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Pilot survey of licensed recreational
sea fishing in Tasmania -
1995/96

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ABSTRACT

Certain recreational sea fishing activities require licences in Tasmania. In 1995/96 there were over 10 000 licensed recreational fishers; with about 6 200 rock lobster pot, 3 500 rock lobster dive, 4 200 abalone dive, 9 000 gillnet (graball and mullet net) and 500 beach seine net licences issued. This report presents the key findings of a pilot survey of licensed recreational fishing for the 1995/96 licensing year, with the primary objectives being to provide baseline information about levels of fishing activity for licensed fishing methods.

The 1995/96 licensing database provided the sampling frame for the survey and a stratified random design was adopted. Telephone surveys were used to collect retrospective information about fishing activity. The influence of recall bias on data precision is difficult to assess and as a consequence catch and effort estimates are presented as indicative rather than absolute values.

Estimates of recreational catch (numbers) for rock lobster and abalone were 110 000 and 133 000 respectively, equivalent to about 5 and 3% of the total catch for each species. Rock lobster pots accounted for 63%, divers 32% and other methods 5% of the rock lobster catch. A total of 80 000 fisher days were targeted at rock lobster using pots along with 22 000 fisher days of dive effort. Abalone diving effort was estimated at about 26 000 fisher days. Rock lobster and abalone dive effort are not, however, additive since abalone and rock lobster are often caught together whilst diving.

Gillnet fishing effort was estimated at 115 000 'net days' (ie days -whole or part- on which a gillnet was fished), 95% of which was graball net effort. Less than 2 000 fisher days of beach seine effort was estimated. Over 70% of gillnet fishers left nets set overnight at least occasionally. Although no estimates of catch are available, the main species targeted and caught by graball nets are bastard trumpeter and warehou. Smaller mesh mullet nets are used mainly to catch mullet and Australian salmon and beach seines to catch flounder and mullet.

Recreational fishing effort (and catch) was greatest over summer, especially during the December/January holiday period. Between May and October fishing activity remained at low levels. Regionally, the East Coast was the most important area for recreational fishing for all methods other than mullet net and beach seines, which are used mainly off the North Coast.

For each licence type, it was evident that small proportion of the fishers accounted for the majority of the total catch/effort. As a general rule, less than half of the licence-holders accounted for 90% of the total catch (or effort) for a given licence type.

In addition to catch and effort data, information about other fishing activities, general awareness and attitudes of licensed fishers was synthesised.

1 INTRODUCTION

1.1 Background

Little is known about recreational sea fishing in Tasmania, though participation levels are believed to be high and many of the species targeted by recreational anglers have commercial significance.

An Australian Bureau of Statistics (ABS) household survey provides the best general statistics on recreational fishing, but figures are out of date and provide no estimates of catch (ABS 1984). In 1983, about 25% of all Tasmanians were engaged in some form of salt water fishing activity, of whom one fifth fished at least once a month. At that time, almost 7% of Tasmanian households (excluding those occupied by commercial fishers) owned graballs and an estimated 15 000 persons used a graball at least once a year. Fifteen percent of anglers who owned graballs used them at least once a fortnight.

A more recent ABS survey of home food production in Tasmania estimated home seafood 'production' for the year ending April 1992 at over 1 000 tonnes for finfish (including trout), 60 tonnes for rock lobster and 25 tonnes for abalone (ABS 1994). Although the survey was relatively large (with low sampling error), estimates are subject to the ability of householders to accurately recall catch over the previous twelve months. Notwithstanding this, it is apparent that the recreational catch is significant, especially in relation to the commercial finfish catch which has ranged between 1 600 - 2 500 tonnes per annum in recent years (these figures exclude school and gummy shark and offshore species such as blue eye trevalla, ling and tuna).

There have been few other attempts to gather information about the recreational fishery in Tasmania. A survey of recreational fishing in the Derwent Estuary in 1984 provided some information about motivation, expenditure and catch rates, but gave no information on effort levels, total catch or catch composition (Winter 1985). A voluntary questionnaire based survey, completed at the time of licensing in 1987, produced a recreational catch estimate of about 250 000 rock lobster for 1986/87, equivalent to about 11% of the commercial catch (A. Schaap unpubl. data).

Logbook based surveys of charter boat operators targeting tuna in 1993 and 1994 provided catch estimates for southern bluefin tuna of 13 and 7 tonnes respectively, catches of other tuna species being low relative to bluefin (Smith 1994).

1.2 Recreational Licensing System

Tasmania has had a recreational fishing licensing system in place since the early 1970s. Prior to 1995 there were three categories of sea fishing licence; non-commercial rock lobster pot, non-commercial dive and non-commercial scallop licences. The rock lobster pot licence entitled recreational fishers to take rock lobster by pot¹, the diving licence permitted the taking of rock lobster, abalone and scallops by diving and the scallop licence permitted the use of dredges to take scallops.

¹ Usually, a round cane pot with a hole at the top and escape gaps at the side to encourage the exit of undersized lobsters.

The licensing year is defined as 1 November to 31 October and since the mid-1980s between 7 500 and 10 400 recreational licences have been issued (Figure 1). The number of dive licences has remained relatively constant in recent years, at around 3 500 - 4 000, while the number of pot licences issued declined from over 7 000 in 1989/90 to about 4 000 in 1994/95.

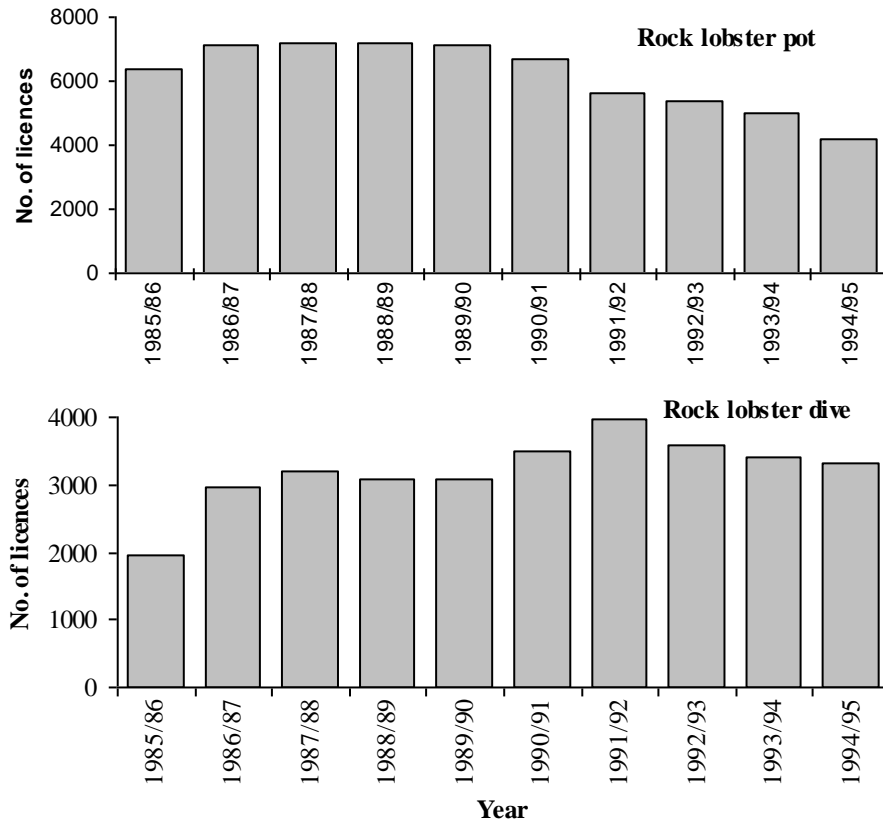


Figure 1 Numbers of recreational sea fishing licences issued in Tasmania between 1985/86 and 1994/95

The licensing system was revised for the 1995/96 licensing year. Changes involved the splitting of the non-commercial dive licence into rock lobster, abalone and scallop dive licences and for the first time, recreational nets were required to be licensed. In Tasmania, unlike most other Australian states, recreational fishers are allowed to fish with (monofilament) gillnets and beach seines. Individuals are currently permitted to use up to two graball nets, one 'mullet' net and one beach seine. A complex suite of regulations apply to their use, including area closures.

Only one rock lobster pot is permitted per licence holder and daily bag limits of 5 rock lobster and 10 abalone, along with minimum size limits, apply to recreational fishers. There is also a fishing season for rock lobster which, in 1995/96, ran from 1 December 1995 to 31 August 1996 for male and 1 December 1995 to 30 April 1996 for female rock lobster.

In 1995/96 there were over 10 000 licensed recreational fishers; with about 6 200 rock lobster pot, 3 500 rock lobster dive, 4 200 abalone dive, 8 300 graball net, 700 mullet net, 500 beach seine, 180 scallop dive and 20 scallop dredge licences issued.

1.3 Need to Survey the Recreational Fishery

The Tasmanian Government is developing management plans for all fisheries, including the recreational fishery. The general lack of empirical data about the recreational sector is making decision making difficult and uncertain.

Estimates of participation rates, catch and effort are essential for effective fisheries management. Such data are collected from the commercial sector through logbook programs but are unavailable for the recreational fishery in Tasmania. The size of the recreational catch remains a major uncertainty in stock assessments of the main Tasmanian fisheries, ie rock lobster, abalone and scalefish. Since many stocks are believed to be either fully or over-exploited and as resource sharing and other management issues become increasingly important, so too does the need for *total* fishery data.

1.4 Survey Objectives

In the lead up to the development and implementation of a major longitudinal study of licensed recreational fishing², recall based surveys of fishing activity for 1995/96 were undertaken. Specific objectives of this research were to:

- provide preliminary estimates of recreational catch and fishing effort for rock lobster and abalone for the 1995/96 licensing year
- estimate fishing effort and targeting practices in the recreational net fishery
- synthesise key attitudinal information (perceptions on resource status, attitudes to change in management, etc) relevant to the management of recreational fishing in Tasmania

² The longitudinal study involves the use of a combination of a fishing diary and frequent telephone contact to monitor fishing activity in detail for selected licence-holders over a period of several months.

2 METHODOLOGY

2.1 Survey Design

The 1995/96 Recreational Licensing Database provided the sampling frame for the survey and a stratified random design was adopted. Stratification was based on a combination of three factors; namely avidity (reported days fished for the twelve months prior to licensing), licence type and region. In relation to avidity, the licence application form included a voluntary section in which the total number of days spent sea fishing (by any method) in the previous 12 months was recorded. The response rate to this question was 63%, with non-respondents being grouped together in a single avidity class ('non-respondent').

The survey utilised a telephone administered questionnaire and involved two periods of data collection. The first survey was conducted in late June/early July 1996 and covered fishing activity between November 1995 and June 1996, inclusive. The second, conducted in early November 1996, gathered information for the period June to October 1996. In addition to providing information about previous fishing, the November survey represented the initial contact for a follow-up longitudinal survey.

By combining survey results, information is available for the full licensing year, with a maximum recall period of eight months. Since the two surveys overlapped in June 1996, analyses based on whole of year data have only included June data from the June/July survey. The primary rationale for excluding June data from the November survey is the greater recall period (five months compared to one month for the initial survey).

In the June/July survey five avidity classes were recognised (0-10 days; 11-20 days; 21-30 days; ≥ 31 days; and 'non-respondent') whereas in the second survey three classes were defined (0-20 days; ≥ 21 days; and 'non-respondent'). Regional stratification was only applied in the November survey, with licence-holders' residential addresses being grouped into three classes, two Tasmanian (East/North East and West/North West) and one non-Tasmanian (interstate) region. The two surveys differed in that non-Tasmanian residents (184 licence-holders or 1.8% of the total) were excluded from the second survey. The impact of excluding non-residents on total estimates of catch and effort for July-October is believed to be minimal³.

Different sampling fractions were applied to the strata in order to ensure that: (a) rarer licence types (and regions) were adequately sampled (eg mullet net and beach seine net were sampled at higher rates than other gear and the West/North West region was sampled at a rate 1.6 times that of the East/North East region), and (b) the more avid classes (ie ≥ 21 days fished) were sampled at rates 2 - 2.5 times higher than the less avid or 'non-respondent' groups. This latter point addresses the issue of non-normal distribution of catch (ie where a large proportion of the catch is taken by a small number of avid anglers). It follows that greater statistical strength will be obtained through a higher than usual sample-take of these avid/skilled anglers.

³ Fishing by non-residents contributed less than 2% to the estimates of total catch for abalone and rock lobster for the November 1995 - June 1996 period. Findings also indicated that non-residents tended to fish over restricted periods (presumably whilst on holiday), concentrated in the summer months. All but 3 non-resident licence-holders had at least a rock lobster pot, rock lobster dive and/or abalone dive licence and only 18 were licensed to use nets.

Licence-holders were selected at random from the licensing database at rates determined by the sampling fraction for their appropriate stratum.

Interviewers were provided with the following information - name, phone number, town, age and licensing details for all respondents. Interviews were generally conducted in person with the 'selected' licence-holder, proxy interviews were only applied to a small number of respondents under 16 years of age⁴. Non-respondents were not replaced and licence-holders selected in the first survey were excluded from selection in the second survey.

Interviews were conducted over a period of three weeks and a minimum of five calls at different times of the day/week were made to minimise 'non-contacts'. If licence-holders did not have a phone number listed, or the number was incorrect, on their licence application form, Telstra Directory Assistance was consulted. Silent and unlisted numbers were treated as 'sample loss', as were licence-holders who had moved (with no forward contact number) or were not contactable (away working or on holidays) for a protracted period.

2.2 Questionnaires

The questionnaires used in the two surveys differed only in relation to the amount of operational and attitudinal information gathered. A uniform approach was employed in the collection of catch and effort data. The June/July survey questionnaire is presented as Appendix I.

The questionnaires are basically divided into four sections. In the first, respondent details are provided for use by interviewers. Licensing details and gear utilisation are confirmed with each respondent in the second section. In the third section, effort data (days fished) are collected by method (rock lobster pot, rock lobster dive, abalone dive, graball, mullet net and beach seine), as appropriate, along with catch estimates (numbers) for rock lobster and abalone. As it is not feasible to collect catch information by recall for net fishing (catches can involve large numbers and many species), only basic information about targeting and main species caught was recorded for graball net, mullet net and beach seine. Operational and gear details were also collected in this section. Catch and effort data were reported as monthly estimates by major fishing regions, ie North Coast, East Coast, West Coast and Bass Strait Islands (Flinders Island and King Island groups) (Figure 2).

The final section of the June/July survey was used to gather a variety of information about other fishing activities, awareness and attitudes. In the November survey, this section include a 'set-up' component for the longitudinal survey.

It should be noted that catch and effort data were not collected for recreational scallop (dive or dredge) fishing.

⁴ Parental permission was obtained before conducting any interview with respondents under 16 years of age. In some cases parents answered the questionnaire or assisted children in answering the questions. Note: respondents under 16 years of age were not asked attitudinal questions.

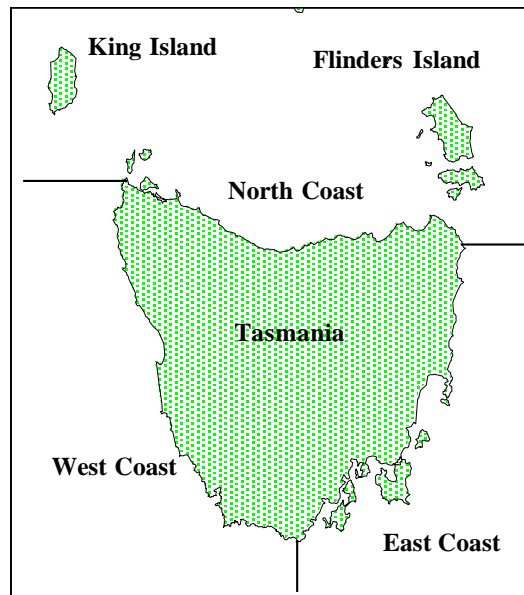


Figure 2 Map of Tasmania showing fishing regions.

2.3 Data Analysis

An expansion matrix in accordance with response rates, stratification variables and differing sampling fractions has been applied to estimate population totals.

The "bootstrap" method has been used to estimate confidence limits (CL) on total catch and effort estimates. In each instance 10 000 simulations were conducted. As the technique is not constrained by distributional assumptions of standard parametric statistical methods, it is a more appropriate approach to the estimation of confidence limits on catch and effort data.

Confidence limits for proportions were derived from the stratified sampling estimate for variance (Cochran 1977, p 107).

3 RESULTS

3.1 Response Rates

In total almost 1 400 licence-holders were selected in the two surveys. When sample loss⁵ is taken into account, 'sample take' rates of over 95% were achieved in both surveys (Table 1). Non-contacts accounted for less than 5% and refusals less than 1% of the samples. Given the extremely high response rates achieved, non-response bias is not considered to be an important factor.

Table 1 Response rates by survey.

Response type	<i>June/July Survey</i>		<i>November Survey</i>	
	<i>Number</i>	<i>%</i>	<i>Number</i>	<i>%</i>
Full response	686	96.7	559	95.4
Refusal	4	0.6	2	0.3
Non-contact (no answer)	16	2.3	21	3.6
Other non-response*	3	0.4	4	0.7
Total	709	100	586	100
Sample loss				
• <i>No listing/silent no</i>	37		38	
• <i>Moved/holidaying</i>	11		16	
Total sample	757		640	

* includes illness or death

3.2 Sample Fractions

In Table 2 the number of licensees sampled and corresponding sample fractions for each licence type are presented. Overall, greater than 6% of licences issued were sampled, with a minimum sample take of 1 in 20 (ie 5%) for a licence class. However, as noted above, stratification was defined in terms of avidity (and region) as well as licence type and the actual sampling intensity within a licence class stratum was further determined by avidity and region.

⁵ Sample loss was represented by licence-holders who were not contactable for the following reasons - no phone, a silent listing, moved away without a contact number provided or away on holidays for a prolonged period.

Table 2 Total number of licences, number sampled and sample fractions achieved for the two surveys.

<i>Licence</i>	<i>June/July Survey</i>			<i>November Survey*</i>		
	<i>No. licences</i>	<i>No. sampled</i>	<i>% total</i>	<i>No. licences</i>	<i>No. sampled</i>	<i>% total</i>
Rock lobster pot	6 200	446	7.2	6 147	375	6.1
Rock lobster dive	3 468	219	6.3	3 333	167	5.0
Abalone dive	4 179	277	6.6	4 077	208	5.1
Graball #1	5 665	426	7.5	5 647	418	7.4
Graball #2	2 663	232	8.7	2 656	196	7.4
Mullet net	678	96	14.2	674	74	11.0
Beach seine	494	68	13.8	493	34	6.9
Total licences	23 347	1 764	7.6	23 027	1 472	6.4
Total licence-holders	10 094	686	6.8	9 910	559	5.6

* non-resident licence-holders were excluded from the November Survey

3.3 Licence Usage

All respondents were asked whether or not they had fished with each of the licences they held during 1995/96. A small proportion had not undertaken any licensed fishing activity, whereas others had fished with some, but not all of their licences.

Overall, an estimated 92.8% of all licence-holders (equivalent to 9 375 licensees) in 1995/96 did some licensed fishing between November 1995 and June 1996. The November 1996 survey, produced a slightly lower estimate of 90.7% (8 991 licensees) for Tasmanian resident licence-holders.

Generally respondents reported some fishing with at least one licence, but usage rates did vary by licence type. Rates for rock lobster pot, rock lobster dive, abalone dive and graball net licences were around 80% or greater (Table 3). Although rates tended to be slightly higher in the second survey, differences between surveys were not significant for these methods. By contrast, only half of the mullet net and beach seine licences were used in the first part of the year. Estimated mullet net usage was significantly higher (around 80%) in the second survey, whereas beach seine usage was slightly, but not significantly, higher (at around 60%).

Table 3 Estimates of licence usage in 1995/96.*(a) Licence usage period : Nov 95 - Jun 96 (June/July Survey)*

<i>Licence</i>	<i>No. licences</i>	<i>% used</i>	<i>No. used</i>	<i>95% CL range</i>
Rock lobster pot	6 200	84.8	5 257	5 036 - 5 478
Rock lobster dive	3 468	77.7	2 694	2 494 - 2 894
Abalone dive	4 179	78.4	3 278	3 070 - 3 486
Graball net	5 665	85.6	4 850	4 651 - 5 048
Mullet net	678	54.9	372	303 - 440
Beach seine	494	51.4	254	193 - 315

(b) Licence usage period : Nov 95 - Oct 96 (November Survey)

<i>Licence</i>	<i>No. licences</i>	<i>% used</i>	<i>No. used</i>	<i>95% CL range</i>
Rock lobster pot	6 147	81.6	5 016	4 739 - 5 294
Rock lobster dive	3 333	82.5	2 750	2 542 - 2 958
Abalone dive	4 077	82.8	3 378	3 136 - 3 619
Graball net	5 647	89.6	5 058	4 880 - 5 236
Mullet net	674	79.7	537	476 - 599
Beach seine	493	61.3	302	260 - 367

3.4 Rock Lobster

3.4.1 Catch and effort

The recreational catch of rock lobster for the 1995/96 season has been estimated to be approximately 111 000 lobsters (95% CL 91 000 - 135 000), of which 63% were caught by pots, 32% by diving and 5% by other methods (Table 4). The issue of rock lobster taken by methods other than pot or diving was only addressed in the June/July survey. Rock lobsters are occasionally taken as a by-catch of gillnet fishing or may be targeted with rock lobster rings which do not require a licence⁶. Due to incomplete coverage of the year (no data were collected for July or August) and, more importantly, because catches by non-licensed fishers using rings were not assessed, the 'other' methods catch will be underestimated in this analysis.

Fishing effort, expressed in terms of fisher days, indicates that almost four times as many days were spent using rock lobster pots (80 000 pot days) than diving (22 000 diver days) (Table 4). Mean catches per fisher day were, however, almost twice as high for diving (1.6 rock lobster) than potting (0.9 rock lobster).

Table 4 Total catch and effort estimates for rock lobster by fishing method. (values in parentheses represent 95% CL; nd not determined)

<i>Method</i>	<i>Catch (no.)</i>	<i>Effort (fisher days)</i>	<i>Catch rate (no. per fisher day)</i>
Pot	69 927 (59 842 - 81 113)	80 053 (70 619 - 89 965)	0.9
Dive	35 904 (27 704 - 45 667)	22 247 (18 982 - 25 816)	1.6
Other*	5 578 (3 482 - 7 986)	nd	-
Total	111 409 (91 028 - 134 766)		

* NB: 'other' estimate applies only to catches taken by licence-holders between Dec 95 and Jun 96.

On average, holders of rock lobster pot licences fished for 13 days, catching a total of 11 rock lobster, compared with 6.4 days for divers for a catch of just over 10 lobsters for the season. If only licences that were used are considered (based on gear usage rates for November - June, refer to Table 3), then the average effort expended was about 15 and 8 days for pot and dive, respectively, for a average total catch of just over 13 rock lobster for each method.

In order to assess the relative contribution to the total catch of individual licence-holders, the cumulative effect of progressively adding one more fisher's catch (after sorting by the size of the catch) to the total has been calculated. From Figure 3 it is evident that a small number fishers account for the majority of the catch. For instance, just over half of the rock lobster pot licence-holders (approximately 3 300 fishers) accounted for 90% of the pot catch, with half the total being taken by just 16% (ie 1 000) of the fishers. Similarly for divers, where

⁶ A rock lobster ring is a single ring or hoop to which mesh of string or twine is attached. Rings are baited in the centre of the hoop to attract rock lobster. Rings have no top and are attended regularly.

half of the total dive catch was taken by only 7% of rock lobster dive licence-holders (just 250 fishers) and 90% of the total catch was accounted for by under one third of the licence-holders (ie 1 100 fishers).

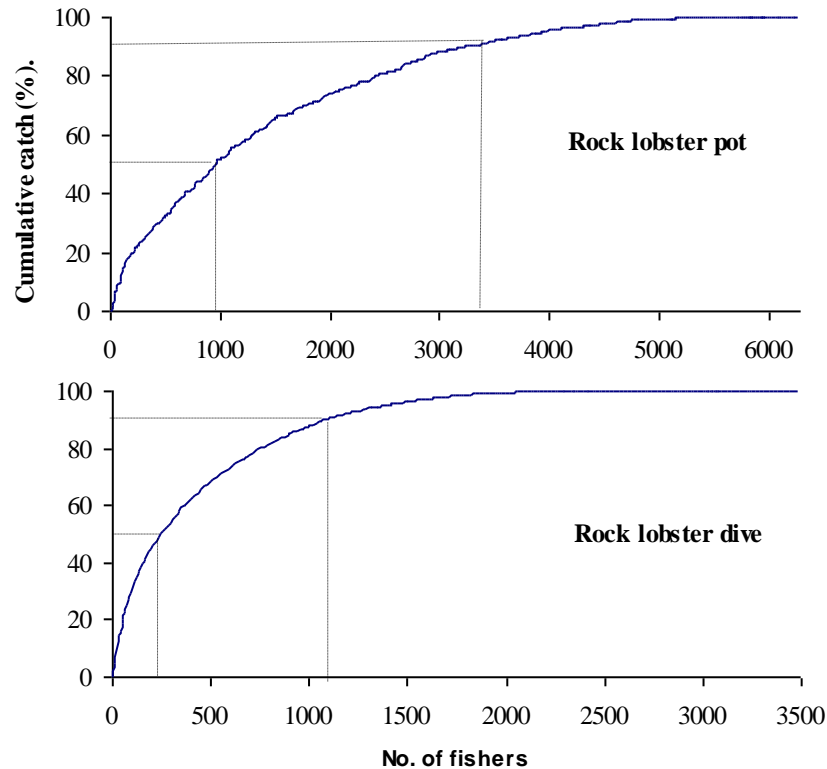


Figure 3 Cumulative catch (%) of rock lobster taken by fishers with rock lobster pot (above) and rock lobster dive (below) licences (based on data for the period Dec 95 - Jun 96).

3.4.2 Catch and effort by region

Four major regions have been recognised for data analysis, namely the North Coast, East Coast and West Coast and offshore Bass Strait Islands (Flinders and King Island groups) (refer Figure 2). The distribution of recreational catch and effort by region is summarised in Figure 4.

Just over 80% of the pot catch (and effort) and around 60% of the dive catch (and effort) came from the East Coast. Off the West Coast, approximately 10% of pot effort was expended, yielding 14% of the catch, compared with 20% of the dive effort and 27% of the dive catch. About 10% of the effort but only 5% of the catch for the two methods came from the North Coast. Very little potting was reported for the Bass Strait Islands, with diving more important in that region - accounting for nearly 8% of the total dive effort and 9% of the dive catch.

As implied in the above analysis, catch rates (numbers per day) for the West Coast were, on average, higher than elsewhere - 1.2 rock lobster for pots and 2.1 for divers. Catch rates were intermediate for the East Coast - 0.9 for pot and 1.5 for divers, and lowest off the North Coast - only 0.5 for pots and 0.9 for divers. The overall daily catch rate for the Bass Strait Islands was relatively high for divers (1.9 rock lobster) but the low level of potting effort suggests that pot catch rate estimates will be unreliable.

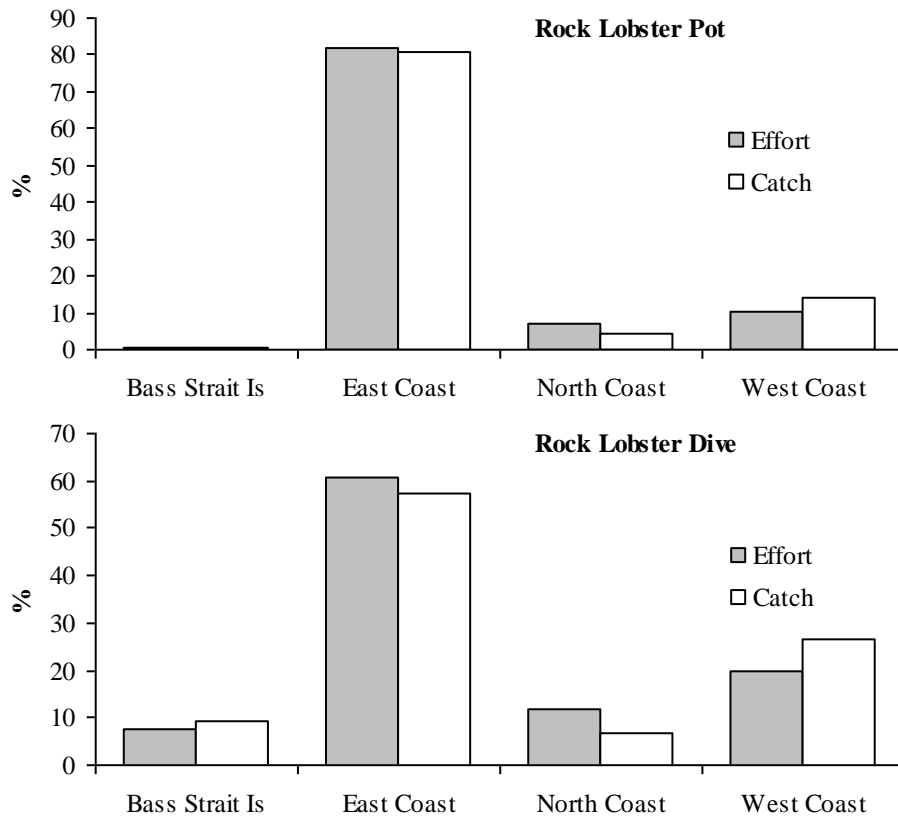


Figure 4 Proportions (%) of rock lobster pot and dive catch and effort by region for 1995/96.

3.4.3 Catch and effort by season

Monthly breakdowns of catches and days fished are presented in Figures 5 & 6. The peak fishing period for rock lobster is during summer, especially December and January. In terms of catch, around 65% of the dive and 78% of total pot catch were taken in the three months December to February. Effort showed a similar pattern, peaking in December/January. By May, catch and effort had fallen to low levels, which remained relatively stable until the end of the fishing season. The two catch and effort estimates for June, representing the overlap between surveys, are very similar and provide some confidence in the results.

Catch rate trends for the two fishing methods exhibited some differences during the season. Pot catch rates declined gradually from around 1.1 rock lobster per day in December to around 0.6 by April, before rising again towards the end of the season. Data for May - August are, however, based on very low levels of effort. By contrast, diver catch rates tended to be more consistent throughout the season, fluctuating between about 1.5 - 1.8 rock lobster per day.

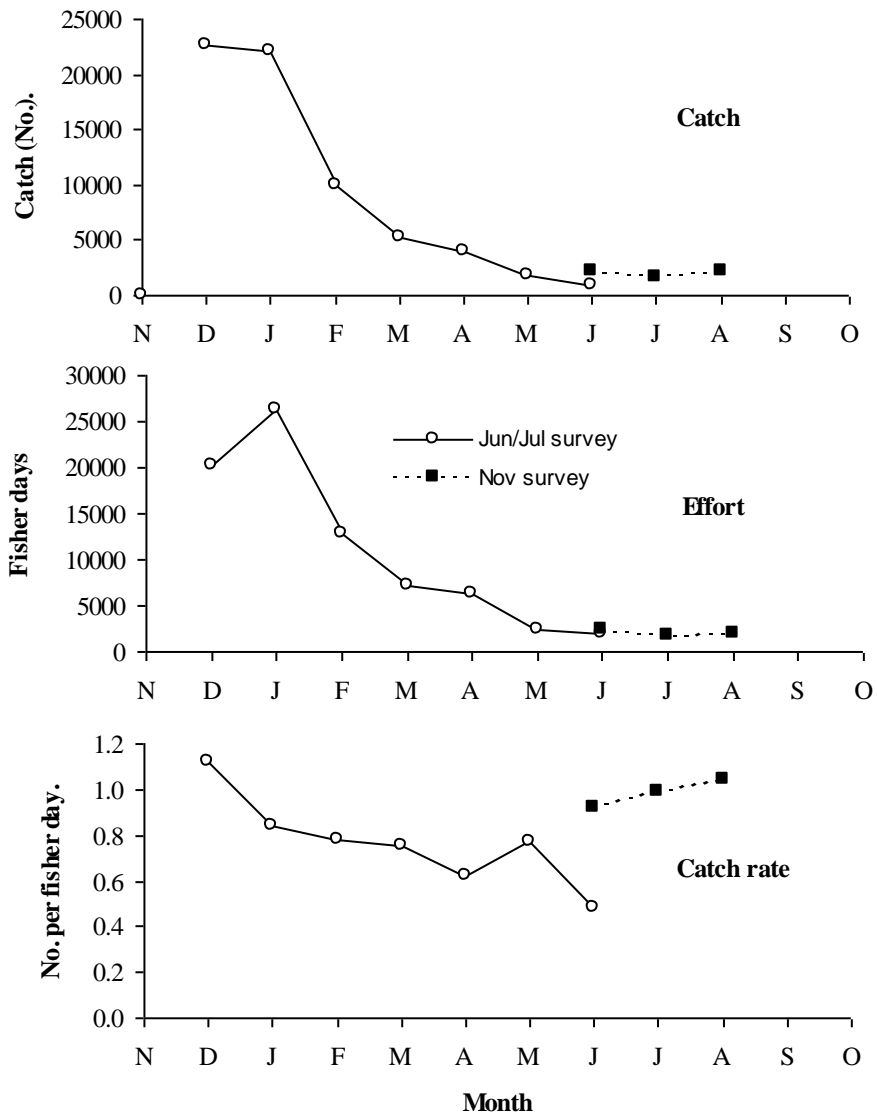


Figure 5 Rock lobster pot effort, catch and catch rates by month for 1995/96.

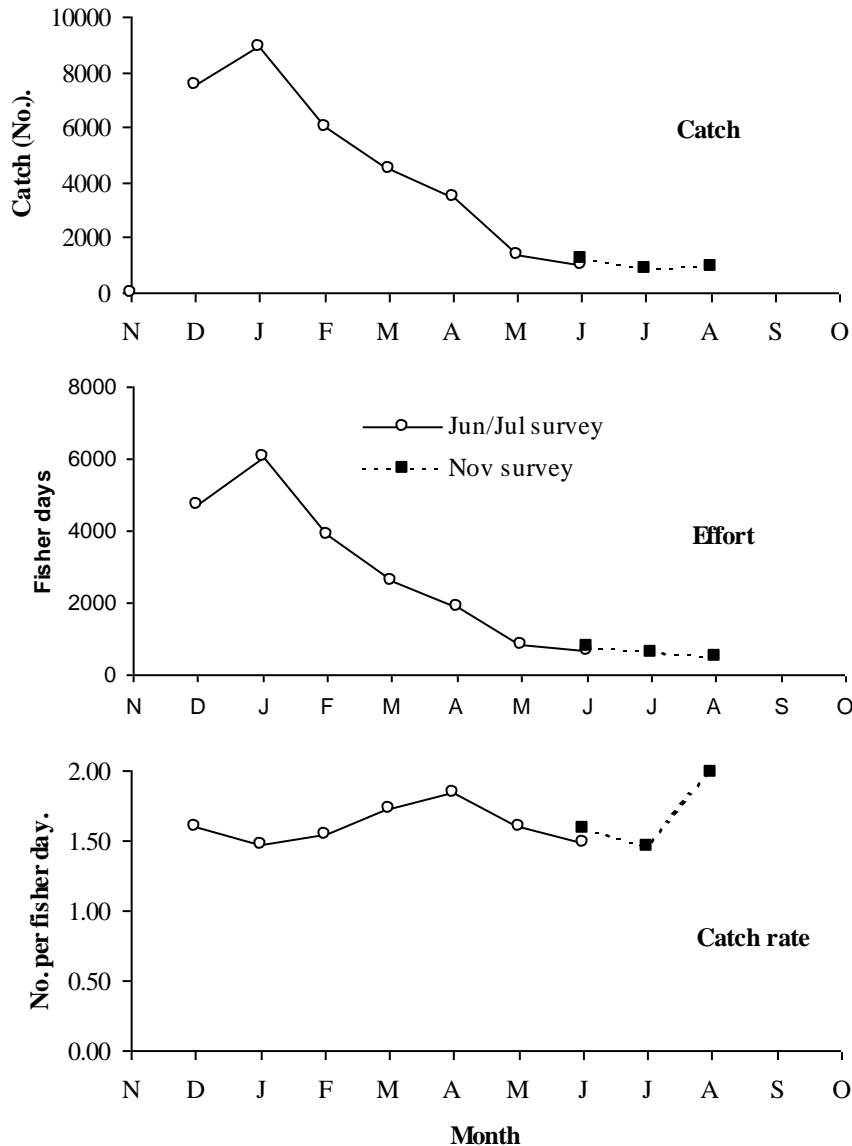


Figure 6 Rock lobster dive effort, catch and catch rates by month for 1995/96.

3.4.4 Dive methods

Respondents reporting diving activity for rock lobster were asked which of the dive methods (snorkel, scuba or surface air) was the main method used to take rock lobster. Results indicate that surface air (hookah) was the most frequently reported ‘main’ method amongst respondents (45%), followed by scuba (35%) and snorkel (20%) (Table 5). Based on the main method reported, estimates of mean catch, effort and catch rates have been calculated. These data suggest that, on average, surface air divers fished fewer days but took almost twice the number of rock lobster per fisher compared with snorkel or scuba divers. The daily catch rate for surface air of 2.7 rock lobster was twice that for the other methods.

This analysis is, however, complicated by the fact that almost 27% of respondents indicated that they had used more than one dive method and, therefore, their actual catch (and effort) will have been derived from a variety of methods. The effect of considering divers who indicated that they had only used one method is to increase the mean daily catch rate for

surface air to 3.0 rock lobster, which compares with 1.2 for snorkel and 1.1 for scuba only divers.

Table 5 Rock lobster diving methods, mean effort, catch and catch rates for December 1995 - June 1996 (based on respondents reporting rock lobster dive activity in June/July survey).

	<i>Main method</i>		
	<i>Snorkel</i>	<i>Scuba</i>	<i>Surface air</i>
No. respondents	35	62	79
% of respondents	19.9	35.2	44.9
Mean days fished	8.5	10.0	7.7
Mean catch (number)	11.8	11.3	21.1
Mean catch per day	1.4	1.1	2.7

3.4.5 Recreational catch share

In order to determine catch share it is necessary to estimate total catch taken by commercial and recreational fishing sectors. Commercial rock lobster fishers are restricted to the use of rock lobster pots and are required to complete detailed catch returns providing information about catch and fishing effort. The 1995/96 commercial rock lobster catch was 1 841 tonnes or 2.1 million lobsters.

Catch information for the 1995/96 season are summarised in Table 6. The recreational component comprised just 5% of the total catch of 2.2 million rock lobster. The need to pull pots by hand and diving restrictions would suggest that the bulk of the recreational catch is taken in depths of less than 20 m. Commercial fishers use hydraulic pot haulers and, having larger vessels, operate over a wider area including deeper offshore reefs. Comparisons based on catches from less than 20 m suggest that the recreational component was equivalent to 16% of the total. For the shallow East Coast region, the relative importance of the recreational fishery is even greater, representing nearly 30% of the total catch.

Table 6 Comparison of Tasmanian commercial and recreational rock lobster catches by depth/area for the 1995/96 season (commercial catch data are derived from commercial Rock Lobster catch returns).

	<i>Catch Numbers (x1000)</i>			<i>% recreational</i>
	<i>Commercial</i>	<i>Recreational</i>	<i>Combined</i>	
Total	2 121	111	2 232	5.0
< 20 m	574	111	685	16.2
East Coast (< 20 m)	184	77	261	29.5

In terms of catch rates, it is possible to compare commercial and recreational fisheries on the basis of catch per pot day. The total number of pot days for the commercial fishery in 1995/96 was reported as 1.5 million, representing an mean annual catch rate of 1.4 rock lobster per pot day. This compares with 0.9 for recreational fishers. In the less than 20 m depth range, however, the commercial catch rate averaged 1.0 rock lobster per pot day, only slightly higher than that estimated for recreational pot fishers.

3.5 Abalone

3.5.1 Catch and effort

The 1995/96 recreational catch of abalone was estimated at over 133 000 abalone (95% CL 113 700 - 155 600), based on a total of 26 000 diver days (95% CL 23 000 - 29 000) of effort (Table 7). This represents an overall catch rate of around 5 abalone per diver day. The mean annual catch and days fished per abalone licence were 32 abalone and 6 days. If only licences that were used are considered, these averages increase to 41 abalone and 8 days per licence.

Table 7 Recreational abalone catch and effort for 1995/96. (values in parentheses represent 95% CL range)

	<i>Catch (no.)</i>	<i>Diver days</i>
Total estimate	133 515 (113 742 - 155 589)	25 959 (22 937 - 29 096)
Mean per licence	31.9	6.2
Mean per licence 'used'*	40.7	7.9

* based on usage rate estimated for Nov 95 - Jun 96 (refer Table 3)

It was evident from survey responses that fishers with abalone dive and rock lobster dive licences often caught (targeted) abalone and rock lobster together whilst diving and therefore, diver days of effort for abalone and rock lobster are not additive.

As for rock lobster, a small number of fishers accounted for a large proportion of the catch (Figure 7). In this case, almost half of the catch was taken by just over 10% of abalone licence-holders (around 500 fishers), with less than half (around 2 000) of the fishers collectively accounting for 90% of the abalone catch.

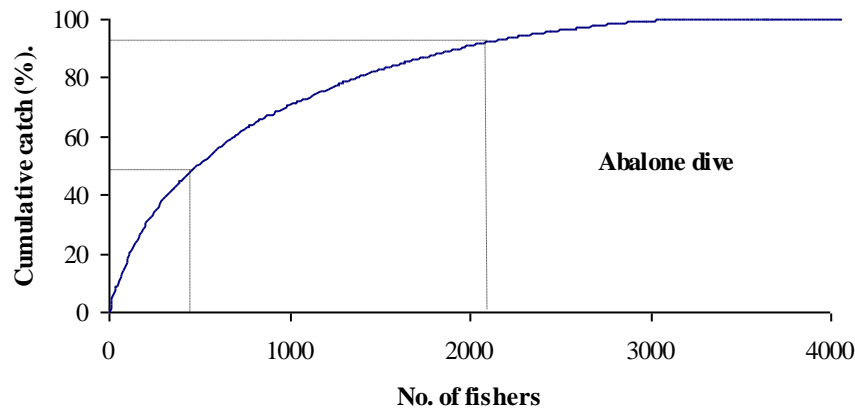


Figure 7 Cumulative catch (%) of abalone taken by holders of abalone dive licences (based on data for the period Dec 95 - Jun 96).

3.5.2 Catch and effort by region

As for rock lobster, the East Coast is the major region for recreational abalone fishing, accounting for about 67% of the catch and effort (Figure 8). In descending importance, in terms of catch and effort, are the West Coast (14%), North Coast (around 10%) and Bass Strait Islands (8%).

Overall, average catch rates of between 5.2 - 5.3 abalone per diver day were estimated for the East Coast, West Coast and Bass Strait Islands. Catch rates were slightly lower for the North Coast, at around 4.6 abalone per day.

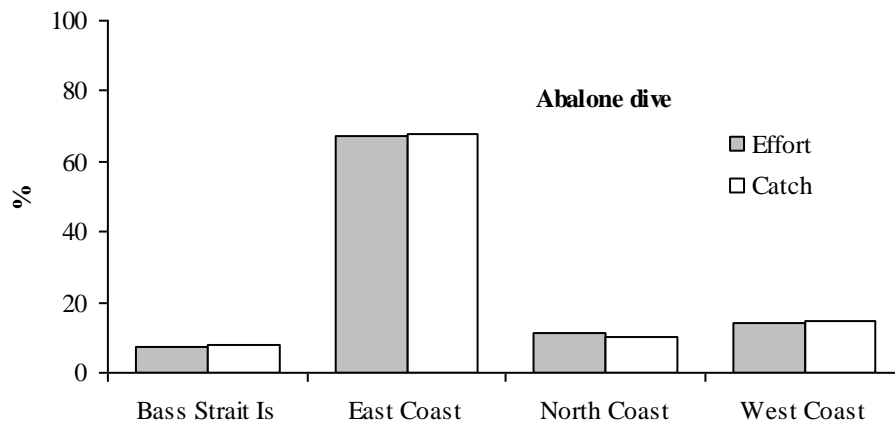


Figure 8 Proportion (%) of abalone dive catch and effort by region for 1995/96.

3.5.3 Catch and effort by season

Monthly catch, effort and catch rate data are summarised in Figure 9. Catch and effort peaked during the summer months, in particular January, before falling to a low but stable level from May onwards. Catches (and effort) for December to February represent over 60% of the annual estimates. There was no consistent trend in catch rate, which fluctuated between 4 and 7 abalone per day over the twelve month period.

3.5.4 Dive methods

Snorkelling was the most frequently reported 'main' method of catching abalone, followed by surface air and scuba (Table 8). Mean days fished were, however, greatest for scuba, almost 10 days, and compared with an average of 7 - 8 days for snorkel and surface air. Highest catch rates (around 6 abalone per day) were achieved by snorkel and surface air diving. The mean daily catch rate for scuba was only 4 abalone.

Since 26% of respondents indicated that they used more than one mode of diving to take abalone, catch rates will be influenced by the mix of methods used. The effect of considering fishers who indicated that they had only used one method is to increase the mean daily catch rate for surface air to 6.0 abalone, which compares with 5.1 for snorkel and 4.1 for scuba.

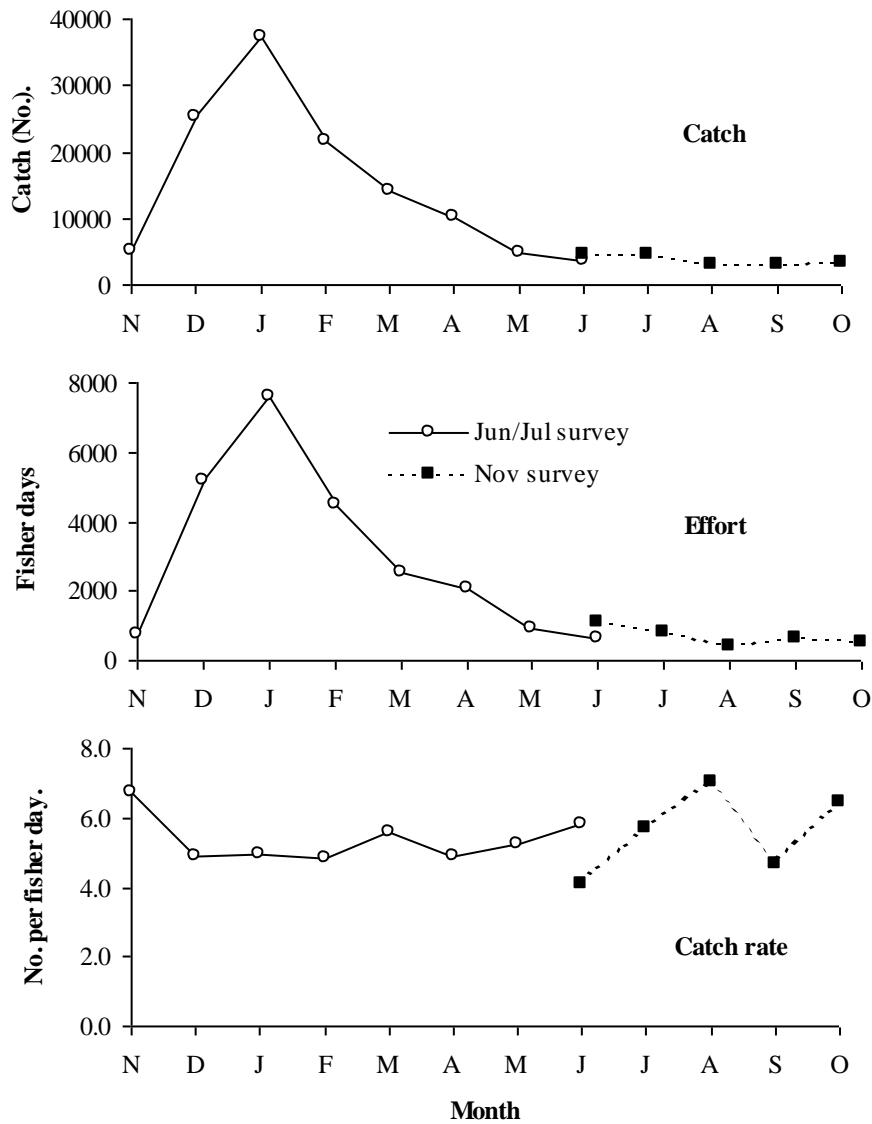


Figure 9 Abalone dive effort, catch and catch rates by month for 1995/96.

Table 8 Abalone diving methods, mean effort, catch and catch rates for November 1995 - June 1996 (based on respondents reporting abalone dive activity in June/July survey).

	<i>Main method</i>		
	<i>Snorkel</i>	<i>Scuba</i>	<i>Surface air</i>
No. respondents	97	58	68
% of respondents	43.5	26.0	30.5
Mean days fished	7.5	9.7	7.9
Mean catch (no.)	42.8	39.0	46.6
Mean catch per day	5.7	4.0	5.9

3.5.5 Recreational catch share

The recreational share of the 1995/96 abalone catch was relatively insignificant, representing just 3% of the total (Table 9). As both recreational and commercial fishers dive for abalone, they will be subject to similar restrictions in terms of depths that can be fished.

Regionally, while around two-thirds of the recreational catch came from the East Coast, it accounted for just under 6% of the total catch from this area.

Table 9 Comparison of Tasmanian commercial and recreational abalone catches for November 1995 - October 1996 (commercial catch data are derived from commercial abalone catch returns).

	<i>Commercial</i>	<i>Recreational</i>	<i>Combined</i>	<i>% recreational</i>
Weight (tonnes)	2 001	-	-	
Number (x 1000)	4 169*	133	4 302	3.1
East Coast (no. x1000)	1 476*	90	1 566	5.7

* derived from catch weight using a conversion factor of 0.48 kg per abalone

3.6 Graball, Mullet and Beach Seine Nets

3.6.1 Effort

Recreational net fishing effort can be expressed either as ‘fisher days’, that is the number of days (part or whole) on which individual licence-holders fished with their net or nets, or as ‘net days’, that is the number of days on which individual nets were fished. This distinction is important since 47% of graball net licence-holders had two licensed graballs. Using an example of a fisher with two licensed nets, each day on which he/she fished with both nets would be counted as *one* fisher day but *two* net days.

Total graball net fishing effort was estimated at almost 79 000 fisher days (95% CL 70 000 - 88 000) or 111 000 net days (95% CL 97 000 - 125 000), mullet net effort totalled 4 700 fisher days (95% CL 3 400 - 6 200) and beach seine effort 1 700 fisher days (95% CL 1 100 - 2 400) (Table 10). Since licence-holders are permitted only one mullet net and/or one beach seine, fisher days for these gear types are equivalent to net days. Recreational gillnet fishing effort (graball and mullet net) was, therefore, in the order of 115 000 net days for 1995/96.

On average, each licence-holder fished with their graball net(s) on about 14 days, their mullet net on 7 days and beach seine on just over 3 days (Table 10). When only those licensees who used their gear are considered, average days fished increases to 16 for graball, 13 for mullet net and 7 for beach seine.

Table 10 Recreational net fishing effort for 1995/96. (values in parentheses represent 95% CL range)

	<i>Graball net</i>		<i>Mullet net</i>	<i>Beach seine</i>
	<i>Fisher days</i>	<i>Net days</i>	<i>Fisher days</i>	<i>Fisher days</i>
Total estimate	78 468 (69 648 - 87 660)	110 659 (97 132 - 125 325)	4 743 (3 401 - 6 226)	1 744 (1 153 - 2 416)
Mean per licence	13.8		7.0	3.5
Mean per licence ‘used’*	16.2		12.8	6.9

* based on usage rate estimated for Nov 95 - Jun 96 (refer Table 3)

In terms of total fishing effort for the period November to June (about 66 000 fisher days), less than 15% of graball licence holders (around 800 fishers) together accounted for about half of the total days fished, with 90% of the effort attributable to about 50% (2 900) of the fishers (Figure 10). Similarly, less than 10% of licence-holders (60 mullet net and 50 beach seine fishers) collectively accounted for about half of the total days fished using mullet nets and beach seines (Figure 10).

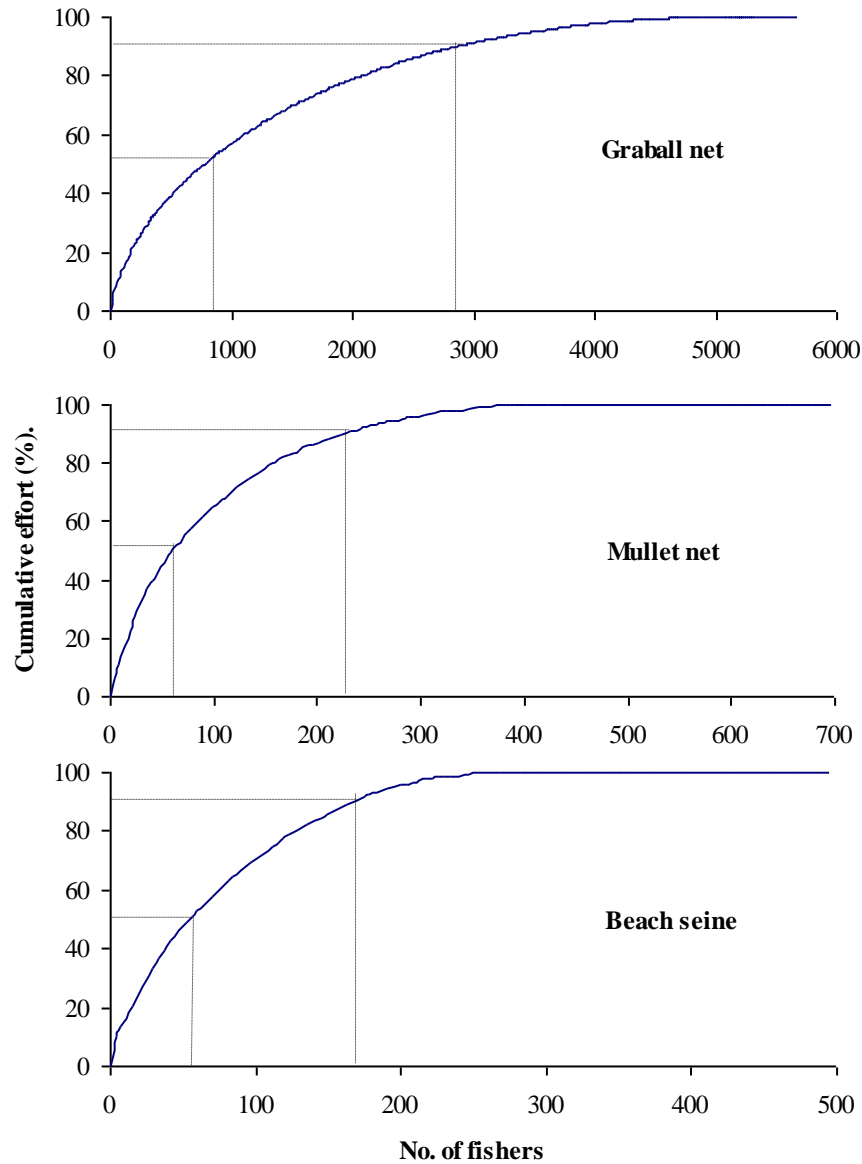


Figure 10 Cumulative effort (fisher days) for holders of graball net, mullet net and beach seine licences (based on data for the period Dec 95 - Jun 96).

3.6.2 Effort by region

Regionally, almost 80% of the graball fishing effort (fisher days) was centred on the East Coast, with 12% off the North Coast and 8% off the West Coast (Figure 11). By contrast, mullet net and beach seine usage was highest on the North Coast (55% for mullet net and 67% for beach seine), followed by the East Coast (32% and 25% respectively) and West Coast (less than 10% in both cases). Comparatively little netting was reported on the Bass Strait Islands.

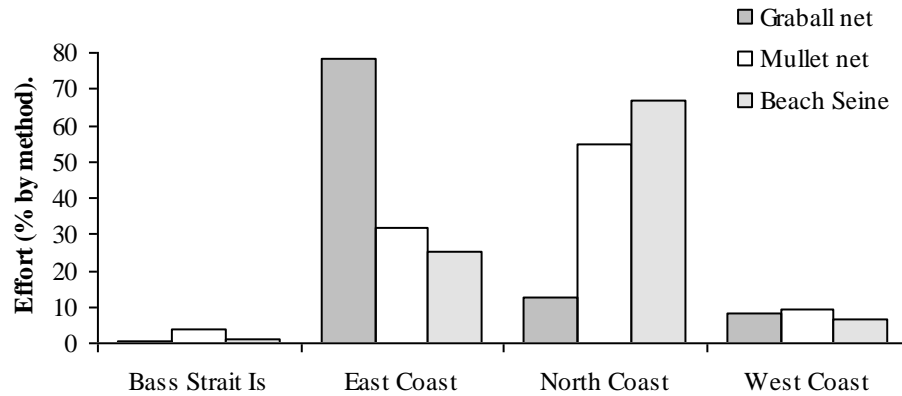


Figure 11 Proportion (%) of total graball net, mullet net and beach seine effort (fisher days) by region for 1995/96.

3.6.3 Effort by season

Net fishing effort was concentrated during the summer months, especially December and January, for the three gear types (Figure 12). In each case over half of the total effort occurred between December and February. Effort levels then declined from February to May, after which they tended to stabilise at low levels. Accordingly, the six months May - October accounted for only 24% of graball, 27% of mullet net and 13% of beach seine effort.

The slight increase in effort during April is likely to represent fishing during the Easter holiday break (early April in 1996).

3.6.4 Main target and catch species

Unlike rock lobster and abalone fishing, no catch data (numbers) were collected for netting. Rather, respondents were asked what the main species (up to two) that they targeted and what were the main species (up to two) that they had caught, for each month in which they reported net fishing activity.

The bulk of fishers (over 75%) nominated at least one target species, untargeted 'effort'⁷ was only reported in about 25% of graball, 10% of mullet net and just under 20% of beach seine cases. Some 40 species or species groups were reported as being targeted and/or caught, with the relative importance of the species varying by method (Table 11). The main species targeted using graball nets were bastard trumpeter and warehou, whereas mullet nets were used mainly to target mullet and, to a lesser extent, Australian salmon. Flounder was the primary target species for beach seines, with Australian salmon, mullet and garfish of secondary importance. These data provide an indication of the relative importance of the various species to recreational net fishers, more detailed catch data for net fishing will be obtained from the subsequent longitudinal diary survey.

A wide range of finfish were taken by graball, with bastard trumpeter a main target in around 37% and the main catch in nearly 50% of instances (Table 11). Warehou too were highly targeted (over 30%) but represented the main catch in only 14% of cases, implying a

⁷ Not effort in the strictest sense - targets were assigned for each month fished and, regardless of the number of days fished (effort) in that month, each record was afforded equal weight.

relatively low success rate in capturing the species. Species of secondary importance in terms of target and catch include striped trumpeter, silver trevally, Atlantic salmon, Australian salmon and flounder. Cod, flathead, wrasse and leatherjacket were not identified as important target species but featured quite strongly in catches.

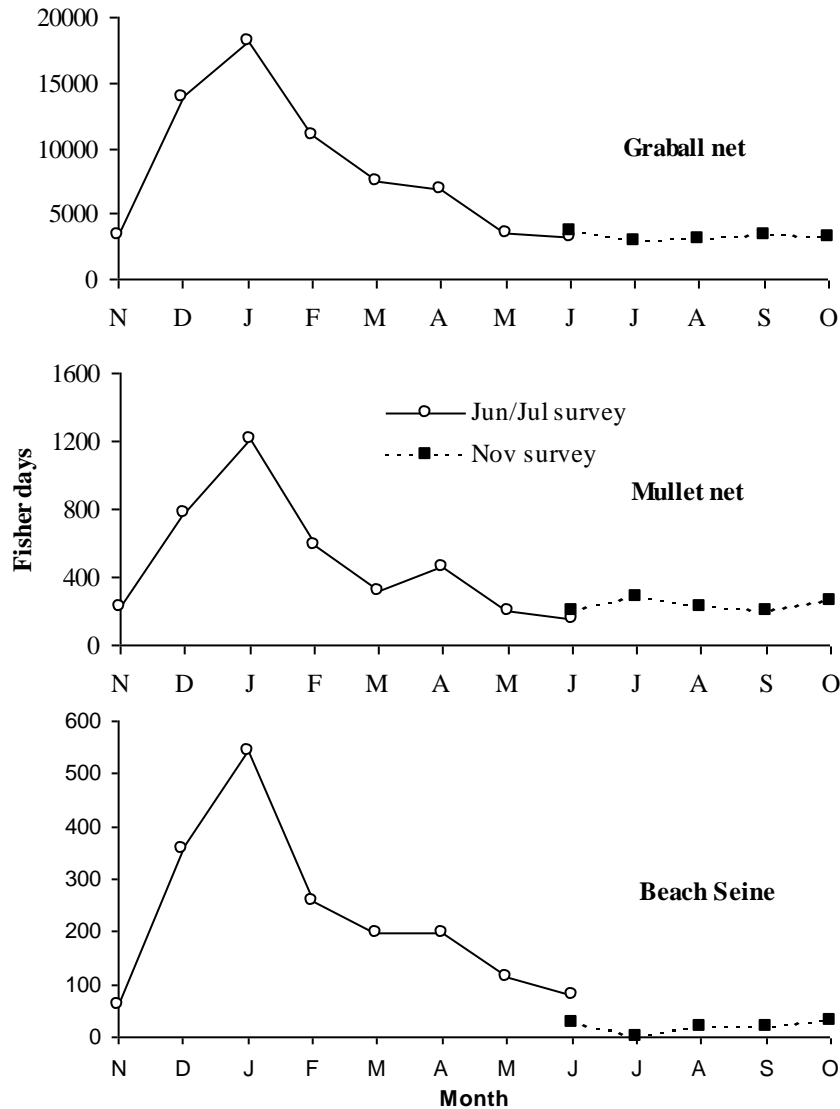


Figure 12 Graball net, mullet net and beach seine effort by month for 1995/96.

The use of mullet nets is highly targeted at mullet (over 80%) and, to a lesser extent, Australian salmon (25%) (Table 11). Species that are not necessarily targeted by mullet nets but of some importance in the catch include flathead, pike and jack mackerel.

Over half of the beach seine ‘effort’ was targeted at flounder, with mullet (17%) followed by Australian salmon (11%), garfish (10%) and flathead (8%) in importance (Table 11). As a main catch, each of these species occurred at rates similar or higher (especially mullet and flathead) than they were targeted. Although not a target species, silver trevally was the main catch in 7% of instances.

Table 11: - Main species targeted and caught (percent of total 'fisher months') for graball net, mullet net and beach seine.

<i>Species</i>	<i>Graball</i>		<i>Mullet net</i>		<i>Beach seine</i>	
	<i>Target</i>	<i>Catch</i>	<i>Target</i>	<i>Catch</i>	<i>Target</i>	<i>Catch</i>
Bastard trumpeter	36.7	46.7	-	1.4	0.9	2.6
Warehou	31.6	14.1	2.8	0	0.9	0
Striped trumpeter	8.4	9.0	-	-	-	-
Silver trevally	8.2	7.6	-	-	-	7.0
Altantic salmon	7.5	9.6	0.5	0	-	-
Australian salmon	5.6	7.3	25.9	34.8	11.4	11.4
Flounder	4.8	6.8	-	1.0	53.5	52.6
Bait	3.3	1.3	3.3	0	0.9	0
Cod	3.2	15.0	-	3.9	3.5	3.5
Jackass morwong	3.0	4.7	-	-	1.8	0
Trout	1.7	2.8	-	-	-	-
Flathead	1.5	6.2	5.2	7.2	7.9	18.4
Mullet	0.8	3.0	83.5	86.0	16.7	28.9
Wrasse	0.8	7.5	0.5	2.9	-	-
Bream	0.7	1.6	-	-	-	-
Leatherjacket	0.7	10.1	0.5	0.5	-	-
Sweep	0.2	0.2	-	-	-	-
Pike	0.2	0.4	3.3	9.2	2.6	2.6
Gummy shark	0.1	0.8	-	-	-	-
Whiting	0.1	0.3	4.2	4.8	-	0.9
Couta	0.1	0.2	-	1.4	2.6	3.5
Jack mackerel	0.1	0.9	7.1	14.5	-	-
Octopus	0.1	0.1	0.5	0.5	-	-
Banded morwong	-	0.7	-	-	-	-
Blue grenadier	-	0.1	-	-	-	-
Boarfish	-	0.3	-	-	-	0.9
Dory	-	0.1	-	-	-	-
Elephant shark	-	0.1	-	-	-	-
Garfish	-	0.2	-	-	10.5	14.9
Marblefish	-	0.4	-	0.5	-	-
Gurnard	-	1.1	-	1.4	-	-
Ling	-	1.6	0.9	0	-	-
Luderick	-	0.1	-	-	-	-
Magpie perch	-	0.1	-	-	-	-
Rock lobster	-	0.1	-	0.5	-	-
School shark	-	0.1	-	-	-	-
Shark (unspecified)	-	0.2	-	3.4	-	-
Skate/rays	-	0.6	-	-	-	2.6
Squid	-	0.1	-	-	-	0.9
Herring cale	-	-	-	0.5	-	-
No specific target	25.7		9.4		18.4	
Total records	1675		212		114	

Seasonality in the pattern of targeting and catch for the top six graball net species is represented in Figure 13. Bastard trumpeter were targeted at consistently high levels throughout the year, with the main catch proportions highest (>50%) between November and February. The level of targeting for warehou generally declined from November, with a sharp decrease in main catch percentages from June onwards. Striped trumpeter, silver

trevally and Australian salmon catch proportions were generally lowest during the winter months. By contrast, the proportion of targeted 'effort' at Atlantic salmon rose during winter and early spring, a trend basically reflected in catch percentages.

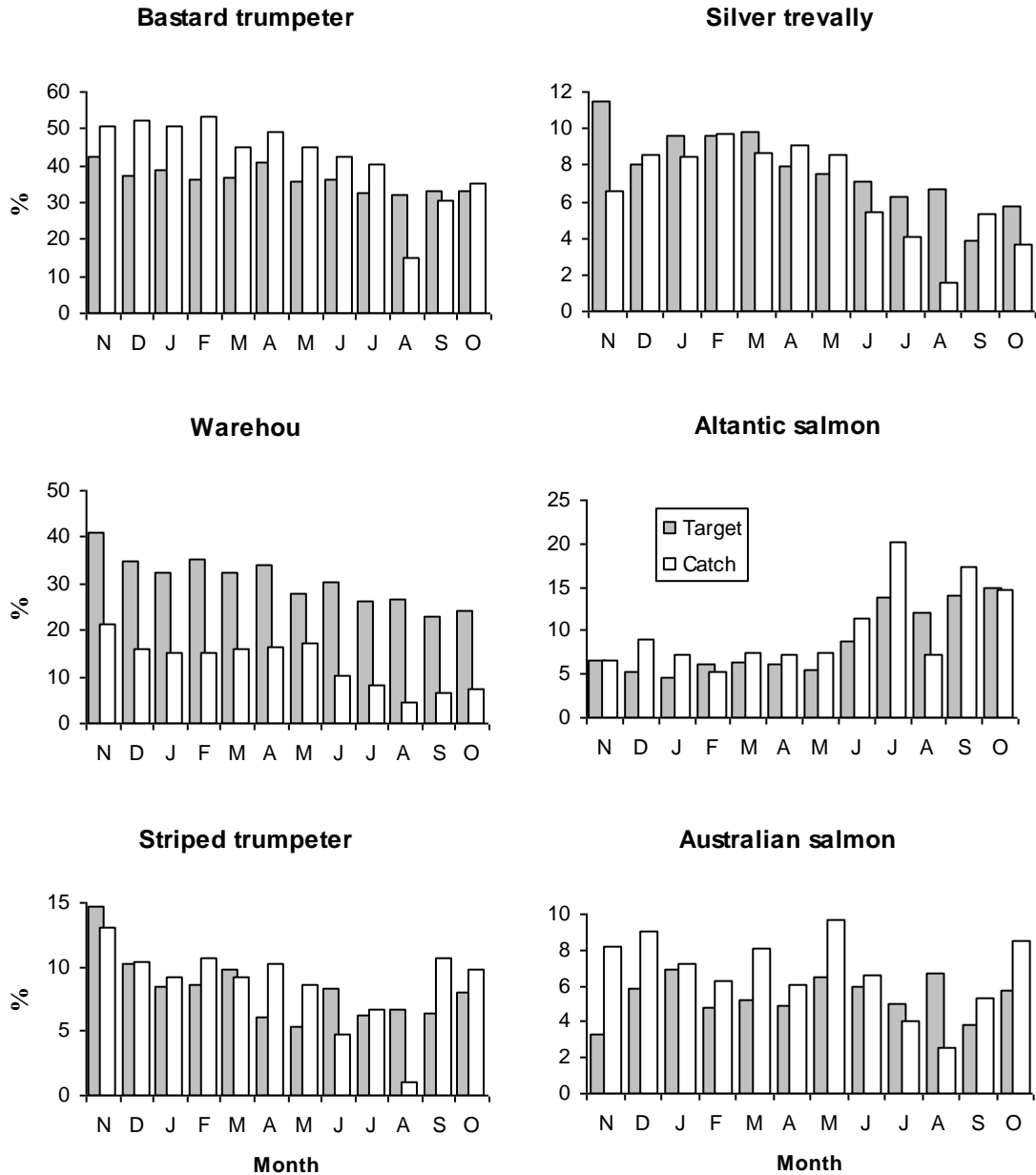


Figure 13 Main target and catch proportions for key graball net species in 1995/96 by month.

3.6.5 Net fishing practices

Respondents who had fished with graball and mullet nets were asked how often each day they (mostly) checked or hauled their nets and whether they left their nets set overnight.

In response, over half of the graball and mullet net fishers reported that they mostly checked their nets only once a day (Table 12). Almost one quarter of mullet net fishers and only 10% of graball fishers indicated that they checked their nets more frequently than twice a day. Over two-thirds of graball net licence-holders at least occasionally left nets set overnight, compared with just 40% of mullet net users.

Table 12 Proportion of licence-holders by frequency of checking/hauling and level of overnight setting of gillnets.

<i>Checking and hauling</i>	<i>Graball</i> %	<i>Mullet net</i> %	<i>Overnight sets</i>	<i>Graball</i> %	<i>Mullet net</i> %
Once a day	51.9	52.4	Mostly	42.4	28.0
Twice a day	36.2	23.9	Occasionally	26.8	15.3
More than twice	11.9	23.8	Never	30.8	56.7

Beach seining is an active fishing method, with the net being set and then hauled back onto the beach. Respondents who reported beach seine activity were asked how many hauls a day they mostly did whilst beach seine fishing. About one third mostly did only one or two hauls per day, with around one in five reporting three hauls and close to half at four or more hauls per day (Table 13).

Table 13 Proportion of licence-holders by the frequency of beach seine hauls per day.

<i>Number of hauls per day</i>	%
One	18.3
Two	15.2
Three	21.3
Four or more	45.2

3.6.6 Net specifications

Basic gear specification details (net length and mesh size for graballs and net length for mullet net and beach seine) were provided by respondents who had reported fishing activity. Some respondents, however, were not certain about the specifications and either answered the questions indicating that they believed their nets were “legal” or they were “unsure”.

Fisheries regulations prescribe that graball nets have a mesh size in the range 100 - 140 mm and a maximum length of 50 m. The majority of graballs (70%) were reported to have mesh sizes of 100 - 109 mm with about one quarter between 110 - 119 mm (Table 14). Very few nets were reported with mesh sizes greater than 120 mm. There were a small number of reports of illegal mesh sizes, the smaller mesh sizes indicating possible confusion with mullet nets. By length, around 80% of nets were reported to be the legal maximum size of 50 m. Net lengths of up to 75 m were reported, suggesting that a small number of fishers might be unaware of length regulations.

Table 14 Reported mesh size and length for recreational graball nets.

<i>Mesh size</i>	<i>Graball net #1</i>		<i>Graball net # 2</i>	
	<i>No. respondents</i>	<i>%</i>	<i>No. respondents</i>	<i>%</i>
Less than 100 mm	4	2.0	1	0.9
100 - 109 mm	137	69.9	78	71.6
110 - 119 mm	46	23.5	26	23.9
120 - 129 mm	5	2.6	1	0.9
130 - 139 mm	2	1.0	3	2.8
140 mm	1	0.5	0	0
> 140 mm	1	0.5	0	0
“Legal”	95		57	
“Unsure”	74		36	
Total	365		202	

<i>Net length</i>				
<i>Net length</i>	<i>Mullet net</i>		<i>Beach seine</i>	
	<i>No. respondents</i>	<i>%</i>	<i>No. respondents</i>	<i>%</i>
Less than 30 m	11	4.6	6	4.9
30 - 39 m	18	7.6	13	10.6
40 - 49 m	13	5.5	8	6.5
50 m	193	81.1	94	76.4
> 50 m	3	1.3	2	1.6
“Legal”	77		56	
“Unsure”	50		26	
Total	238		123	

Mullet nets are defined as gillnets with mesh size of 60 - 70 mm and maximum length of 50 m. Beach seines are required to have a minimum mesh size of 30 mm and maximum length of 50 metres. Although based on small sample sizes, it is apparent that the majority (75%) of mullet nets and just over half of the beach seines were of the maximum permissible length (Table 15). One respondent reported using an over-sized (75 m) beach seine.

Table 15 Reported lengths for recreational mullet net and beach seines.

<i>Net length</i>	<i>Mullet net</i>		<i>Beach seine</i>	
	<i>No. respondents</i>	<i>%</i>	<i>No. respondents</i>	<i>%</i>
Less than 30 m	3	9.4	3	14.3
30 - 39 m	2	6.3	3	14.3
40 -49 m	3	9.4	2	9.5
50 m	24	75.0	12	57.1
> 50 m	0	0	1	4.8
“Legal”	11		9	
“Unsure”	11		6	
Total	54		36	

3.7 Other Fishing Activities, Awareness and Attitudinal Questions

Information presented in this section was collected in the June/July survey and refers to licence-holders 16 years or older (refer section 2.1).

3.7.1 Other fishing activities

Respondents were asked whether they had undertaken any other types of fishing activity in the previous twelve months (Table 16).

Participation levels for rod or handline fishing were very high at over 80%, with an estimated 13% of licence-holders also undertaking some tuna fishing. Flounder spearing was relatively popular (22%), whereas other spear-fishing (basically underwater spearing) was less common (6%). Usage of bait nets was comparatively rare (3%).

An estimated 20% of licence-holders had done some freshwater fishing during the previous year (Table 16).

Table 16 Other fishing activities undertaken by 1995/96 licence-holders, 16 years and older.

	<i>% of licence-holders</i>	<i>95% CL range</i>
Rod or handline fishing	81.0	77.8 - 84.2
Tuna fishing	13.4	10.7 - 16.0
Spearing for flounder	22.2	19.0 - 25.4
Other spear-fishing	5.6	3.9 - 7.3
Bait net usage	3.1	1.7 - 4.6
Freshwater fishing	21.3	18.1 - 24.6

The rate of boat ownership, either sole or jointly-owned, was very high (66%) amongst licence-holders (Table 17).

Table 17 Rate of boat ownership by 1995/96 licence-holders, 16 years and older.

	<i>% of licence-holders</i>	<i>95% CL range</i>
Boat ownership	66.0	61.2 - 70.8

3.7.2 Frequency of recreational fishing

Respondents were asked on how many separate days in the previous twelve months (July 1995 - June 1996) had they done any kind of recreational sea fishing (including licensed fishing). The majority (65%) had fished for fewer than 21 days, with a small proportion (3%) not fishing at all and one third fishing 1 to 10 days (Figure 14). Approximately 22% of licence holders fished for greater than 30 days, 8% for more than 50 days and 2% for over 100 days in the previous year.

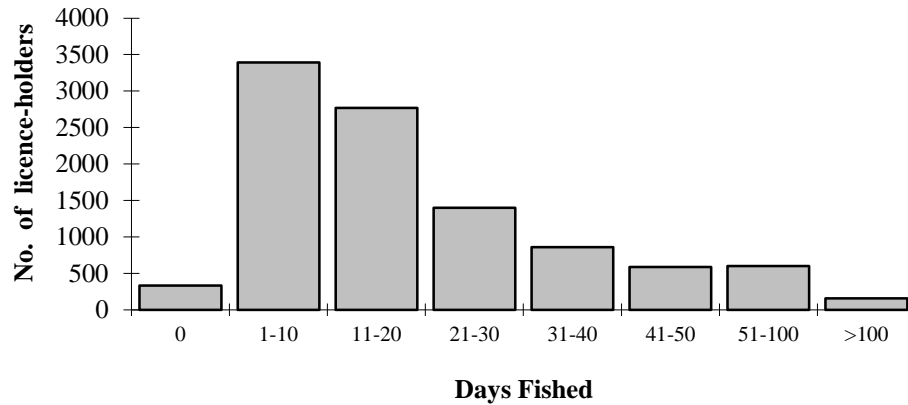


Figure 14 Total days fished by licence-holders in the twelve months prior to June 1996.

3.7.3 Club membership

Respondents were asked whether they were currently a member of a fishing/dive club or association. The estimated level of club membership was around 10% amongst licence-holders, of whom almost half were members of dive clubs, 20% freshwater fishing clubs and around 10% were associated with game fishing clubs (Table 18). Membership of the Tasmanian Amateur Sea Fisherman's Association (TASFA) was low (6% of club members), but it should be noted that several clubs in other categories are affiliated with TASFA. A small proportion of recreational licence-holders are also commercial fishers, reflected in their membership of commercial fishing associations.

Table 18 Details of club/association membership for 1995/96 licence-holders, 16 years and older, with breakdown by club type.

	% of licence holders	
		95% CL range
Any Club/association membership	9.9	7.6 - 12.2
<i>Club type</i>	<i>Membership by club type %</i>	
• Dive clubs	47.5	
• Freshwater fishing clubs	20.2	
• Game fishing clubs	11.2	
• Tasmanian Amateur Sea Fisherman's Association	6.1	
• Other	5.3	
• Commercial fishers associations	4.5	
• Sea fishing clubs	3.3	
• Australian National Sportfishing Association	1.8	

3.7.4 Satisfaction with fishing

Respondents were asked how satisfied (in general) they had been with the sea fishing in Tasmania over the previous few years. In response, nearly two-thirds reported being at least quite satisfied, a third less than satisfied and a small minority (3%) were unsure (Table 19).

Table 19 Satisfaction with sea fishing in general, 1995/96 licence-holders, 16 years and older.

<i>Response</i>	<i>%</i>
Very satisfied	10.4
Quite satisfied	54.4
Not very satisfied	27.7
Not at all satisfied	4.9
Unsure	2.6
Total	100

Respondents who indicated that they were not satisfied with sea fishing were then asked for the reasons/causes for their dissatisfaction (Table 20). Overwhelmingly, the main reason given was the depleted state of the fish stocks (ie low catches/catch rates), with overfishing being perceived as the primary cause. Overfishing by commercial operators was stated as the main cause in 65% of instances, while 9% of respondents considered that overfishing by recreational fishers was a contributing factor. Illegal fishing activity and poor management were also given as causes for dissatisfaction.

Table 20 Main reasons and perceived causes for dissatisfaction with sea fishing.

<i>Main reason for dissatisfaction</i>	<i>%</i>
Low stock levels	97.8
Degraded habitats	0.5
Other	1.6
<i>Perceived cause associated with dissatisfaction</i>	
Overfishing	16.2
Overfishing by commercial fishers	64.6
Overfishing by recreational fishers	8.5
Illegal fishing activities	2.3
Inappropriate management	3.1
Other	5.4

3.7.5 Satisfaction with management

Respondents were asked how satisfied (in general) they had been with the overall management of sea fishing in Tasmania. Almost 60% reported being at least quite satisfied, nearly one third were less than satisfied and almost one in ten were unsure (Table 21).

Table 21 Satisfaction with the management of sea fishing, 1995/96 licence-holders, 16 years and older.

<i>Response</i>	<i>%</i>
Very satisfied	6.8
Quite satisfied	52.9
Not very satisfied	24.8
Not at all satisfied	5.7
Unsure	9.7
Total	100

A number of reasons were given for dissatisfaction, the main ones in order of importance included inadequate policing, inadequate controls on commercial fishing, the recreational licensing system (cost of licences, value for money, etc) and general concerns about poor management (Table 22). A number of respondents mentioned a general lack of feedback from management and a lack of recognition of recreational fishers interests when making management decisions. A small number of respondents also cited alienation of waters to marine farms and even the lack of marine reserves as their reasons for not being satisfied.

Table 22 Main reasons for respondent dissatisfaction with the management of sea fishing.

<i>Main reason for dissatisfaction</i>	<i>%</i>
Inadequate policing	26.3
Inadequate controls on commercial fishing	21.0
Recreational licensing system (cost, benefits)	14.1
General mismanagement	9.3
Regulations too restrictive	7.8
Regulations too lax	6.8
Input (and feedback) into management inadequate	4.4
Recreational interests not considered adequately	3.4
Other	3.4
Alienation of waters to marine farms	2.0
Too few marine reserves	1.5

3.7.6 Satisfaction with fishing and diving association representation

Respondents were asked how satisfied they were with the overall representation of their own interests by recreational fishing and diving organisations. The main feature of responses to the question was very high 'unsure' response (over 50%), indicating a generally low awareness of the role of the clubs/associations (Table 23). Although relatively low at less than 40%, satisfaction with club representation was over four times higher than the dissatisfaction rating (8%).

Table 23 Satisfaction with recreational fishing and diving association representation, including reasons for dissatisfaction.

<i>Response</i>	<i>%</i>
Very satisfied	5.5
Quite satisfied	32.6
Not very satisfied	4.7
Not at all satisfied	3.6
Unsure	53.6
Total	100

Of those respondents who expressed dissatisfaction, almost three quarters (72%) gave the low public profile of the associations and generally poor representation of members' interests as their main reason for dissatisfaction. Approximately 22% (almost exclusively rock lobster potters) were concerned that dive clubs encourage the taking of rock lobsters by diving.

3.7.7 Main sources of information about recreational fishing

Respondents were asked about sources of information they may have used to find out about recreational fishing in Tasmania. As a main source, other fishers (45%) and print media (23%) (but not fishing magazines) were identified as the most important (Table 24). Department of Primary Industry and Fisheries (DPIF) publications, principally the recreational sea fishing booklet (up-dated each year with recreational fishing regulations and information) and TV fishing programs were of secondary importance.

In terms of the top three information sources, the order of importance was other fishers (67%), other print media (43%), DPIF publications (20%) and TV (15%). Fishing magazines, tackle shops, radio and clubs/associations were not rated highly as sources of information about fishing (all less than 8% of mentions).

Table 24 Main sources of information about recreational fishing, 1995/96 licence-holders, 16 years and older.

<i>Source</i>	<i>Any mention (%)</i>	<i>Main source (%)</i>	<i>2nd source (%)</i>	<i>3rd source (%)</i>
Other fishers	66.8	44.7	17.2	9.5
Other print media	43.4	23.1	19.3	3.5
DPIF publications	20.2	9.8	8.8	3.5
TV	15.2	6.8	5.9	4.6
Fishing magazines	7.9	2.4	3.1	4.1
Radio	6.8	1.2	4.5	2.3
Clubs/associations	5.3	1.4	3.6	0.8
Tackle shop	4.9	2.4	1.9	1.1
Other*	4.8	2.2	2.4	0.6
None	5.9	5.9	33.4	70.1
Total	181	100	100	100

* Almost exclusively personal experience

3.7.8 Voluntary code of practice for recreational fishing

In 1995 a voluntary code of practice was developed jointly by the recreational fishing community and DPIF and a booklet published. In order to assess the level of awareness of the code, respondents were asked whether or not they had seen or heard of it. In response, just under one third of respondents (32%) reported some awareness of the code, with over half (59%) claiming no knowledge and close to one in ten (9%) unsure (Table 25).

Table 25 Awareness of the code of practice for recreational fishing by 1995.96 licence-holders, 16 years and older.

<i>Aware of Code of Practice</i>	<i>%</i>
Yes	31.9
No	59.3
Unsure	8.8
Total	100

3.7.9 1995 DPIF recreational fishing booklet

Each year DPIF produces a booklet which provides a summary of fisheries regulations and other information about recreational fishing in Tasmania. The booklet is made available free of charge to fishers from the point of sale of licences (DPIF offices and post offices).

Respondents were asked whether or not they had seen the 1995 booklet and, if so, whether they still retained a copy. In response, the vast majority (84%) indicated that the booklet had been seen (Table 26). Based on the response to the second part of the question, an estimated 77% of licence-holders still retained a copy of the booklet.

Table 26 Awareness of the 1995 recreational fishing booklet by licence-holders, 16 years and older..

<i>Booklet seen</i>	<i>%</i>
Yes	83.9
No	14.1
Unsure	1.9
Total	100

3.7.10 Attitudes to selected management proposals

Respondents were asked whether they agreed or disagreed with a number of suggestions concerning the management of sea fishing in Tasmania. In conducting the interviews, it was stressed that suggestions were not necessarily proposals of the DPIF or Government.

Nearly 80% agreed with the establishment of certain areas specifically for recreational fishing, by restricting most commercial fishing activities in those areas (Table 27). There was also strong support (nearly 84%) for the protection of fish stocks in particularly sensitive areas, by not allowing any commercial or recreational fishing in such areas (Table 27).

Table 27 Responses to suggestions relating to the management of sea fishing in Tasmania, 1995/96 licence-holders, 16 years and older.

<i>Response</i>	<i>Recreational only fishing areas (%)</i>	<i>Areas closed to fishing (%)</i>
Agree	79.6	83.7
Disagree	14.4	9.0
Unsure	5.9	7.3
Total	100	100

A series of options relating to the use of gillnets was also posed to respondents, the results of which appear in Table 28. In order to determine whether, in general, gillnet fishers differed from non-net fishers in their responses to these questions, data were also considered on the basis of whether or not respondents held gillnet (graball and/or mullet net) licences.

Almost twice as many fishers agreed (62%) as disagreed (32%) with the suggestion to reduce the maximum number of graball nets from two to one per person. Not surprisingly, the level of support for the option among net fishers was lower (58%) than among non-net fishers (69%), but significantly still represented a majority of net fishers.

A suggestion to reduce the maximum length of mullet nets from 50 to 25 m was supported by just under half of all fishers, with one third disagreeing and over 20% unsure. Support for the proposal from non-net fishers was slightly over 50%, compared with about 40% from net fishers (and only 25% for mullet net licence-holders). Greatest resistance (71%) to the suggestion was from mullet net fishers.

The vast majority (nearly 80%) agreed with restricting the maximum number of nets per boat to three. Both net and non-net fishers strongly supported this suggestion, though levels of disagreement differed - 6% for non-netters and 20% for netters. A greater proportion of the non-netters were unsure about the suggestion.

The final option to restrict usage of all gillnets to daylight hours only (ie prohibit overnight netting) was strongly opposed, with less than 30% in favour and over 60% disagreeing. Approximately half of the non-net and 70% of net fishers disagreed with the suggestion.

Table 28 Responses to suggestions relating to the management of gillnet fishing in Tasmania, 1995/96 licence-holders, 16 years and older.

<i>Response</i>	<i>Reduce number of graballs to one per person</i>	<i>Reduce length of mullet nets</i>	<i>Restrict number of nets to 3 per boat</i>	<i>Restrict netting to daylight hours</i>
Agree	62.4	45.3	77.5	28.6
Disagree	31.7	30.9	15.0	61.1
Unsure	5.9	23.7	7.5	10.3
<i>Non-net licence-holders</i>				
Agree	68.8	53.5	80.5	33.6
Disagree	19.5	21.9	5.9	49.0
Unsure	11.7	24.6	13.6	17.5
<i>Net licence-holders</i>				
Agree	58.0	39.3	76.2	25.0
Disagree	40.2	37.6	20.6	69.7
Unsure	1.8	23.1	3.2	5.4

4 DISCUSSION

4.1 Licensed Fishing - Catch and Effort

Overall, about 80% of all recreational sea fishing licences issued in 1995/96 were used, usage rates varying with fishing method. Highest usage rates (>80%) were estimated for rock lobster pot, rock lobster dive, graball net and abalone dive licences while rates were lowest (< 60%) for beach seine. To some extent, the licence fee structure, namely a base-fee for the first licence (\$35) with additional licences costing just \$5 each, provides some incentive for fishers to take out multiple licences, even when there is a low expectation of using all of the licences.

The estimated recreational catch of rock lobster for the 1995/96 season of about 111 000 lobsters compares to previous estimates of 250 000 for 1986/87 (Schaap, unpubl. data) and 60 tonnes, equivalent to approximately 76 000 lobsters, for 1991/92 (ABS 1994). By comparison with the 1991/92 catch of 25 tonnes, or about 52 000 abalone (ABS 1994), the 1995/96 estimate was substantially higher, at around 133 000 abalone.

Comparison between years is, however, complicated by the fact that different survey methodologies, and consequent biases, apply to each of these estimates. The 1986/87 rock lobster survey was based on a self-administered questionnaire, completed at the time of re-licensing, and is subject to self-reporting, non-response and recall biases. By contrast, the 1991/92 ABS survey was part of a general household survey of home food production in which respondents were asked to estimate the weight of a variety of food stuffs, including rock lobster and abalone, 'home produced' over the previous twelve months. The present survey, while also involving retrospective data collection, was based on a stratified random design that was specifically developed to address licensed fishing and, as seen from consistently high response rates, non-response bias was minimal. Given these differences, it would not be valid to conclude that 1995/96 was either a better or worse fishing season (in terms of catch) for rock lobster and abalone, than earlier years.

Potting was the main method of catching rock lobster, accounting for nearly two thirds of the recreational catch. Divers took just under one third and the remainder was caught using rock lobster rings or as a by-catch of gillnetting. In terms of days fished, potting effort was almost four times that for diving (80 000 compared with 22 000 fisher days) but average daily catch rates for diving (1.6 rock lobster) were over twice those for potting (0.9 rock lobster). The overall average catch rate for abalone was 5 per day.

In the case of rock lobster and abalone, factors influencing catch rates not only include the abundance/availability of fish, efficiency of the method, skill of the fisher but also the existence of daily bag limits (5 for rock lobster and 10 for abalone). However, as respondents reported catch and effort pooled by month, the impact of bag limits on catches (and hence catch rates) remains unclear⁸.

For both rock lobster and abalone, around 90% of the total catch for each method was taken by just half of the licence-holders or, conversely, half of the fishers collectively accounted for just 10% of the catches. This analysis clearly demonstrates that a small proportion of avid/skilled anglers can have a particularly high impact on the overall fishery.

⁸ ie, how often they were reached and fishing either ceased or excess fish were released.

Regionally, recreational abalone and rock lobster fishing effort was heavily concentrated off the East Coast, highest catch rates were, however, reported for the West Coast. The importance of the East Coast lies in its proximity to the major population and holiday centres, accessibility (including placement of boat ramps) and its generally protected waters. The West Coast, although producing good catch rates, is more remote, less populated and subject to more unfavourable sea conditions. Despite the presence of several large population centres along the North Coast, this region was less significant for rock lobster and abalone fishing than even the West Coast. The limited availability of suitable reef habitat and apparent low abundances (reflected in the comparatively poor catch rates) are probably contributing factors.

By comparison with the commercial fisheries for rock lobster and abalone, the recreational catches were relatively small, representing just 5% of the total catch of rock lobster and 3% of the abalone catch. Off the East Coast, however, the recreational rock lobster catch accounted for almost 30% of the total. Whilst representing a significant share of the catch for that region, the inshore East Coast produces only a small portion (< 10%) of the total commercial rock lobster catch. By contrast, the recreational abalone catch represents a small component of the total fishery, even within the region of highest recreational fishing activity.

The recreational rock lobster and abalone fisheries are highly seasonal, with fishing activity peaking over the summer holiday period, especially during December and January. By late autumn (May), catch and effort were at low levels, which remained relatively stable until the end of the licensing year (or season for rock lobster). Catch rates for rock lobster generally declined as the season progressed for potting but were relatively consistent over the whole season for diving. These differences can be explained, in part, by the fact that potting is a passive fishing method whereas diving involves actively searching for rock lobster. Pots rely on a behavioural response from rock lobsters to the bait and as the available number of legal sized lobsters are fished down during the season, the chance of catching a lobster declines. Divers, on the other hand, actively search for lobsters and can compensate to some extent for low abundances by increasing search times (a measure of effort not recorded in this study).

Of the diving methods, surface air (hookah) was the most popular method used to take rock lobster whereas snorkelling was the main method for abalone. On average catch rates were highest for divers using surface air, followed by snorkelling and scuba. Rather than implying that hookah gear makes divers more effective at catching rock lobster, it is more probable that hookah users tend to be more experienced and/or more 'serious' about searching for rock lobster and abalone. The reason scuba catch rates tended to be lower than snorkel is not immediately apparent.

Recreational gillnet fishing is a significant activity in Tasmania, with about 115 000 net days fished in 1995/96, of which 95% was graball and 5% mullet net effort. Beach seine effort was estimated at around 1 700 fisher days. In each case, fewer than 15% of the licence-holders collectively accounted for half of the total effort, with greater than half of the fishers contributing less than 10% to the totals. Although catch was not estimated, the impact of recreational net fishing on inshore fish stocks is likely to be significant.

Information about targeting and main species caught indicated that a wide variety of finfish are caught using graballs, with bastard trumpeter and warehou the principal target species. Species of secondary importance include striped trumpeter, silver trevally, Atlantic salmon, Australian salmon and flounder. While not identified as important target species, cod,

flathead, wrasse and leatherjackets featured quite strongly in catches, indicating they are common by-catch species. The popularity of fishing with graballs in Tasmania is no doubt linked to the fact that the two principal target species, namely bastard trumpeter and warehou, will rarely take a baited hook and are thus difficult to catch on lines.

The smaller meshed mullet nets are used mainly to catch mullet and Australian salmon, with flathead, pike and jack mackerel generally taken as by-catch. Flounder, mullet, and Australian salmon are the main beach seine species.

Regionally, about 80% of the graball effort was concentrated off the East Coast whereas for mullet net and beach seine fishing, the East Coast was of secondary importance behind the North Coast. The significance of the East Coast for net fishing includes factors reported above for rock lobster and abalone, noting also that fishing with rock lobster pots and gillnets are often linked. The importance of the North Coast for mullet net and beach seines would appear to be largely a function of the availability of the main target species, ie mullet, Australian salmon and flounder, which are relatively abundant in the region.

Along with rock lobster and abalone fishing, net fishing effort exhibited a strong seasonal pattern characterised by a summer peak, in particular in December and January, with comparatively little fishing activity during winter and early spring. A number of scalefish species (eg bastard trumpeter, warehou, flathead, etc.) tend to be more abundant (available) during summer and early autumn (based on commercial catch rate information), at a time when recreational netting activity is also greatest. There was some limited evidence of seasonality in species targeting and catch, with levels for bastard and striped trumpeter, warehou, silver trevally and Australian salmon generally higher between November and May than at other times of the year.

Analysis of fishing practices indicated that about half of all gillnet fishers mostly checked their nets at least twice a day. Over two-thirds of graball net fishers and less than half of mullet net users at least occasionally left their nets set overnight. The reason for differences in the rates of overnight setting is not clear but may be related to prevailing sea conditions (North Coast being more exposed than the East Coast), levels of by-catch and hence wastage (expected to be higher for smaller mesh sizes), etc. Over 80% of beach seine fishers reported more than one haul for each day fished, with almost half reporting four or more hauls a day.

Survey data indicate that the vast majority (80%) of recreational graballs are 50 m in length and most have mesh sizes between 100 - 109 mm (4-4.25"), with about one quarter with larger meshes, primarily 110 - 119 mm (4.5"). Choice of mesh size will be determined to some extent by the species targeted. The majority of mullet nets (75%) and just over half of the beach seines were reported to be the maximum legal length of 50 m.

4.2 Other Fishing Activities, Awareness and Attitudes

The number of Tasmanians currently engaged in some form of recreational fishing activity is unknown, the only estimate available, 25% of Tasmanians or 107 000 people, was determined in 1983 (ABS 1984). Although out of date, these data imply that licensed fishers represent about 10% of all recreational anglers which, when coupled with the types of fishing undertaken, suggests that licensed fishers will not necessarily be representative of all recreational anglers in terms of avidity, fishing activities, awareness and attitudes.

Inferences about such issues determined in this study are only really valid for licensed fishers.

In addition to licensed fishing activities, the majority (80%) of licence-holders did some rod and line fishing, with flounder spearing also relatively popular (20%). Just over 20% of licensed fishers also fished in freshwater. These participation rates are broadly comparable to those determined in the 1983 survey of recreational fishing, where about two thirds of all salt water anglers fished with rod and line (for flathead), around 20% did some spearing for flounder and 21% also fished in freshwater (ABS 1984).

In 1983, about 38% of Tasmanian households either owned or had access to a boat and over 70% of boats owned (or part owned) by householders were used for fishing (ABS 1984). The rate of boat 'ownership' amongst licence-holders is much higher (66%), which is to be expected since most licensed fishing activities are undertaken from a boat.

Just over one third of licence-holders had fished for ten or fewer days in the previous twelve months, while fishers reporting more than 20 days fished represented 36% of licensees. A small proportion (7%) of fishers can be considered to be particularly avid (fishing more than 50 days a year). In the 1983 survey, the majority of fishers were found to fish either 'occasionally' or 'whilst on holidays', with those fishing once a month or more representing around one fifth of all anglers (ABS 1984). Comparison between the general population of recreational fishers and licence-holders is further complicated by the fact that questions relating to past fishing were different in the two surveys.

Recent surveys of recreational fishing in South Australia (Cierpicki *et al.* 1997) and Queensland (Roy Morgan Research 1996) have estimated fishing club membership at below 5% for recreational anglers. Club membership amongst licence holders in Tasmania, although twice this rate, is still low in relation to the total number of fishers.

A clear majority of fishers were generally satisfied with the state of recreational fishing in Tasmania. For those who were not satisfied, the depleted state of the fish stocks was identified as the main reason for dissatisfaction, with overfishing (primarily by commercial operators) considered the main cause of the poor resource status. Although most respondents were satisfied with the management of Tasmania's sea fishing, inadequate policing and lack of controls on commercial fishing activities were identified as the main reasons for dissatisfaction.

There was a high level of uncertainty regarding recreational fishing association representation, implying that many fishers know very little about the role and activity of these organisations. This is undoubtedly reflected in the low fishing/diving club membership rate amongst licence-holders. Of those respondents who expressed an opinion about this matter, four times as many were satisfied with the representation as were dissatisfied.

If information/education programs are to be developed for recreational fishing, it is important to access the main sources of information used by fishers. Apart from other fishers, print media such as fishing columns in newspapers (but not necessarily fishing magazines) have been identified as important information sources. Regarding Departmental publications, there was an extremely high awareness of the recreational fishing booklet among licence-holders.

In terms of the management options canvassed, strong support exists for 'recreational only' fishing areas and for the closing of specific areas to all fishing to conserve fish stocks. Of suggestions designed to reduce gillnet effort, greatest support was given to restricting the number of nets per boat to three, followed by a reduction in the number of graballs from two to one per person. Reduction in the length of mullet nets gained only moderate support with greatest opposition given to the prohibition of overnight netting. Not surprisingly, for each question the proportion of net fishers supporting restrictions was lower than amongst non-net fishers, though in all but the last two there was still majority support from net fishers.

4.3 Future Directions

The present study represents a preliminary assessment of the recreational fisheries for rock lobster, abalone and net fishing in Tasmania. Being based on recall, results will be subject to the ability of respondents to accurately remember information about previous fishing activity. Several overseas studies have demonstrated that recall bias can lead to significant over-estimates of both catch and effort, the extent of the bias being influenced by not only the length of the recall period but also the frequency of participation (Fisher *et al.* 1991; Tarrant *et al.* 1993; Connelly and Brown 1995). Careful questionnaire design and thorough training of interviewers were key elements employed to help minimise this bias, along with limited recall periods (maximum of eight months). Notwithstanding this, the influence of recall bias on data precision is very difficult to assess and as a consequence, catch and effort data should be regarded as indicative rather than absolute.

Cost effective collection of detailed catch and effort data for the recreational fishing sector is no simple task. For small areas (eg individual river), creel surveys produce greater precision in terms of reporting accuracy, species identification and size data, but are comparatively expensive to undertake. When larger scale assessment is required (in time and space), creel surveys become cost prohibitive.

By contrast, conventional general population surveys have limited application in recreational fisheries assessment, being most suited to measuring participation, broad effort and species targeting. For detailed catch and effort data, respondent recall becomes a problem as it is unrealistic to expect respondents to recall fishing activity in detail over a full year.

Prospective data collection is the best approach with some form of angler logbook/diary an obvious solution. Building on the present study, a follow-up survey (utilising a combination of fishing diary and frequent interviewer contact) has been implemented and will provide a detailed assessment of the licensed recreational fishery in terms of catch and effort for the 1996/97 and first half of the 1997/98 licensing years. This study will also investigate the influence of recall bias on catch and effort estimation through direct comparisons of data collected by diary and by recall surveys. In this way it may be feasible to account/correct for recall bias and therefore refine the estimates presented in this report.

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References

- ABS (1984). Household fish consumption and non-commercial fishing activities, Tasmania. *Australian Bureau of Statistics*.
- ABS (1994). Home production of selected food stuffs, Australia, year ended April 1992. *Australian Bureau of Statistics*. Cat. No. 7110.1.
- Cierpicki, S., Riquier, C. and Kennedy, R. (1997). South Australian recreational fishing survey 1997. *South Australian Fisheries Management Series Paper No. 25*, 58pp
- Cochran, W.G. (1977). *Sampling Techniques* (Third Edition) John Wiley & Sons, New York, 428pp.
- Connelly, N.A. and Brown, T.L. (1995). Use of angler diaries to examine biases associated with 12-month recall on mail questionnaires. *Transactions of the American Fisheries Society* **124**: 413-422.
- Fisher, W.L., Grambsch, A.E., Eisenhower, D.L. and Morganstein, D.R. (1991). Length of recall and accuracy of estimates from the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. *American Fisheries Society Symposium* **12**: 367-374.
- Roy Morgan Research (1996). Recreational fishing in Queensland - A survey of Queensland residents. Prepared for Queensland Fisheries Management Authority. Roy Morgan Research, East Brisbane.
- Smith, J T. (1994). Charter fishing for tuna in Tasmania. Department of Primary Industry and Fisheries *Recreational Fishing Report No. 1*, 26pp.
- Tarrant, M.A., Manfredo, M.J., Bayley, P.B. and Hess, R. (1993). Effects of recall bias and nonresponse bias on self-report estimates of angling participation. *North American Journal of Fisheries Management* **13**: 217-222.
- Winter, O.N. (1985). The Derwent Estuary recreational fishing survey, Research Report No. 1. *Urban Fringe Recreation Programme Environmental Report No. 8*, 80pp

APPENDIX 1: June/July survey questionnaire

