Southern Fisheries Centre • Deception Bay

QO 00010

Assessing the recreational fishery for blue swimmer crab in Moreton Bay

Wayne Sumpton

FRDC Project No. 98/120

Queensland Government
Department of Primary Industries

FISHERIES RESEARCH & DEVELOPMENT CORPORATION

QO00010
ISSN 0727-6281
Agdex 476/06

ISBN 0 7345 0103 X

Manager, Publication Production
Department of Primary Industries
GPO Box 46
Brisbane Qld 4001

TABLE OF CONTENTS

1 NON TECHNICAL SUMMARY

98/120 Assessing the Recreational Fishery for Blue Swimmer Crab in Moreton Bay

PRINCIPAL INVESTIGATOR: Wayne Sumpton

ADDRESS:
Queensland Department of Primary Industries
Southern Fisheries Centre
PO Box 76
Deception Bay Q. 4508
Telephone 07 3817 9584
Fax 07 3817 9555
Email sumptow@dpi.qld.gov.au

OBJECTIVES:

1. To estimate recreational catch rates of blue swimmer crab in Moreton Bay.

2. To validate data collected from other programs estimating recreational catch and effort.

NON TECHNICAL SUMMARY:

Recreational anglers were interviewed at 5 boat ramps in Moreton Bay during 1999 to determine catch rates of popular fish species and in particular blue swimmer crabs (*Portunus pelagicus*). Fifty two survey days were allocated to each of the following boat ramps:- Scarborough, Shorncliffe, Manly, Wellington Point and Raby Bay. Eight weekend days and 5 weekdays were surveyed per quarter at each ramp with randomly allocated 6-hour interview shifts beginning at either 0600hr or 1200hr.

A total of 2161 interviews with recreational fishers were conducted over the 12-month period. Fishing gear used by recreational fishers to capture blue swimmer crabs was predominantly tangle nets or "dillys" with the most popular bait being mullet (*Mugil cephalus*).

Blue swimmer crabs were the third most popular species targeted by Moreton Bay recreational boat fishers. Only diver whiting (*Sillago maculata*) and snapper (*Pagrus auratus*) were more frequently targeted. Numerically, blue swimmer crabs were the second most common component of the catch behind diver whiting. Of those fishers who targeted crabs 40% failed to return with any blue swimmer crab catch, and only 4 fishers caught in excess of 20 crabs. Catch rates varied between ramps and seasonally, with an overall average targeted catch of 3.01 $\pm$ 0.71 crabs per boat day. The average number of crabs caught but later released because they were undersized or female, was 4.64 $\pm$ 0.37 per boat day. Catch rates were highest during the first and fourth quarters and there were significant differences in catch rates between the various ramps. Fishers who returned to ramps in southern Moreton Bay had higher catch rates than those in the northern Bay. The percentage of undersized blue swimmer crabs in the recreational catch was 7.8% (compared with 10.0% obtained during 1994/95). The average size of crabs in recreational creels did not vary significantly seasonally or between ramps.

An earlier survey of recreational crabbers who returned tagged crabs during the mid 1980's showed that it was common to see catches in excess of 20 crabs per boat day. The distribution of catch sizes in the current survey (where catches in excess of 10 crabs were rare) suggested that recreational catch rates had declined in the last 15 years.

Targeted catch rates (number per boat day) of other popular recreational fishing species were as follows:-

Snapper (*Pagrus auratus*) caught outside Moreton Bay	2.00 ± 0.48
Snapper (*Pagrus auratus*) caught inside Moreton Bay	1.05 ± 0.16
Bream (*Acanthopagrus australis*)	2.58 ± 0.58
Diver whiting (*Sillago maculata*)	34.63 ± 2.68
Sand whiting (*Sillago ciliata*)	4.64 ± 1.40

Almost 12% of snapper that were landed were below the minimum legal size as were 22% of sand whiting (*Sillago ciliata*). Species which were rarely seen as undersized were dusky flathead (0.96%) and mackerel species (0%).

At the intensity of sampling achieved in this survey (and with similar levels of variation in catch rate), it should be possible in the future to detect a 15% change in blue swimmer crab catch rate with 95% certainty. The catch rate information collected during this survey will be useful in validating data collected by diary and phone surveys currently taking place as part of the National Recreational Survey. At the time of printing, these data were not yet available. Results of this survey, however, have provided a better indication of the size structure of the recreational catch in one of the Queenslands' most important recreational fishing areas. They have also provided data on size limit compliance amongst the participants of the recreational boat fishery in Moreton Bay.

KEYWORDS: Blue swimmer crab, recreational survey,

2 BACKGROUND

The blue swimmer crab *Portunus pelagicus* is fished in all Australian states other than Victoria and Tasmania. Australia-wide the commercial fishery produces over 1500 tonnes per annum (Kumar, 1997), however the size of the recreational catch is presently unknown. Management measures vary considerably from state to state and involve size limits, gear restrictions and in some states protection of females. In Queensland there are no bag limit restrictions on the recreational blue swimmer crab fishery and apart from limiting gear to 4 traps or pots per recreational fisher, regulations governing recreational and commercial sectors are essentially the same.

A national workshop on blue swimmer crabs conducted in South Australia (Kumar, 1997) highlighted the need for a national approach to research on blue swimmer crabs. One of the national priorities identified by that workshop was an assessment of the recreational catch.

The blue swimmer crab fishery in Queensland has changed dramatically during the 1990's. Since the implementation of the CFISH commercial logbook system in 1988 the trawl catch of blue crabs has doubled and the trap/pot catch has decreased by 30%. The commercial catch in Queensland is currently about 450 tonnes with a GVP of about $3 million. The magnitude and value of the recreational catch is at present unknown, but it is commonly believed to be similar in magnitude to that of the commercial sector. A recent phone survey of recreational fishers throughout Queensland highlighted blue swimmer crabs as one of the top three targeted species in a number of geographic regions (Anon, 1999). In recent times recreational fishers have also been concerned about declining crab catches, but there is no data to support this view.

This report addresses the objective of providing information on recreational blue crab catches in Moreton Bay, which is believed to be the area from which the majority of the State's recreational blue swimmer crab catch is taken.

3 NEED

The Strategy for Collaborative Research Programs on the blue swimmer crab (*Portunus pelagicus*) identifies the need to determine the recreational catch as a national priority. At present we have very limited information about the recreational blue swimmer crab fishery in Queensland (apart from widespread anecdotal reports of declining recreational catches).

Should the recreational catch prove to be significant, (which is most likely) and if there are differences in the catch characteristics of commercial and recreational fisheries, then management advice based solely on commercial statistics may be inappropriate.

The Queensland Fisheries Management Authority is currently conducting a project to document recreational catch and effort using phone interviews and voluntary recreational diaries. "Off-site" methods such as these are known to give less precise estimates of average fish size and are more likely to be biased than "on site" methods where face to face interviews are conducted and catches are counted and measured by creel clerks.

Although small catches are taken off jetties and bridges, the Queensland recreational fishery for blue swimmer crabs is almost exclusively a boat based activity and therefore lends itself to assessment by on-site surveys conducted at boat ramps. The conduct of an on-site survey such as that described here would also help validate the results of diary programs and give more precise estimates of recreational catch rate than would off-site methods. It also has the added benefit of providing validating information on various other recreational species. The public education properties of face to face interviews are also an advantage of these methods.

4 OBJECTIVES

To estimate recreational blue swimmer crab catch rates in Moreton Bay.

To validate data collected from other programs estimating recreational catch and effort.

5 METHODS

5.1 Pilot survey

A pilot survey was conducted during November and December 1998 to determine whether a bus route survey was appropriate for estimating recreational catch and effort in Moreton Bay. This survey involved counting the number of vessels leaving popular marinas and boat ramps. It was thought that a bus route survey would be inappropriate (particularly for the estimation of recreational effort) should the number of vessels leaving from marinas prove to be significant. Unlike boat ramps, where trailer counts can be obtained, it is difficult to get a measure of fishing effort from a short visit to a marina. Timing of traversing various survey routes was also undertaken, however no interviews of recreational fishers were conducted during the pilot work.

The pilot survey was conducted on 7 occasions for 3 hours (0500 to 0800 hrs) during randomly chosen mornings. These times were chosen as they were times when previous studies had shown that the majority of fishing trips begin (Ferrell and Sumpton, 1997). Two surveys were undertaken at each of Raby Bay and Manly and three survey days were allocated to the boat ramps at Scarborough and its associated marina, as well as the nearby marina at Newport. The areas were chosen because each had a popular boat ramp and a large marina complex nearby. On all sampling days, vessels leaving boat ramps made up the majority of recreational fishing vessels leaving an area (See Table 1) but at all surveyed locations the number of vessels leaving marinas and private berths was significant. In some cases over 30% of the total vessels leaving a ramp/marina complex left from the marina. A number of survey routes were trialed and timed. Several ramps were only a couple of kilometres apart on the shore, but required over an hour of car travel to get from one to the other. This, and the fact that the logistics of adequately surveying vessels leaving from private berths and marinas was prohibitive, led us to choose a fixed access point design rather than a bus route survey (this was foreshadowed in the original design). We therefore chose to concentrate on the measurement of recreational catch rates and to investigate methods of deriving indices of effort at popular boat ramps.

Table 1 Numbers of boats leaving marinas compared with numbers leaving nearby ramps during November- December 1998. Numbers beside location names refer to different sampling occasions.

Location	Boats leaving marina	Boats leaving boat ramp
Raby Bay (1)	7	12
Raby Bay (2)	6	13
Manly (1)	2	6
Manly (2)	0	3
Newport/Scarborough (1)	1	6
Newport/Scarborough (2)	5	13
Newport/Scarborough (3)	2	11

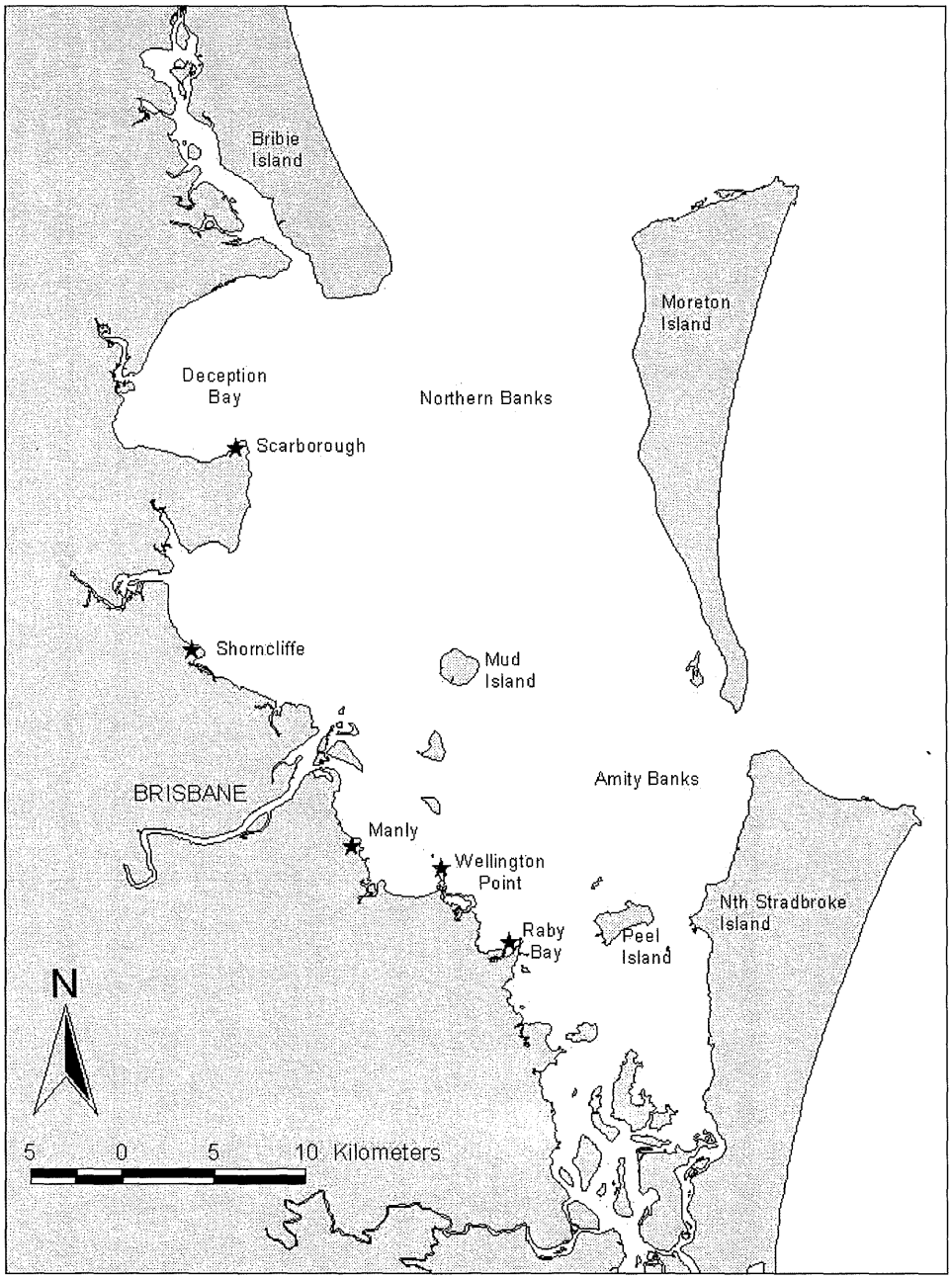

Figure 1 Moreton Bay showing ramps (Locations marked with stars) where creel surveys were undertaken during 1999. (Surveys have also previously been conducted at both Manly and Raby Bay during 1994/95)

5.2 Catch Survey

Recreational catch information was gathered using a random stratified access point survey conducted at 5 locations (Scarborough, Shorncliffe, Manly, Wellington Point and Raby Bay,). These locations (Figure 1) were chosen after the pilot survey showed that anglers fishing in Moreton Bay used these ramps most frequently. In addition, enforcement officers and fishing club members were asked for their views on the most popular ramps used by anglers. This advice correlated closely with the results of the pilot survey. While non-

random selection of ramps was considered a possible source of bias in determining catch rates, the fact that there were over 50 ramps in the survey area necessitated a compromise. No interviews were obtained at other ramps to allow an assessment of the variability of catches among minor ramps. The assumption was that the skill of anglers did not vary significantly among ramps. It was also recognised that non-random selection of ramps would heavily bias any estimates of effort obtained from the survey. However, it was considered that maximising the numbers of interviews was a better strategy since recreational effort was not being assessed directly during the survey.

Sampling was undertaken on 54 randomly chosen days at each location (13 days per quarter) with unequal probability of sampling weekends and weekdays (public holidays were included as weekends but school holidays were considered weekdays). Eight weekends and 5 weekdays were sampled per quarter at each location. Surveys were conducted during daylight hours only between 0600 and 1800 hrs. The length of a survey shift was typically 6 hours with the morning shift beginning at 0600 hr and the afternoon shift at 1200 hr. The following data were collected where possible from the boat owners of recreational vessels returning to the ramp on the sampling days (see also Appendix 3 and 4 for interview and effort recording sheets).

Estimated time the vessel left the ramp
Number and sex of persons fishing from the vessel
Vessel size (metres)
Postcode of the boat owner's residential address
Location(s) fished (up to a maximum of 3)
Number of lines and hooks used
Estimated travelling and fishing times
Target species (up to 3 species were recorded)
Crabbing apparatus used, numbers of apparatus and number of "lifts"
Bait used
Estimates of the number of each species caught and released.
Number and size (Total Length in centimetres) of each fish retained (These were generally identified and measured by the creel clerk).

All fish were measured ($\pm$ 0.5 cm) from the tip of the snout to the tip of the caudal fin (with the fin extended to maximum length). This method is different from the standard scientific definition of total length that normally specifies the caudal fin in its "natural position". However, as the Queensland Fisheries Act specifies this method of measurement, and enforcement agencies and fishers are familiar with it, we also chose to use it. Blue swimmer crabs were measured across the tips of the lateral spines (carapace width) and were usually measured more accurately ($\pm$ 1mm). When the overall catch of any one species exceeded 30 individuals a sub-sample was measured. There were also times when a smaller sub-sample was measured, or fish could not be measured due to lack of co-operation by anglers, or other circumstances. This was the case in fewer than 4% of interviews.

Generally an occupant from each vessel returning to boat ramps was surveyed, except at times when there were too many vessels to allow a total coverage. Since other surveys have shown that recreational fishing effort in non-estuarine areas of Moreton Bay was negligible on days when wind strength exceeded 25 knots, survey days were rescheduled to the next available day within the particular stratum when wind speed was predicted to exceed 25 knots. The overall percentage of missed interviews was less than 5% of those vessels returning, although on some weekends it reached 10% at the larger 4 lane ramps (e.g. Raby Bay).

6 RESULTS

6.1 Current management measures

Management measures imposed clearly have a major impact on the catch landed by either the recreational or commercial sector. This is particularly the case for blue swimmer crabs. In Queensland, there is a total ban on the taking of female crabs by both recreational and commercial sectors, and there is a minimum legal size of 15 cm for male blue swimmer crabs. The size is measured as the carapace width from the extremities of the lateral spines. Crabs with damaged spines can be measured by an alternative means on the underside of the body. This is from the joint of the claw to the joint of the last walking leg and the minimum allowable size is 3.7 cm. There are also effort restrictions on the number of apparatus used to catch blue swimmer crabs with 4 pieces of apparatus able to be used by each recreational fisher. It is also illegal to damage or mutilate crabs in any way, except immediately prior to consumption.

6.2 Description of the Moreton Bay recreational blue swimmer crab fishery

The recreational fishery for blue swimmer crabs in Moreton Bay takes place in virtually the entire Bay including the rivers and creeks that drain into the large central embayment. Effort tends to concentrate in particular areas usually close to shore or adjacent to the large sandbanks in the central and northern regions of the Bay. The typical gear that is used by recreational fishers is the tangle net or "Dilly". These are baited with fish (usually mullet) and lifted repeatedly to remove the entangled crabs that have been attracted to the bait. A proportion of fishers also use baited traps similar to those used by commercial operators. The usual practise is for crabbing gear to be set at the beginning of a fishing trip and then fishers will move off to another area (usually close by) to line fish for other species. Anecdotal information and popular fishing literature note that the best months for recreational crabbing are months containing the letter "r" (September to April).

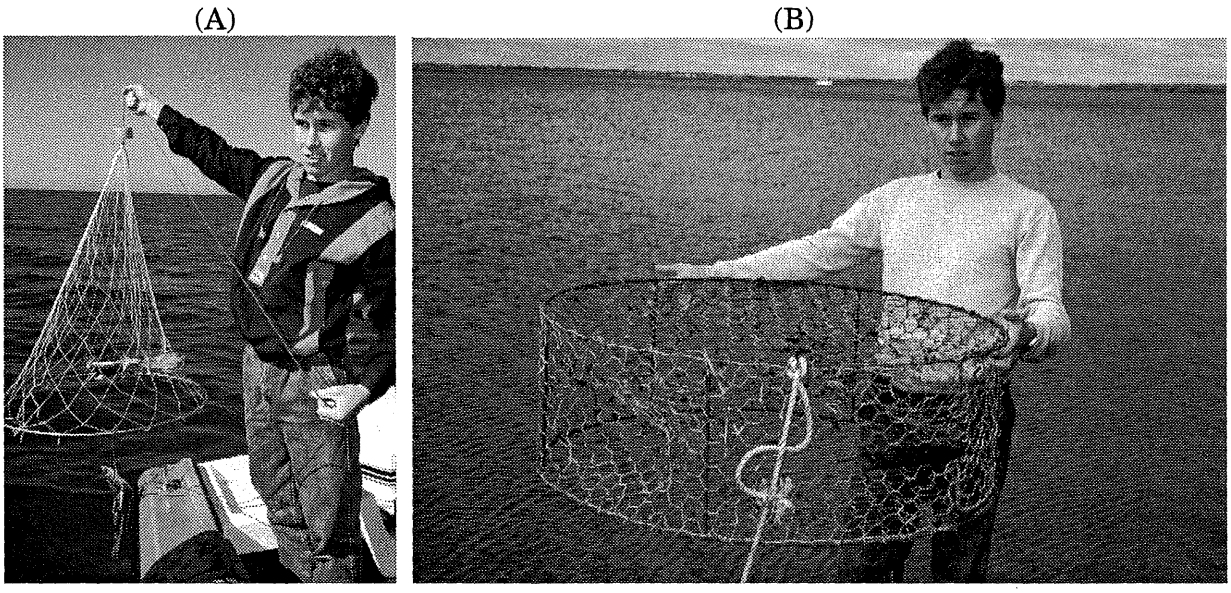

Figure 2 Crabbing apparatus commonly used by recreational fishers in Queensland. (A) Tangle net or "Dilly" (B) Crab pot (There are many variations on this basic design)

6.3 Historical Data Summary

There have been two previous studies that have collected data on the recreational catch of blue swimmer crabs in Moreton Bay. The first of these was a tagging study (Potter *et al,* 1991) of blue swimmer crabs conducted during 1985 when approximately 6000 crabs were

tagged and released with subsequent recaptures being collected from the trawl, commercial pot and recreational sectors. When tagged crabs were collected, the fishers were asked about their total catch on the day they caught the tagged crab. Approximately 20 crabs were caught by each boat with some considerably large catches (in excess of 50 crabs) being reported (Figure 3).

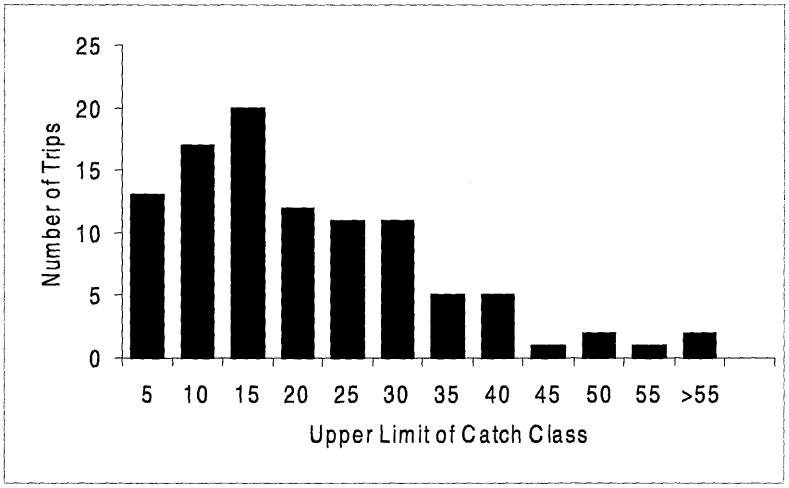

Figure 3 Frequency distribution of various catches of blue swimmer crabs per recreational fishing boat day. (Data from interviews of recreational fishers who returned tagged blue swimmer crabs during the 1985 - 1986 survey)

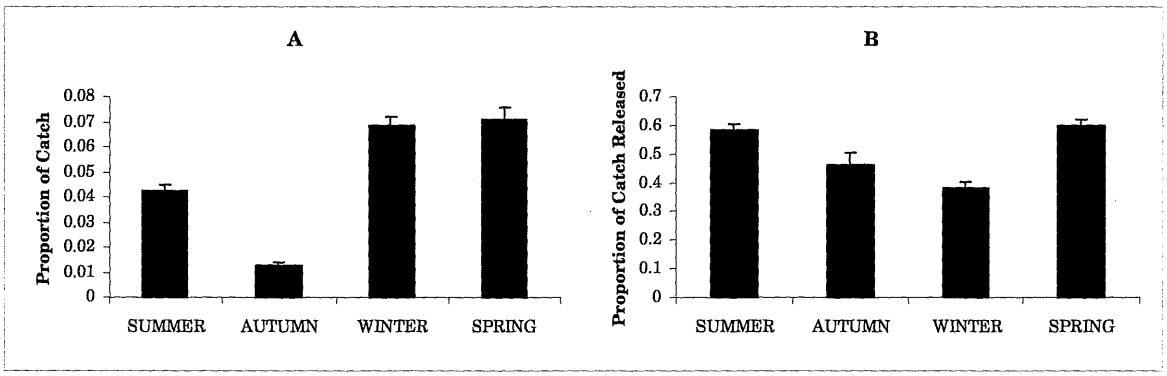

Figure 4 Seasonal variation in the proportion of blue swimmer crabs in the retained catch of inshore anglers (A), and the proportion of all blue swimmer crabs caught from inshore waters that were released (B). Bars represent the standard error.

The second study was an access point creel survey conducted during 1994/95. That survey was designed to estimate catch rates of species caught offshore from the Qld/NSW border to Fraser Island. However, large numbers of interviews were also obtained from recreational fishers targeting blue swimmer crabs in Moreton Bay. In that study, blue swimmer crabs made up 4.32% (by number) of the total inshore catch with 99.49% of blue swimmer crabs caught coming from fishers returning to the boat ramps at Manly and Raby Bay (The only ramps surveyed inside Moreton Bay). Blue swimmer crabs contributed most to total catches in winter and spring and contributed least in autumn (Figure 4).

The overall catch per unit effort, considering only those anglers that targeted blue swimmer crabs was 3.36 crabs per boat (Table 2). At both Manly and Raby Bay catch rates were highest during the first and fourth quarters with catch rates at Manly being roughly twice those at Raby Bay.

Table 2 Catch rates (number per boat trip) of blue swimmer crabs for recreational fishers who targeted the species during a 1994/95 survey in Moreton Bay.

Ramp	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Total
Manly	3.68 (0.84)	0.75 (0.75)	1.20 (0.97)	4.49 (0.84)	3.89 (0.58)
Raby Bay	2.60 (1.25)		2.00 (2.00)	2.63 (1.45)	2.00 (0.72)
Total	3.23 (0.66)	0.38 (0.38)	1.25 (0.73)	4.10 (0.73)	3.36 (0.47)

Release rates of crabs per boat trip (ie crabs that were caught by crabbers but which were subsequently released because they were undersized or females) are shown in Table 3. An average of 4.97 crabs were released overall although the variance was high reflecting the fact that some crabbers released considerable more crabs than the average.

Table 3 Rates of release (numbers per boat trip) of blue swimmer crabs by recreational fishers who targeted the species during a 1994/95 survey in Moreton Bay.

Ramp	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Total
Manly	4.41 (2.41)		1.60 (1.61)	6.57 (2.44)	5.37 (2.42)
Raby Bay	2.40 (1.80)	4.00 (2.99)		7.88 (2.53)	4.75 (2.55)
Total	3.70 (2.30)	2.22 (2.58)	1.00 (1.46)	6.52 (2.45)	4.97 (2.43)

Almost 45% of fishing trips that targeted blue swimmer crabs failed to land crabs above the minimum legal size, and most of the successful catches comprised fewer than 10 crabs (Figure 5). In fact there was only one catch that exceeded 20 crabs. Crab size data collected during the 1994/1995 survey suffered from lack of accuracy and appeared to be unreliable.

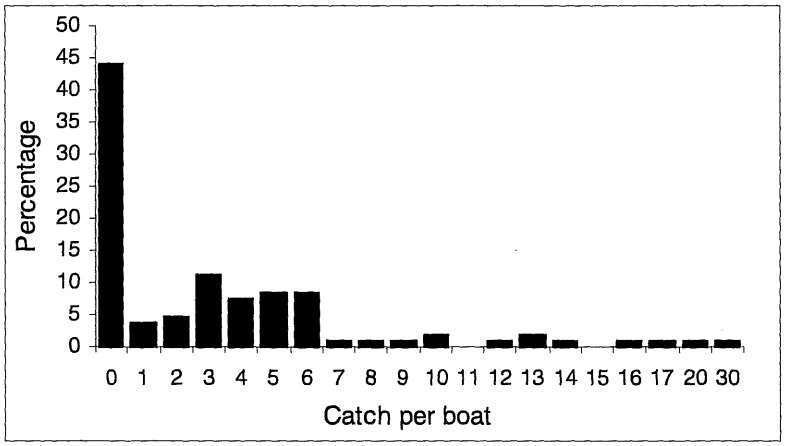

Figure 5 Frequency distribution of blue swimmer crab catches (crabs per boat trip) by recreational anglers that targeted the species.

6.4 Results of 1999 survey -blue swimmer crabs

During 1999 a total of 2161 interviews with recreational fishers were conducted throughout Moreton Bay. Regardless of the time of year males fishers always made up around 85% of people on recreational fishing vessels, and this trend was consistent across all sampling locations and times (Figure 6). Most trips were less than 10 hours in duration with the modal time being 4.4 hours (Figure 6). There was no significant difference (G = 0.16,

P>0.05) in the length of crabbing trips when compared with trips that targeted other species.

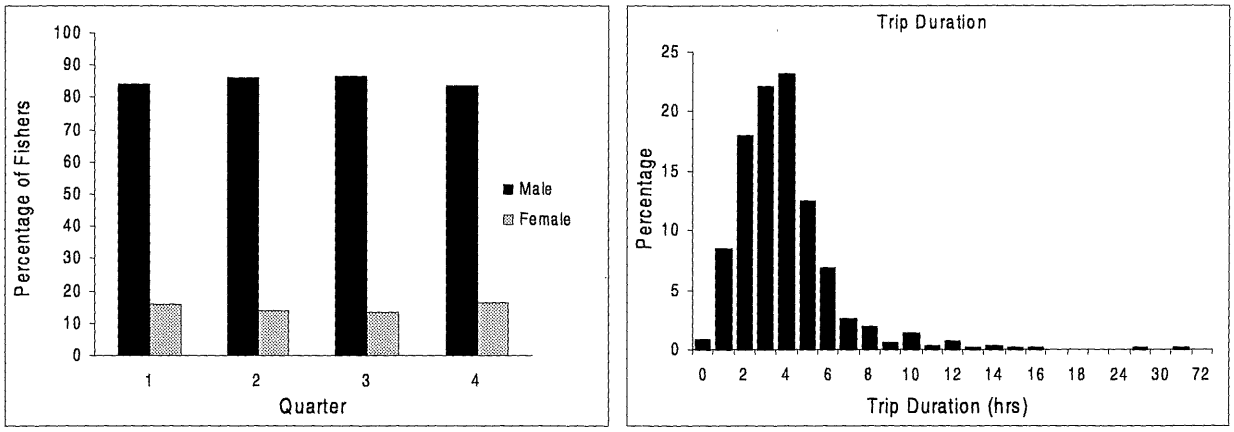

Figure 6 The sex ratio of fishers and duration of boat based fishing trips in Moreton Bay during 1999.

The most popular fishing destinations are shown in Figure 7. The waters around Peel Island in southern Moreton Bay were the most popular fishing areas, probably due to the more sheltered conditions and easy access. The waters around Peel Island are also important fishing grounds for crabs, whiting and several rocky reef species including snapper. Many people were also non-specific in their response to the question of fishing location with over 10% responding with the general answer of "Moreton Bay". As expected the general trend was for increasing popularity of the more sheltered locations.

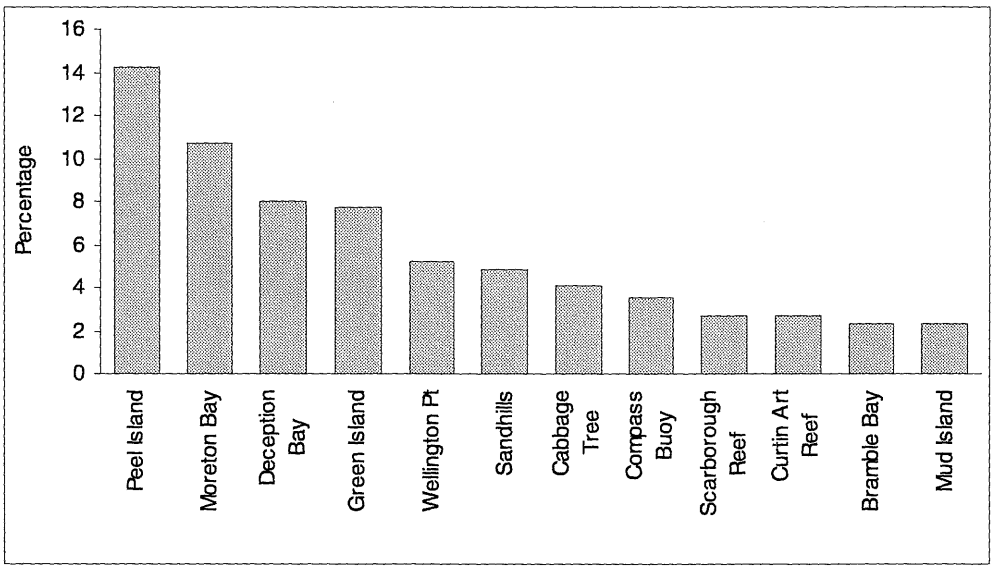

Figure 7 Popular fishing locations within Moreton Bay (percentage of fishers who reported fishing at various locations).

The most targeted species by recreational anglers was diver whiting (Figure 8) which were targeted on almost 20% of fishing trips, although the bulk of fishers failed to target any particular species. Blue swimmer crabs were targeted on 8% of fishing trips and were the third most targeted species. Snapper, a prized offshore species was also important to recreational fishers fishing both inside Moreton Bay and in the offshore waters outside the Bay. An interesting result was the targeting of prawns by fishers, particularly by those leaving from the Shorncliffe boat ramp.

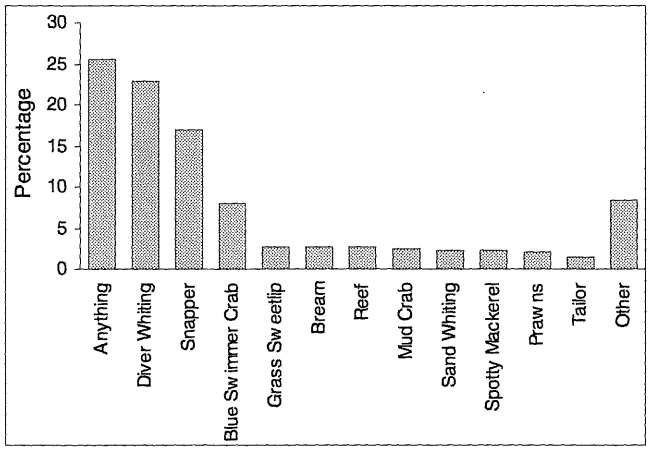

Figure 8 Target preferences of recreational boat fishers returning to 5 surveyed ramps in Moreton Bay.

The targeting preferences were reflected in the overall catch figures (Figure 9) which showed 80% of the catch (numerically) were diver whiting with blue swimmer crabs making up only 4% of the catch but being numerically the second most common element of the catch. Snapper were also well represented in recreational creels (3.5% of catch). A very high proportion of snapper were small and were released by recreational fishers. Significant numbers of diver whiting and blue swimmer crabs were also released.

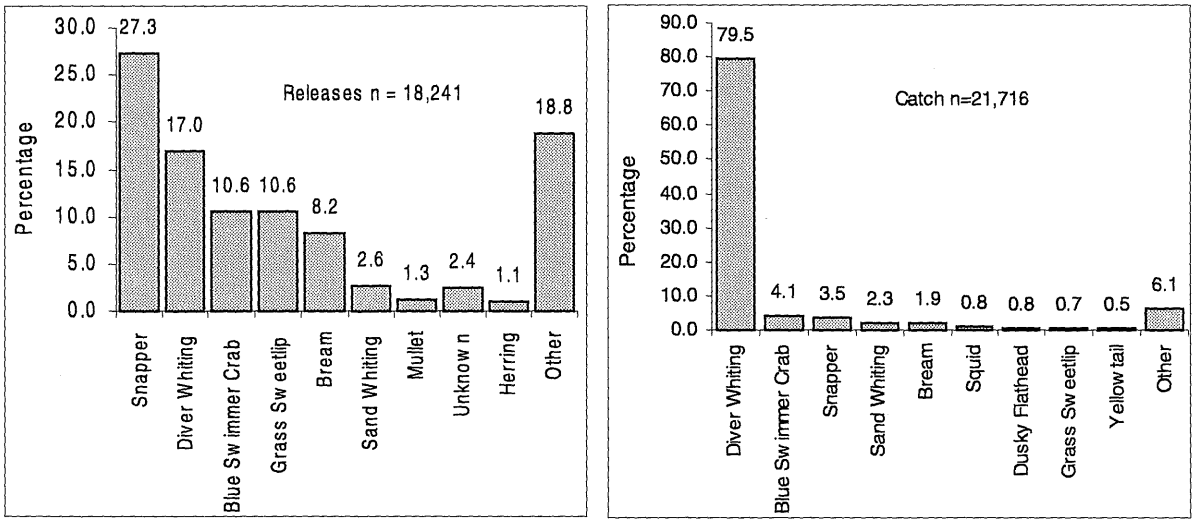

Figure 9 Percentage composition of common fish species released and retained by recreational boat anglers surveyed at 5 boat ramps in Moreton Bay.

Table 4 Number of recreational vessels participating in various boating activities in Moreton Bay

Activity	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
Offshore Fishing	132	30	24	13
Estuary Fishing	378	503	360	505
Cruising	42	32	19	40
Other	21	14	8	19
Total	573	579	411	577

For the purpose of this survey, offshore fishing was defined as any fishing activity that took place outside the waters of Moreton Bay (ie outside Bribie, Moreton or Stradbroke Islands). The vast majority of fishers were fishing within Moreton Bay (Table 4).

Despite the fact that crabs are known to be numerous in offshore waters, none of the 199 offshore recreational fishers interviewed reported that they had targeted, or caught blue swimmer crabs.

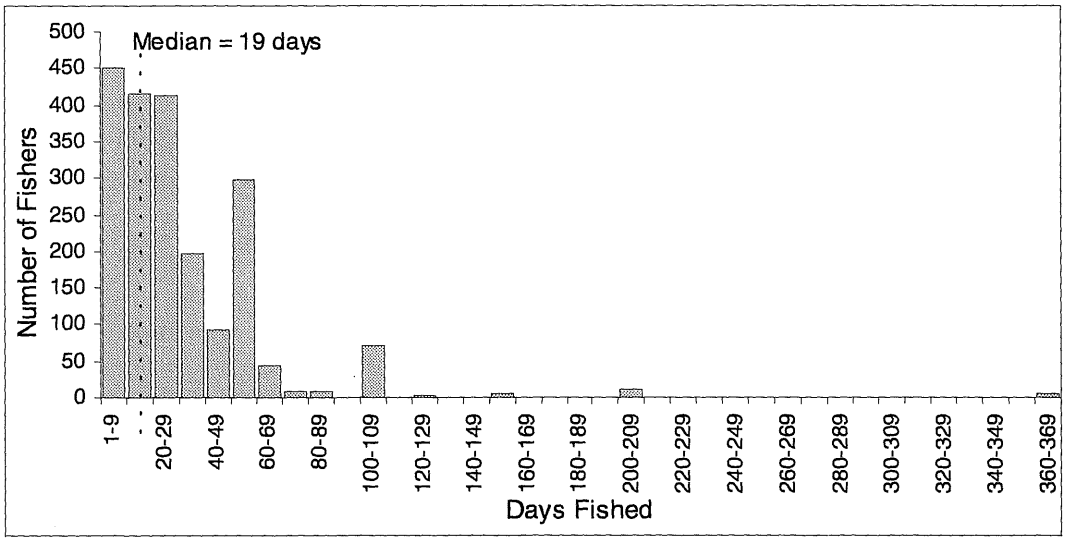

Figure 10 Number of days fished per year by recreational boat anglers in Moreton Bay.

Fishers were also asked to recall the number of fishing trips (including boat based and shore based trips) that they had undertaken in the last 12 months. The sample of fishers in this survey fished an average of 34.3 days, with the median at 19 days.

Table 5 Seasonal change in average catch rates of blue swimmer crabs (*Portunus pelagicus*) in recreational catches at 5 ramps in Moreton Bay. Standard errors are shown in parentheses.

Ramp	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Total
Scarborough	0.50 (1.20)	1.50 (0.54)	1.00 (0.99)	2.46 (0.54)	1.95 (0.39)
Shorncliffe	1.52 (1.18)	2.23 (0.62)	1.20 (1.02)	1.71 (1.38)	1.66 (0.81)
Manly	3.50 (0.54)	2.00 (0.67)	2.47 (0.59)	2.85 (0.53)	2.78 (0.31)
Wellington Point	2.50 (0.50)	1.42 (0.72)	2.38 (1.00)	5.45 (0.61)	3.86 (0.43)
Raby Bay	4.29 (1.11)	4.50 (1.50)		5.89 (2.06)	4.95 (1.03)
Total	2.81 (0.92)	1.95 (2.15)	2.00 (1.20)	3.81 (1.71)	3.01 (0.71)

Catch rates of fishers who targeted blue swimmer crabs are shown in Table 5. The highest average catch rates were found at Raby Bay and generally, catch rates from ramps in southern Moreton Bay were higher than those in the north of the Bay. Seasonally, highest catch rates were in the first and fourth quarters and these were almost double those of the second and third quarters. The third quarter is traditionally the time when commercial catch rates decline due to crabs becoming inactive in winter. No crabs were landed at Raby Bay in that period. Day type was not a significant factor that influenced recreational catch rates. The weekend catch rate was 3.04 ± 0 39 compared with 2.97 ± 0 39. Power analysis

indicated that with the level of sampling intensity used in this survey a 15% change in catch rates could be detected with 95% confidence.

Table 6 Seasonal change in average number of blue swimmer crabs (*Portunus pelagicus*) released in targeted recreational catches. Standard errors are shown in parentheses.

Ramp	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Total
Scarborough	1.29 (0.62)	1.29 (0.41)	1.33 (0.72)	2.64 (0.58)	1.98 (0.35)
Shorncliffe	0.81 (0.34)	4.45 (3.56)	2.29 (1.03)	2.50 (1.09)	2.33 (1.01)
Manly	4.95 (1.28)	12.15 (3.17)	5.30 (1.49)	5.50 (0.79)	6.12 (0.68)
Wellington Point	6.14 (1.74)	3.38 (0.61)	7.17 (2.34)	8.15 (1.41)	6.95 (0.93)
Raby Bay	3.76 (1.17)	9.75 (5.25)		5.69 (0.91)	4.93 (0.79)
Total	2.95 (0.52)	5.41 (1.46)	4.65 (0.93)	5.38 (0.49)	4.64 (0.37)

Overall the number of blue swimmer crabs which were released was more than one and a half times the number landed (Table 6). Fishers returning to ramps at the northern end of the Bay (and presumably fishing in the northern Bay) tended to release fewer crabs than those returning to the 3 most southern ramps. Seasonally, fewer crabs were released in the first quarter than later in the year.

Table 7 Seasonal change in average size (centimetres) of blue swimmer crabs (*Portunus pelagicus*) in recreational catches surveyed at 5 ramps in Moreton Bay. Standard errors are shown in parentheses.

Ramp	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Total
Scarborough	15.60 (0.40)	15.20 (0.20)	16.50 (0.50)	15.87 (0.10)	15.82 (0.10)
Shorncliffe	15.78 (0.64)	16.47 (0.34)	16.03 (0.28)	16.00 (0.25)	16.04 (0.21)
Manly	15.86 (0.16)	15.57 (0.17)	15.60 (0.17)	15.68 (0.06)	15.70 (0.06)
Wellington Point	15.88 (0.26)	15.43 (0.20)	15.46 (0.28)	15.32 (0.09)	15.41 (0.08)
Raby Bay	15.52 (0.11)	15.17 (0.15)		15.90 (0.07)	15.67 (0.06)
Total	15.67 (0.10)	15.55 (0.11)	15.66 (0.14)	15.69 (0.04)	15.66 (0.04)

The average size of blue swimmer crabs was not significantly different ($P>0.05$) seasonally (Table 7). The size was remarkably constant at about 15.5 centimetres carapace width. The differences among ramps were also low, however, some of the pair-wise comparisons differed significantly.

Table 8 Seasonal change in the percentage of blue swimmer crabs which were undersized at boat ramps in Moreton Bay.

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Total
% Undersized	9.64	12.86	9.09	5.68	7.80

During the period of the survey no females blue swimmer crabs were seen in recreational catches, however about 8% of crabs that were measured were less than the minimum legal size of 15 cm (Table 8).

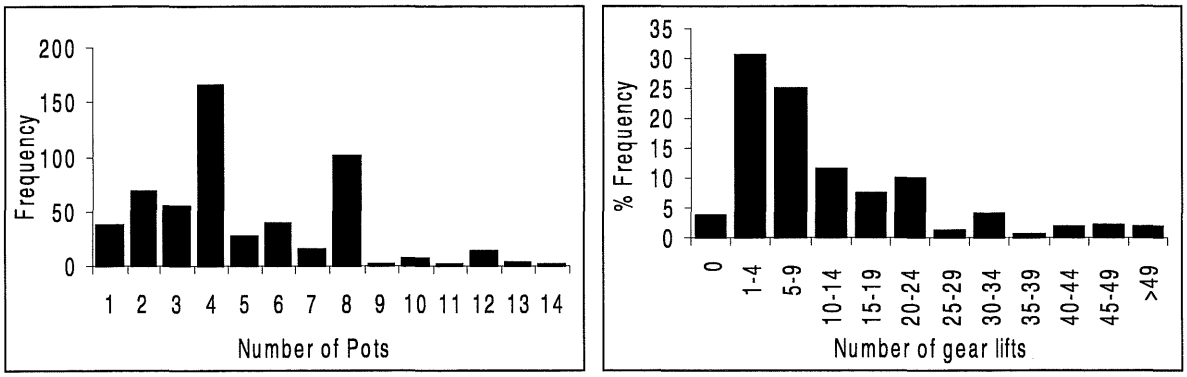

Figure 11 Number of pots used and numbers of lifts per recreational vessel during crabbing trips in Moreton Bay

Over 90% of recreational vessels which targeted crabs used fewer than 8 apparatus and two modes were clearly visible at 4 and 8 (Figure 11). Recreational fishers are permitted to use 4 crabbing apparatus each and so it was not surprising to find 4 and 8 as the most common numbers of apparatus. Overall the average number of apparatus used was 4.87 per trip. The dominant gear used by recreational angler was the tangle net ("dilly") which was used by 62% of fishers who targeted blue swimmer crabs. The other 38% used some form of trap or pot to catch crabs. Tangle nets in particular are usually set and retrieved a number of times during a fishing trip whilst pots may be left for longer periods before checking. The shorter time between checks for tangle nets is due to crabs becoming entangled in the mesh and subsequently becoming difficult to remove.

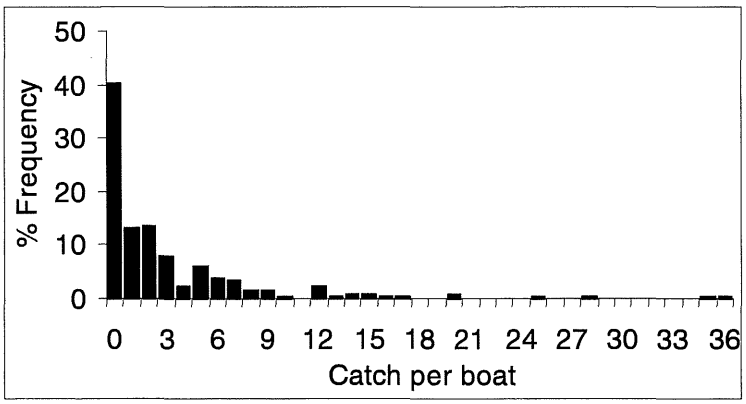

Figure 12 Distribution of catch sizes (numbers of crabs) for vessels that were targeting blue swimmer crabs in Moreton Bay during 1999.

Figure 12 shows the distribution of various catches of blue swimmer crabs for boats that targeted the species. Forty percent of targeted crabbing trips failed to return with any crab catch. Over 90% of fishing trips were unsuccessful in capturing more than 10 crabs and on only 4 occasions were catches in excess of 20 crabs recorded.

A wide range of bait types was used, but most bait consisted of some type of fish. Mullet (*Mugil cephalus*), which is the preferred bait used by commercial fishers was also the most popular recreational bait used by 65% of recreational crabbers (Figure 13).

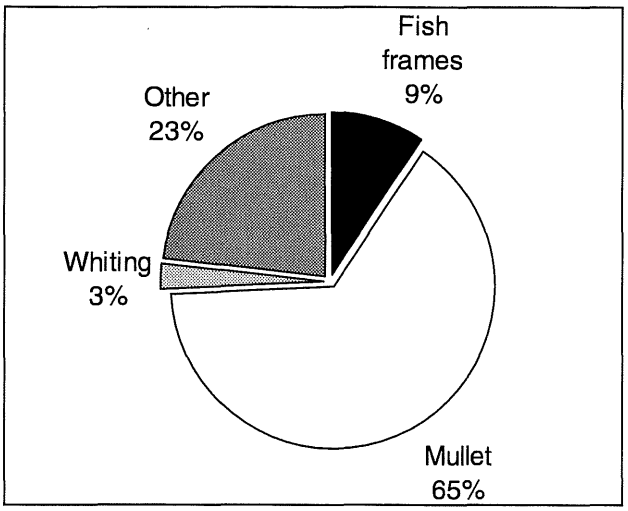

Figure 13 Bait used by recreational fishers.

6.5 Results of 1999 survey - other species

As well as information on blue swimmer crabs, data on catch rates, sizes etc were collected for a range of other popular recreational species. The most important of these (see Figure 9) were diver whiting, snapper, sand whiting, tailor, various mackerel species, grass sweetlip, yellowtail, bream, moses perch and squid. The size structure of the catch of a number of these species is shown in Figure 14 and the percentage of these that were undersized is shown in Table 9.

Table 9 Percentage of common fish species in recreational catches that were undersized.

Species	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Total
Snapper	10.92	11.38	10.28	13.77	11.70
Dusky Flathead	0	2.70	0	0	0.96
Tailor	0	4.55	4.88	0	4.55
Spotty Mackerel	0	0	0	0	0
Bream	3.19	5.96	5.41	18.75	7.51
Grass Sweetlip	13.50	3.30	0	14.29	13.01
Sand Whiting	36.17	21.67	3.70	9.38	22.04

Undersized fish were common in recreational catches. The species that were most commonly sighted as undersized were snapper, bream, grass sweetlip and sand whiting. The frequency of undersized snapper in catches was fairly consistent at over 10% each quarter. Sand whiting was the species most often retained as undersized with 22% of the landed catch being below the minimum legal size of 23 cm. It could be argued that problems with identification were the cause of the large number of undersized sand whiting since a similar species, diver whiting (*Sillago maculata)* is very abundant and does not have a minimum legal size. Red emperor were uncommon in recreational catches, however 7 of the 8 measured were under the current minimum legal size of 45 cm. The frequency of undersized flathead was very low during the survey and no undersized mackerel of any species were sighted. The presence of creel clerks at boat ramps appeared to do little in reducing the taking of undersized fish as there was no declining trend in the proportion of undersized fish through time.

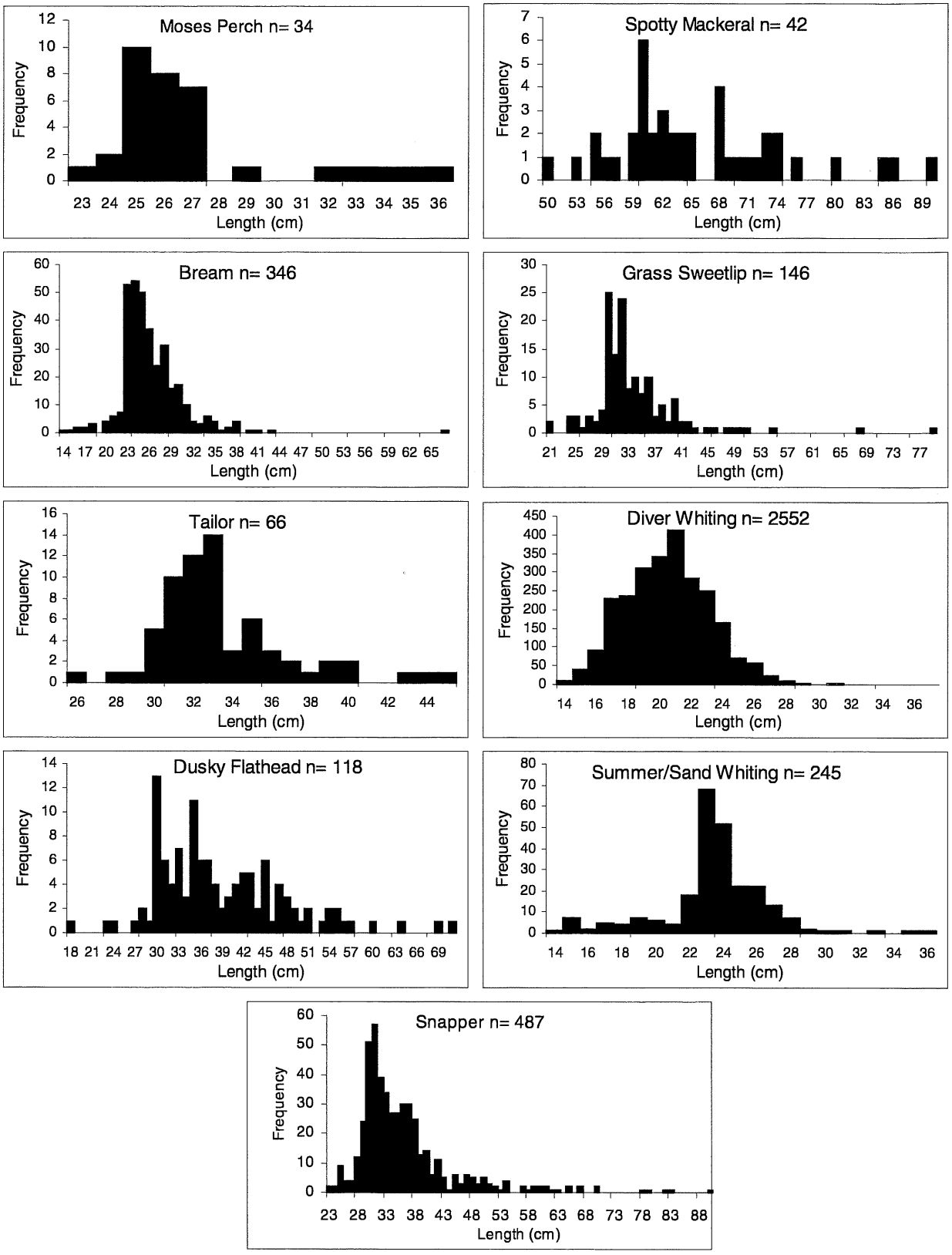

Figure 14 Total length (centimeters) of important recreational finfish species found in recreational creels in Moreton Bay.

The two groupings of whiting which consisted of diver whiting (*Sillago maculata*) and summer/sand whiting (*Sillago ciliata* and *Sillago analis*) had very different size structures. Diver whiting do not currently have a minimum legal size whereas the other whiting species have a size limit of 23 cm. Despite the fact that any size diver whiting can be landed only a

small proportion of fishers chose to retain diver whiting less than 17 cm in length. The size distributions of both spotty mackerel and dusky flathead were extended over a much greater range of sizes. Snapper were again spread over a large size range but relatively few larger specimens (>50 cm) were sighted during surveys.

Table 10 Seasonal change in average size of snapper (*Pagrus auratus*) in recreational catches at 5 ramps in Moreton Bay

Ramp	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Total
Scarborough	35.70	35.36	41.00	37.98	35.97
Shorncliffe	47.50		30.50		39.00
Manly	33.96	35.00	44.29	33.62	37.99
Wellington Point	32.00	32.45	41.67	36.24	38.07
Raby Bay	35.67	37.53	34.88	32.87	34.52
Total	35.46	35.71	39.56	34.38	36.12

Table 11 Seasonal change in average size of Bream (*Acanthopagrus australis*) in recreational catches at 5 ramps in Moreton Bay

Ramp	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Total
Scarborough	35.00	24.22	28.67	24.50	25.02
Shorncliffe	24.33	26.43	24.33	24.50	25.75
Manly	27.40	27.89	25.00	26.59	26.89
Wellington Point	29.00	26.22	27.44	25.70	26.40
Raby Bay	28.14	25.91		22.82	26.34
Total	27.49	25.95	26.30	24.71	26.18

Table 12 Seasonal change in average size of diver whiting (*Sillago maculata*) in recreational catches at 5 ramps in Moreton Bay

Ramp	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Total
Scarborough	18.69	19.34	20.41	18.76	19.46
Shorncliffe	18.91	17.94	18.08	17.86	18.36
Manly	21.94	20.14	21.15	22.93	21.49
Wellington Point	20.88	21.00	22.39	21.89	21.80
Raby Bay	22.13	21.50	19.00	21.93	21.81
Total	20.77	19.59	20.89	21.37	20.50

The average size of snapper, bream, diver whiting and sand whiting is shown in Tables 10 to 13. Analysis of variance showed that there were no significant differences in size of any of these species among ramps. Snapper, however, were significantly larger during the third quarter, which is the time when the larger spawners become more available to recreational and other fishers.

Table 13 Seasonal change in average size of sand whiting (*Sillago ciliata*) in recreational catches at 5 ramps in Moreton Bay

Ramp	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Total
Scarborough	20.78	22.70	23.00	23.93	22.07
Shorncliffe	24.46	27.00	25.00	26.65	25.01
Manly	24.28	26.00	25.60	27.00	25.32
Wellington Point			24.63	24.66	24.65
Raby Bay	21.25			23.58	23.25
Total	22.41	23.28	25.07	24.40	23.44

Table 14 Catch rates of species targeted by recreational anglers. Standard errors are shown in parentheses.

Species	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Total
Snapper (offshore)	2.00 (0.69)	1.50 (1.00)	2.50 (1.10)	1.50 (1.50)	2.00 (0.48)
Snapper (inshore)	0.59 (0.17)	1.43 (0.39)	1.25 (0.43)	0.84 (0.16)	1.05 (0.16)
Bream	2.20 (0.44)	3.22 (1.10)	0.69 (0.24)	3.33 (2.36)	2.58 (0.58)
Diver Whiting	39.47 (7.16)	26.34 (2.61)	33.96 (4.87)	45.56 (8.32)	34.63 (2.68)
Sand Whiting	7.79 (3.16)	3.75 (1.47)		2.08 (0.86)	4.64 (1.40)

Table 14 shows the catch rate of important recreational species that were specifically targeted by recreational anglers. Only catches from anglers who specifically said that they were targeting the species were used in this analysis. In many cases, these species were also caught by anglers who were not targeting any particular species, but those fish were not included in this analysis. Catch rates of snapper were significantly higher when fishing offshore than inshore. Targeted catch rate of diver whiting were high (average 35 fish per boat) compared with other species and were mainly caught during the first and last quarters.

Table 15 Numbers of various targeted species released by recreational anglers. Standard errors are shown in parentheses.

Species	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Total
Snapper (offshore)	5.00 (1.22)	4.80 (1.80)	5.75 (2.77)	1.00 (1.00)	4.98 (0.98)
Snapper (inshore)	5.22 (0.88)	8.35 (1.46)	7.11 (0.96)	7.81 (1.02)	7.30 (0.59)
Bream	1.96 (0.65)	1.93 (0.52)	0.63 (0.35)	1.50 (0.66)	1.66 (0.31)
Diver Whiting	8.49 (2.60)	5.97 (0.69)	4.24 (0.84)	1.71 (0.42)	5.03 (0.56)
Sand Whiting	8.17 (3.99)	2.50 (1.24)	1.00	3.24 (1.05)	5.14 (1.73)

More small snapper were caught and released inshore than offshore (Table 15) but still an average of 5 fish were released during offshore targeted fishing trips. About 5 diver and sand whiting were released each targeted trip compared to less than 2 bream.

The distribution of various catches amongst recreational fishers who targeted various species is shown in Figure 15. These graphs confirm the generally low catch rates achieved by recreational anglers who target all species other than diver whiting. The latter is the only species seen in very large numbers in many recreational catches in Moreton Bay.

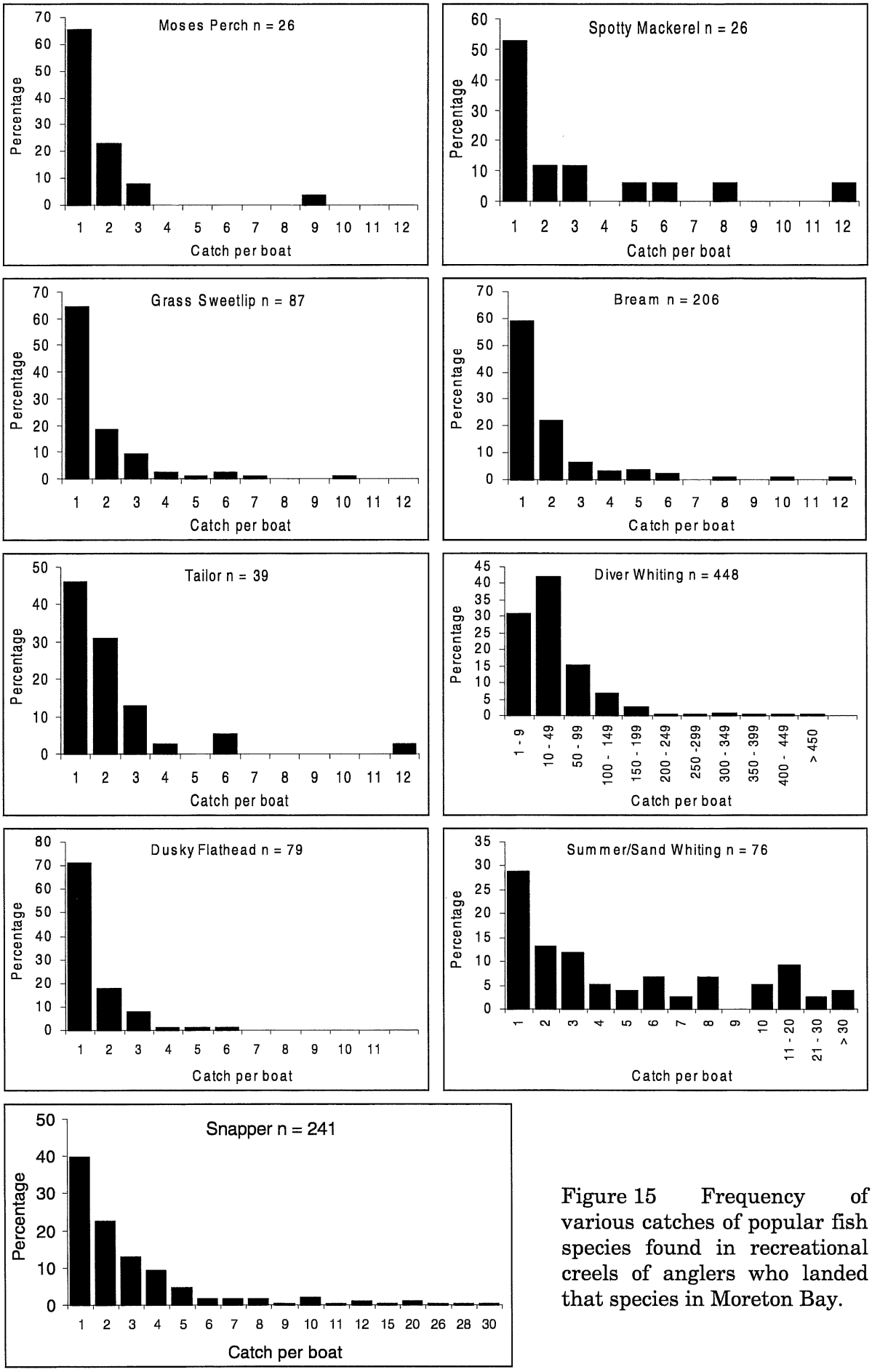

Figure 15 Frequency of various catches of popular fish species found in recreational creels of anglers who landed that species in Moreton Bay.

7 DISCUSSION

There appears to be little difference in the blue swimmer crab catch characteristics between 1994/95 and 1999. The distributions of various catches between the two surveys were very similar with 44% of targeted crabbing trips being unsuccessful in the earlier survey compared with 40% during the present survey. The frequency of catches exceeding 10 crabs was very low for both surveys. Data from 1985, however, does suggest a significant decline in recreational catch rates over the past 15 years. Interviews with 116 recreational fishers who returned tagged crabs during the mid-1980's showed that the average daily catch for that group was 19.1 crabs per boat day. The frequency of catches exceeding 20 crabs was also much higher in the 1980's. It can certainly be argued that the group who returned tagged crabs was a biased group in that they were successful crabbers. However, the frequency at which their catch rates exceeded 20 per trip (over 1/3 of the 116 trips) clearly indicates a general reduction in catch rates. The reasons behind this decline are a little more difficult to determine. One of the most disturbing features of the present results is that the 1998/1999 commercial crabbing season was the best on record, yet recreational catch rates remained relatively low. Obviously there is a degree of skill involved in catching blue swimmer crabs and low catch rates may reflect a general inability of inexperienced fishers to catch crabs. Counter to this argument is the fact that boat based fishers in Moreton Bay fished more often than did the general Queensland salt water fishing public. A state-wide phone survey (Anon, 1999) found that for those people who fished, a mean of 16 days were spent salt water fishing in the last 12 months compared to 34 days in the present survey. This result was expected given the greater investment boat owners have in their recreational activity and it logical to assume that they would be more frequent fishers. This also implies a greater level of skill by these fishers. As mentioned earlier, jetty and shore based anglers make up a small minority of those fishers targeting blue swimmer crabs.

The proportion of undersized blue swimmer crabs in recreational catches has declined a little in the last 4 years (10.0% in 1994/95 compared with 7.8% in 1999). The proportion of undersized fish of other species in creels of recreational fishers had also declined significantly. This may in part be due to the different locations that were sampled during the two surveys, but even when only common ramps were analysed there were still significant declines in the frequency of sighting undersized fish. Snapper, in particular, whilst still generally small were not taken as undersized fish as often as in 1994/95 when about 70% of the inshore catch was undersized (Sumpton *et al*, 1998). The high rate of undersized snapper in the earlier survey may in part be due to management changes in 1993 that increased the size limit of snapper from 25 to 30 cm. It probably took a couple of years for this to be widely known in the recreational fishing community, despite widespread public education programs.

From a public education perspective, the presence of survey clerks at a boat ramp did little (at least in a 12 month period) to reduce the frequency of undersized fish being retained. In many cases fishers appeared to be unaware of size limit restrictions on some of the species in their creels and often did not even know the species of fish that they had caught. Despite the fact that the overall data did not show any impact, creel clerks commented on greater compliance by people they had previously surveyed. It is likely that the positive impacts of clerk interaction were swamped by the large numbers of people (>90% of the sample) which were only interviewed once and thus not contributing to any positive impact in the short term.

The release data obviously suffers from recall bias as the interviewer is relying on the memory of the fisher to recall the numbers of fish they released and thus it is not as reliable as the catch data where fish were physically sighted. However, the release data do confirm a large proportion of both snapper and blue swimmer crabs that are caught and

subsequently released. In the case of blue swimmer crabs, the vast majority of those caught in pots would be released undamaged and survive. The survival of crabs caught in dillies and subsequently discarded may not be as high. This is because dillies work by entanglement and trapped crabs have to be removed from the netting. Entangled limbs are often pulled off and the extent of damage sustained depends on the patience and skill of the fisher. The general trend towards greater use of collapsible pots rather than entangling dillies is a positive sign. On the negative side, the ghost fishing potential of all these gears is unknown, as is the rate of loss of recreational crabbing apparatus.

From a state wide perspective whiting (all species) was the main targeted species throughout Queensland (Anon, 1999) and this was again the case for boat based anglers in Moreton Bay. On a state-wide basis, however, the next most targeted species from the current survey (snapper and blue swimmer crabs) were 9th and 10th most targeted. Other popular species in Moreton Bay (flathead, bream, tailor and mackerel) were all in the top 10 targeted species state-wide.

In recent years commercial blue swimmer crab fishing effort has been displaced from the sheltered waters of Moreton Bay and moved into deeper offshore waters where catch rates tend to be higher and the size of crabs is also on average larger. This trend has not yet translated to the recreational sector where there is currently little offshore crabbing effort. It will be interesting to monitor developments over the next few years to see if recreational fishing activities change and become more widespread offshore as has happened in the commercial fishery.

8 BENEFITS

The project was originally designed to obtain estimates of recreational catch rates of blue swimmer crab and to provide validating data for the diary program being undertaken by the Queensland Fisheries Management Authority. Data collected will be of benefit to both recreational and commercial fishing sectors as foreshadowed in the application. Rather than relying on anecdotal reports of catch rates and characteristics of the recreational fishery, the data presented here enables an objective quantification of the Moreton Bay blue swimmer crab fishery.

The data will also be of benefit to resource managers as it confirms that few undersized crabs are taken and the size structure of the recreational catch is similar to the commercial catch in Moreton Bay. The data will also provide a reference point for documenting changes in recreational catch characteristics of other species in Moreton Bay in the future.

9 FURTHER DEVELOPMENT

The most important area for further development lies in the comparison of the catch rate data and size structure information gathered from this research and the estimates provided by the diary and phone interviews which have been conducted by the QFMA, and those planned to be undertaken in the future. The ability to validate information collected by way of off-site methods is one of the major benefits of this research. Much of the data collected for species other than blue swimmer crabs has only received rudimentary analysis in this report, but there is considerable scope for further analysis and incorporation of the data into an overall recreational database. All data collected during this research will be archived with the RFISH data being collected by the QFMA and will thus be comparable with future surveys of recreational fishing.

10 CONCLUSION

This report fulfils the objective of describing recreational catch rates in Moreton Bay. A less comprehensive study during 1994/95 provided the first estimates of blue swimmer crab catches at two ramps in Moreton Bay. However, the present report has examined the fishery as it operates throughout Moreton Bay. We have also established that with similar levels of sampling intensity we have the power to detect changes in catch rates. Evidence has also been presented which confirms a decline in recreational catch rates during the last 15 years.

The recreational fishery for blue swimmer crabs is the second most important boat based recreational fishery in Moreton Bay, with only winter whiting outranking crabs as the most common recreational catch species. Catch rates overall were around 3 per boat day and the overall average size of crabs was remarkably stable both among sites and seasonally.

We have also presented a range of data on other species that are important to the recreational sector in Moreton Bay. This information will provide a useful mechanism of validating data currently being analysed as part of the recreational data collection program (RFISH) being run by the QFMA. We have confirmed the importance of winter whiting as a recreational species in Moreton Bay and demonstrated that the magnitude of the undersized catch of many species has declined in recent years, although for some species the undersized component of the catch is still quite high.

11 ACKNOWLEDGEMENTS

I wish to thank the many recreational fishers whose assistance made this project possible. Most fishers willingly provided answers to interview questions and allowed access to their catches. This often entailed considerable patience on their part whilst catches were checked and measured. Thanks are also due to Ian Breddin, Amanda Cootes, Robert Fioravanti, Shane Gaddes, Mark McLennan, Genevieve Quirk, Kirrily McInnes, Wendy Scorey and Leigh Slater who all assisted with the survey at some point and spent many hours on weekends standing at boat ramps interviewing fishers. Mathew Campbell also assisted with the preparation of some of the graphs. I also wish to thank Ian Brown and Jenny Ovenden who provided constructive comments on the manuscript.

12 REFERENCES

Anon (1999) Recreational fishing in Queensland - a Survey of Queensland Residents. Roy Morgan Research, Queensland.

Dichmont C., Haddon, M., Yeomans, K., and Kelly, K. (1999) Proceedings of the South-East Queensland Stock Assessment Review Workshop. Queensland Department of Primary Industries Conference and Workshop Series QC99003.

Ferrell, D and W.D. Sumpton (1997) Assessing the snapper (Pagrus auratus) fishery in Queensland and New South Wales. FRDC Final Report No 93/074.

Higgs J.(1999) Experimental recreational catch estimates for Queensland residents. RFISH Technical Report # 2 Results from the 1997 Diary Round

Kumar, M.S. (1997). Proceedings of the First National Workshop on Blue Swimmer crab *Portunus pelagicus.* SARDI, South Australia.

Potter M.A. and W.D. Sumpton (1986) A study of the sand crab *Portunus pelagicus* and its exploitation in a subtropical multi-sector fishery. Fishing Industry Research Trust Account Final Report 84/23. 46 pp.

Potter, M.A., Sumpton, W.D. and G.S. Smith (1991). Movement, fishing sector impact, and factors affecting the recapture of tagged sand crabs, *Portunus pelagicus* (L.) in Moreton Bay, Queensland. Aust. J. Freshwater Res. 42: 751-760.

Queensland Fish Management Authority (1999) Queensland Blue Swimmer Crab Fishery Queensland Fish Management Authority – Discussion Paper No. 8

Sumpton, W.D, Yeates, M., Joyce, R. McLennan, M and S. Jackson (1998) Offshore Rocky Reef Fisheries of South-east Queensland, Report to the Queensland Fisheries Management Authority.

Thomson J.M. (1951) Catch composition of the sand crab fishery in Moreton Bay. Australian Journal of Marine and Freshwater Research 2: 237-244.

Williams, L.E., (1997) Queenslands Fisheries Resources: Current condition and recent trends 1988-1995 Queensland Department of Primary Industries Information Series Q197007

13 APPENDICES

Appendix 1 INTELLECTUAL PROPERTY

There is no intellectual property (in the sense of commercially marketable information or patents) associated with this research. Intellectual property relates to the data that has been collected from recreational fishers. These data have been analysed and summarised in this report and will also subsequently be made available to the Queensland Fisheries Service for inclusion into the RFISH recreational database.

Appendix 2 STAFF

Wayne Sumpton	Senior Fisheries Biologist (Principal Investigator)
Ian Breddin	Creel Survey Clerk
Amanda Cootes	Creel Survey Clerk
Robert Fioravanti	Creel Survey Clerk
Shane Gaddes	Fisheries Technician
Mark McLennan	Fisheries Technician
Genevieve Quirk	Creel Survey Clerk
Kirrily McInnes	Creel Survey Clerk
Wendy Scorey	Survey Clerk
Leigh Slater	Creel Survey Clerk

Appendix 3 CREEL SURVEY INTERVIEW SHEET USED DURING SURVEYS

Interviewer	Site	Date	Time	Boat Size (m)	Com
				.	

Time Left Ramp	Male	Female	Children <15	Postcode	Previous Interview	Y	N

Today did you go		Location	Code	Fishing Club	Y	N
1	Offshore fishing			Home Phone	Y	N
2	Estuary Fishing			QFMA Diary	Y	N
3	Cruising					
4	Other					

Number of times fishing in last 12 months		Number of lines	
Actual fishing time this trip (hr)		Number of hooks	

Fishing Bait	Code	Crabbing Gear		Species Targeted	Code
		Gear Numbers			
		Number of Lifts			
		Crab Bait			

Did you catch any fish you later released?				Reason Codes
Species	Code	Quantity (Number)	Reason	N = Not wanted
				U = Undersized
				T = Tagged
				B = Bag Limit
				O = Other

Species	Code	Number Counted	Number Measure	Total Lengths (cm) (Measure a maximum of 30 for each species)									
				1	2	3	4	5	6	7	8	9	10

Appendix 4 **FISHING EFFORT DATA RECORDING SHEET**

DATE _____ LOCATION _____

	BOATS LEAVING RAMP					BOATS RETURNING TO RAMP				
TIME	Rec. Fishing Vessels	Comm. Fishing Vessels	Trailer Sailors	Charter	Other	Rec. Fishing Vessels	Comm. Fishing Vessels	Trailer Sailers	Charter	Other
0400-0500										
0500-0600										
0600-0700										
0700-0800										
0800-0900										
0900-1000										
1000-1100										
1100-1200										
1200-1300										
1300-1400										
1400-1500										
1500-1600										
1600-1700										
1700-1800										
1800-1900										
1900-2000										
2000-2100										
2100-2200										
2200-2300										
2300-2400										

Appendix 5 LIST OF COMMON NAMES AND SCIENTIFIC NAMES OF FISH OBSERVED DURING THE SURVEY IN MORETON BAY.

COMMON NAME	*SPECIES NAME*
Leatherjacket, Starry	*Abalistes stellaris*
Longtom,Barred	*Ablennes hians*
Longtom, Unknown	*Ablennes hianus*
Wahoo	*Acanthocybium solandri*
Bream	*Acanthopagrus australis*
Surgeon Fish, Spotted	*Acanthurus xanthopterus*
Surgeon Fish, Grey	*Acanthusus triostegus*
Surgeon Fish, Unknown	*Acathuridae*
Blue Grouper	*Achoerodus gouldii*
Red Squirrel Fish	*Adioryx ruber*
Ray, Eagle	*Aetobatus narinari*
Barracuda/Barracuta	*Agrioposphyraena barracuda*
Anything	
Jobfish, Green	*Aprion viriscens*
Jew Fish/Mullaway	*Argyrosomus hololepidotus*
Garfish, Snub-nosed	*Arrhamphus sclerolepis*
Teraglin,jew	*Atractoscion aequidens*
Sergeant Baker	*Aulopus purpurissatus*
Pigfish, Gold-spot / Wrasse	*Bodianus perditio*
Pigfish, Black-spotted	*Bodianus vulpinus*
Shark, Grey nurse	*Carcharias arenarius*
Fusilier,Red bellied	*Caesio cuning*
Perch, Orange	*Caprodon schlegeli*
Trevally, Bludger	*Carangoides gymnostethoides*
Trevally, White	*Caranx nobilis*
Trevally, Silver	*Caranx nobilis*
Trevally Spp unknown	*Caranx spp.*
Shark, Black-tip Reef	*Carcharhinus melanopterus*
Shark, Whaler / River Shark	*Carcharhinus obscurus*
Shark, School	*Carcharhinus obscurus*
Catfish, Unknown	
Cod, Tomato	*Cephalopholis formosanus*
Crab, Coral	*Charybdis feriatus*
Wrasse, Sharp-nosed	*Cheilio inermis*
Morwong, Red	*Cheilodactylus fuscus*
Wrasse, Crimson	*Chelinus diagrammus*
Wrasse, Maori Hump headed	*Chelinus undulatus*
Turtle	*Chelonia spp*
Tusk-fish, Venus (Parrot)	*Choerodon venustus*
Tusk Fish, Blue	*Choerodon venustus*
Tusk-fish, Purple	*Choerodon cephalotes*
Tusk-fish, Black-spotted	*Choerodon schoenleinii*
Tusk-fish, Unknown	*Choerodon sp*
Dolphin fish/Mahi Mahi	*Coryphaena hippurus*
Crabs, Unknown	*Crabs*
Bonito, Watsons leaping	*Cybiosarda elegans*
Flathead, Fringe-eyed	*Cymbacephalus nematophthalmus*
Gurnard, Red-spot	*Dactyloptaena papilio*
Ray, Brown	*Dasyatis fluviorum*
Dorsal Fish	
Eel, Unknown	
Rainbow runner	*Elagatis bipinnulatus*
Cod, Black-tip rock (footballer)	*Epinephelus fasciatus*
Cod, wire netting/Honeycomb	*Epinephelus mera*
Cod, Estuary	*Epinephelus tauvina*
Cod, Maori	*Epinephelus undulostriatus*
Groper, Queensland	*Epinephelus lanceolatus*
Cod, Unknown	*Epinephilus sp*
Tuna, mackeral	*Euthynnus alletteratus affinis*
Shark, Tiger	*Galeocerdo cuvieri*
Garfish, Unknown	
Toadfish, Giant	*Gastrophysus scleratus*
Black Bream, (Luderick)	*Girella tricuspidata*
Perch, Pearl	*Glaucosoma scapulare*
Trevally, Golden	*Gnathanodon speciosus*
Mackeral, Shark	*Grammatocynus bicarinatus*
Grinners, Unknown	*Grinners, Unknown*
Spine cheek / Caloundra	*Scolopsis temporalis*
Eel, White-spot Moray	*Gymnothorax prionodon*
Gar, three by two	*Hemiramphus robustus*
Herring	
Sea-Snake, Olive	*Hydrophis elegans*
Jellyfish	
Tuna, Striped / Skipjack	*Katsuwonis pelamis*
Drummer, Black	*Kyphosus gibsoni*
Leatherjacket, Unknown	*Leatherjacket*
Sweetlip, Grass	*Lethrinus fraenatus*
Sweetlip, Red-throat	*Lethrinus miniatus*
Sweetlip, Sand/yellow	*Lethrinus nebulosus*
Lancer	*Lethrinus nematacanthus*
Sweetlip, Unknown	*Lethrinus sp*
Emperor, Long-nosed	*Lethrinus sp*
Emperor, Variegated	*Lethrinus variegatus*
Squid, Tiger	*Loligo sp*
Squid	*Loligo spp.*
Hussar	*Lutjanus amabilis*
Mangrove Jack	*Lutjanus argentimaculatus*
Stripey	*Lutjanus carponatatus*
Nannygai, Large-mouthed	*Lutjanus malabaricus*
Perch, Moses	*Lutjanus russelli*
Nannygai, Small-mouthed	*Lutjanus sanguineus*
Emperor, Red	*Lutjanus sebae*
Marlin, Black	*Makaira indica*
Ray, Manta	*Manta alfredi*
Oxeye Herring / Tarpon	*Megalops cyprinoides*
Mixed Fish	
Butterbream	*Monodactylus argenteus*
Moonfish	
Morwong, Unknown	*Morwong, Unknown*
Mullet, Sea	*Mugil cephalus*
Eel, Pike	*Muraenesox cinereus*
Mutton Bird	
Surgeon Fish, Hump-headed	*Naso unicornis*
Unicorn fish	*Naso unicornis*
Jewfish, Silver	*Nibea soldado*
Octopus	*Octopus ornatus*
Shark, Wobbegong	*Orectolobus ornatus*
Flounder, Unknown	
Snapper/Squire	*Pagrus auratus*
Crayfish, Painted	*Panulirus spp*
Fusilier, Southern	*Paracaesio pedleyi*
Weever, Bar-faced / Rock Whiting	*Parapercis nebulosus*
Sole, Spotted tongue	*Paraplagusia guttata*
Goat fish, Black-spot	*Parupeneus signatus*
Trumpeter	*Pelates quadrilineatus*
Whiptail	*Pentapodus setosus*
Bass, Fresh water	*Percalates colonorum*
Pigfish, Unknown	
Batfish	*Platax sp*
Flathead, Sand	*Platycephalus arenarius*
Flathead, Dusky	*Platycephalus fuscus*
Flathead, Bar-tailed	*Platycephalus indicus*
Flathead, Unknown	*Platycephalus sp*
Coral Trout	*Plectopomus leopardus*
Morwong, Netted (speckled hind)	*Plectorhynchus flavomaculatus*
Sweetlip, Many lined	*Plectorhynchus goldmanni*
Morwong, Brown	*Plectorhynchus nigrus*
Sweetlip, Painted	*Plectorhynchus pictus*
Morwong, Slaty bream	*Plectorhyncus pictus*
Grunter	*Pomadasys maculatus*
Tailor	*Pomatomus saltatrix*
Crab, Sand	*Portunus pelagicus*
Hardy Head	*Pranesus ogilbyi*
Jobfish, Rosy	*Pristipomoides filimentosus*
Jobfish, Gold-banded	*Pristipomoides multidens*

COMMON NAME	*SPECIES NAME*
Flounder Large-toothed	*Pseudohombus arsius*
Cod, Butterfly	*Pterois volitans*
Kingfish, Black(Cobia)	*Rachycentron canadus*
Crab, Spanner	*Ranina ranina*
Ray, Unknown	
Reef fish Unknown	
Remora /Sucker fish	*Remora remora*
Tarwhine	*Rhabdosargus sarba*
Shark, Shovel-nose	*Rhinobatos batillum*
Shark ,White spot shovelnosed	*Rhynchobatus djiddensis*
Ray, Shovel-nosed	*Rhynchobatus djiddensis*
Bonito, Australian	*Sarda australis*
Grinner, Yellow-banded	*Saurida tumbil*
Grinner,Large scaled	*Saurida undosquamis*
Parrot Fish, Surf	*Scarus rivulatus*
Leatherjacket, Rough	*Scobinichthys granulatus*
Shark, Little blue	*Scoliodon palasorrah*
Shark, Dog (Gummy)	*Scoliodon jordani*
Mackeral, Slimy	*Scomber australasicus*
Queenfish	*Scomberoides commersonianus*
Mackerel, Spanish	*Scomberomorus commerson*
Mackerel, Spotty	*Scomberomorus munroi*
Mackerel, School	*Scomberomorus queenslandicus*
Mackerel, Unknown	*Scomberomorus sp*
Mackerel Grey	*Scomberomorus semifasciatus*
Scorpion Cod (Red Ned)	*Scorpaena cardinalis*
Sweep	*Scorpis acquipinnis*
Crab, Mud	*Scylla serrata*
Kingfish, Yellowtail	*Seriola lalandi*
Amberjack	*Seriola dumerilii*
Samson fish	*Seriola hippos*

COMMON NAME	*SPECIES NAME*
Shark, Unknown	*Shark Unknown*
Wrasse, unknown	*Chelinus sp*
Happy moments	*Siganus spinus*
Whiting, Unknown	*Sillago sp*
Whiting, Summer / Sand	*Silligo ciliata*
Whiting, Diver	*Silligo maculata*
Sole, Unknown	*Sole Unknown*
Toadfish	*Spheroides hamiltoni*
Pike, Yellow-tail	*Sphyraenella obtusata*
Shark, Hammer-head	*Sphyrna lewini*
Shark, Leopard/zebra	*Stegostoma fasciatum*
Triggerfish Brown	*Sufflavem fraenatus*
Chinaman - Fish	*Symphorus nematophorus*
Stone Fish	*Synanceia horrida*
Ray, Blue Spot	*Taeniura lymna*
Wrasse, Moon	*Thalassoma lunare*
Tuna, Yellowfin	*Thunnus albacares*
Grinner,Painted	*Trachinocephalus myops*
Dart	*Trachinotus russelli*
Dart, Snub-nosed	*Trachinotus blochii*
Mackeral, Horse /	*Trachurus declivis*
Scad, Yakka	*Trachurus novaezelandiae*
Rubbish Fish	
Hairtail	*Trichiurus savala*
Tuna, Unknown	*Tuna Unknown*
UNKNOWN	*UNKNOWN*
Stingray	*Urolophus testaceus*
Prawns	
Cuttlefish	
Anything	