in at another). As well, the fishermen in this area did not appear to be as co-operative as the fishermen in the Geraldton area.

Table 46 gives a summary of the census results at this beach. Note that most of the effort here was put in during November-January, and after January there was a considerable decline in the numbers of pots pulled per day. Note also the high catch per pot lift in November-December and in March.

Table 47 gives the numbers of boats and fishermen encountered and pots accounted for over the season. Table 48 gives the sizes of boats encountered here. Of eighty-five boats, only eight fished in depths greater than 5 fathoms, eleven did not have a rock lobster measuring gauge, eleven had echo sounders, sixteen had occupants who were new to the fishery and twenty one had occupants who were holidaymakers.

(d) Summary of catch and effort data at selected Perth beaches from the 1977-78 creel census.

Table 49 summarises the number of pot lifts and the catch at each of the three beaches for each month of the season. Combining these results gives an estimate of the number of rock lobsters caught per pot lift in the Perth region of 1.14.

(v) Creel census of other areas of interest

(a) Kalbarri

Table 50 gives the summary of the census results at Kalbarri for the 1976-77 season, and Table 51 for the 1977-78 season. The January and May figures in each case indicate that there may have been a drop in the level of amateur activity in the 1977-78 season. The high catch per pot lift for December, 1977, is due to a few very successful local amateur fishermen; the holidaymakers certainly did not fare as well as this.

(b) Rottnest Island

Interviewing amateur fishermen at Rottnest Island was an extremely difficult task. By far the greatest amount of rock lobster fishing is done by people using boats. These fishermen set out from and return to any one of a number of bays all around the island. However, this method of interviewing was restricted in anything other than calm seas.

It was extremely difficult to assess the effort put in by the shore-based fishermen. This type of fisherman was extremely wary - once the whereabouts of his pots were discovered by other people on the island, they were "fair game". Certainly anything these fishermen caught they richly deserved.

The census results for the 1977-78 season are given in Table 52. The mean catch per pot lift for December was quite high, and reflects the excellent catches made during this period. Further, there is a considerable effort put in by the local fishermen up to Christmas time; from then on the bulk of the effort is exerted by holidaymakers. Moreover, over the summer period, there is always a much greater effort exerted at weekends. For instance, the interviewing team counted 313 set pots early on Sunday 22 January 1978, but on Monday 23 January 1978, only 162 remained. For the weekend 18-19 February 1978, there were only 94 set pots counted, and these remained on the following Monday.

(c) Mandurah

Interviewing was difficult, primarily because of the large number of boats in the area, very few of which were actually involved in amateur rock lobster fishing. It was virtually impossible to interview from the land here; the best method of interviewing was from a boat situated at the mouth of the estuary, and interviewing those boats that came in from the ocean.

Table 53 summarises the results of the census for the 1977-78 season in the Mandurah area. Due to boat trouble, interviews were carried out at the Lagoon, Halls Head, in January 1978 on several days. The catch per pot lift over the interviewing period was very poor; indeed this was a very poor season generally for amateur fishermen in this area.

The amateurs in this area usually pot close to the shore. Most of those at Falcon use small dinghies (< 12 ft. in length). During holiday periods any pot seen appears fair game to any passing boat. Indeed many locals remove their pots over the Christmas holiday period. Between Hall's Head and Avalon, 95 pots were counted on 20 December 1977, and 81 on 22 March 1978.

(vi) Fisherman's Log Sheets

Tables 54 and 55 summarise the catch rates for fishermen using pots throughout the 1976-77 and 1977-78 seasons respectively at the various fishing localities as obtained from log sheets. For each month at each area it lists:-

(i) the number of logs examined (and note that there may be more than one fisherman represented on each log);

(ii) the total catch given in all the logs;

(iii) the catch per pot lift.

Very few log sheets were returned by divers, so no information will be given for divers.

The average catch per pot lift for each month in each area compares favourably with the results of the creel census given in Tables 19 and 20.

Results from individual Fisherman Log Sheets

Of the individual fisherman log sheets a few were examined in detail in order to show:-

(1) the numbers of legal size rock lobsters which may be caught in pots;

(2) differing catch success between seasons for the same fisherman.

Table 56 is a summary of the log sheet information obtained from the same fisherman in the Dongara area for the 1976-77 and 1977-78 seasons. This fisherman had an average season in 1976-77, but even he admits he had a very good season in

1977-78, and doesn't expect too many more like it. For the 1976-77 season, this fisherman caught 0 or 1 rock lobster from his two pots 60% of the time, whereas for the 1977-78 season, this fisherman caught 0 or 1 rock lobster only 36% of the time. Note that in this case, the better the catches the more the effort that is put in.

Table 57 is a summary of the 1977-78 log sheet information from two fishermen operating four pots in the Geraldton area. This was an average season for them, and even with four pots they caught only 0,1 or 2 rock lobsters 51% of the time.

Table 58 is a summary of log sheet data obtained from the same fisherman at Mandurah for the 1976-77 and 1977-78 seasons. The 1976-77 season was an average one for the fisherman, during which for 60% of the time he caught only 0 or 1 rock lobsters. However, the 1977-78 season was very poor; 85% of the time he caught only 0 or 1 rock lobster.

Thus the main point to be made is that in an average season, an amateur with two pots caught 0 or 1 rock lobster 60% of the time, and 0,1 or 2 rock lobsters 80% of the time. Further, the daily bag limit (8 rock lobsters) was rarely exceeded. This is consistent with the results of both the creel census (Tables 19 and 20) and the fishermen's log sheets (Tables 54 and 55), which showed that the average catch per pot lift never exceeded three rock lobsters. From this it can be concluded that the bag limit of eight rock lobsters per day is not often achieved.

IV DISCUSSION AND CONCLUSIONS

Information on the recreational or amateur fishery for the western rock lobster has been gathered from various sources and any attempt at combining the information from these different sources must always be prefaced with a caution as to the likely biases involved in the various data gathering exercises. These biases have been fully discussed with the results of the methods. Accepting this difficulty, it is nevertheless possible to combine the information gathered from the creel census, the questionnaire and the application forms for AFLs to arrive at an acceptable estimate of the total catch of *P. cygnus* by amateur fishermen.

The two basic quantities which are necessary for this assessment are:-

(1) catch rate information and

(2) fishing effort information.

The first has been gathered from both the creel census at the various localities and from the questionnaire for fishermen who use pots. However, because few divers

were encountered in the creel census, information regarding their activities (as well as fishermen using other methods) is only available from the questionnaire.

From the questionnaire, the overall catch rate of rock lobsters for the 1975-76 season was 0.913 rock lobsters per pot lift (Tables 7,8 and 9) for those fishermen using pots, 2.904 rock lobsters per day for those diving (Tables 11 & 12) and 1.842 rock lobsters per day for those using other methods (Tables 14 and 15). This may be compared with the overall creel census data of 0.99 rock lobsters per pot lift for the 1976-77 season and 1.04 rock lobsters per pot lift for the 1977-78 season (see Tables 19 and 20).

The results from the two methods are therefore in close agreement, particularly when it is considered that the period 1975-76 to 1977-78 was a time of increasing catch rates in the commercial fishery, brought about by improved recruitment of puerulus larvae four years previously (B.F. Phillips, personal communicaton). The catch rates for amateur fishermen are nevertheless low when compared with professional fishermen. If, as it has been assumed, the average rock lobster caught by an amateur fisherman weighs 0.5 kg, the amateur catch rate in the 1975-76 season would have been 0.46 kg per pot lift (data from questionnaire) compared with 0.850 kg per pot lift for professional fishermen during the same period (Morgan and Barker, 1979).

The principal sources of data on fishing effort are the questionnaire and the application forms for the amateur fishing license. The questionnaire results indicate (Table 4) that 84.8% of fishermen fishing for rock lobsters in 1975-76 used pots, 18.8% dived and 2.1% used other methods, while most of the amateur fishermen were concentrated in the Geraldton and Perth-Fremantle areas (Table 3). The questionnaire results also indicated that pot fishermen fished an average of 28.51 days during the season (Table 7), divers fished an average of 15.46 days during the season (Table 11) and fishermen using "other methods" an average of 10.24 days during the season.

However, data obtained from the AFL applications suggested that those fishermen who had returned questionnaires were not representative of those who fished for rock lobsters; those who fished for short periods were not well represented in the questionnaire survey. The AFL applications were used to show that the average number of days fished by each fisherman in the 1976-77 season was 19.51. It is this figure which will be used for the average number of days fished per season for rock lobsters by pot fishermen.

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Of those applicants for AFLs in 1977-78 who owned lobster pots, 3879 out of 6238 had an AFL in 1976-77. 3747 (weighted for unknown replies) applicants who had an AFL in 1976-77 went fishing for rock lobsters in 1976-77. Using the percentages obtained from the questionnaire results,

3177 were pot fishermen,

704 were divers,

79 used "other methods".

Hence 81.9% (3177 out of 3879) of those who owned pots and had an AFL in 1976-77 and in 1977-78 used their pots in 1976-77. Assuming then that 81.9% of fishermen with an AFL who own pots use them, 26.9% of AFL holders in 1977-78 (viz 7158) used pots to fish for rock lobsters. The total number of pot lifts by amateur fishermen during the 1977-78 season was therefore 262 547 pot lifts (viz 7158 x 19.51 x 1.88 (from Table 9) pot lifts).

Using the percentages obtained from the questionnaire results, there were 8441 people who fished for rock lobsters during the 1977-78 season:

7158 used pots,

1587 were divers,

177 used "other methods".

The total number of days spent diving for rock lobsters was then 24 535 days (viz 1587 x 15.46 days), and the total number of days spent fishing for rock lobsters using "other methods" was 1812 days (viz 177 x 10.24 days).

Using the catch rates above (from the 1977-78 creel census for pot fishermen and from the questionnaire for divers and for fishermen using "other methods"), pot fishermen captured 273 049 rock lobsters, divers 71 250 and "other methods" fishermen 3 338 - a total of 347 637 rock lobsters or (if the mean weight of a rock lobster caught by amateur fishermen is 0.5 kg) 173 819 kg. This represents, in gross terms, 1.62 % of the total professional catch of rock lobsters for the 1977-78 season, as recorded by the Australian Bureau of Statistics.

In calculating the catch of 347 637 rock lobsters, it was assumed that 81.9% of fishermen with an AFL who own pots use them; however the apparent high turnover in AFLs (only 48.6% of those with an AFL in 1977-78 also had one in 1976-77) combined with general observations and creel census catch data suggest that probably only about 60% of fishermen who own pots use them. On this basis, the catch for the 1977-78 season would have been 254 700 rock lobsters.

It is difficult to apply the above arguments to calculate catches for previous seasons, for the proportion of AFL holders owning pots is extremely inconsistent - see Table 1. However, for seasons after 1977-78, the above arguments can be used, with reference to the data on the AFL application forms, to obtain an estimate of the amateur effort in the rock lobster fishery each season. The amateur catch for the season can then be roughly estimated by assuming a catch rate of 1.0 rock lobster (or 0.5kg of rock lobster) per pot lift for amateur pot fishermen, 3 rock lobsters (or 1.5 kg) per day for divers, and 2 rock lobsters (or 1 kg) per day for fishermen using other methods. Application forms for AFLs have been discontinued for the time being. However it would be possible to effectively monitor the fishing effort of amateurs in the rock lobster fishery in future years by reintroducing application forms for AFLs and applying the same methodology.

The vast majority of rock lobsters taken by amateurs are captured in waters less than 5 fathoms in depth with the most popular fishing time being during the summer months. The concentration of amateur fishermen in areas such as the shallow waters of Geraldton and Perth-Fremantle, however, results in the overall comparison of total catch (of less than 2%) with the professional fishery being rather misleading. In such areas competition between amateur and professional fishermen is no doubt intense at times, and the increased fishing pressure in such areas may pose special problems to the maintenance of local stock abundance. However, in most areas the amateur-professional conflict is more a social issue than one of biological concern.

There are several problems inherent with this survey. The first major problem was the lack of staff to do the work. It was difficult for the two full time officers and temporary staff to obtain anything more than a very basic knowledge of the fishery. It is strongly recommended that if further studies of this nature are to be carried out, then additional reliable workers are needed.

The other major problem with the survey is that it was difficult to accurately gauge the extent of illegal activities. The vast majority of fishermen encountered were reasonable in abiding with the rules. Nevertheless, stories were heard about large-scale illegal amateur activities. However, the cases which were investigated turned out to be a mixture of exaggeration, imagination and memories of the past. With today's system of fisheries inspection, it would be difficult for any amateur in the western rock lobster fishery to carry out a large-scale operation for any period of time before it comes to the notice of the Fisheries Inspectors.

Some amateur fishermen do, however, infringe the rules (See Appendix C), in the following ways:-

(i) *By taking undersize rock lobsters.* This happens especially at isolated holiday sites.

(ii) *By taking females with eggs.* The majority of amateurs are quick to return these to the water. There is, however, always the occasional fisherman who does not. In addition, any spawners taken amongst rock lobsters caught illegally with spearguns would not survive.

(iii) *By exceeding the bag limit.* The amateur pot fisherman with only two pots will rarely have the opportunity to catch more than the permitted eight rock lobsters per fisherman per day. Indeed for probably 60% of the time, he is only likely to catch 0 or 1 legal size rock lobster, and 80% of the time he will probably catch at most two rock lobsters. Most divers will abide by this rule, but there are always a few who will blatantly disregard it.

(iv) *By overpotting.* The amateur pot fisherman soon realises that the only way to regularly achieve a catch anything like the bag limit is to operate more pots. However, only a small minority actually do it. The greatest number of pots seen pulled during the course of this study by one fisherman was five (and all pots were his) and by two fishermen, ten (but in this case not all pots belonged to these fisherman and some had already been pulled several times that morning).

(v) *By pulling other people's pots.* This happens particularly at holiday periods in busy places. Some local fishermen remove their pots from the water over holiday periods. In fact, pulling (and stealing) other people's pots is one of the greatest problems in this fishery.

(vi) *By not having a large enough escape gap in a pot.* This can happen with "home-made" pots, however most amateurs have "standard" pots.

(vii) *By selling their catch.* It happens, but rarely, since most amateurs don't catch enough to sell.

(viii) *By spearing or using hooks to catch rock lobsters.* Most divers find it virtually impossible to catch rock lobsters using only a gloved hand. The majority of divers therefore resort to an additional "aid" to catch rock lobsters. Some divers use spearguns to catch rock lobsters; most of these catch no more than "a feed" and usually seem quite careful about

selecting a target of a reasonable size. For the diver preferring not to use a speargun, there are many gadgets which can be used, generally home-made; however any such gadget which can damage the rock lobster is illegal.

(ix) *By failing to have a valid AFL.* Most pot fishermen have an AFL; it is mainly a few divers at fault here.

(x) *By fishing out of season.* This very rarely occurs - if it does it is more likely to occur at out of the way places.

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TABLE 1: The number of Amateur Fisherman's Licenses issued in W.A. each year from 1950 to 1978 (partly from Lenanton, 1979).

Year	No. of licenses (Dept. file)	No. of licenses (Research Data Slips)	No. owning rock lobster pots (from Research Data Slips)	Estimate of total numbers owning pots *
1950	322			
1951	896			
1952	639			
1953	535			
1954	487			
1955	535			
1956	1 094			
1957	1 459			
1958	1 535			
1959	1 493			
1960	1 007			
1961	925			
1962	1 105			
1963	1 386			
1964	3 770			
1965	2 826			
1966	3 748			
1967	5 671			
1968	7 058			
1969	7 894			
1970	not available			
1970/71	8 195	1,036		2,522
1971/72	8,730	7,869		3,432
1972/73	9,534	9,142		3,996
1973/74	11,006	8,225		3,998
1974/75	13,141	12,839	4,913	5,799
1975/76	18,729	18,471	6,573	8,277
1976/77	22,400	22,330	9,370	11,227
1977/78	26,644	21,410	6,228	7,019
1978/79	30,994	24,232	6,980	7,818

* Each licensed amateur is entitled to use two lobster pots. Doubling the figures listed will therefore give a first estimate of the number of pots used annually by amateurs.

TABLE 2A: Distribution of fishermen returning questionnaires who fished for rock lobsters during the 1975-76 season

Home locality	OFFICE OF ISSUE										
	Unknown	Bunbury	Busselton	Dongara	Fremantle	Geraldton	Jurien	Mandurah	Perth	Other Offices	TOTAL
Unknown	8				1						9
Augusta-Margaret River		2	10								12
Bunbury, Capel	2	29		1		2					34
Busselton	1		21						1		23
Carnarvon	2									23	25
Carnamah, Coorow				3	2	8	2		5		20
Central Agri.Division					1	1	2		11	5	20
Boddington, Collie, Dardanup, Donnybrook-Balingup	1	5				1			1		8
Dandaragan							4		1		5
Eastern Goldfields Division						1			1		2
Exmouth, Upper Gascoyne, West Pilbara, Roebourne, Port Hedland									1		1
Geraldton, Greenough				1		244					245
Gingin					1				6		7
Harvey		1								6	7
Irwin				11		2			1		14
Northampton (North of 28°S)						1					1
Mandurah, Murray	1				1	1		13	1		17
Manjimup, Nannup, Bridgetown, Greenbushes, Boyup Brook			3						2	3	8
Mullewa, Mingenew, Morawa, Three Springs, Perenjori	1			7		8			1		17
Moora					2					7	9
Northampton (South of 28°S) Chapman Valley						37					37
Perth	23				168	7	3	2	362	6	571
Rottnest Is.					1				1		2
Southern Agri.Division	1		1							9	11
Shark Bay						2				2	4
Dalwallinu, Wongan-Ballidu, Victoria Plains, Chittering								1	1		2
Wyndham-East Kimberley, Halls Creek									1		1
TOTAL:	40	37	35	23	177	315	11	16	397	61	1112

TABLE 2B

1976-77 AMATEUR FISHERMAN'S LICENSE DETAILS

Office of Issue	Total Number of research data slips received	Numbers owning pots (from research data slips)	Number of data slips containing no information	Information from Questionnaire: Went rock lobster fishing in 1975-76 Yes	Went rock lobster fishing in 1975-76 No	Total number completing questionnaire	Estimated percentage of AFL holders who had previously fished for rock lobsters
Unknown				40	101	141	28.4
Albany	807	100	93	8	112	120	6.7
Broome	23	12	-	-	9	9	-
Bunbury	1 802	308	239	37	60	97	38.1
Busselton	367	132	18	35	99	134	26.1
Carnarvon	366	145	8	26	8	34	76.5
Collie	74	25	-	-	-	-	-
Derby	33	20	1	-	6	6	-
Dongara	152	125	-	23	67	90	25.6
Esperance	59	19	5	-	5	5	-
Fremantle	3 809	1 522	192	177	715	892	19.8
Geraldton	1 666	1 370	22	315	304	619	50.9
Harvey	169	25	1	6	31	37	16.2
Jurien	99	67	5	11	11	22	50.0
Kalgoorlie	-	-	-	-	1	1	-
Katanning	10	-	2	1	-	1	100.0
Karratha	-	-	-	-	2	2	-
Lancelin	71	59	1	3	4	7	42.9
Mandurah	1 507	403	15	16	113	129	12.4
Manjimup	139	27	2	3	66	69	4.3
Moora	89	88	-	7	5	12	58.3
Mt. Magnet	1	1	-	-	-	-	-
Narrogin	42	6	-	-	-	-	-
Pemberton	7	1	1	-	6	6	-
Perth	10 720	4 747	3 073	397	775	1 172	33.9
Pingelly	30	15	4	4	15	19	21.1
Shark Bay	69	19	2	3	11	14	21.4
Wagin	9	-	-	-	-	-	-
Waroona	117	95	6	-	14	14	-
Wongan Hills	42	38	-	-	3	3	-
Wyndham	51	1	4	-	5	5	-
TOTALS:	22 330	9 370	3 694	1 112	2 548	3 660	613.1

TABLE 3: Numbers of fishermen returning questionnaires who fished for rock lobsters during 1975 - 76 season.

Fishing Area	No. of Potters	Percentage of Potters	No. of Divers	Percentage of Divers	No. using other Methods	Percentage of Other Methods Users
Carnarvon	2	0.2	28	13.4	6	26.1
Shark Bay	2	0.2	8	3.8	2	8.7
Kalbarri	38	4.0	3	1.4		
Horrocks	87	9.2	2	1.0	6	26.1
Geraldton	233	24.7	33	15.8	4	17.4
Dongara	36	3.8	1	0.5		
Leeman	38	4.0	1	0.5	2	8.7
Jurien Bay	60	6.4	8	3.8		
Cervantes	30	3.2	3	1.4		
Lancelin	48	5.1				
Guilderton	16	1.7	1	0.5		
Perth Metro-politan area	50	5.3	21	10.0	1	4.3
Rottnest Is.	111	11.8	21	10.0	2	8.7
Garden Is.	33	3.5	8	3.8		
Rockingham	82	8.7	18	8.6		
Mandurah	45	4.8	3	1.4		
Bunbury	6	0.6	13	6.2		
Busselton	18	1.9	25	12.0		
Augusta	5	0.5	11	5.3		
Unknown	3	0.3	1	0.5		
TOTAL:	943	100.0	209	100.0	23	100.0

Total number of fishermen returning questionnaires who fished for rock lobsters during 1975 - 76 season = 1112

TABLE 4: Numbers of fishermen returning questionnaires who used various methods to fish for rock lobsters during the 1975-76 season.

Method of fishing used	Numbers of fishermen	Percentage of fishermen
Pots only	885	79.6
Pots + diving only	49	4.4
Pots, diving + other methods	1	0.1
Pots and other methods only	8	0.7
Diving only	155	13.9
Diving + other methods only	4	0.4
Other methods only	10	0.9
TOTAL	1112	100.0

No. of Potters	943	84.8
No. of Divers	209	18.8
No. using other methods	23	2.1

Other Methods	Numbers of fishermen	Percentage of fishermen
Drop net	2	8.7
Fishing line	2	8.7
Scoop net	1	4.3
Walking	17	73.9
Unknown	1	4.3
TOTAL	23	100.0

TABLE 5A: Months of the year fished for rock lobsters by fishermen who returned questionnaires during the 1975-76 season.

Months of year fished	Numbers of fishermen	Percentage of fishermen	Adjusted percentage of fishermen
Nov - Jan only	298	26.8	31.6
Nov - Apr only	230	20.7	24.4
Nov - Aug only	126	11.3	13.4
Nov - Jan & May - Aug only	23	2.1	2.4
Feb - Aug only	21	1.9	2.2
Feb - Apr only	118	10.6	12.5
May - Aug only	127	11.4	13.5
Missing	169	15.2	-
TOTAL	1 112	100.0	100.0

Months	No. of fishermen	Percentage of total	Adjusted percentage of total
November - January	677	60.9	71.8
February - April	495	44.5	52.5
May - August	297	26.7	31.5
Missing	169	15.2	0.0

TABLE 5B: Times of the year fished for rock lobsters by fishermen who returned questionnaires during the 1975/76 season.

Code* for time of year fished	Numbers of fishermen	Percentage of fishermen	Adjusted percentage of fishermen
0001	166	14.9	20.8
0010	172	15.5	21.6
0011	24	2.2	3.0
0100	44	4.0	5.5
0101	9	0.8	1.1
0110	10	0.9	1.3
0111	2	0.2	0.3
1000	144	13.0	18.0
1001	75	6.7	9.4
1010	40	3.6	5.0
1011	23	2.1	2.9
1100	30	2.7	3.8
1101	13	1.2	1.6
1110	33	3.0	4.1
1111	13	1.2	1.6
No information	314	28.2	-
TOTAL	1 112	100.0	100.0
On Weekends	371	33.4	46.5
During school holidays	154	13.6	19.3
During annual holidays	317	28.5	39.7
Occasionally throughout the season	325	29.2	40.7

* Key

1000	On weekends
0100	During school holidays
0010	During annual holidays
0001	Occasionally throughout the season
0101	During school holidays and occasionally throughout the season
1100	On weekends and school holidays
etc.	

TABLE 6: Distribution of fishermen who used pots at the various fishing localities during the 1975/76 season and who returned questionnaires.

Home Locality	Fishing codes as in Figure 1																				
	AU	BU	BS	CA	CE	DO	GE	GI	GU	HO	JB	KA	LA	LE	MA	PE	RI	RO	SB	UNKNOWN	TOTAL
Unknown					1		1						1		1		5				9
Augusta-Margaret River			8																		8
Bunbury, Capel		1	3			1	1			9		3					1				19
Busselton	1		4			2					1	1									9
Carnarvon				1																	1
Carnarmah, Coorow						1	1				9			9							20
Central Agricultural Divsn.					1		1	1	1	2	4	2	2	3	2						19
Boddington, Collie			1							3									1		5
Dandaragan					1						4										5
Eastern Goldfields Divsn.						1						1									2
Exmouth, Upper Gascoyne, West Pilbara, Roebourne, Port Hedland												1									1
Geraldton, Greenough					1		209			4	2	1	1	1							219
Gingin									1				6								7
Harvey	1	5																			6
Irwin						11								1		1	1				14
Northampton (North of 28°S)												1									1
Mandurah, Murray					1					2					13						16
Manjimup, Nannup, Bridgetown-Greenbushes, Boyup Brook	1									3		1						1			6
Mullewa, Mingenew						12	2				1			2							17
Morawa, Three Springs, Perenjori, Moora					5						2			1							8
Northampton (south of 28°S) Chapman Valley,							3			29		4									36
Perth	2		2	1	19	8	12	32	13	32	36	22	38	20	28	49	102	81		3	500
Rottnest Island																	2				2
Southern Agricultural Divsn.					1		3			3	1	1		1							10
Shark Bay																			1		1
Dalwallinu, Wongan-Ballidu, Victoria Plains, Chittering															1						1
Wyndham-East Kimberley Halls Creek									1												1
TOTAL:	5	6	2	2	30	36	233	33	16	87	60	38	48	38	45	50	111	82	2	3	943

TABLE 7: Table showing the number of days on which fishermen lifted pots during the 1975-76 season.

Fishing Area	Number of days during the 1975-76 season on which fishermen who returned questionnaires lifted pots.								Total No. of fishermen
	0-10	11-20	21-30	31-50	51-100	101-150	151-200	> 200	
Augusta	3	2							5
Bunbury	4	1			1				6
Busselton	6	2	6		1				15
Carnarvon	1								1
Cervantes	9	11	8	2					30
Dongara	19	9	3				1		32
Geraldton	35	41	40	34	45	15	10	5	225
Garden Is.	14	7	2	6	2			1	32
Guilderton	9	3	2	2					16
Horrocks	45	23	6	8	1				83
Jurien Bay	30	13	8	3	4				58
Kalbarri	21	14	2						37
Lancelin	21	18	3	2	1	1	1		47
Leeman	17	10	3	1	2				33
Mandurah	17	13	6	3	2				41
Perth	12	5	7	10	10	2	1		47
Rottnest Is.	43	44	9	7	3	1			107
Rockingham	25	20	14	8	9	1	1		78
Shark Bay	2								2
TOTAL	333	236	119	86	81	20	14	6	895

Mean 28.51

Std. Dev: 37.65

TABLE 8: Number of rock lobsters estimated to be caught in pots during the 1975-76 season by fishermen who returned questionnaires.

Fishing Area	Number of fishermen returning questionnaires who estimated their catch of rock lobsters caught in pots to be:-							TOTAL
	0	1-20	21-50	51-100	101-200	201-300	>300	
Augusta	1	3						4
Bunbury	1	3						4
Busselton		15	3					18
Carnarvon	1		1					2
Cervantes		14	10	5				29
Dongara	5	19	9	1				34
Geraldton	4	47	68	65	28	8	8	228
Garden Is.	1	11	8	7	6			33
Guilder-ton	2	7	2	1	2	1		15
Horrocks	4	30	37	8	3	1		83
Jurien Bay	1	31	18	5	3			58
Kalbarri	2	15	16	1	1			35
Lancelin	2	19	18	6	1	1		47
Leeman		15	15	4	2			36
Mandurah	2	24	10	5	1			42
Perth	3	8	12	8	12	1		44
Rottnest Is.	4	38	38	18	9	2		109
Rockingham		28	27	17	5			77
Shark Bay		2						2
TOTAL:	33	329	292	151	73	14	8	900

Mean: 49.46
Std. Dev: 66.38

TABLE 9: Number of pots used at the various fishing areas during the 1975-76 season by fishermen who returned questionnaires.

Fishing Area	Number of pots used					Total
	1 Pot	2 Pots	3 Pots	4 Pots	Not Known	
Augusta	2	3				5
Bunbury	2	4				6
Busselton	3	15				18
Carnarvon	1	1				2
Cervantes	1	29				30
Dongara	7	29				36
Geraldton	16	216		1		233
Garden Is.	2	31				33
Guilderton	1	15				16
Horrocks	14	70	1		2	87
Jurien Bay	9	50			1	60
Kalbarri	8	29			1	38
Lancelin	3	44			1	48
Leeman	6	32				38
Mandurah	8	36	1			45
Perth	6	44				50
Rottnest Is.	13	97			1	111
Rockingham	8	74				82
Shark Bay	0	2				2
TOTAL:	110	821	2	1	6	940

Mean number of pots used = 1.88

TABLE 10: Distribution of fishermen returning questionnaires who dived at the various fishing localities during the 1975-76 season

FISHING LOCALITY CODES AS IN FIGURE 1

Home Locality	AU	BN	BS	CA	CE	DO	GE	GI	GU	HO	JB	KA	LA	LE	MA	PE	RI	RO	SB	Unknown	Total
Augusta-Margaret River	3		2																		5
Bunbury, Capel	2	8	4	1								1									16
Busselton	1	1	13													1					16
Carnarvon				21															1		22
Central Agricultural Division		1												1					1		3
Boddington, Collie, Dardanup, Donnybrook-Balingup	2	1	1																1		5
Geraldton, Greenough						1	30														31
Harvey	1	1																			2
Irwin																	1				1
Mandurah, Murray															1						1
Manjimup, Nannup, Bridgetown-Greenbushes, Boyup Brook	1		1																		2
Mullewa, Mingenew, Morawa, Three Springs, Perenjori							1														1
Moora											1										1
Perth	1	1	4	5	3		2	8	1	2	6	2			2	20	20	18		1	96
Southern Agricultural Division				1																	1
Shark Bay																				4	4
Dalwallinu, Wongan-Ballidu, Victoria Plains, Chittering																				1	1
TOTAL	11	13	25	28	3	1	33	8	1	2	7	3		1	3	21	21	18	3	6	208

TABLE 11: Number of days spent diving during the 1975-76 season by fishermen who returned questionnaires

Fishing Area	Number of days spent diving					TOTAL
	1-10	11-20	21-30	31-50	> 50	
Augusta	5	5				10
Bunbury	5	5	3			13
Busselton	10	6	5	4		25
Carnarvon	14	8	3	2		27
Cervantes	1	1	1			3
Dongara		1				1
Geraldton	15	5	5	3	4	32
Garden Is.	1	6				7
Guilderton	1					1
Horrocks	2					2
Jurien Bay	6	1				7
Kalbarri	2		1			3
Leeman	1					1
Mandurah	2		1			3
Perth	10	6	2	1		19
Rottnest Is.	12	5			2	19
Rockingham	13	2		1		16
Shark Bay	5	2				7
TOTAL:	105	53	21	11	6	196

Mean: 15.46
Std. Dev. 15.52

TABLE 12: Number of rock lobsters caught while diving by fishermen who returned questionnaires during the 1975-76 season.

Fishing Area	Number of rock lobsters caught while diving								TOTAL
	0	1-10	11-20	21-50	51-100	101-150	151-200	>200	
Augusta		2	2	3	2	1			10
Bunbury		3	1	4	2	3			13
Busselton		3	7	8	4		2	1	25
Carnarvon	1	2	6	9	7	3			28
Cervantes			1	1	1				3
Dongara		1							1
Geraldton		7	6	12	3	1	3	1	33
Garden Is.		1		3	3				7
Guilderton		1							1
Horrocks	1			1					2
Jurien Bay	1	2	1	1	2				7
Kalbarri		1		1		1			3
Leeman			1						1
Mandurah		2			1				3
Perth	1	6	3	6	3				19
Rottnest Is.		6	6	4	1	2			19
Rockingham		7	4	5			1		17
Shark Bay	1	1	3	1	1		1		8
TOTAL:	5	45	41	59	30	11	7	2	200

Mean: 44.90
Std. Dev. 55.35

TABLE 13: Distribution of fishermen returning questionnaires who used other methods at the various fishing areas during 1975-76 season

Home Locality	Fishing Area							TOTAL
	Carnarvon	Geraldton	Horrocks	Leeman	Perth	Rottnest Is.	Shark Bay	
Carnarvon	6							6
Central Agricultural Division			1					1
Geraldton, Greenough		4	1	1				6
Northampton (South of 28°S), Chapman Valley			3					3
Perth			1	1	1	2		5
Shark Bay							2	2
TOTAL:	6	4	6	2	1	2	2	23

TABLE 14: Number of days fishermen who returned questionnaires used other methods to catch rock lobsters during the 1975-76 season.

Fishing Area	Number of days fishermen who returned questionnaires used other methods to catch rock lobsters				TOTAL
	1-5	6-10	11-20	21-50	
Carnarvon	2	4			6
Geraldton	1	1		1	3
Horrocks	1	3	1		5
Leeman	1			1	2
Perth	1				1
Rottnest Is.	2				2
Shark Bay	1		1		2
TOTAL	9	8	2	2	21

Mean 10.24
Std. Dev. 13.35

TABLE 15: Catch of rock lobsters by fishermen who returned questionnaires while using other methods during the 1975/76 season.

Fishing Area	Number of rock lobsters caught using other methods by fishermen who returned questionnaires.				TOTAL
	0-10	11-20	21-30	31-50	
Carnarvon	2	3	1		6
Geraldton	1		1	1	3
Horrocks	1		3	2	6
Leeman	1	1			2
Perth	1				1
Rottnest Is.	2				2
Shark Bay	1		1		2
TOTAL:	9	4	6	3	22

Mean 18.86
Std. Dev. 14.51

TABLE 16: Amateur Fisherman's License Applications 1977-78. Numbers owning lobster pots

	Statewide		Perth & Fremantle Offices combined		Geraldton Office	
	Number of Fishermen	Adjusted Frequency(%)	Number of Fishermen	Adjusted Frequency(%)	Number of Fishermen	Adjusted Frequency(%)
Lobster pots	6 230	32.8	3 644	31.0	1 344	67.9
No lobster pots	12 773	67.2	8 093	69.0	635	32.1
Unknown	2 407	-	1 188	-	72	-
TOTAL	21 410	100.0	12 925	100.0	2 051	100.0

Numbers Applying for Amateur Fisherman's Licenses in 1977-78 who had an Amateur Fisherman's License in 1976-77

	Statewide		Perth & Fremantle Offices combined		Geraldton Office	
	Number of Fishermen	Adjusted Frequency(%)	Number of Fishermen	Adjusted Frequency(%)	Number of Fishermen	Adjusted Frequency(%)
No AFL in 1976/77	9 768	51.4	6 272	53.4	1 037	52.3
AFL in 1976/77	9 249	48.6	5 471	46.6	945	47.7
Unknown	2 393	-	1 182	-	69	-
TOTAL	21 410	100.0	12 925	100.0	2 051	100.0

TABLE 17: Number of days fished for rock lobsters during the 1976-77 season by persons applying for an Amateur Fisherman's License in 1977-78

(a) Including zero days fished

	Statewide		Perth & Fremantle Offices Combined		Geraldton Office	
	Number of fishermen	Adjusted Frequency Percentage	Number of fishermen	Adjusted Frequency Percentage	Number of fishermen	Adjusted Frequency Percentage
No days	5 502	62.6	3 315	64.5	187	20.3
1 - 5	958	10.9	633	12.3	89	9.7
6 -10	717	8.2	464	9.0	100	10.9
11 -20	831	9.5	462	9.0	196	21.3
21 -50	564	6.4	212	4.1	219	23.8
Over 50 days	215	2.4	52	1.0	129	14.0
Unknown-held license	462	-	333	-	25	-
TOTAL:	9 249	100.0	5 471	100.0	945	100.0

(b) Not including zero days fished

	Number of Fishermen	Percentage Frequency	Cumulative Percentage Frequency	Number of fishermen	Percentage Frequency	Cumulative Percentage Frequency	Number of fishermen	Percentage Frequency	Cumulative Percentage Frequency
1 - 5	958	29.2	29.2	633	34.7	34.7	89	12.1	12.1
6 -10	717	21.8	51.0	464	25.5	60.2	100	13.6	25.8
11 -20	831	25.3	76.3	462	25.3	85.5	196	26.7	52.5
21 -50	564	17.2	93.5	212	11.6	97.1	219	29.9	82.4
Over 50 days	215	6.5	100.0	52	2.9	100.0	129	17.6	100.0
TOTAL:	3 285	100.0		1 823	100.0		733	100.0	

TABLE 18: Number of Amateur Fisherman's License holders (1977-78) owning lobster pots who did/did not have an Amateur Fisherman's License during the 1976-77 season

Statewide :

	No. of fishermen	Percentage Frequency
No	2 359	37.8
Yes	3 879	62.2
Total	6 238	100.0

Perth Office:

	No. of fishermen	Percentage Frequency
No	946	39.1
Yes	1 476	60.9
Total	2 422	100.0

Fremantle Office :

	No. of fishermen	Percentage Frequency
No	428	34.9
Yes	798	65.1
Total	1 226	100.0

Geraldton Office:

	No. of fishermen	Percentage Frequency
No	547	40.6
Yes	800	59.4
Total	1 347	100.0

TABLE 19: Estimated catch per pot lift of rock lobsters by amateur fishermen during the 1976-77 season.

Fishing Area	November	December	January	February	March	April	May	June	July	August
	Catch/ pot lift	Catch/ pot lift	Catch/ pot lift	Catch/ pot lift	Catch/ pot lift	Catch/ pot lift	Catch/ pot lift	Catch/ pot lift	Catch/ pot lift	Catch/ pot lift
Kalbarri	0.3		0.5				1.1			
Horrocks		1.9	0.6							
Geraldton		1.5	0.4		1.1	0.7	0.9	0.8	0.7	0.3
Dongara		1.6	0.2		0.5					
Jurien			0.7		1.9					
Cervantes			1.5		1.0					
Lancelin		0.9	0.5		1.3		0.8			
Guilderton			2.0							
Perth	0.2	1.4	0.6	1.3	1.2	0.6				
Rottnest Is	1.4	1.9	1.7				2.5			
Garden Is			0.6							
Rockingham	0.6	1.2		1.0	0.8	0.3				
Mandurah		1.4	0.5				1.4			
Augusta			0.3							

Mean catch per pot lift over season = 0.99

Standard deviation = 0.56

TABLE 20: Estimated catch per pot lift of rock lobsters by amateur fishermen during the 1977-78 season.

Fishing Area	November	December	January	February	March	April	May	June
	Catch/ pot lift	Catch/ pot lift	Catch/ pot lift	Catch/ pot lift	Catch/ pot lift	Catch/ pot lift	Catch/ pot lift	Catch/ pot lift
Kalbarri		2.01	0.60		1.10		1.16	
Geraldton	1.01	0.68	0.41	0.72	0.74	0.78	0.75	0.98
Dongara		0.86	0.11					
Lancelin	1.00	0.98	0.76					
Perth	1.14	1.58	0.97	1.00	1.20	0.95		
Rottnest Is		2.20	0.83	1.40				
Garden Is		2.59						
Rockingham	1.08	1.51	0.73	1.12	1.29	0.31		
Mandurah	0.93	0.49	0.29					
Augusta		2.33						

Mean catch per pot lift over season = 1.04
Standard deviation = 0.55

TABLE 21: Creel census carried out at Town Beach, Geraldton, 1976-77 season.

		April	May	June	July	August
Number of days interviewing		11	10	11	5	3
Number of boats encountered per day	Mean	10.73	6.50	3.91	3.80	4.33
	Std Error	1.21	0.90	0.87	0.58	1.76
Number of fishermen encountered per day	Mean	20.73	11.20	7.09	6.40	8.00
	Std Error	2.18	1.62	1.59	1.03	3.46
Total number of pots pulled per day	Mean	38.45	22.00	13.45	12.60	14.33
	Std Error	3.95	3.25	2.91	2.04	5.78
Number of fishing parties giving catch data		116	63	40	17	12
Catch per pot lift (numbers)	Mean	0.66	0.85	0.76	0.70	0.54
	Std Error	0.06	0.11	0.10	0.25	0.20
Total estimated pot lifts (with 95% confidence limits where possible)		1150 ± 260	680 ± 230	400 ± 190	390 ± 180	220
Total estimated catch (with 95% confidence limits where possible)		760 ± 230	580 ± 250	310 ± 180	270	120

TABLE 22: Creel census carried out at Town Beach, Geraldton, 1976-77 Season.

	April	May	June	July	August
Total number of boats encountered	37	29	15	8	13
Total number of fishermen encountered	75	51	27	14	23
Total number of pots accounted for	128	102	52	28	41
Total number of boats not previously encountered	37	12	3	2	4
Total number of fishermen not previously encountered	75	23	5	3	5
Total number of pots not previously accounted for	128	46	10	6	8
Cumulative total of boats	37	49	52	54	58
Cumulative total of fishermen	75	98	103	106	111
Cumulative total of pots	128	174	184	190	198

TABLE 23: Creel census carried out at Town Beach, Geraldton, 1977-78 season.

		November	December	January	February	March	April	May	June
Number of days interviewing		5	9	11	9	11	10	13	10
Number of boats encountered per day	Mean	13.20	26.89	10.27	12.33	12.82	10.80	6.77	5.00
	Std Error	2.71	2.25	1.00	0.73	0.70	0.71	0.62	0.83
Number of fishermen encountered per day	Mean	23.00	50.67	16.82	22.56	23.91	20.60	13.08	9.00
	Std Error	5.15	4.87	1.62	1.54	1.49	1.32	1.24	1.39
Number of pots pulled per day	Mean	44.20	96.89	31.82	43.89	47.27	39.60	25.69	18.20
	Std Error	10.67	9.14	3.09	3.02	0.09	2.57	2.59	2.79
Number of fishing parties giving catch data		66	239	112	111	140	104	86	47
Catch per pot lift (numbers)	Mean	1.09	0.68	0.47	0.78	0.83	0.91	0.83	1.15
	Std Error	0.13	0.04	0.05	0.05	0.06	0.07	0.08	0.15
Total estimated pot lifts (with 95% confidence limits where possible)		710 ± 470	3000±650	990±210	1230±190	1470±210	1190±170	800±170	550±190
Total estimated catch (with 95% confidence limits where possible)		770 ± 570	2030±540	460±160	960±220	1220±270	1080±250	660±210	630±280

Total estimated pot lifts = 9940± 2260

Total estimated catch = 7810± 2500

Average number of rock lobsters per pot lift = 0.97

TABLE 24: Creel census carried out at Town Beach, Geraldton, 1977-78 season.

	November	December	January	February	March	April	May	June
Total number of boats encountered	38	72	37	31	37	37	23	14
Total number of fishermen encountered	69	143	67	58	71	71	44	26
Total number of pots accounted for	130	275	123	113	141	139	83	52
Total number of boats not previously encountered	38	40	8	8	6	11	2	0
Total number of fishermen not previously encountered	69	84	14	14	12	19	7	0
Total number of pots not previously accounted for	130	167	24	27	25	38	10	0
Cumulative total of boats	38	78	86	94	100	111	113	113
Cumulative total of fishermen	69	153	167	181	193	212	219	219
Cumulative total of pots	130	293	317	344	369	407	417	417

TABLE 25: Creel census carried out at Town Beach Geraldton 1977-78 season.

Lengths of boats attending pots

Boat length (ft)	Number of boats	Relative Frequency (%)	Cumulative Frequency (%)
9	2	1.77	1.77
10	5	4.42	6.19
11	2	1.77	7.96
12	28	24.78	32.74
13	6	5.31	38.05
14	18	15.93	53.98
15	6	5.31	59.29
16	17	15.04	74.34
17	4	3.54	77.88
18	11	9.73	87.61
19	3	2.65	90.27
20	8	7.08	97.35
21	2	1.77	99.12
22	1	0.88	100.00
Total	113	100.00	

TABLE 26: Interviews carried out at Town Beach Geraldton 1977-78 season

	No. of parties interviewed	Relative Frequency %
Number of parties of local pot fishermen interviewed	945	97.22
Number of parties of holidaymaker pot fishermen interviewed	21	2.16
Number of parties of local divers interviewed	6	0.62
Number of parties of holidaymaker divers interviewed	0	0.00
Total:	972	100.00

TABLE 27: Creel census carried out at Town Beach, Geraldton 1977-78 season

DEPTHS FISHED	Frequency	Relative Frequency (%)
Number of boats whose pots were in ≤5 fathoms	101	89.38
Number of boats whose pots were in >5 fathoms	12	10.62
Total:	113	100.00

USE OF ECHO SOUNDERS	Frequency	Relative Frequency (%)
Number of boats (attending pots) which had an echo sounder	19	16.81
Number of boats (attending pots) which did not have an echo sounder	94	83.19
Total:	113	100.00

RECRUITMENT (OF FISHERMEN)	Frequency	Relative Frequency (%)
Number of boats attending pots whose occupants were new to the fishery	25	22.12
Number of boats attending pots whose occupants were not new to the fishery	88	77.88
Total:	113	100.00

BOATS - HOLIDAYMAKERS AND LOCALS	Frequency	Relative Frequency (%)
Number of boats (attending pots) containing holidaymakers	11	9.73
Number of boats (attending pots) containing local fishermen	102	90.27
Total:	113	100.00

TABLE 28: Creel census carried out at Rundle Park, Geraldton, 1977-78 season.

		November	December	January	February	March	April	May	June
Number of days interviewing		4	9	11	7	9	9	9	10
Number of boats encountered per day	Mean	9.25	17.78	8.55	11.29	10.89	5.22	2.44	1.90
	Std Error	1.89	1.85	0.99	1.44	1.05	1.16	0.85	0.48
Number of fishermen encountered per day	Mean	17.75	36.78	17.55	22.14	21.78	9.33	4.11	3.10
	Std Error	3.25	3.77	2.27	2.54	2.04	1.96	1.42	0.77
Number of pots pulled per day	Mean	31.75	66.67	34.27	41.57	42.11	18.22	7.89	5.50
	Std Error	5.88	6.80	4.44	4.68	3.88	3.85	2.80	1.42
Number of fishing parties giving catch data		37	157	91	76	92	47	22	18
Catch per pot lift (numbers)	Mean	0.65	0.64	0.30	0.55	0.55	0.49	0.61	0.41
	Std Error	0.10	0.05	0.03	0.06	0.05	0.09	0.15	0.11
Total estimated pot lifts (with 95% confidence limits)		510±300	2070±490	1060±310	1160±320	1310±280	550±270	240	170
Total estimated catch (with 95% confidence limits)		330±250	1320±390	320±120	640±250	710±210	270±170	150	70

Total estimated pot lifts for season = 7070
Total estimated catch for season = 3810 rock lobsters
Estimated catch per pot lift for season= 0.54 " "

TABLE 29: Creel census carried out at Rundle Park, Geraldton, 1977-78 season.

	November	December	January	February	March	April	May	June
Total number of boats encountered	23	39	25	29	30	18	12	9
Total number of fishermen encountered	44	83	52	55	62	33	20	14
Total number of pots accounted for	80	157	101	106	123	65	40	27
Total number of boats not previously encountered	23	21	8	5	5	6	1	3
Total number of fishermen not previously encountered	44	48	16	10	11	10	2	4
Total number of pots not previously accounted for	80	93	30	20	23	19	4	7
Cumulative total of boats	23	44	52	57	62	68	69	72
Cumulative total of fishermen	44	92	108	118	129	139	141	145
Cumulative total of pots	80	173	225	245	268	287	291	298

TABLE 30: Creel census carried out at Rundle Park, Geraldton 1977-78 season

Lengths of boats attending pots

Boat length (ft)	Number of boats	Relative Frequency (%)	Cumulative Frequency (%)
10	8	11.4	11.4
11	5	7.1	18.6
12	25	35.7	54.3
13	7	10.0	64.3
14	5	7.1	71.4
15	7	10.0	81.4
16	8	11.4	92.9
17	3	4.3	97.1
18	0	0.0	97.1
19	1	1.4	98.6
20	1	1.4	100.0
Total	70	100.0	

TABLE 31: Interviews carried out at Rundle Park, Geraldton 1977-78 season

	Number of parties interviewed	Relative Frequency (%)
Number of parties of local pot fishermen interviewed	573	99.7
Number of parties of holidaymaker pot fishermen interviewed	2	0.3
Number of parties of local divers interviewed	0	0.0
Number of parties of holidaymaker divers interviewed	0	0.0
Total:	575	100.0

TABLE 32: Creel census carried out at Rundle Park, Geraldton 1977-78 season

DEPTHS FISHED	Frequency	Relative Frequency(%)
Number of boats whose pots were in ⩽ 5 fathoms	65	92.86
Number of boats whose pots were in > 5 fathoms	5	7.14
Total:	70	100.00

USE OF ECHO SOUNDERS	Frequency	Relative Frequency(%)
Number of boats attending pots which had an echo sounder	4	5.71
Number of boats attending pots which did not have an echo sounder	66	94.29
Total:	70	100.00

RECRUITMENT (OF FISHERMEN)	Frequency	Relative Frequency(%)
Number of boats attending pots whose occupants were new to the fishery	25	35.71
Number of boats attending pots whose occupants were not new to the fishery	45	64.29
Total:	70	100.00

BOATS - HOLIDAYMAKERS AND LOCALS	Frequency	Relative Frequency(%)
Number of boats (attending pots) containing holidaymakers	2	2.86
Number of boats (attending pots) containing local fishermen	68	97.14
Total:	70	100.00

TABLE 33: Creel census carried out at Pages Beach, Geraldton, 1977-78 season

		November	December	January	February	March	April	May	June
Number of days interviewing		5	9	5	7	6	7	7	7
Number of boats encountered per day	Mean	6.00	7.22	5.60	6.00	4.50	2.43	1.71	0.86
	Std Error	0.55	1.54	1.50	0.93	0.43	0.57	0.68	0.26
Number of fishermen encountered per day	Mean	11.80	14.56	11.20	11.14	9.00	5.29	3.71	1.71
	Std Error	0.66	3.01	3.09	1.50	0.86	1.27	1.52	0.52
Number of pots pulled per day	Mean	22.60	27.67	21.20	21.43	16.33	10.29	7.14	3.14
	Std Error	1.50	5.84	5.45	2.84	1.61	2.63	2.82	0.86
Number of fishing parties giving catch data		29	65	27	41	27	17	12	6
Catch per pot lift (numbers)	Mean	1.29	0.81	0.63	0.88	0.95	0.81	0.42	0.95
	Std Error	0.18	0.09	0.09	0.09	0.13	0.19	0.16	0.28
Total estimated pot lifts (with 95% confidence limits)		360±170	860±420	660±470	600±190	510±130	310±190	220	90
Total estimated catch (with 95% confidence limits)		470 ±200	700 ±380	410 ±340	530 ±210	480 ±210	250 ±210	90	90

Total estimated pot lifts over season = 3610
Total estimated catch of rock lobsters over season = 3020
Estimated catch per pot lift over season = 0.84 rock lobsters

TABLE 34: Creel census carried out at Pages Beach, Geraldton, 1977-78 season

	November	December	January	February	March	April	May	June
Total number of boats encountered	14	24	16	20	14	10	7	4
Total number of fishermen encountered	24	46	32	38	25	20	15	8
Total number of pots accounted for	45	87	59	74	46	38	28	16
Total number of boats not previously encountered	14	14	6	5	5	3	1	1
Total number of fishermen not previously encountered	24	29	14	8	8	6	3	2
Total number of pots not previously accounted for	45	53	23	17	13	12	5	4
Cumulative total of boats	14	28	34	39	44	47	48	49
Cumulative total of fishermen	24	53	67	75	83	89	92	94
Cumulative total of pots	45	98	121	138	151	163	168	172

TABLE 35: Creel census carried out at Pages Beach, Geraldton 1977-78 season.

Lengths of boats attending pots

Boat length (ft)	Number of boats	Relative Frequency (%)	Cumulative Frequency (%)
10	5	10.2	10.2
11	1	2.0	12.2
12	22	44.9	57.1
13	5	10.2	67.3
14	7	14.3	81.6
15	3	6.1	87.8
16	3	6.1	93.9
17	3	6.1	100.0
Total:	49	100.0	

TABLE 36: Interviews carried out at Pages Beach, Geraldton, 1977-78 season

	No. of parties interviewed	Relative Frequency (%)
Number of parties of local pot fishermen interviewed	227	97.4
Number of parties of holidaymaker pot fishermen interviewed	5	2.1
Number of parties of local divers interviewed	1	0.4
Number of parties of holidaymaker divers interviewed	0	0.0
Total:	233	100.0

TABLE 37: Creel census carried out at Pages Beach, Geraldton, 1977-78 season

DEPTHS FISHED	Frequency	Relative Frequency(%)
Number of boats whose pots were in ⩽ 5 fathoms	47	95.9
Number of boats whose pots were in >5 fathoms	2	4.1
Total:	49	100.0

USE OF ECHO SOUNDERS	Frequency	Relative Frequency(%)
Number of boats (attending pots) which had an echo sounder	1	2.0
Number of boats (attending pots) which did not have an echo sounder	48	98.0
Total:	49	100.0

RECRUITMENT (OF FISHERMEN)	Frequency	Relative Frequency(%)
Number of boats (attending pots) whose occupants were new to the fishery	8	16.3
Number of boats (attending pots) whose occupants were not new to the fishery	41	83.7
Total:	49	100.0

BOATS - HOLIDAYMAKERS AND LOCALS	Frequency	Relative Frequency(%)
Number of boats (attending pots) containing holidaymakers	2	4.1
Number of boats (attending pots) containing local fishermen	47	95.9
Total:	49	100.0

TABLE 38A. Number of pot lifts by fishermen interviewed in the Geraldton area, 1977-78 season

		November	December	January	February	March	April	May	June	Total for Season
Number of pot lifts	Pages Beach	360	860	660	600	510	310	220	90	
	Rundle Park	510	2070	1060	1160	1310	550	240	170	
	Town Beach	710	3000	990	1230	1470	1190	800	550	
	TOTAL	1580	5930	2710	2990	3290	2050	1260	810	20620

TABLE 38B. Catch (numbers of rock lobsters) by fishermen interviewed in the Geraldton area 1977-78 season

		November	December	January	February	March	April	May	June	Total for Season
Potting Catch	Pages Beach	470	700	410	530	480	250	90	90	
	Rundle Park	330	1320	320	640	710	270	150	70	
	Town Beach	770	2030	460	960	1220	1080	660	630	
	TOTAL	1570	4050	1190	2130	2410	1600	900	790	14640

TABLE 39: Catch per pot lift in the Geraldton area, 1977-78 Season.

Month	No. of rock lobsters/pot lift
November	0.99
December	0.68
January	0.44
February	0.71
March	0.73
April	0.78
May	0.71
June	0.98
Season	0.71

TABLE 40: Creel census carried out at Quinns, 1977-78 season

		November	December	January	February	March	April
Number of days interviewing		4	6	7	6	5	4
Number of boats encountered per day	Mean	6.25	13.67	11.86	8.67	3.40	3.75
	Std Error	2.59	2.99	1.94	1.43	1.03	0.85
Number of fishermen encountered per day	Mean	9.75	22.50	19.57	13.17	6.20	6.00
	Std Error	3.71	5.62	3.48	2.33	1.74	1.15
Number of pots pulled per day	Mean	18.50	37.50	32.14	23.33	12.00	11.25
	Std Error	7.27	8.89	4.03	3.32	3.03	2.50
Number of parties giving catch data		23	73	71	48	16	14
Catch per pot lift (numbers)	Mean	1.37	1.90	0.99	0.72	1.28	0.91
	Std Error	0.24	0.15	0.11	0.13	0.26	0.18
Total estimated pot lifts (with 95% confidence limits)		300	1160±710	1000±310	650±240	370±260	340±240
Total estimated catch (with 95% confidence limits)		410	2210±1420	990±400	470±280	470±430	310±290

TABLE 41: Creel census carried out at Quinns, 1977-78 season.

	November	December	January	February	March	April
Total number of boats encountered	15	33	31	20	11	10
Total number of fishermen encountered	24	64	58	34	19	15
Total number of pots accounted for	43	102	81	57	36	27
Number of new boats encountered	15	19	7	4	1	2
Number of new fishermen encountered	24	41	17	8	3	3
Number of new pots accounted for	43	61	19	12	7	4
Cumulative number of boats encountered	15	34	41	45	46	48
Cumulative number of fishermen encountered	24	65	82	90	93	96
Cumulative number of pots accounted for	43	104	123	135	142	146

TABLE 42: Creel census carried out at Quinns, 1977-78 season.

Size Range of Boats in the Amateur Rock Lobster Fishery.

Length (ft)	Number of boats	Relative Frequency(%)	Cumulative Frequency(%)
10	1	2.2	2.2
11	0	0	2.2
12	16	35.6	37.8
13	6	13.3	51.1
14	17	37.8	88.9
15	2	4.4	93.3
16	1	2.2	95.6
17	1	2.2	97.8
18	1	2.2	100.0
Total	45	100.0	

TABLE 43: Creel census carried out at Whitfords, 1977-78 season.

		November	December	January	February	March	April
Number of days interviewing		3	7	8	6	5	6
Number of boats encountered per day	Mean	4.67	7.00	5.63	6.83	7.60	5.17
	Std Error	1.45	1.07	0.84	0.87	1.44	0.31
Number of fishermen encountered per day	Mean	8.67	12.00	9.75	11.33	12.60	7.83
	Std Error	3.48	2.08	1.63	1.65	2.68	0.48
Number of pots pulled per day	Mean	13.33	19.86	17.13	19.83	22.20	15.00
	Std Error	4.06	3.58	2.75	3.06	4.18	1.00
Number of parties giving catch data		14	48	38	40	37	31
Catch per pot lift (numbers)	Mean	0.65	1.21	0.85	1.10	1.16	0.87
	Std Error	0.20	0.16	0.16	0.15	0.21	0.13
Total estimated pot lifts (with 95% confidence limits		210	620±270	530±200	560±220	690±360	450±80
Total estimated catch (with 95% confidence limits)		140	750±410	450±260	610±330	800±580	390±160

TABLE 44: Creel census carried out at Whitfords, 1977-78 season.

	November	December	January	February	March	April
Total number of boats encountered	10	24	19	22	19	10
Total number of fishermen encountered	19	42	33	40	32	16
Total number of pots accounted for	29	65	51	62	57	30
Number of new boats encountered	10	17	10	10	4	0
Number of new fishermen encountered	19	30	17	20	8	0
Number of new pots accounted for	29	46	21	27	12	2
Cumulative total of boats encountered	10	27	37	47	51	51
Cumulative total of fishermen encountered	19	49	66	86	94	94
Cumulative total of pots accounted for	29	75	96	123	135	137

TABLE 45: Creel census carried out at Whitfords - 1977-78 season.

Size range of boats in the amateur rock lobster fishery.

Length (ft)	Number of boats	Relative Frequency (%)	Cumulative Frequency (%)
10	2	4.4	4.4
11	3	6.7	11.1
12	15	33.3	44.4
13	5	11.1	55.5
14	13	28.9	84.4
15	5	11.1	95.6
16	2	4.4	100.0
Total	45	100.0	

TABLE 46: Creel census carried out at Safety Bay, 1977-78 season.

		November	December	January	February	March	April
Number of days interviewing		3	8	4	5	3	3
Number of boats encountered per day	Mean	7.00	16.63	15.00	3.80	3.33	2.33
	Std Error	1.53	1.38	4.18	0.73	2.03	0.67
Number of fishermen encountered per day	Mean	10.67	26.13	28.50	6.00	4.67	4.00
	Std Error	3.18	2.51	7.96	1.14	2.33	1.00
Number of pots pulled per day	Mean	19.33	40.50	34.75	9.80	8.00	7.33
	Std Error	4.37	3.67	9.18	1.93	4.16	1.76
Number of parties giving catch data		19	130	55	19	10	5
Catch per pot lift (numbers)	Mean	1.08	1.51	0.73	1.12	1.29	0.31
	Std Error	0.33	0.12	0.12	0.25	0.33	0.11
Total estimated pot lifts (with 95% confidence limits)		310	1260 ± 270	1080	270 ± 150	250	220
Total estimated catch (with 95% confidence limits)		330	1900 ± 530	780	310 ± 250	320	70

TABLE 47: Creel census carried out at Safety Bay, 1977-78 season.

	November	December	January	February	March	April
Number of boats encountered	15	62	44	13	10	4
Number of fishermen encountered	25	102	85	21	15	7
Number of pots accounted for	44	154	101	35	24	12
Number of new boats encountered	15	49	18	5	4	0
Number of new fishermen encountered	25	82	43	8	7	0
Number of new pots accounted for	44	114	38	11	10	0
Cumulative number of boats encountered	15	64	82	87	91	91
Cumulative number of fishermen encountered	25	107	150	158	165	165
Cumulative number of pots accounted for	44	158	196	207	217	217

TABLE 48: Creel census carried out at Safety Bay, 1977-78 season.

Sizes of boats in the amateur rock lobster fishery.

Boat length (ft)	Number of boats	Relative Frequency (%)	Cumulative Frequency (%)
10	4	4.7	4.7
11	0	0	4.7
12	17	20.0	24.7
13	3	3.5	28.2
14	12	14.1	42.3
15	5	5.9	48.2
16	15	17.6	65.8
17	2	2.4	68.2
18	14	16.5	84.7
19	4	4.7	89.4
20	1	1.2	90.6
21	2	2.4	92.9
22	4	4.7	97.6
23	0	0	97.6
24	0	0	97.6
25	2	2.4	100.0
Total	85	100.0	

TABLE 49: Summary of Catch and Effort Data at Selected Perth Beaches - Creel Census, 1977-78.

Pot lifts	Nov	Dec	Jan	Feb	Mar	Apr	Total
Quinns	300	1160	1000	650	370	340	
Whitfords	210	620	530	560	690	450	
Safety Bay	310	1260	1080	270	250	220	
Total	820	3040	2610	1480	1310	1010	10270

Catch (numbers)	Nov	Dec	Jan	Feb	Mar	Apr	Total
Quinns	410	2210	990	470	470	310	
Whitfords	140	750	450	610	800	390	
Safety Bay	330	1900	780	310	320	70	
Total	880	4860	2220	1390	1590	770	11710
Catch per pot lift	1.07	1.60	0.85	0.94	1.21	0.76	

Seasonal catch per pot lift = 1.14 rock lobsters

TABLE 50: Creel census carried out at Kalbarri, 1976-77 season.

		November	January	May
Number of days interviewing		7	6	5
Number of boats per day	Mean	4.00	10.17	9.40
	Std Error	0.31	0.83	1.86
Number of fishermen per day	Mean	5.14	10.17	18.60
	Std Error	0.34	0.83	4.18
Number of pots pulled per day	Mean	7.71	16.83	21.60
	Std Error	0.64	1.49	4.15
Number of fishing parties giving catch data		28	61	47
Catch per pot lift (numbers)	Mean	0.17	0.50	1.09
	Std Error	0.08	0.11	0.15
Total estimated pot lifts (with 95% confidence limits)		120 ± 30	520 ± 110	670 ± 360
Total estimated catch (with 95% confidence limits)		20	260 ± 160	730 ± 490

TABLE 51: Creel census carried out at Kalbarri, 1977-78 season.

		December	January	March	May
Number of days interviewing		8	7	9	7
Number of boats encountered per day	Mean	4.00	7.71	4.78	5.57
	Std Error	0.27	0.89	0.91	1.21
Number of fishermen encountered per day	Mean	7.25	14.29	9.67	12.57
	Std Error	0.72	1.47	1.76	3.02
Number of pots pulled per day	Mean	9.75	18.14	11.22	15.86
	Std Error	0.59	1.47	2.15	3.76
Number of fishing parties giving catch data		32	54	43	38
Catch per pot lift (numbers)	Mean	2.01	0.60	1.10	1.16
	Std Error	0.29	0.11	0.21	0.21
Total estimated pot lifts (with 95% confidence limits)		300 ± 40	560 ± 110	350 ± 150	490 ± 290
Total estimated catch (with 95% confidence limits)		610 ± 220	340 ± 170	380 ± 240	570 ± 410
Total number of boats encountered		7(3)*	17(14)*	16(12)*	16(13)*
Total number of fishermen encountered		13	32	32	38
Total number of pots accounted for		15	37	36	47

* Number of boats containing holidaymakers given in brackets.

TABLE 52: Creel census out at Rottnest Island, 1977-78 season.

		December 1977	January 1978	February 1978
Number of days interviewing		3	17	3
Number of boats encountered per day	Mean	22.33	16.65	8.33
	Std Error	8.82	1.07	3.93
Number of fishermen encountered per day	Mean	44.33	26.47	14.33
	Std Error	14.44	2.05	6.01
Number of pots pulled per day	Mean	60.00	37.53	16.00
	Std Error	17.93	2.21	8.62
Number of interviews giving catch data		64	279	23
Catch per pot lift (numbers)	Mean	2.20	0.83	1.40
	Std Error	0.23	0.07	0.26
Estimated catch		4090	970 ± 200	630
Estimated pot lifts		1860	1160 ± 150	448

TABLE 53: Creel census carried out in the Mandurah area, 1977-78 season.

		Estuary		Falcon	
		December	January	December	January
Number of days interviewing		8	8	8	3
Number of boats encountered per day	Mean	16.38	11.88	5.50	9.33
	Std Error	1.16	2.21	0.96	0.33
Number of fishermen encountered per day	Mean	23.00	20.63	10.38	16.33
	Std Error	1.56	3.91	2.46	1.45
Number of pots pulled per day	Mean	41.50	31.75	14.63	21.00
	Std Error	2.29	6.03	2.54	1.53
Number of parties giving catch data		132	75	44	21
Catch per pot lift (numbers)	Mean	0.58	0.29	0.28	0.38
	Std Error	0.08	0.05	0.10	0.14
Total estimated pot lifts (with 95% confidence limits)		1290±170	980±440	450±190	650±200
Total estimated catch (with 95% confidence limits)		750±260	290±180	130	250

TABLE 54: Amateur fisherman's log sheets, 1976-77 season.

	November			December			January			February			March			April			May			June			July			August		
KEY	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Fishing Locality																														
Kalbarri	3	8	0.29	1	1	0.33	2	21	1.40																1	10	0.22			
Horrocks	1	35	2.19	1	41	1.58																								
Geraldton	6	163	1.36	6	265	1.71	2	24	0.92	1	2	0.25																		
Dongara	1	3	0.37	1	19	0.73	1	6	0.30				1	48	1.26	1	4	0.5	1	37	1.95									
Leeman				1	51	0.98	1	24	0.92																					
Jurien	2	13	0.65	4	84	0.74	6	56	0.85	2	10	0.71	4	99	1.21	5	53	0.68	3	30	0.75	4	10	0.63	3	2	0.33	2	11	2.75
Lancelin	1	1	0.04	1	41	0.66	2	9	0.16	1	27	0.75	1	22	0.37	1	27	0.54	1	11	0.28	1	3	0.50						
Guilderton				1	51	2.31	1	27	1.69																					
Perth	3	55	0.72	4	271	1.94	4	86	1.28	2	53	1.02	3	33	0.85															
Rottnest Is.	8	107	1.30	8	356	2.14	5	94	0.95	3	34	0.49	3	25	0.37	2	9	0.28												
Rockingham							1	14	1.17	1	7	1.75																		
Garden Is.	1	9	1.50	1	4	1.00																								
Mandurah				3	32	0.94	1	5	0.36	2	78	0.78	2	87	0.70	3	70	0.61	2	31	0.74									

*KEY - 1. Number of logs examined.
2. Total catch.
3. Number of rock lobsters caught per pot lift.

TABLE 55: Amateur fisherman's log sheets, 1977-78 season.

	November			December			January			February			March			April			May			June		
KEY	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Fishing Locality																								
Kalbarri				1	46	0.77	1	36	0.69	1	15	0.75	1	81	1.69									
Horrocks	1	12	0.50	1	22	0.58	1	17	0.61															
Geraldton	26	977	1.07	29	1161	0.81	14	432	0.63	11	445	0.75	15	620	0.85	9	566	1.00	9	690	1.27	8	537	1.11
Dongara	2	89	1.71	1	26	0.84				1	35	1.17	1	60	1.15	1	61	1.27	1	32	1.00	1	87	2.49
Jurien	1	3	0.38	4	25	0.57	3	27	0.71	2	24	0.92	4	51	1.11	1	18	0.90	1	21	2.63	3	16	1.00
Lancelin	2	27	1.35	2	67	1.08	1	31	0.82															
Guilderton							1	5	0.36															
Perth	7	217	1.99	9	877	2.19	8	539	1.38	7	450	1.69	6	335	1.44	5	133	1.48	2	34	0.89	1	36	1.80
Rottnest Is.	4	44	1.00	8	237	1.36	5	103	0.82	4	73	0.81	3	80	0.96	1	17	0.28	1	13	0.28	1	9	0.26
Rockingham	2	75	0.83	3	274	1.58	3	57	0.53	1	39	1.50												
Mandurah	4	124	1.27	5	168	0.80	2	16	0.33	4	59	0.31	5	89	0.42	4	45	0.58	2	3	0.30			

*KEY - 1. Number of logs examined.
2. Total catch.
3. Number of rock lobsters caught per pot lift.

TABLE 56

Amateur Rock Lobster Fisherman's Log Sheet

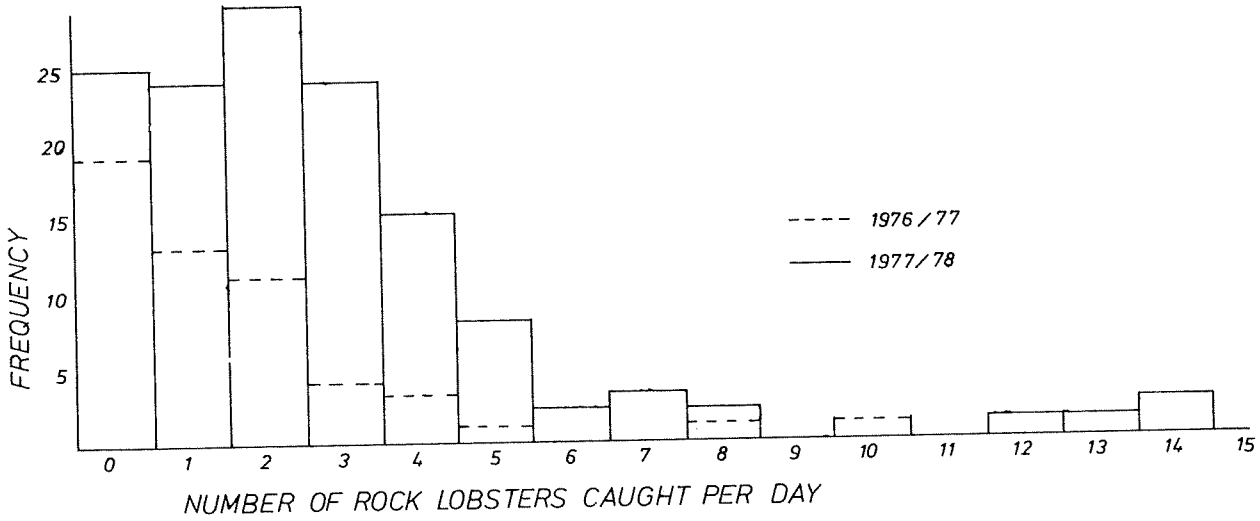
Location: Dongara No. of pots used = 2

1976-77 Season

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Overall
Total catch	3	19	6		48	4	80
Total No. of pot lifts	8	26	20		38	8	100
Mean catch/ pot lift	0.38	0.73	0.30		1.26	0.50	0.80

1977-78 Season

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Overall
Total catch	65	26		35	60	61	32	87	366
Total No. of pot lifts	24	31		30	52	48	32	35	252
Mean catch/ pot lift	2.71	0.84		1.17	1.15	1.27	1.00	2.49	1.45



Frequency histogram of the number of legal size rock lobsters caught per day, using two pots, in the Dongara area, 1967/77 and 1977/78 season.

TABLE 57

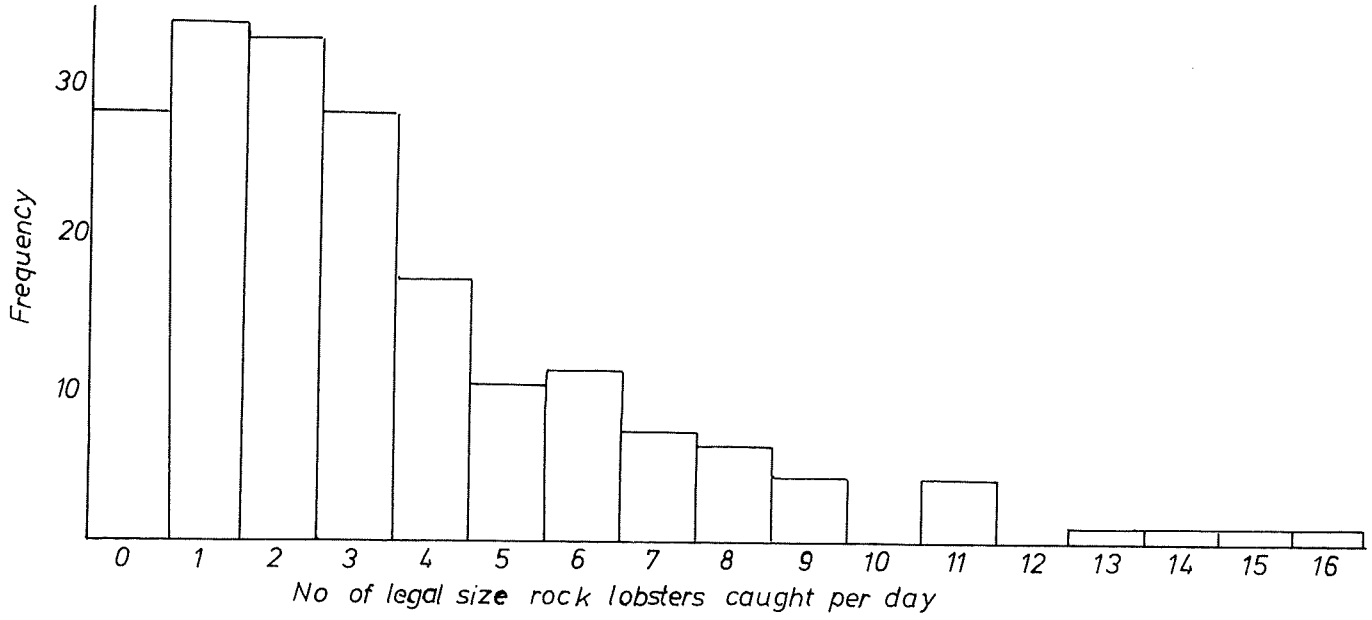
Amateur Rock Lobster Fisherman's Log Sheet 1977-78 Season

No. of Fishermen: 2

Location: Geraldton

No. of pots used = 4

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Overall
Total catch	47	54	77	37	95	86	91	116	603
Total No. of pot lifts	40	93	120	92	108	96	76	116	741
Mean catch/ pot lift	1.18	0.58	0.64	0.40	0.88	0.90	1.20	1.00	0.81



Frequency histogram of the number of legal size rock lobsters caught per day, using four pots, in the Geraldton area, 1977-78 season.

TABLE 58

Amateur Rock Lobster Fisherman's Log Sheet

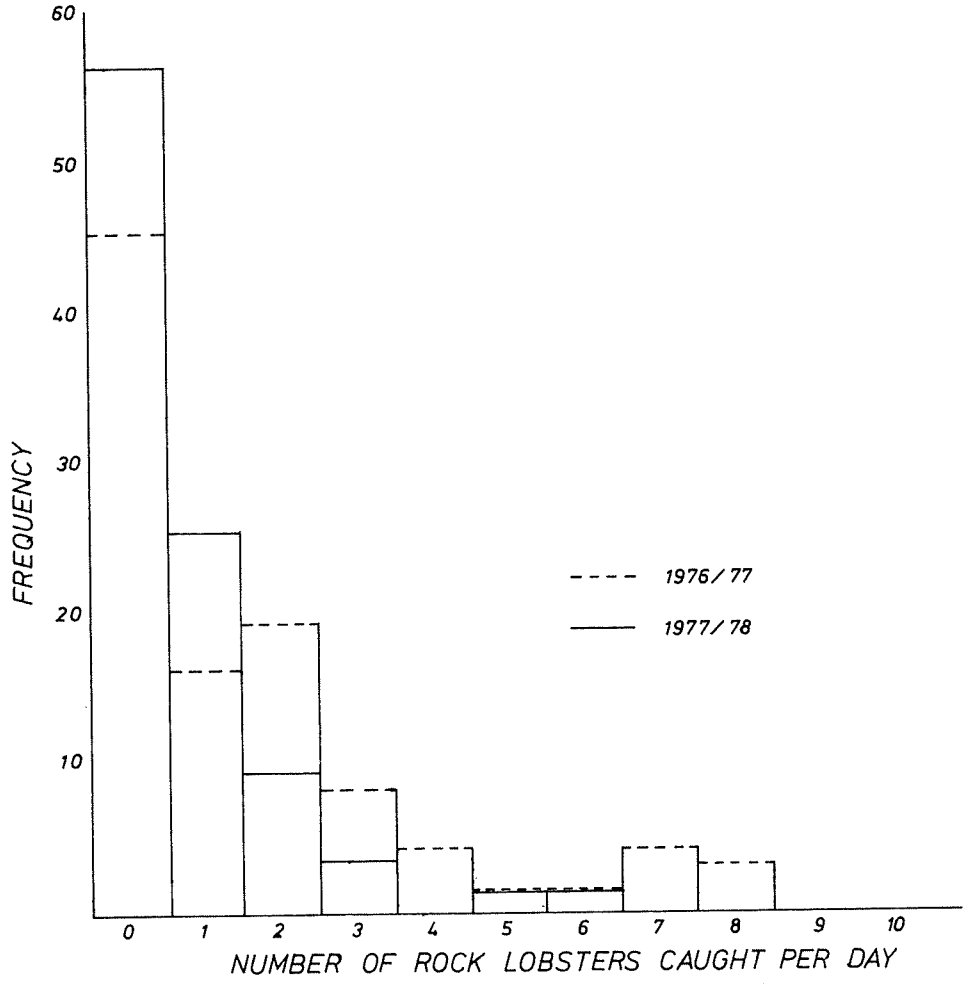
Location: Mandurah No. of pots used = 2

1967-77 Season

	Dec.	Jan.	Feb.	Mar.	Apr.	May	Overall
Total catch	3		35	49	47	23	157
Total No. of pot lifts	16		52	62	54	22	206
Mean catch/ pot lift	0.19		0.67	0.79	0.87	1.05	0.76

1977-78 Season

	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Overall
Total catch	20	12		12	14	1	59
Total No. of pot lifts	28	48		56	54	4	190
Mean catch/ pot lift	0.71	0.25		0.21	0.26	0.25	0.31



Frequency histogram of the number of legal size rock lobsters caught per day, using two pots, in the Mandurah area, 1976/77 and 1977/78 season.

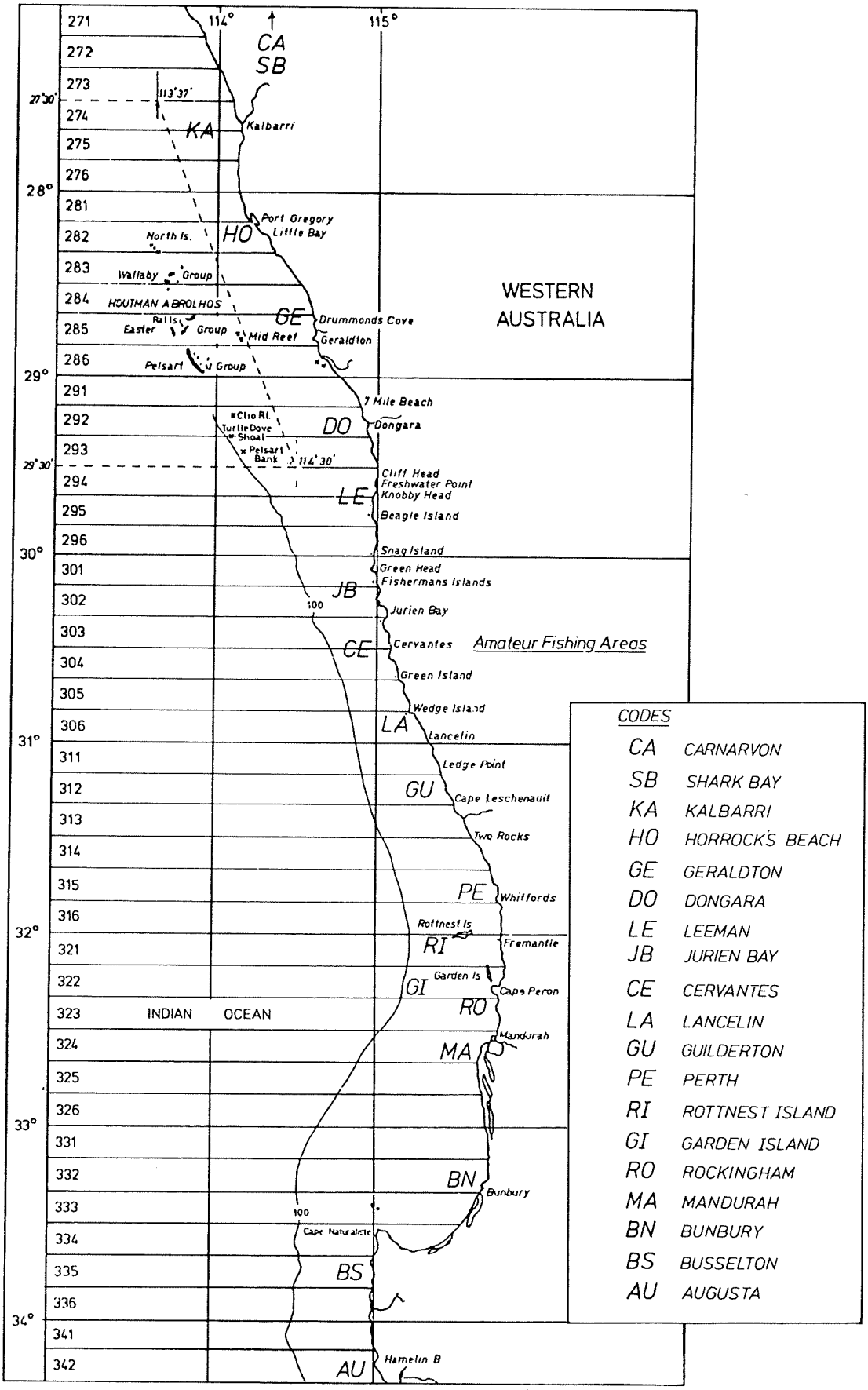
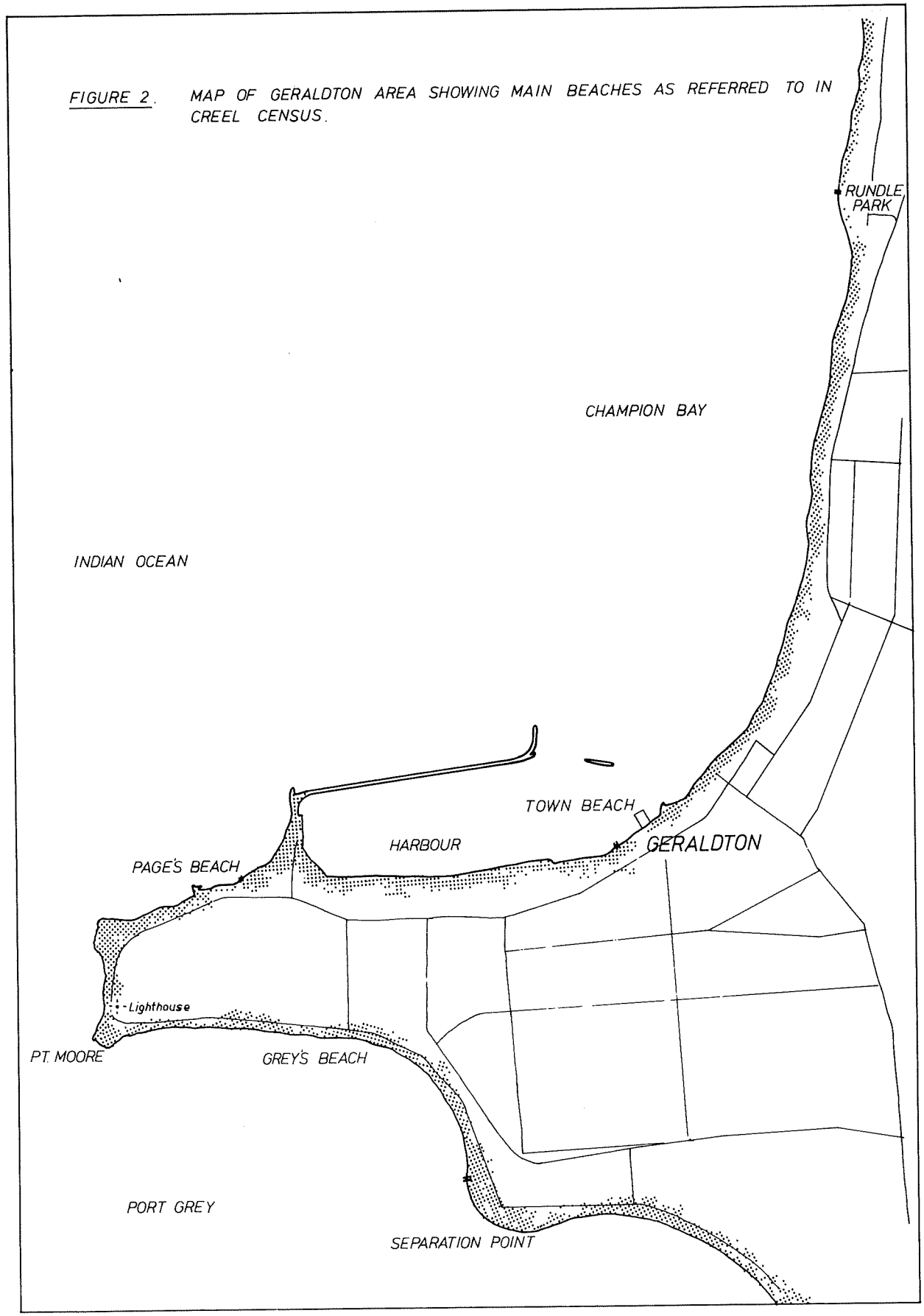


Figure 1 Coastline of Western Australia showing amateur fishing areas referred to in the text. These have been based on grouped subdivisions (271,272 etc.) used as reference areas in the commercial fishery.

FIGURE 2. MAP OF GERALDTON AREA SHOWING MAIN BEACHES AS REFERRED TO IN CREEL CENSUS.



APPENDIX A

AMATEUR ROCK LOBSTER FISHERY STUDY - QUESTIONNAIRE

NAME: _____

ADDRESS: _____

LICENCE NUMBER: _____ DATE: _____

OFFICE OF ISSUE: _____

1. Did you fish for rock lobsters at any time during the period from 15 November, 1975 to 15 August, 1976?

   Yes/No

   If "No" to Question 1, please go straight to Question 10. Otherwise continue.

   DURING THE PERIOD FROM 15 NOVEMBER, 1975 TO 15 AUGUST, 1976:

2. What fishing methods did you employ to catch rock lobsters:

   ☐ Lobster pots
   ☐ Diving methods
   ☐ Other methods

   (Insert an "x" in as many squares as applicable.)

   Please state other methods (if any) .....

   .....

3. How many lobster pots did you use? .....

4. Where did you fish for rock lobsters (town or locality):

   (i) using lobster pots? .....

   (ii) by diving? .....

   (iii) using other methods? .....

5. When did you fish for rock lobsters?

   ☐ November-January
   ☐ February-April
   ☐ May-August
   ☐ On weekends
   ☐ During School Holidays
   ☐ During annual holidays (Please give dates:

   .....

   ☐ Occasionally throughout the season.

   (Insert an "x" in as many squares as applicable.)

6. How many days did you lift your lobster pots to catch rock lobsters?

.....(approximately)

7. On how many days did you dive to catch rock lobsters?

.....(approximately)

8. On how many days did you use other methods to catch rock lobsters?

.....(approximately)

9. Please estimate the total number of rock lobsters you caught (throughout the season).

(i) using lobster pots .....

(ii) by diving .....

(iii) using other methods .....

10. Did you hold a valid amateur fishing licence at any time during the period from 1 July, 1975 to 30 June, 1976?.

Yes/No

APPENDIX B

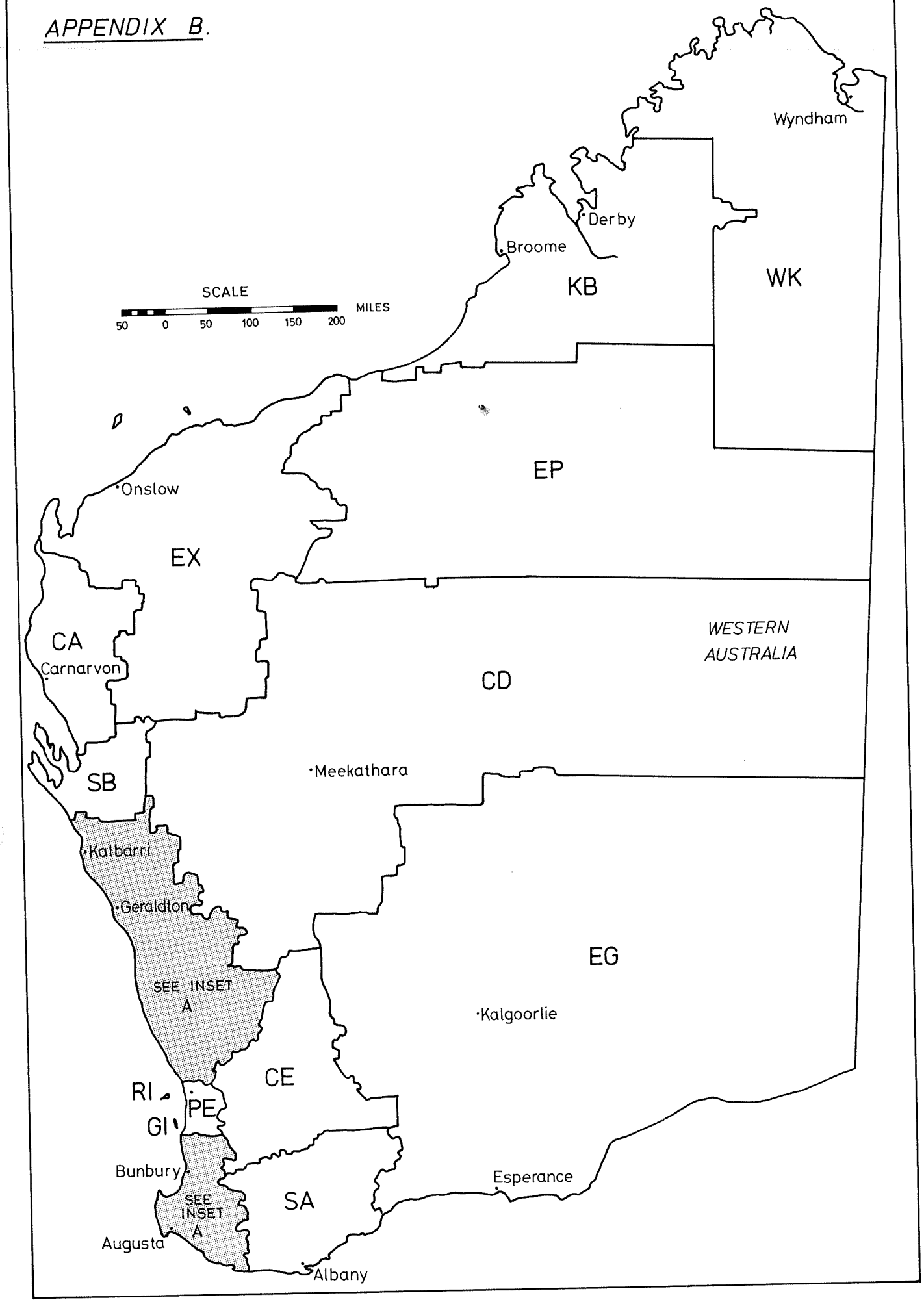
Localities of Addresses of Amateur Fisherman's License Holders

(Based on statistical division boundaries and local government boundaries in Western Australia as at December 31, 1973. See Key)

Key to Amateur Fishermen's home centres referred to in Appendix B and in the text.

Code	Area
WK	Wyndham - East Kimberley, Halls Creek
KB	West Kimberley, Broome
EP	East Pilbara
CD	Central Division
EG	Eastern Goldfields Division
EX	Exmouth, Upper Gascoyne, West Pilbara, Roebourne, Port Hedland
CA	Carnarvon
SB	Shark Bay
CE	Central Agricultural Division
SA	Southern Agricultural Division
PE	Perth Statistical Division
RI	Rottnest Island
GI	Garden Island
KA	Northampton (north of 28°S)
NO	Northampton (south of 28°S), Chapman Valley
GE	Geraldton, Greenough
MM	Mullewa, Mingenew, Morawa, Three Springs, Perenjori
IR	Irwin
CC	Carnamah, Coorow
DA	Dandaragan
MO	Moora
WH	Dalwallinu, Wongan - Ballidu, Victoria Plains, Chittering
GG	Gingin
MA	Mandurah, Murray
WA	Waroona
HA	Harvey
BN	Bunbury, Capel
BS	Busselton
AU	Augusta - Margaret River
CO	Boddington, Collie, Dardanup, Donnybrook - Balingup
MJ	Manjimup, Nannup, Bridgetown - Greenbushes, Boyup Brook.

APPENDIX B.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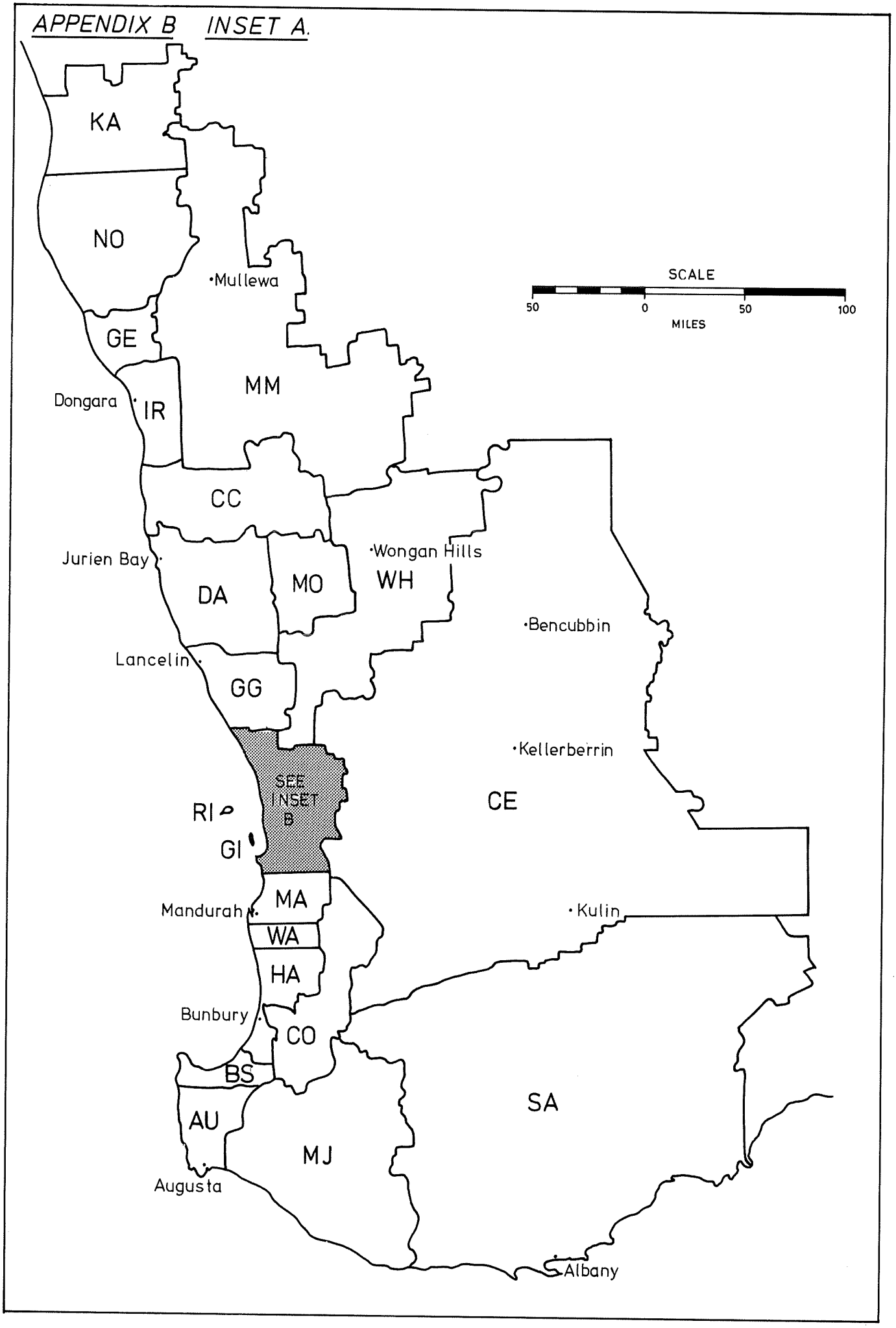
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Jurien Bay
Wongan Hills
Bencubbin
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Bunbury
Augusta
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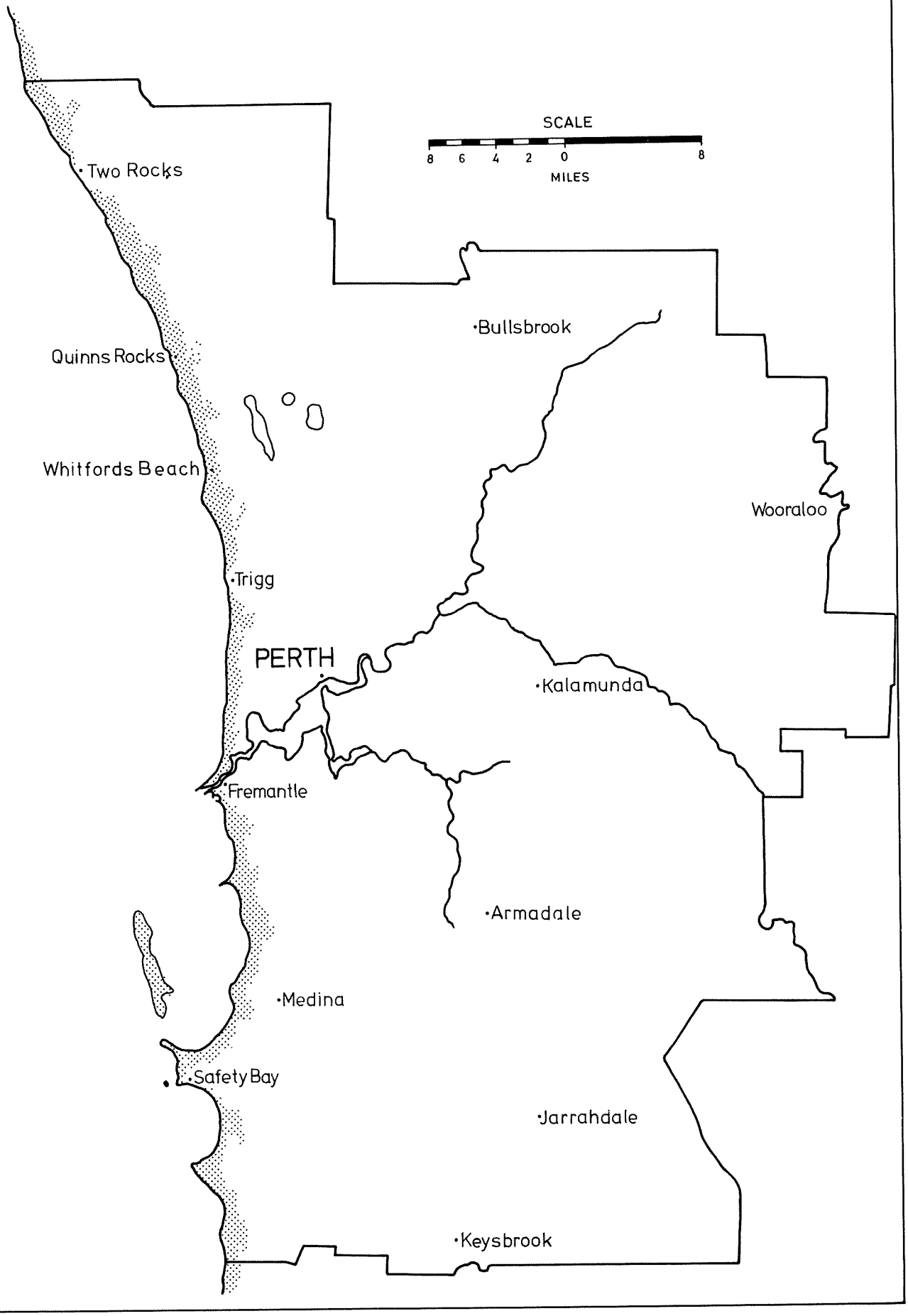

APPENDIX C

REGULATIONS COVERING AMATEUR FISHING FOR ROCK LOBSTERS IN WESTERN AUSTRALIA

(For further details of the closed areas see "Amateur-Inland Fishing, A Guide to the Rules", Department of Fisheries and Wildlife, 108 Adelaide Terrace, Perth.

Pots and Nets:

Not more than two pots shall be used or carried in any boat at any one time irrespective of the number of licensed amateur fishermen in the boat.

Every pot must have attached a surface float of not less than 150 mm in diameter. The float must be branded or stamped with the amateur license number and the numbers shall not be less than 6 cm high nor less than 1 cm wide. Pots not conforming to these requirements may be confiscated, and all pots, floats etc., set during closed seasons or in closed water will be confiscated.

Pots shall not be pulled by anyone other than the licensee.

A lobster pot is any pot, trap or other appliance intended or used for taking lobsters.

The use of fishing nets for taking lobsters is prohibited.

Pots must be fitted with a rectangular escape gap measuring not less than 305 mm wide by 54 mm deep.

Escape gaps shall be constructed of either steel rod of not less than 9.5 mm diameter or steel flatbar of not less than 19 mm width and not less than 4.7 mm thickness.

No pot shall have more than one entrance (neck).

There shall be no form of obstruction inside the escape gap.

Bag Limit:

Not more than eight rock lobsters shall be taken in any one day.

Sale of lobsters :

Lobsters shall not be sold, consigned or offered for sale.

Closed seasons:

The taking of any lobsters by any means is prohibited:

(i) From 1st July to 14th November, both dates inclusive in all that portion of the Indian Ocean lying south of $21^{\circ}44'$ South Latitude (Tubridgi Point, north of Exmouth Gulf).

(ii) In the Abrolhos area from 1st July to 14th March, both dates inclusive.

The taking of Western rock lobsters and Southern rock lobsters is prohibited in all Western Australian waters from 1st July to 14 November, both dates inclusive.

Restricted-Prohibited areas:

The taking of lobsters by any means is prohibited in the following areas:

(a) Within 400 metres of the shore of Garden Island between 32° 10' South Latitude (Pt Calista) and 32° 11' South Latitude (Pt Collins).

(b) Seven Mile Beach Area (north of Dongara).

(c) Jurien Bay area.

(d) All other areas which are closed to the taking of any fish whatsoever.

Lobsters shall not be taken in the Abrolhos area by any means other than lobster pots.

Fish (includes rock lobster, prawns, abalone, oysters etc.) marine algal life and shells shall not be taken, by any method, in the marine reserve areas listed below:

(i) within 400 metres radius of the Western Australian Marine Research Laboratories Waterman, except by rod or line fishing from the shore.

(ii) within 400 metres radius of PJoint Quobba. Oyster fishing only permitted.

(iii) south of Point Maud in the area known as Coral Bay.

Minimum size:

The minimum legal length at which Western rock lobsters may be taken is 76 mm. This is the carapace or body length between the two horns to the rear of the carapace.

The minimum legal length at which Southern rock lobsters may be taken is 98.5 mm. This is the carapace or body length measured from the anterior (front) surface of the median suture (middle groove) of the frontal tubercle (protuberance) to the mid-point of the posterior (rear) edge of the dorsal (upper) region of the carapace.

Processing:

The detailing or otherwise processing of rock lobsters is prohibited except:

(a) in a licensed processing establishment or,

(b) at a place where the lobsters are to be eaten.

The possession of rock lobster tails, except those referred to in (a) and (b) as above is prohibited.

Berried or spawning females:

The possession or taking of lobsters having spawn or eggs attached is prohibited.

The possession of lobsters from which the eggs or spawn have been removed is prohibited.

Amateur Fishermans License:

Any person, other than a professional fisherman, who catches or attempts to catch any fish (this includes prawns) other than crabs, by means of a fishing net, or rock lobsters by hand or with rock lobster pots shall hold an amateur fisherman's license.

Students under the age of 16 years and pensioners are exempt from payment of the fee, but are required to hold this license.

"Fishing net" includes any scoop net, drop net, dredge net, dip net or landing net.

Spearguns:

Spearguns, harpoons, Hawaiian slings and all other pointed instruments shall not be used for the taking of any rock lobsters in all Western Australian waters.

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