INTERNAL REPORT

SPECIES AND SIZE COMPOSITION OF RECREATIONAL CATCHES BASED ON 2000/2001 CREEL SURVEYS

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Summary

The present study was undertaken as a component of the 2000/01 National Recreational Fishing Survey (NRFS) and was designed to evaluate the ability of recreational fishers to correctly identify their catch and provide size composition data for the major recreational finfish species. Representative size composition data is required to convert catch estimates, reported as numbers in the NRFS, into weights so that comparison can be made with the commercial fishery. This study also provided an opportunity to collect independent information about catch composition and to examine issues of compliance with fisheries regulations.

Intercept surveys, covering boat and shore-based fishing at a number of coastal centers on the north, east and south-east coasts of Tasmania, were conducted between September 2000 and April 2001. A non-random survey design was adopted, with over 2,000 fishing parties interviewed. Over 80% of the fishing events monitored involved line fishing, methods such as the use of rock lobster pots, gillnets and dive collection were of secondary importance.

Flathead, principally sand flathead, dominated the line catch (80% by number), though catch composition for each fishing trip was strongly influenced by targeting. For instance, albacore and striped tuna were the major catch taken when gamefishing.

Blue warehou, bastard trumpeter and leatherjackets were the primary catch in gillnets. Rock lobster accounted for almost all of the catch taken by pots while abalone and rock lobster were the primary components of the dive catch.

Information was collected on release/discarding rates for line fishing; with low rates of release (<10%) identified for albacore tuna, tiger flathead and blue eye trevalla, moderate rates (40-50%) for sand flathead, whiting, mullet and bream and high rates (>70%) for gurnards, sharks and rays and pufferfish. While no direct inferences can be made about post release survival rates, with almost half of all line caught fish released, there is potential for fishing induced mortality to be substantially higher than indicated simply by the size of the retained catch alone.

This study confirmed that Tasmanian fishers were able to correctly identify their catches to the level of reporting required by the NRFS (i.e. to species or species group) with a very high degree of accuracy.

Size composition data were gathered for a wide variety of finfish species, although sample sizes were relatively small in some cases. This situation was exacerbated to some extent by the fact that fish were often filleted at sea. There was evidence of regional differences in size structure of sand flathead and marked differences in the size composition between shore and boat based catches. Fishing method also influences size structure. In order to provide representative data, it is recognised that consideration need to be given to spatial, temporal and fishing method factors.

Of particular importance to management was the finding that about 30% of the retained catch of sand flathead by number was below the minimum legal size limit of 30 cm. Although an improvement over the situation observed in 1997/98 (40% undersized), this remains an issue of concern, especially given the importance of the species to the recreational fishery. The problem of undersized fish tended to be lower (<5% of the catch numbers) amongst most of the other species examined. There is a clear need to improve fisher awareness of and compliance with minimum size regulations, especially for flathead.

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1. Introduction

The 2000/01 National Recreational Fishing Survey (NRFS) was designed to provide comprehensive catch, effort and economic information at national, state and regional scales. The NRFS was implemented as a series of nationally coordinated state-wide surveys, using a combined telephone/diary methodology as the primary source of data collection. As such, these primary data were collected ‘off-site’, with respondents self-reporting fishing activity, including catches, via frequent telephone contact with survey interviewers (Lyle *et al*. 2002). The question of how reliable respondents are in being able to correctly identify their catches was identified as an important issue in terms of data quality and utility. Furthermore, it was recognised that there are problems with fishers estimating fish size and weight and as a consequence respondents were only required to report catches in terms of numbers.

As a component of data validation/calibration for the NRFS, a limited program of on-site (creel) surveys was conducted in each State and Territory of Australia. Sampling effort was directed at sites and during periods of greatest recreational fishing activity. In this regard these surveys were not designed to provide representative catch and catch rate information but were primarily intended to evaluate the identification skills of fishers, in terms of the level of detail required by the diary survey, and to assess the size structure of the catches. From size composition information it is possible to assess mean lengths and weights for key recreational species, the latter can be applied to convert catch numbers, as reported by diarists, to weights. This latter aspect has relevance when comparing fish catch or production levels between commercial and recreational sectors.

The present report describes the creel survey methodology and key findings from the Tasmanian on-site survey component of the NRFS. These findings will contribute to a more detailed synthesis of the recreational fishery data provided by the NRFS (to be reported elsewhere).

Although not a primary objective, direct examination of recreational catches also provides an independent verification of catch composition and catch rates along with insights into the level of compliance with fisheries regulations, for instance size limits.

2. Methods

A team of creel survey agents located at various sites around the north, east and south-east coasts of Tasmania was recruited and trained in fish identification and interview techniques. This provided broad spatial coverage of the recreational fishing activity, with surveys conducted between September 2000 and April 2001, inclusive.

A non-random survey design was adopted in order to maximise the number of interviews and the types of fishing surveyed. Survey agents were encouraged to survey boat ramps of shore fishing sites in their local area at times when fishers were likely to be returning from fishing trips or actively fishing. Sampling effort was therefore concentrated on weekends and public holidays. In addition, greater sampling intensity was directed during the peak fishing months of December-February and also during the Easter holiday period. Choice of sampling site on a given day was determined to some extent by local knowledge of the types of fishing conducted within that area. In this manner, sampling of recreational fishers was weighted towards certain types of fishing and as a consequence, the relative proportions of each fishing method (and target fishery) was not necessarily representative of proportions within the overall fishery.

For boat ramp intercept surveys, interviews were conducted with all fishing parties returning to shore where feasible, otherwise fishing parties were selected at random. Interviews were generally conducted with one fisher, on behalf of the entire fishing party. If there was no evidence of fishers (e.g. no boat trailers) at a given site, survey agents would move to alternative sites. Therefore, when method, fishing region, time of year and targeting are taken into account, systematic biases in terms of catch rates, catch and size composition were minimised.

The following information was collected:

- number of fishers in the party and their gender,
- region of residence (based on Australian Bureau of Statistics statistical divisions) of all fishers[1],
- water body type fished (estuary, coastal and/or offshore),
- fishing method/gear and amount of gear where appropriate,
- fishing platform (boat, shore or both),
- estimated start time, end time and any breaks from fishing,
- species targeted (up to two), and
- species and number of fish retained and numbers released or discarded

Where more than one fishing method had been used, every effort was made to collect information pertaining to each gear type separately. In this study a ‘fishing event’ referred to a fishing operation that was completed on the day of interview and could be defined by the fishing method/gear used. In a small number of instances fishers were unable to attribute their catch to each of the different methods employed (i.e. to the event level) and these data have not been used in the analysis of species composition by method.

[1] The use of ABS statistical divisions provided a link with NRFS ‘home regions’.

Survey agents sought permission to measure the catch and in doing so were able to assess the ability of fishers to correctly identify their catch to species or species group levels. Lengths were based on the measurement of snout to the medial caudal ray[2], with the exception of sharks and squid which were measured for total length or dorsal mantle length, respectively. Where fishers had filleted their catch at sea it was not feasible to confirm species identification nor count or measure the catch. Length measurements were reported to the centimetre rounded down, i.e. 30.1 and 30.8 cm were recorded as 30 cm. Rock lobster and abalone were not measured for size.

Supplementary length frequency information was also provided through the Fishcare Volunteer Program and has been incorporated in the size composition analyses.

3. Results and Discussion

3.1 Overview

In total 2,107 fishing parties were contacted between September 2000 and April 2001, with all but 29 (1.3%) providing information about their fishing activity. Of those responding, 1,390 (66%) were boat fishing parties, with the remainder shore based fishers. Information was collected for 2,206 individual fishing events, indicating that some parties reported fishing with more than one method (commonly lines and gillnets).

For the purpose of analysis, the north, east and south-east coasts were divided into 8 regions; namely North-West (NW), Tamar, North-East (NE), St Helens, East, Tasman, Norfolk and Frederick Henry Bays (NFH) and the Derwent-Channel (DC) (Fig. 1).

By method, line fishing (including bait, lure and the use of squid jigs) accounted for 80% of all fishing events monitored (Table 1). Pot, gillnet and dive methods accounted for the bulk of the remainder. It should be emphasised that, by adopting a non-random sampling design, these data are not necessarily representative of relative spread of effort around the State or the relative contributions of the various fishing methods.

[2] For species with emarginate or forked caudal fins this measurement represented fork length, whereas species with truncate or rounded caudal fin this measurement was total length.

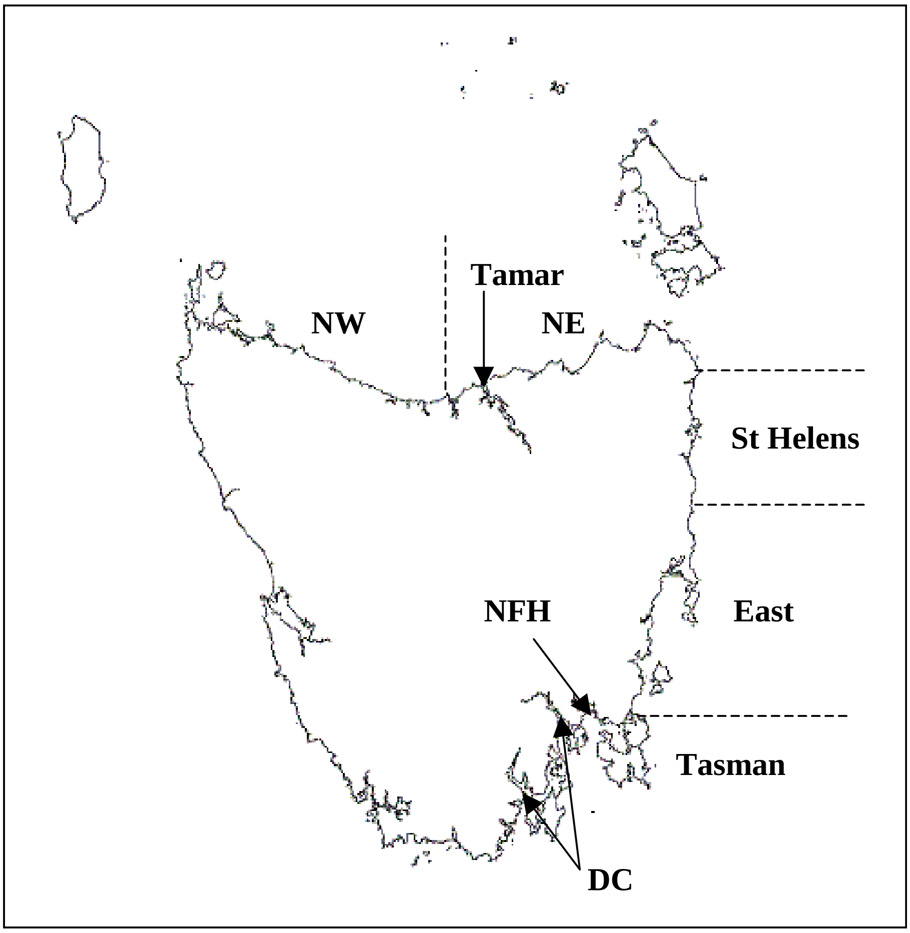

Fig. 1 Map of Tasmania showing fishing regions defined for data analysis (refer text for abbreviations).

Table 1 – Number of fishing events by fishing method and region covered by survey interviewers.

Method	NW	Tamar	NE	St Helens	East	Tasman	NFH	DC	Total
Line	96	252	81	312	171	158	545	167	1782
Gillnet	1	0	0	15	10	15	19	41	101
Pot	0	0	0	92	11	29	26	41	199
Dive	5	1	5	0	5	19	44	3	82
Other	2	1	0	13	12	0	5	9	42
Total	104	254	86	432	209	221	639	261	2206

3.2 Catch composition

Over 60 species or species groups of fish and shellfish were recorded in monitored catches, represented by over 43,000 individuals. Common and scientific names of all species are presented in Appendix 1.

A feature of the recreational fishery in Tasmania is that fish catches are commonly processed (filleted) at sea and under such instances identification and quantification of the catch is difficult and measurement of fish sizes impossible. As a consequence it was not always possible to confirm the identity of the catch and species categories such as ‘unspecified’ have been used.

3.2.1 Line and gillnet methods

Almost 50 species or species groups were caught by line fishing (Appendix 1), representing a total catch of about 40,000 fish, of which just under half (47%) were released or discarded. (Table 2). Release rates varied between species, from under 10% for albacore tuna, tiger flathead, blue eye trevalla, pike, calamary and striped trumpeter to over 70% for gurnards, various sharks and ray species and pufferfish. Intermediate rates of release (40-50%) existed for sand flathead, whiting, mullet and bream.

Numerically, sand flathead dominated the line catch (>70%) with whiting, gurnard and Australian salmon next in importance, collectively accounting for 8% of the catch examined.

Gillnet catches were, by contrast, dominated by bastard trumpeter, blue warehou and leatherjackets, the former two species being rarely recorded in line catches[3]. Although based on smaller sample sizes, release rates were lower for gillnets (about 26% overall) compared to line fishing. For the key gillnet species, bastard trumpeter and blue warehou, the vast majority of the catch (> 90%) was retained whereas over half of the leatherjackets taken in nets were released (Table 2). As for line fishing, release/discard rates were high for sharks and rays.

The line fishery can be split into a number of sub-fisheries based on target species (and fishing practice). For the purposes of this analysis, three main fisheries, namely flathead, Australian salmon and tuna fishing, were identified based on nominated target species. Note these activities are not necessarily mutually exclusive, with fishers often reporting a range of target species on a fishing trip.

When flathead fishing, flathead accounted for over 90% of the total number of fish captured, of which just under half (48%) was released (Table 3). Whiting and gurnard appeared to be the main by-catch of fishing for flathead.

[3] Line caught blue warehou sampled by Fishcare Volunteers have been incorporated in the length frequency analysis.

Table 2 Catch numbers (including proportion released/discarded) for line and gillnet methods.

	Line			%	Gillnet			%
Species	Kept	Released	Total	released	Kept	Released	Total	released
Sand flathead	15157	14079	29236	48	25	10	35	29
Flathead (unspecified)	1684	1563	3247	48	4	20	24	83
Whiting	678	524	1202	44				
Gurnard	332	843	1175	72	8	4	12	33
Australian salmon	529	318	847	38				
Albacore tuna	511	34	545	6				
Tiger flathead	487	56	543	10	2	0	2	0
Barracouta	395	134	529	25				
Mullet	204	196	400	49	41	0	41	0
Skipjack tuna	186	103	289	36				
Bream	171	110	281	39	2	0	2	0
Jack mackerel	212	29	241	12	0	2	2	100
Silver trevally	75	163	238	68	8	0	8	0
Wrasse	58	105	163	64	40	21	61	34
Leatherjacket	82	74	156	47	47	87	134	65
Gummy shark	10	143	153	93	0	3	3	100
Blue eye trevalla	149	0	149	0				
Jackass morwong	106	31	137	23	19	0	19	0
Cod	87	45	132	34	35	9	44	20
Long-finned pike	106	6	112	5	1	0	1	0
Spurdog shark	1	66	67	99				
Southern calamary	58	6	64	9				
Shark (other)	9	49	58	84	1	10	11	90
Pufferfish	1	57	58	98				
Garfish	37	6	43	14				
Arrow squid	32	6	38	16				
Squid (unspecified)	31	4	35	11				
Rays/skates	2	30	32	94	1	13	14	93
Striped trumpeter	25	0	25	0	2	0	2	0
Finfish other	5	20	25	80	3	0	3	0
Butterfly perch	21	0	21	0				
Bastard trumpeter	1	0	1	0	295	20	315	6
Blue warehou					133	15	148	10
Banded morwong					14	7	21	33
Other	63	47	110	47	29	29	58	50
Total	21496	18839	40335	47	709	247	956	26
No. fishing parties			1782				101	

Table 3 Catch composition for line fishing where flathead was the nominated target

Species	Kept	Released	Total	% total
Sand flathead	13754	12482	26236	82.8
Flathead (unspecified)	1334	1133	2467	7.8
Tiger flathead	448	48	496	1.6
Whiting	568	385	953	3.0
Gurnard	244	550	794	2.5
Australian salmon	82	51	133	0.4
Gummy shark	6	122	128	0.4
Other	170	328	498	1.6

Where Australian salmon was targeted, sand flathead was the principal species caught but because of relatively high release rates (55%) for flathead, Australian salmon was the dominant species harvested (Table 4). Apart from flathead, the main by-catch included mullet, barracouta, whiting and silver trevally.

Table 4 Catch composition for line fishing where Australian salmon was the nominated target species

Species	Kept	Released	Total	% total
Sand flathead	282	350	632	40.3
Australian salmon	394	141	535	34.1
Mullet	44	57	101	6.4
Barracouta	19	41	60	3.8
Flathead (unspecified)	16	29	45	2.9
Whiting	27	12	39	2.5
Silver trevally	21	16	37	2.4
Tiger flathead	13	20	33	2.1
Wrasse	3	15	18	1.1
Bream	2	11	13	0.8
Gurnard	3	10	13	0.8
Other	24	18	42	2.7

Albacore, together with skipjack tuna, accounted for just over 80% of the catch taken by tuna (or billfish) fishing (Table 5). Other typical gamefish species such as yellowfin tuna, striped marlin and mako shark comprised only a small component of the surveyed catches. Of the non-gamefish species, flathead and barracouta dominated, indicating at least some instances of trips involving some bottom fishing (for flathead) as well as game fishing.

Table 5 Catch composition for line fishing where tuna or billfish were nominated target species

Species	Kept	Released	Total	% total
Albacore tuna	511	34	545	52.9
Skipjack tuna	186	103	289	28.1
Yellowfin tuna	10	0	10	1.0
Striped marlin	3	0	3	0.3
Mako shark	4	0	4	0.4
Sand flathead	44	62	106	10.3
Barracouta	50	0	50	4.9
Other	13	10	23	2.2

Based on reported target species, about 88% of the total flathead catch, 63% of the Australian salmon catch and all of the tuna/billfish catch could be attributed to targeted fishing for the given nominated species.

3.2.2 Other fishing methods

Catch compositions for rock lobster pot, ring and dive methods are presented in Table 6. Apart from rock lobster there was very little by-catch in pots and rings, by-catch included crabs, octopus, sharks (mainly draughtboard shark), conger eels, wrasse and cod, the majority of which were discarded. Over half of all lobsters caught in the pots were released (mainly undersized lobsters). Abalone and rock lobster dominated dive catches, there was little evidence of spear fishing for scalefish (Table 6). Being an active and highly selective (based on size) capture method, issues of release for lobster (and abalone) by divers is not a major concern.

Table 6 Catch numbers for rock lobster pot, ring and dive fishing methods.

	Pot			Ring			Dive		
Species	Kept	Released	Total	Kept	Released	Total	Kept	Released	Total
Rock lobster	365	426	791	4	14	18	216	46	262
Abalone							1078	100	1178
Crab	1	9	10						
Octopus	0	3	3						
Leatherjacket							8	0	8
Shark	0	9	9						
Eel	1	0	1	0	1	1			
Wrasse	0	1	1				1	0	1
Cod	1	0	1						
Flathead							0	1	1
Luderick							1	0	1
Jack mackerel							1	0	1
Banded morwong							1	0	1
Long-finned pike							1	0	1
Total	368	448	816	4	15	19	1307	147	1454
No. fishing parties			199			3			82

3.3 Size composition

3.3.1 General

Length weight relationships used to convert size composition data into weights are presented in Appendix 2. Details of all fish measured, including sample size, size range, average lengths and weights are summarised in Appendix 3.

References to size limits are based on those that applied at the time of the survey. Since most size limits are expressed as total lengths, it has been necessary to convert them into fork lengths, where appropriate, in order to assess the level of adherence to these regulations. Total-fork length relationships are available for the trumpeters (Murphy and Lyle 1998) and blue warehou (Lyle and Campbell 1999). For all other species, a conversion factor was derived from the ratio of fork length to total length measured from taxonomic drawings of the particular species (Last *et al*. 1983).

3.3.2 Australian salmon

There are two species of Australian salmon commonly found in Tasmanian waters, the eastern Australian salmon (*Arripis trutta)* and the western Australian salmon (*Arripis truttacea).* The two species may form mixed or single species schools in Tasmania and are externally similar, requiring analysis of gillrakers to differentiate them.

Australian salmon ranged between 13 and 48 cm FL, with most in the 20 - 30 cm size range (Fig. 2). The mean length of 27 cm compared with 32 cm for surveys of recreational line catches undertaken in 1997/98 (Lyle and Campbell 1999). In the early surveys, catches included greater representation of fish exceeding 35 cm.

The length frequency distributions for shore and boat based catches are summarised in Fig. 3. Although there was general overlap in the size ranges, boat based catches were on average larger (30 cm for shore and 32 cm for boat), reflecting the greater proportion of 25-30 cm fish in the boat catch.

The size limit for Australian salmon is 20 cm TL, equivalent to about 18 cm FL. It is apparent from the data that only a very small proportion (<1%) of the retained catch was below the minimum legal size limit.

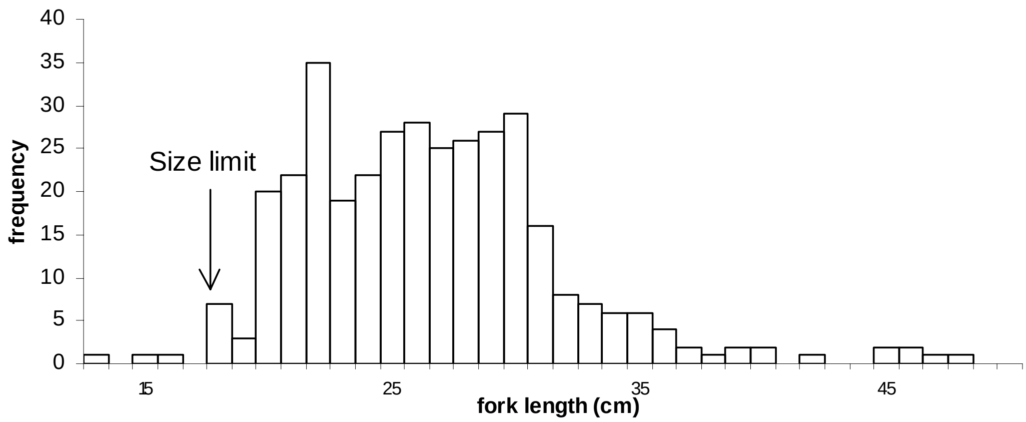

Fig. 2. Australian salmon length frequency distribution

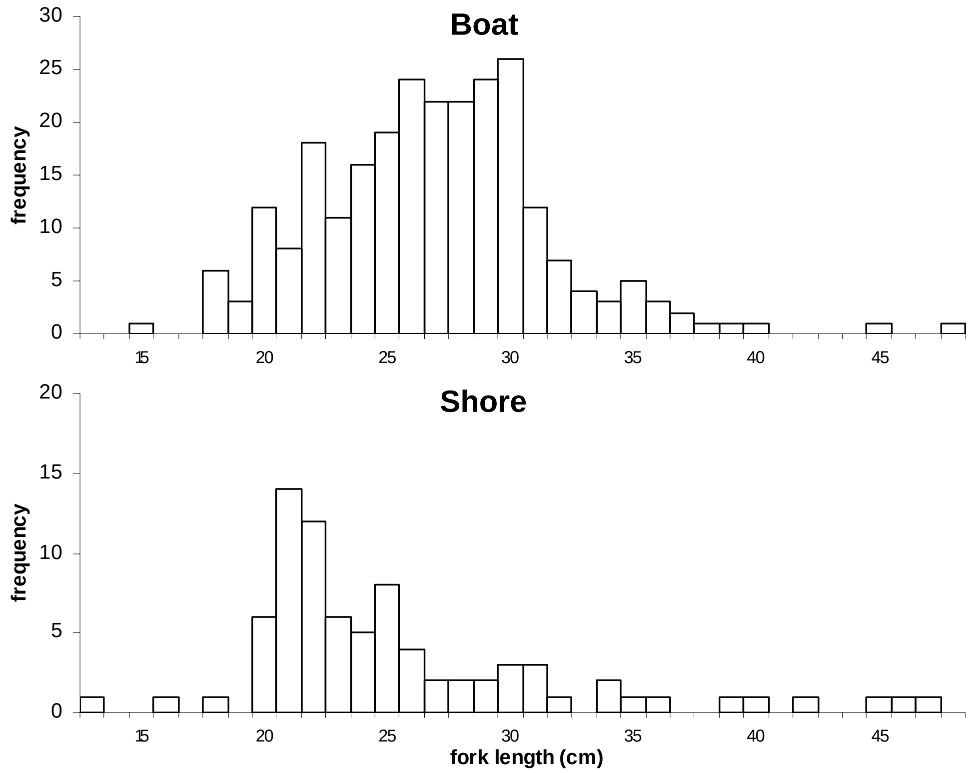

Fig. 3 Australian salmon length frequency distribution by fishing platform

3.3.3 Barracouta

Barracouta measured between 33 and 151 cm FL, with 70-90 cm fish dominating the catch (Fig. 4). The distribution was strongly unimodal with a peak at 79 cm and a mean length of 79 cm FL. By contrast, in a previous recreational fishing survey, smaller fish, mainly in the 60-75 cm size class, dominated the line catch (Lyle and Campbell 1999).

There is no size limit for barracouta in Tasmania.

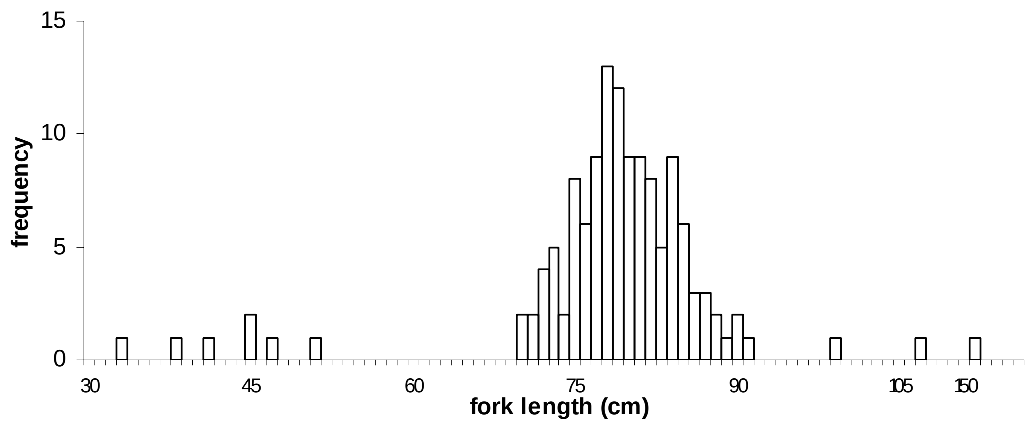

Fig. 4 Barracouta length frequency.

3.3.4 Bream

Bream ranged between 21 and 42 cm FL, with an average length of 30 cm (Fig. 5). The size distribution was characterised by a single mode at between 29-32 cm and few fish larger than 36 cm. The size of fish taken by shore and boat based fishers were generally similar with the exception of fish less than 25 cm, which were retained exclusively by shore-based fishers (Fig. 6).

The current size limit for bream is 25 cm TL, equivalent to about 23 cm FL. There was only a low incidence (<3%) of undersized bream being kept by recreational fishers.

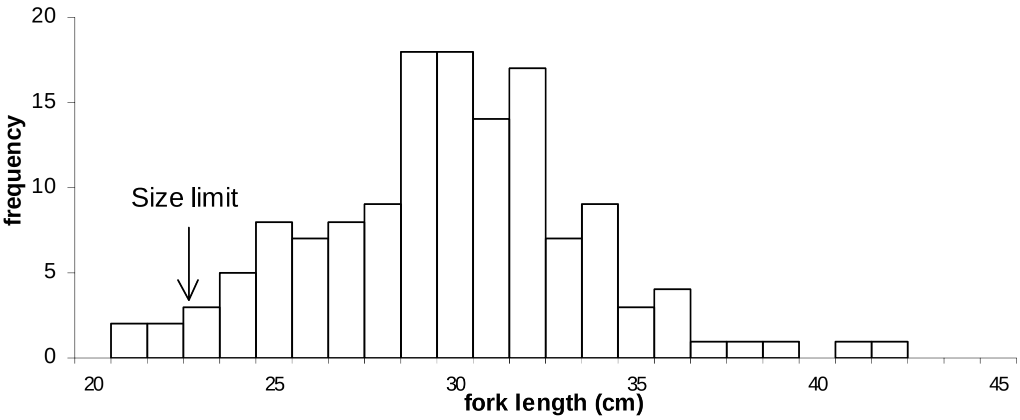

Fig. 5 Bream length frequency distribution

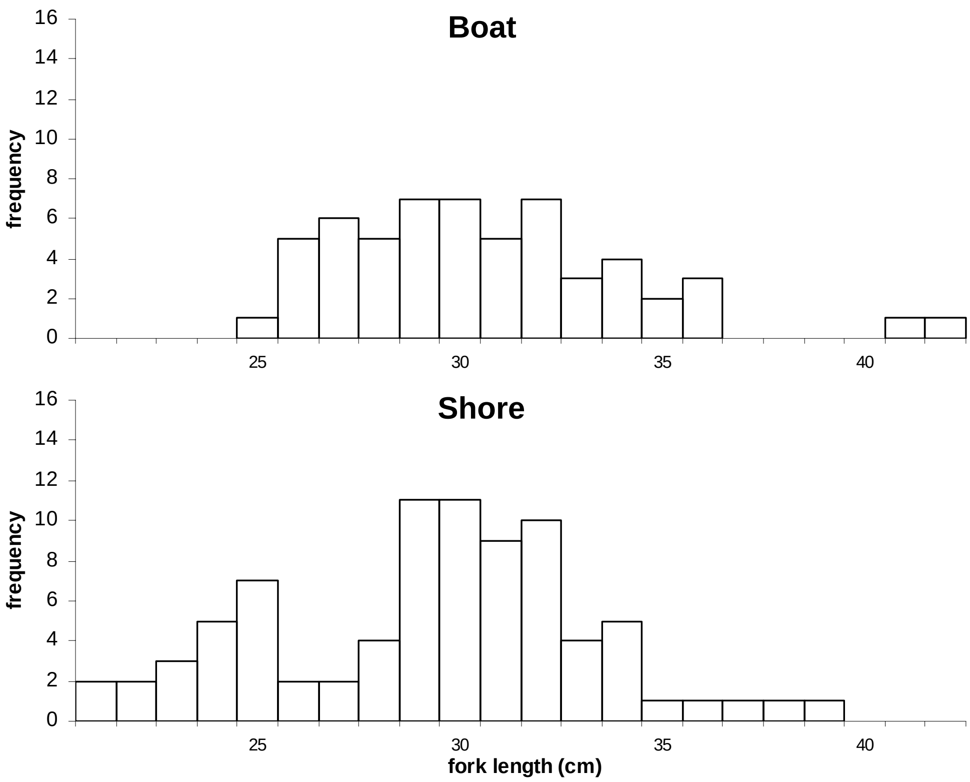

Fig. 6 Bream length frequency distribution by fishing platform

3.3.5 Southern calamary

Southern calamary ranged between 21 and 42 cm dorsal mantle length (DML) with a mean length of 29 cm (Fig. 7). Although based on a relatively small sample size, the present size composition is similar to that obtained in previous creel surveys (Lyle and Campbell 1999).

There is no size limit for southern calamary in Tasmania.

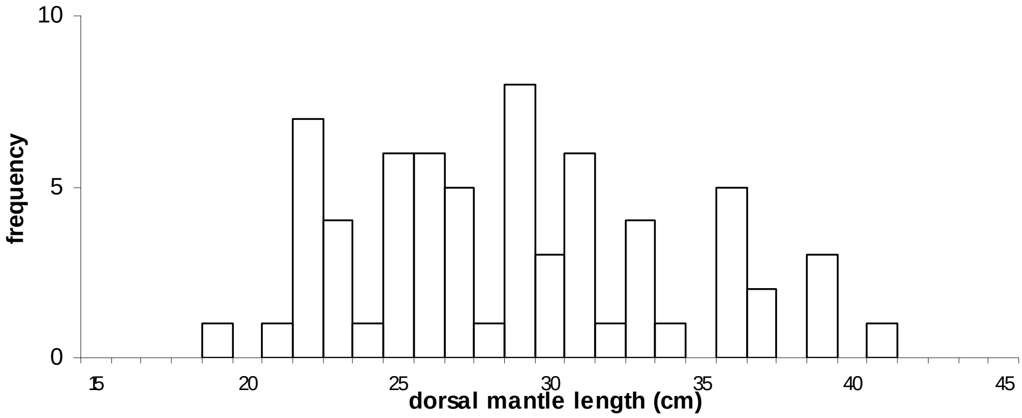

Fig. 7 Southern calamary length frequency distribution

3.3.6 Cod

Up to three species of cod, namely bearded cod *Pseudophycis barbarta,* red cod *P. bachus* and beardie *Lotella rhacina,* have been grouped together in the length frequency analysis, making interpretation difficult.

Cod ranged from 25 to 54 cm FL with modes at 29-30 cm and 39 cm (Fig. 8). The mean length was 36 cm. The current size composition differed to that observed by Lyle and Campbell (1999) in that the mode of smaller fish evident in the present study was virtually absent.

There is no size limit for cod in Tasmania.

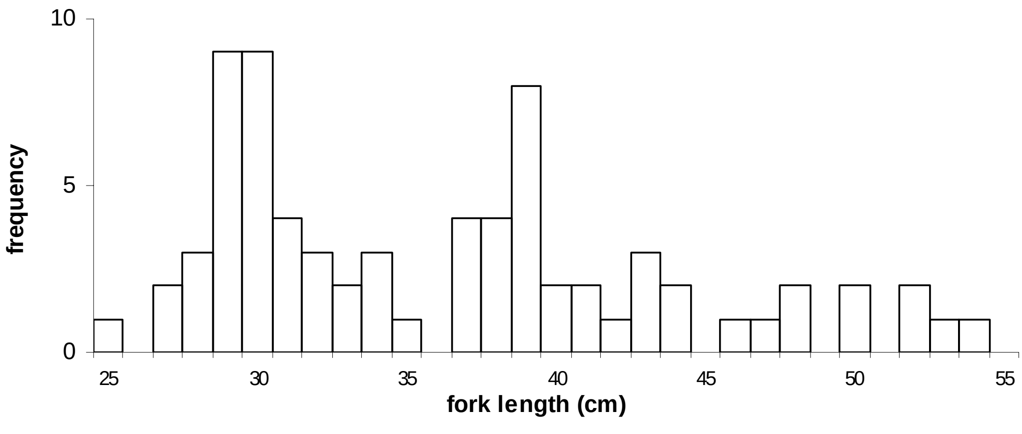

Fig. 8 Cod length frequency distribution

3.3.7 Sand flathead

Sand flathead ranged in length between 17 and 53 cm FL (Fig. 9). The length frequency distribution was represented by a single mode with a peak at 31-32 cm, and a mean of 32 cm.

The minimum size limit for flathead is 30 cm TL which, given the very shallow fork in the caudal fin of flathead, is effectively equivalent to 30 cm FL. On the basis of the sampled catches, almost 30% of the retained fish were undersized, this compares with just over 40% undersized fish for creel surveys conducted in 1997/98 (Lyle and Campbell 1999). Although an improvement, the proportion of undersized fish remains of concern, especially given the importance of the species to the recreational fishery.

Length frequency distributions for shore and boat based catches are presented in Fig. 10. The relatively low number of shore caught fish makes comparisons uncertain but it is noteworthy that there was a much higher proportion of fish below the legal minimum size in the shore-based (55%) compared to boat-based (28%) catches. The mean size of shore caught fish was in fact roughly equivalent to the minimum size limit for the species.

The size composition for boat-based catches by fishing regions is summarised in Fig. 11. Overall, the size distributions were characterised by modes at 31-32 cm with mean lengths ranging between 32 cm (Great Oyster Bay and Tasman) and 33 cm (East). The regions with the highest proportions of undersized fish were Norfolk/Frederick Henry Bays, NW and Tasman, with undersized fish representing 33, 32 and 28% of the retained catches, respectively.

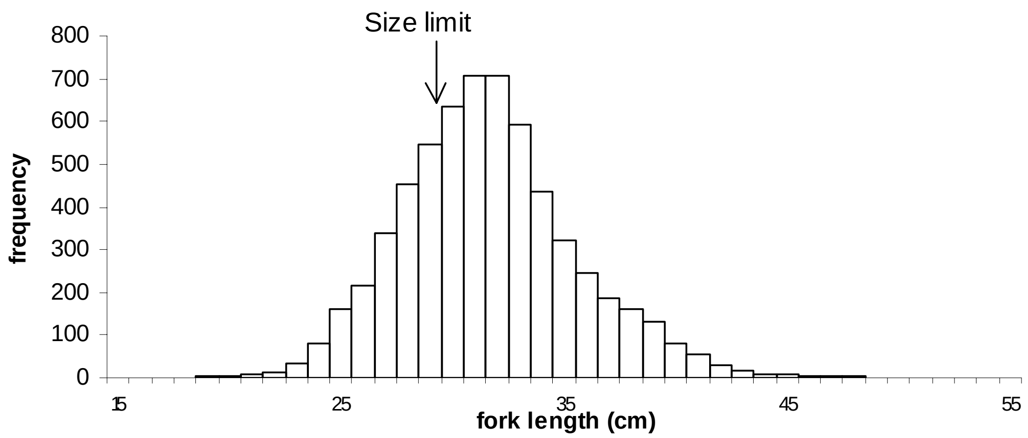

Fig. 9 Sand flathead length frequency distribution

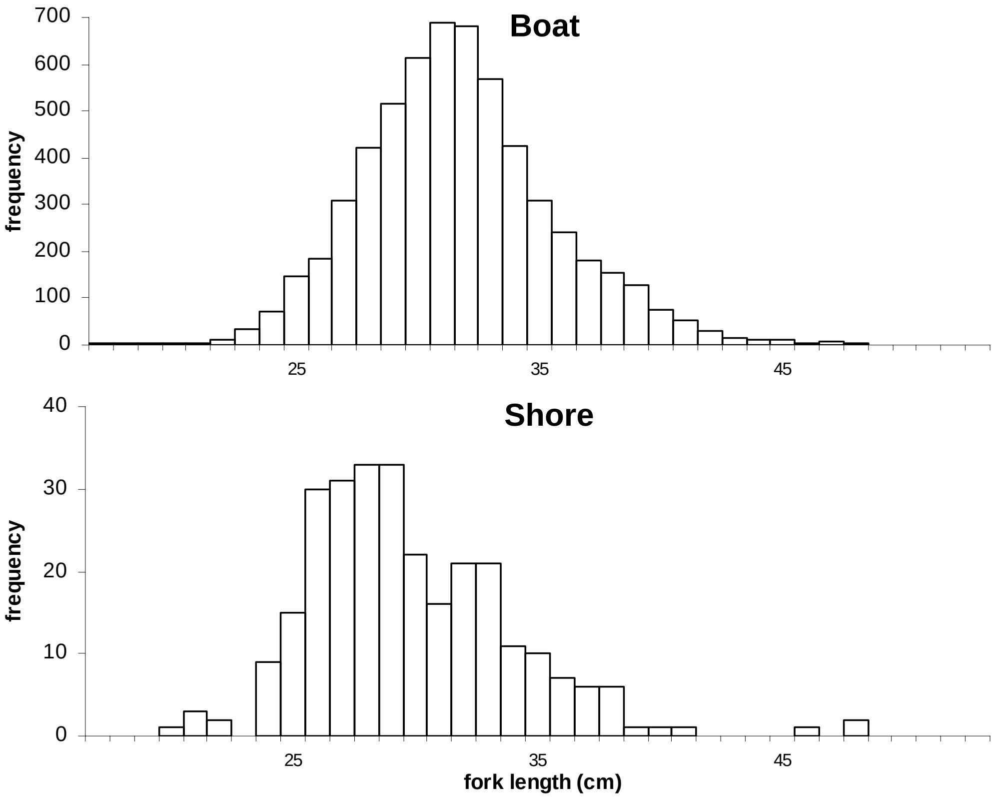

Fig. 10 Sand flathead length frequency distribution by fishing platform

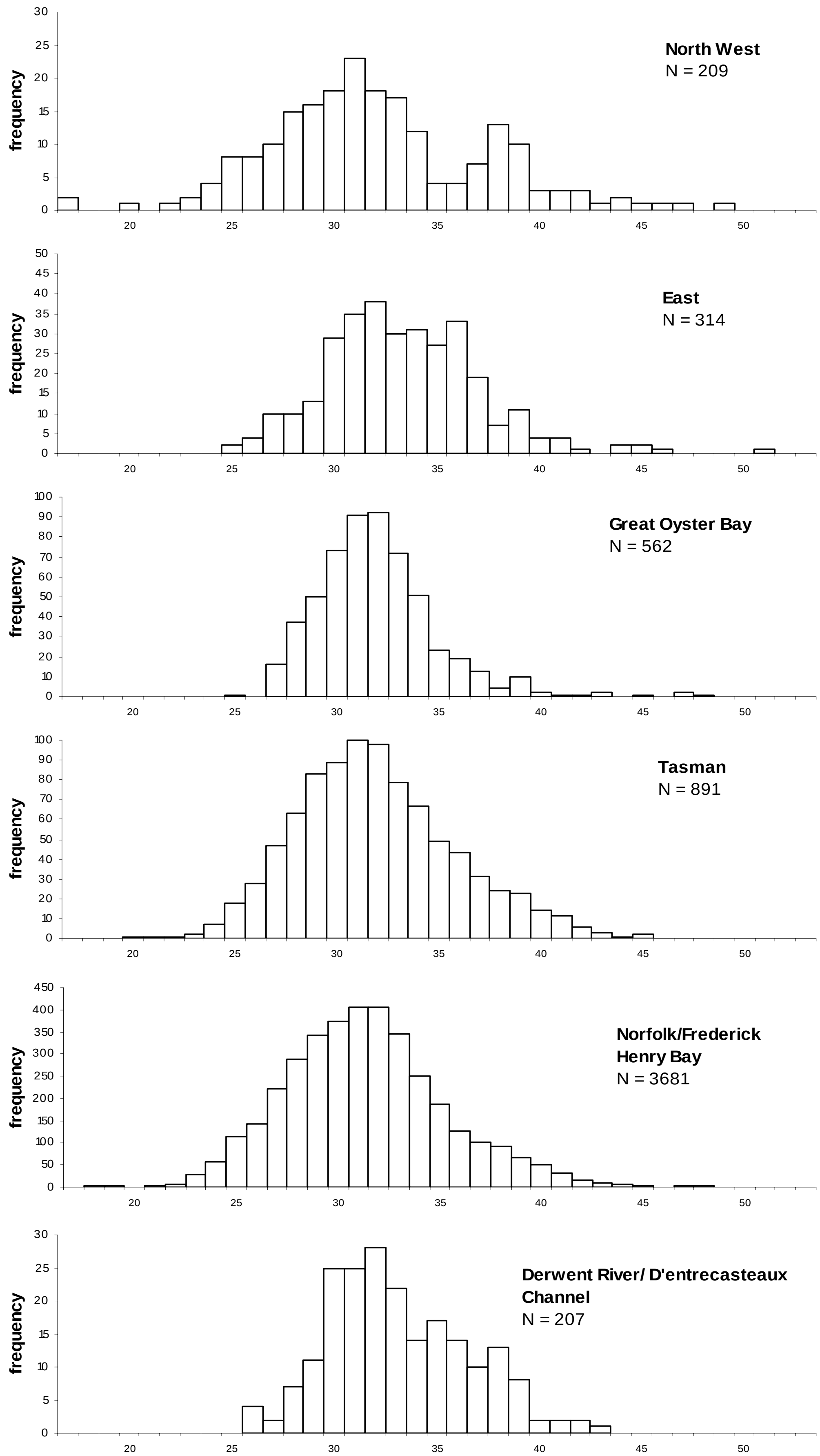

Fig. 11 Sand flathead length distribution by region ('East' here refers to East excluding Great Oyster Bay)

3.3.8 Tiger flathead

Tiger flathead were less commonly caught than sand flathead but were generally of a larger size, with few fish under about 35 cm FL. Lengths ranged from 22 cm to 52 cm FL and the distribution was skewed to the left with a mode of 36 cm, and mean length of 39 cm (Fig. 12). Unlike sand flathead, the harvest of tiger flathead below the minimal legal length was negligible, accounting for just 1% of the total sampled catch.

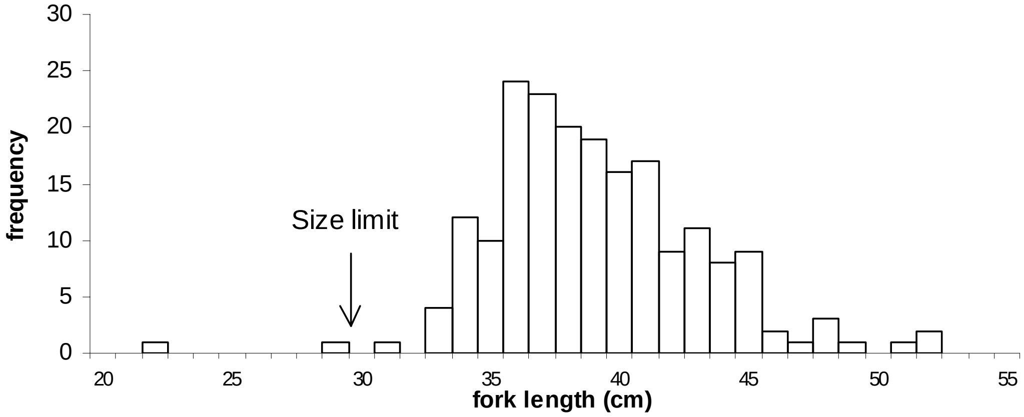

Fig. 12 Tiger flathead length frequency

3.3.9 Gurnard

It is probable that a number of species, representing at least two families (Scorpaenidae and Triglidae), were grouped together as gurnards, thus confounding the interpretation of the length frequency data.

Gurnards ranged between 19 and 44 cm FL, with a mode at 28 cm and mean of 30 cm (equivalent 30 cm TL) (Fig. 13). This general size structure is consistent with that observed in previous surveys (Lyle and Campbell 1999).

There is no size limit for gurnard in Tasmania.

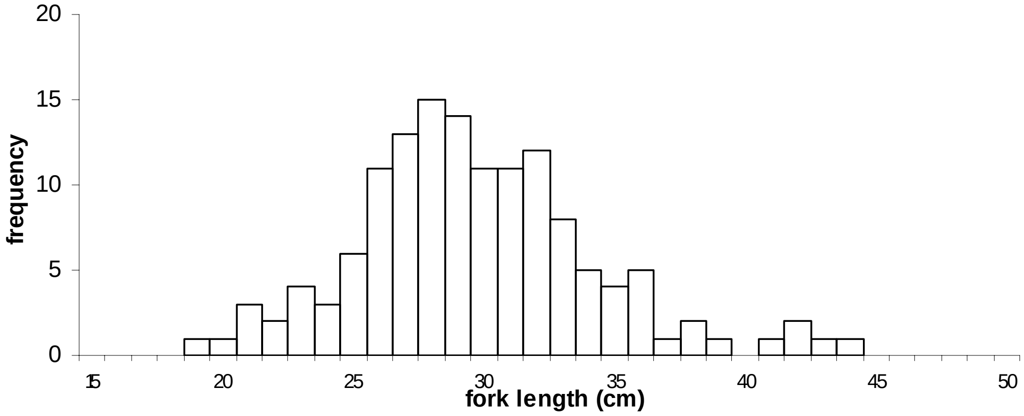

Fig. 13 Gurnard length frequency distribution.

3.3.10 Leatherjacket

Leatherjackets are an important component of the shallow reef finfish community, with approximately 12 species found in Tasmanian waters, of which 3 are commonly caught by recreational fishers. The potential for multi-species catch and the small sample size limits interpretation of the length frequency data.

Fish lengths (in this case equivalent to total length) ranged between 18 and 41 cm, with most individuals in the 24-32 cm size range (Fig. 14). The mean length of the leatherjackets examined was 28 cm.

Only a small proportion (<4 %) of the catch was below the legal size limit of 20 cm TL.

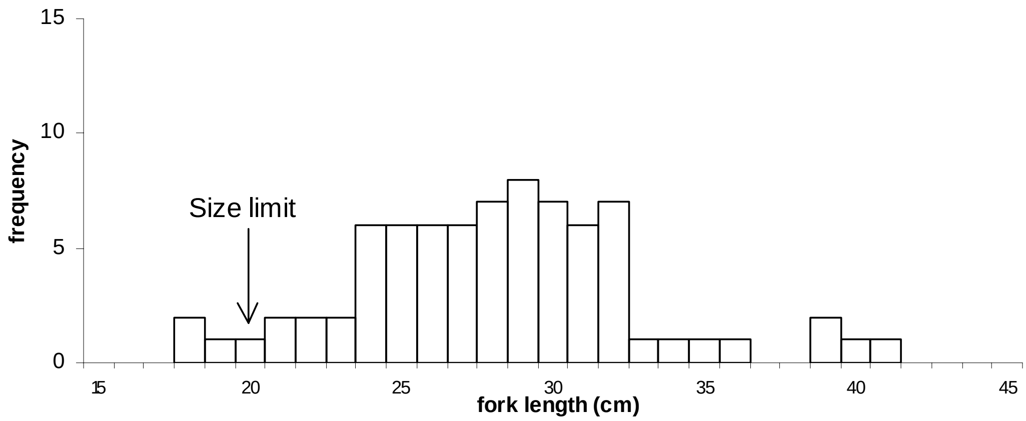

Fig. 14 Leatherjacket length frequency distribution

3.3.11 Jack mackerel

Jack mackerel ranged between 17 and 34 cm FL with a strong mode at 24 cm and a mean of 24 cm (Fig. 15).

There is no size limit for jack mackerel in Tasmania.

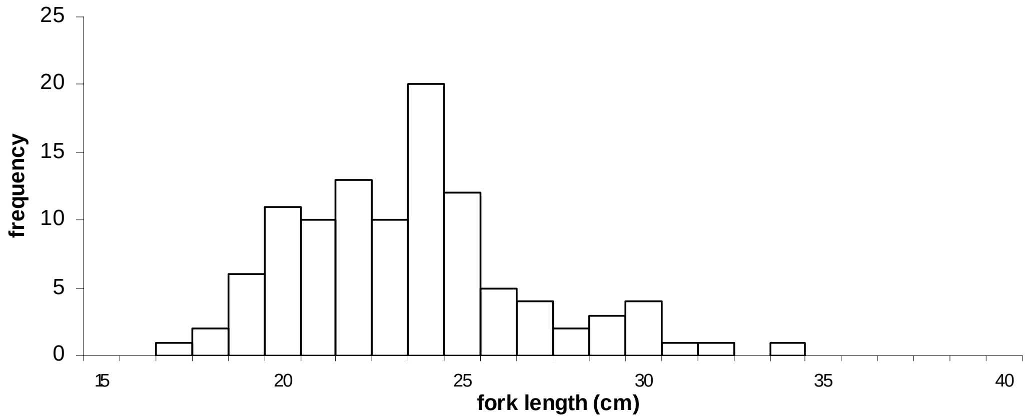

Fig. 15 Jack Mackerel length frequency distribution

3.3.12 Jackass morwong

Jackass morwong ranged between 28 cm and 53 cm FL with a mean length of 38 cm (Fig. 16). Based on a larger sample of recreationally caught jackass morwong, Lyle and Campbell (1999) observed a much greater proportion of fish smaller than 35 cm, resulting in a mean length for line caught fish of less than 30 cm.

The size limit for morwong in Tasmania is 25 cm TL (equivalent to about 22 cm FL), no undersized fish were observed.

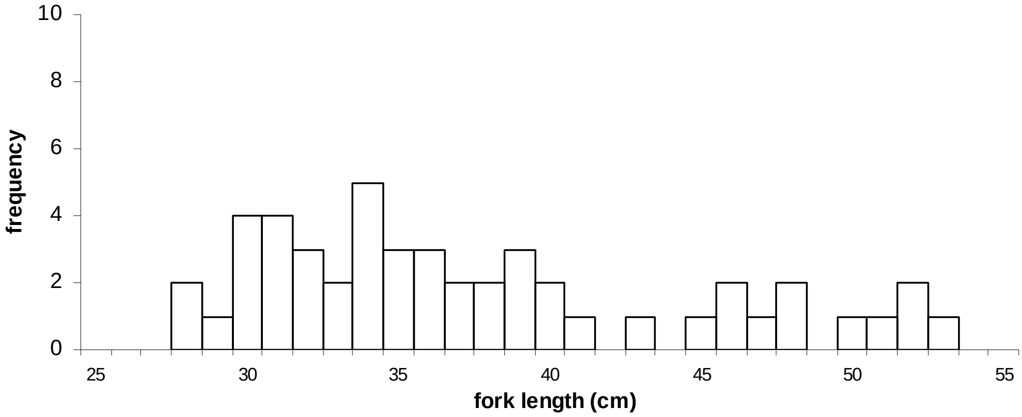

Fig. 16 Jackass morwong length frequency distribution

3.3.13 Mullet

Mullet potentially comprise two species, yellow-eye mullet (*Aldrichetta forsteri)* and sea mullet *(Mugil cephalus).* Of these, yellow-eye mullet are more common in Tasmanian waters and probably accounted for the bulk of the catch.

Fish ranged in length between 14 and 37 cm FL with a mode at 25 cm and mean length at 27 cm (Fig. 17).

The size limit for mullet in Tasmania is 25 cm TL, equivalent to 23 cm FL. Approximately 11% of mullet examined were under the legal minimum size.

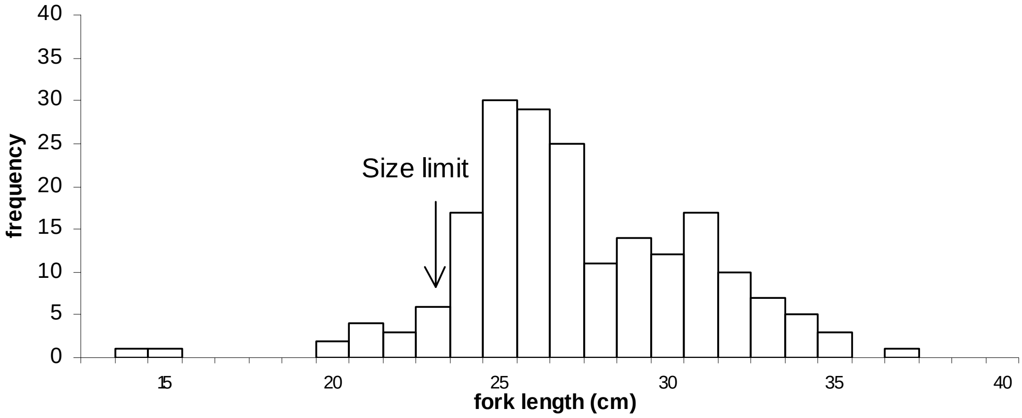

Fig. 17 Mullet length frequency distribution

3.3.14 Blue eye trevalla

Blue eye trevalla ranged in length between 48 and 77 cm FL with low numbers distributed throughout the size range (Fig. 18). The mean length was 60 cm FL.

There is no size limit for blue eye trevalla in Tasmania.

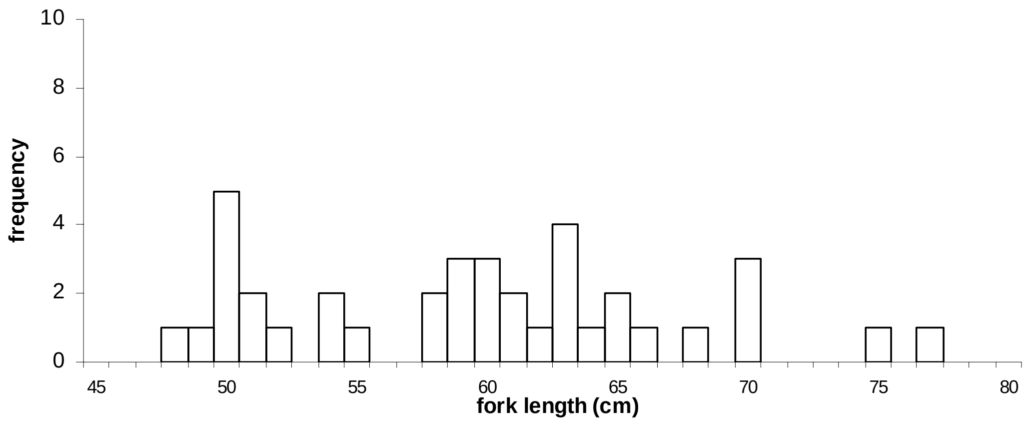

Fig. 18 Blue eye trevalla length frequency distribution

3.3.15 Silver trevally

Silver trevally ranged between 15 and 35 cm FL with a mode at 20 cm and a mean length of 22 cm (Fig. 19).

The size limit for silver trevally is 20 cm TL, equivalent to about 17 cm FL. Only 6% of the sample was below the minimum legal size.

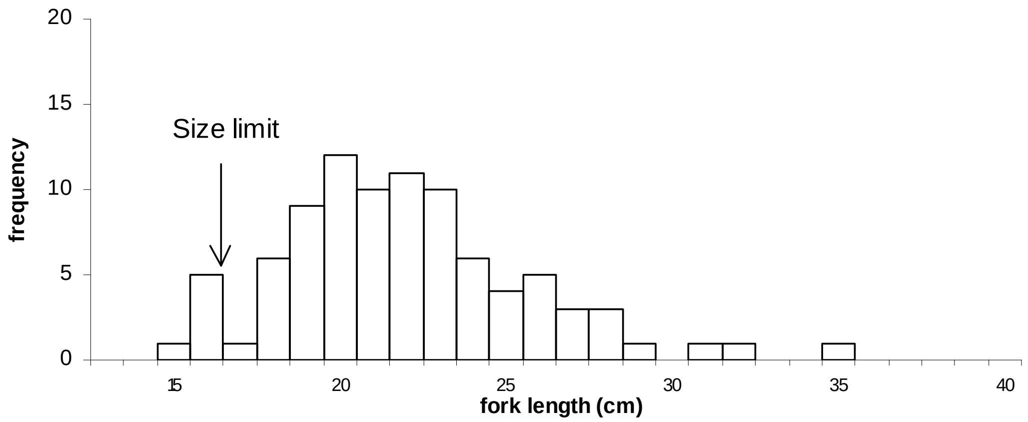

Fig. 19 Silver trevally length frequency distribution

3.3.16 Bastard trumpeter

The bastard trumpeter sample was based on gillnet catches and fish ranged from 29 to 52 cm FL (Fig. 20). The distribution was characterised by a single broad mode with a peak between 35 and 45 cm and a mean of 40 cm FL. Previous surveys of recreational gillnet catches (1997/98) indicated greater representation of fish under 30 cm, resulting in a mean length about 10 cm smaller than observed here (Lyle and Campbell 1999).

The minimum size limit for bastard trumpeter is 35 cm TL, equivalent to about 30 cm FL. Less than 1% of the sample was below the minimum legal size limit.

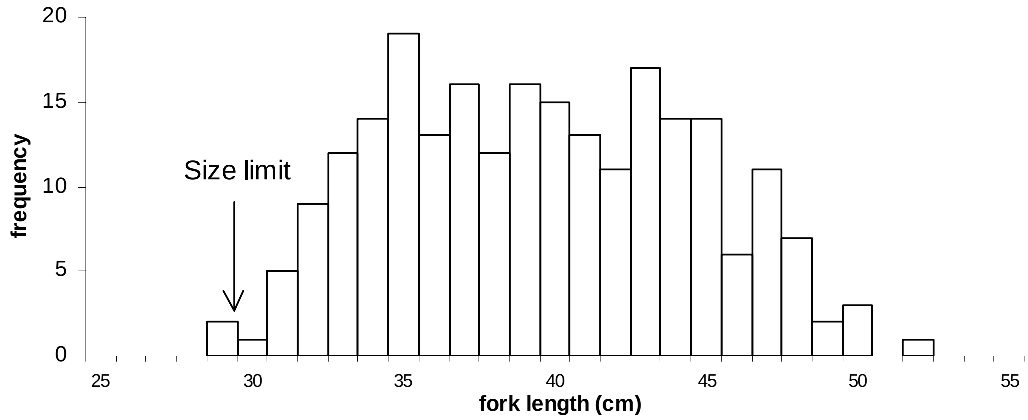

Fig. 20 Bastard trumpeter length frequency distribution

3.3.17 Albacore tuna

Albacore catches ranged between 34 and 82 cm FL with a mode at around 50 cm and mean length of 55 cm (Fig. 21). A very similar size composition has been determined for the recreational catch in previous surveys (Lyle and Campbell 1999).

There is no size limit for tuna in Tasmania.

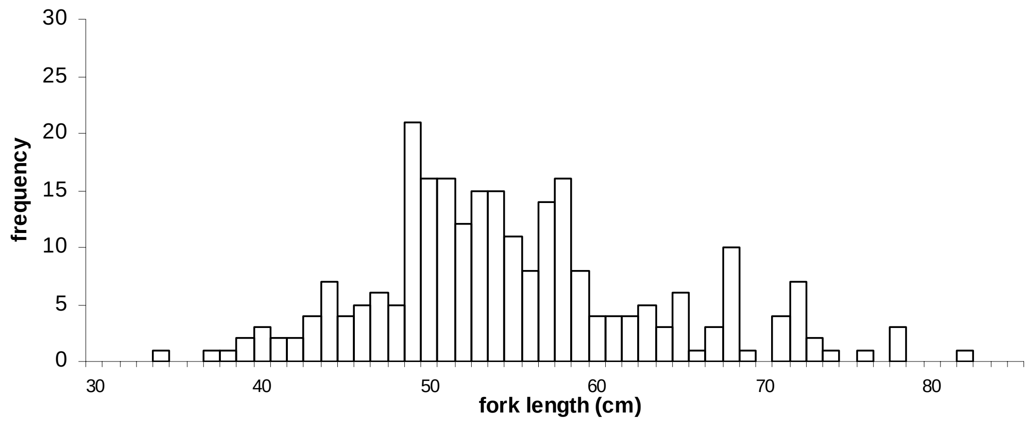

Fig. 21 Albacore tuna length frequency distribution

3.3.18 Skipjack tuna

Skipjack tuna ranged from 32 to 52 cm FL, with a mean length of 43 cm (Fig. 22).

There is no size limit for tuna in Tasmania.

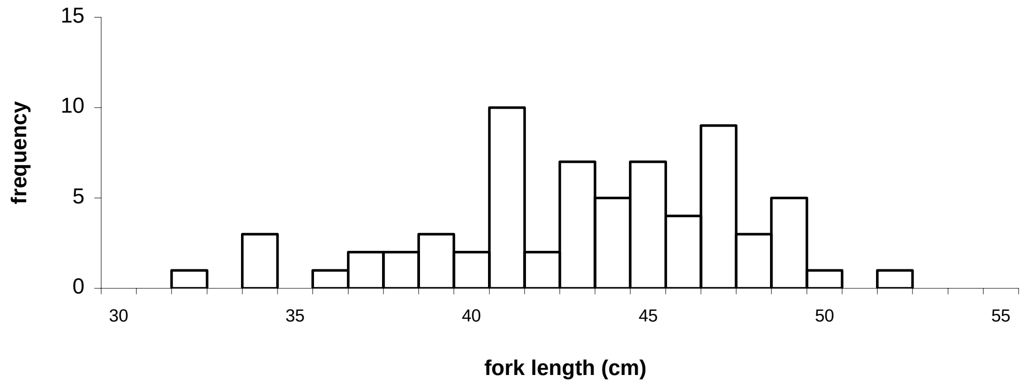

Fig. 22 Skipjack tuna length frequency distribution

3.3.19 Blue warehou

The blue warehou sample was based a combination of gillnet and line[4] catches, with fish measuring 22 to 48 cm FL (Fig. 23). The distribution had a peak between 32 and 36 cm and a mean length of 34 cm FL.

No fish below the minimum size limit of 25 cm TL (equivalent to about 22 cm FL) were present in the sample.

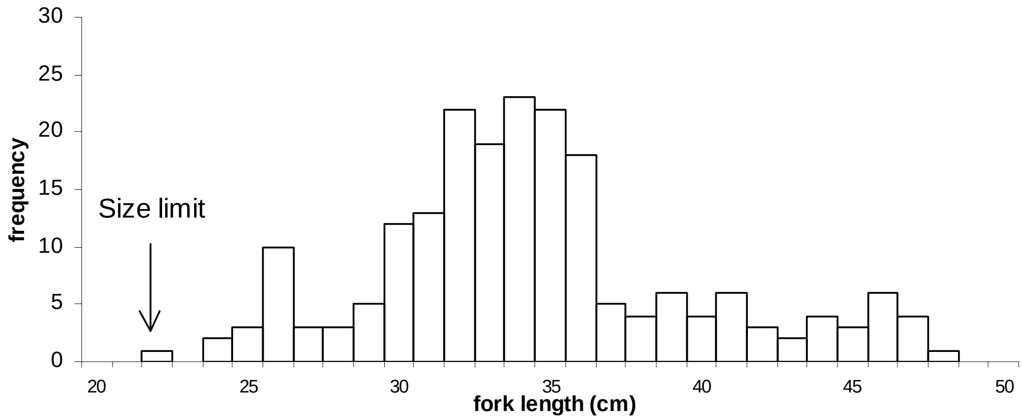

Fig. 23 Blue warehou length frequency distribution

[4] Line samples were provided by Fishcare Volunteers.

3.3.20 Whiting

Whiting ranged in length between 14 and 27 cm FL (Fig. 24). The distribution was skewed to the right with a mode at 22 cm and mean length at 21cm.

There is no size limit for whiting in Tasmania.

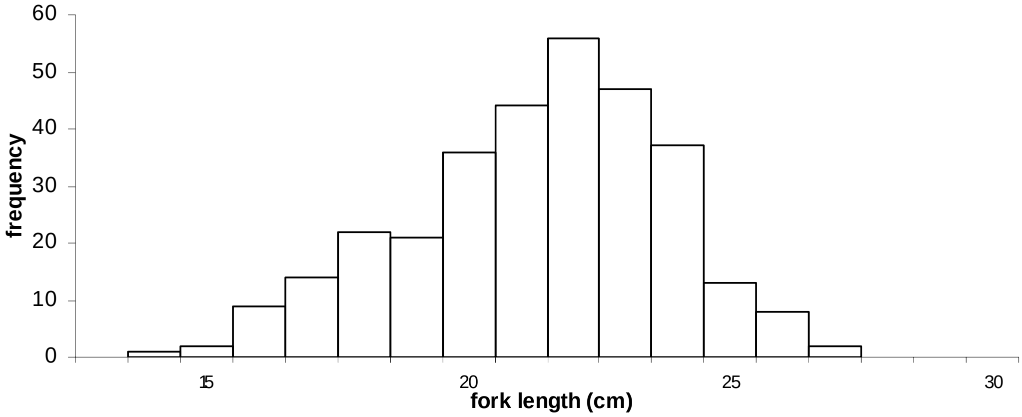

Fig. 24 Whiting length frequency distribution

3.3.21 Wrasse

Seven species of wrasse have been described from Tasmanian waters, although only two species, purple wrasse (*Notolabrus fucicola*) and blue-throat wrasse *(N. tetricus*) would be large enough to be targeted by recreational fishers.

Wrasse ranged between 18 and 46 cm (FL being equivalent to TL) (Fig. 25). The distribution was relatively flat with a mean of 31 cm.

The minimum size limit for wrasse at the time of the survey was 28 cm with an upper maximum size limit of 43 cm. About 37% of the wrasse examined were outside of this slot size, the majority of which were undersized. In late 2001 the minimum size limit was increased to 30 cm and the upper size limit was removed.

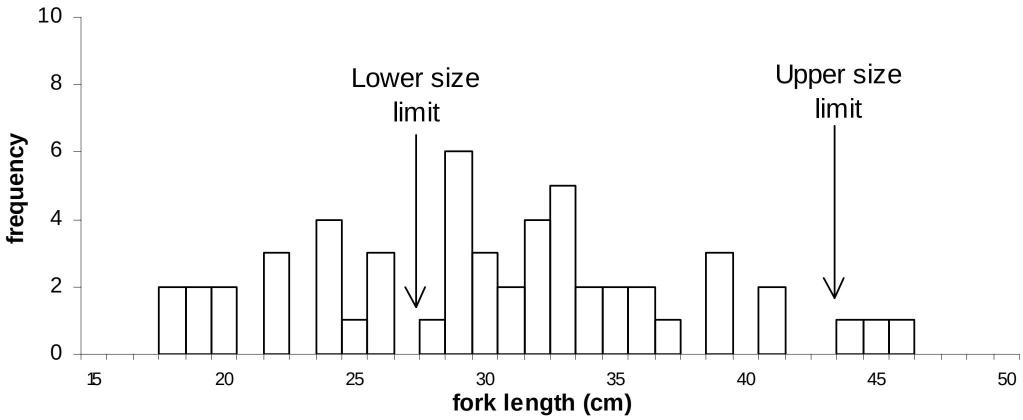

Fig. 25 Wrasse length frequency distribution

3.4 Fish Identification

The ability of fishers to correctly identify their catch to species or species group level was assessed by survey agents and, as indicated in Table 7, the more common species were correctly identified with a very high degree of accuracy (>90%). Of the 22 finfish species assessed, 14 were correctly identified 100% of the time. In a small number of instances, fishers required some prompting by the survey agent ('aided') through the use of a species show-card which was also available for use by diarist participants in the NRFS.

Table 7 Recreational fisher catch identification profiles for key finfish species, responses based on the number of fishing groups interviewed.

	Correct		*Incorrect*	*Total No.*	*% correct*
Species	*Unaided*	*Aided*			
Australian salmon	69	1	2	72	97
Atlantic salmon	6			6	100
Bream	25		1	26	96
Barracouta	37			37	100
Blue eye trevalla	5			5	100
Cod	29			29	100
Sand flathead	390	20	2	412	100
Tiger flathead	53	4	2	59	97
Gurnard	61	3	1	65	98
Jack mackerel	21	1	1	23	96
Jackass morwong	10			10	100
Mullet	61	2	3	66	95
Leatherjacket	27			27	100
Silver trevally	22	4		26	100
Bastard trumpeter	31	2		33	100
Striped trumpeter	8			8	100
Albacore tuna	69			69	100
Striped tuna	29			29	100
Blue warehou	9			9	100
Whiting	65		1	66	98
Wrasse	26	3		29	100
Southern calamary	10	1	1	12	92

4. Implications for Management

The importance of flathead as a recreational species has been reinforced by this study. The high proportion of undersized flathead, principally sand flathead, is however of considerable concern. Our data indicate that around 30% of all flathead sampled were less than the legal minimum size of 30 cm. It is clear that when fishing locality was taken into account, the problem was widespread throughout the State. Furthermore, the problem was greater for shore-based fishing. Since flathead are mainly taken by lines, this problem is not related to gear selectivity but rather awareness/compliance.

The observed practice of filleting catches at sea has ramifications for size limit based management, in effect making size limits very difficult to enforce. In certain areas of the State processing of catches adjacent to landing sites is prohibited by local councils, more or less obliging fishers to fillet at sea. In the light of this practice, compliance may be best addressed through targeted education and awareness programs since direct enforcement will prove difficult in many instances.

5. Acknowledgments

This study was undertaken as a component of the National Recreational Fishing Survey and was funded jointly by the National Heritage Trust, Fisheries Research and Development Corporation and the Marine Recreational Licensing Trust Fund.

Creel surveys were conducted by Tony Burton, David Campbell, Malcolm Campbell, John Churchill, Andrew Duke, Debbie Duke, Louisa Fitzpatrick, Gael Gault, Fiona Hope, Reg Hutton, Andrew Jones, Chris Lazarus, Ron McCauley and Barry Wilson. Their dedication and commitment to completing the survey is greatly appreciated. Some additional length frequency information was provided by the Fishcare Volunteers, including Damien Heran, Anne Kopplemann, Wayne Beckett and Glen Taylor.

Finally, the co-operation and assistance of the recreational fishers of Tasmania is gratefully acknowledged.

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Appendix 1 Common and scientific names for species caught by recreational fishing methods. *X* indicates taken by the fishing method

Common name	Scientific name	Line	Gillnet	Pot	Ring	Dive
Atlantic salmon	*Salmo salar*	*X*	*X*			
Australian salmon	*Arripis trutta & A. truttacea*	*X*				
Barracouta	*Thyrsites atun*	*X*				
Black bream	*Acanthopagrus butcheri*	*X*	*X*			
Blue eye trevalla	*Hyperoglyphe antartica*	*X*				
Boarfish	*Pentaceropsis recurvirostris*		*X*			
Cod	*Pseudophycis bachus, P. barbata & Lotella rhacina*	*X*	*X*	*X*		
Dory	Zeidae		*X*			
Eel, conger	*Conger verreauxi*			*X*	*X*	
Flathead, dusky	*Platycephalus fuscus*	*X*				
Flathead, sand	*Platycephalus bassensis*	*X*	*X*			
Flathead, tiger	*Neoplatycephalus richardsoni*					
Flounder, greenback	*Rhomosolea tapirina*		*X*			
Garfish	*Hyporhamphus melanochir*	*X*				
Gurnard	Scorpaenidae & Triglidae	*X*	*X*			
Hapuka	*Polprion oxygeneios*	*X*				
Jack mackerel	*Trachurus declivis*	*X*	*X*			*X*
Latchet	*Pterygotrigla polyommata*	*X*	*X*			
Leatherjacket	Monacanthidae	*X*	*X*			
Ling	*Genypterus blacodes & G. tigerinus*	*X*	*X*			
Luderick	*Girella tricuspidata*	*X*				*X*
Marblefish	*Dactylosargus arctiden*		*X*			
Marlin, striped	*Tetrapturus audax*	*X*				
Morwong, banded	*Cheilodactylus spectabilis*		*X*			*X*
Morwong, jackass	*Nemadactylus macropterus*	*X*	*X*			
Mullet	Mugilidae, esp *Aldrichetta forsteri*	*X*	*X*			
Pike, long-finned	*Dinolestes lewini*	*X*				
Pike, shortfin	*Sphyraena novaehollandiae*	*X*				
Butterfly perch	*Caesioperca lepidoptera*	*X*				
Sergeant baker	*Aulopus purpurissatus*	*X*				
Shark, draughtboard	*Cephaloscyllium laticeps*		*X*			
Shark, elephant	*Callorhynchus milii*	*X*	*X*			
Shark, gummy	*Mustelus antarcticus*	*X*	*X*			
Shark, mako	*Isurus oxyrinchus*	*X*				
Shark, Port Jackson	*Heterodontus portusjacksoni*	*X*	*X*	*X*		
Shark, school	*Galeorhinus galeus*	*X*	*X*			
Shark, spurdog	*Squalus acanthias & S. megalops*	*X*				
Silver trevally	*Pseudocaranx dentex*	*X*	*X*			
Skates/rays	Rajiformes	*X*	*X*			
Snapper	*Pagrus auratus*	*X*				
Stargazer	Uranoscopidae		*X*			
Tailor	*Pomatomus saltator*	*X*	*X*			
Trout, brown	*Salmo trutta*	*X*				
Pufferfish	Tetradontidae	*X*				
Trumpeter, bastard	*Latridopsis forsteri*	*X*	*X*			
Trumpeter, striped	*Latris lineata*	*X*	*X*			
Tuna, albacore	*Thunnus alalunga*	*X*				
Tuna, skipjack	*Katsuwonus pelamis*	*X*				
Tuna, yellowfin	*Thunnus albacares*	*X*				

Common name	Scientific name	Line	Gillnet	Pot	Ring	Dive
Warehou, blue	*Seriolla brama*		*X*			
Warehou, spotted	*Seriolella punctata*	*X*				
Whiting	Sillaginidae, esp *Sillago flindersi*	*X*				
Wrasse	Labridae, incl *Notolabrus tetricus & N. fucicola*	*X*	*X*	*X*		*X*
Yellowtail kingfish	*Seriola lalandi*	*X*				
Abalone	*Haliotis ruba & H. laevigata*					*X*
Rock lobster	*Jasus edwardsii*			*X*	*X*	*X*
Crabs	Decapoda			*X*		
Squid, arrow	*Nototodarus gouldi*	*X*				
Squid, calamary	*Sepioteuthis autralis*	*X*				
Octopus	*Octopus* spp.	*X*	*X*	*X*		

Appendix 2 Length-weight relationships used to convert size composition data into weights. Lengths are fork lengths except for total length[1] and dorsal mantle length[2].

Species	Length-weight relationship	Source
Australian salmon	$W(g) = 1.17x10^{-2}*L\ (cm)^{3.09}$	MRL, unpub data
Barracouta	$W(g) = 1.06x10^{-1}*L(cm)^{2.238}$	Blackburn (1960).
Bream	$W(g) = 2.49x10^{-2}*L(cm)^{2.962}$	Conron (unpubl.data)
Cod (*Pseudophycis bachus*)	$W(g) = 7.4x10^{-3}*L(cm)^{3.06}$	Annala and Sullivan (1997)
Squid, calamary[2]	$W(g) = 8.9x10^{-2}*L(cm)^{2.7}$	McGlennon and Kinloch (1997)
Flathead, sand	$W(g) = 1.89x10^{-3}*L(cm)^{3.381}$	Jordan (1997)
Flathead, tiger	$W(g) = 4.1x10^{-3}*L(cm)^{3.163}$	Jordan (1997)
Jack mackerel	$W(g) = 1.15x10^{-2}*L(cm)^{3.061}$	Williams *et al.* (1986)
Leatherjacket (Monocanthidae)	$W(g) = 1.65x10^{-2}* L(cm)^{3.014}$	Steffe *et al.* (1996)
Morwong, jackass	$W(g) = 1.4x10^{-2}*L(cm)^{3.086}$	Jordan (1997)
Mullet, yellow eye (*Aldrichetta foresteri*)	$W(g) = 3.78x10^{-3}* L(cm)^{3.34}$	MRL, unpub. data
Silver trevally	$W(g) = 3.35x10^{-2}* L(cm)^{2.846}$	Steffe *et al*. (1996)
Trumpeter, bastard	$W(g) = 1.12x10^{-2}*L(cm)^{3.14}$	Murphy and Lyle (1998)
Tuna, albacore	$W(kg) = 1.09x10^{-5} * L(cm)^{3.14}$	AFMA
Tuna, skipjack	$W(kg) = 6.8x10^{-6} * L(cm)^{3.283}$	AFMA
Warehou, blue	$W(g) = 1.7x10^{-2}*L(cm)^{3.037}$	Lyle and Ford (1993)
Whiting, eastern school (*Sillago flindersi*)	$W(g) = 6.2x10^{-3}*L(cm)^{3.15}$	Jordan (1997)
Wrasse[1] (Labridae)	$W(g) = 5.35\ x10^{-2}* L(cm)^{2.71}$	MRL, unpub data

Appendix 3. Sample size, size range and mean lengths and weight for species measured during the survey (mean weight based on estimated total sample weight [using Length-weight relationships] divided by sample size). nd not determined

Species	Sample size (no.)	Length (cm) Min	Max	Mean	Mean Weight (g)
Atlantic salmon	26	41	83	51	nd
Australian salmon	354	13	48	27	354
Barracouta	131	33	151	79	1,933
Boarfish	6	39	45	43	nd
Bream	139	21	42	30	639
Southern calamary	66	19	41	29	722
Cod	73	25	54	36	469
Eel	1	92	92	92	nd
Elephant fish	2	55	68	62	nd
Dusky flathead	1	44	44	44	nd
Sand flathead	6197	17	53	32	249
Tiger flathead	195	22	52	39	480
Flathead (unspecified)	298	19	73	33	nd
Greenback flounder	10	22	33	30	nd
Garfish	17	24	37	29	nd
Gurnard	138	19	44	30	nd
Leatherjacket	77	18	41	28	438
Blue mackerel	6	23	40	32	nd
Jack mackerel	106	17	34	24	204
Marblefish	2	25	26	26	nd
Striped marlin	2	196	220	208	nd
Banded morwong	11	30	44	34	nd
Jackass morwong	49	28	53	38	1,183
Mullet	198	14	37	27	268
Ocean perch	5	26	35	30	nd
Long-finned pike	26	28	51	37	nd
Pike (unspecified)	9	38	63	48	nd
Sergeant baker	2	30	31	31	nd
Shark, spurdog	1	40	40	40	nd
Shark, gummy	3	50	130	100	nd
Shark, mako	7	79	263	185	nd
Snapper	4	20	36	25	nd
Short-finned pike	1	62	62	62	nd
Arrow squid	10	18	43	28	nd
Squid (unspecified)	14	19	34	27	nd
Tailor	2	31	33	32	nd
Blue eye trevalla	38	48	77	60	nd
Silver trevally	90	15	35	22	222
Brown trout	3	30	39	34	nd
Bastard trumpeter	233	29	52	40	1,267
Striped trumpeter	24	38	63	52	nd
Albacore tuna	255	34	82	55	3,561
Skipjack tuna	68	32	52	43	1,600
Yellowfin tuna	4	55	130	76	nd
Blue warehou	204	22	48	34	885
Whiting	312	14	27	21	107
Wrasse	49	18	46	31	589