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UNIVERSITY OF TASMANIA

EVALUATION OF A RECREATIONAL ANGLER LOGBOOK PROGRAM
FOR TASMANIA

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Evaluation of a recreational angler logbook program for Tasmania

Executive summary

This study represents the first implementation of a statewide research angler logbook program (RALP) within Tasmania to report on recreational fishing activity, with a focus on marine fishing. The study was designed as a pilot to assess practicalities of such a program and whether it is a cost effective means of collecting data to complement existing survey methodologies, and if the data is suitable for input into scientific assessment of Tasmania's recreational fisheries.

One of the greatest challenges in implementing the program successfully was the recruitment and retention of participants. However, the amount of data collected by those involved was substantial.

Over a period of two years and three months 22 fishers provided information on 516 fishing events, many reporting on group catches from multiple fishers. Most of the popular fishing activities and target species synonymous with recreational fishing in Tasmania were represented in the data. Respondents were distributed around the state with the exception of the west and far south coasts, with the greatest proportion based around southeast Tasmania. Close to 8200 individual animals were caught representing over 90 taxa. Size measurements were reported from more than 4600 individuals. Based on these metrics the project proved successful at collecting information on a range of fishing activities as well as a significant amount of information on the size composition of species captured by recreational fishers in Tasmania, including high profile species such as southern rock lobster, southern bluefin tuna, striped trumpeter, scallops and abalone. However, in its current form limitations were revealed in the approach to provide a robust representation of the behaviour of the average recreational fisher. Potentially significant biases in catch rates and catch composition were also revealed.

Researchers and managers need to consider the biases associated with a RALP as a form of data collection from recreational fisheries, including the limitations of the data, and weigh the costs and benefits of the program if it is to be continued. For the ongoing success of a RALP, there need to be appropriate resources and support to effectively manage respondents. If the potential biases and limitations of the data are recognised, and the program is focused on species and/or regions that are amenable to this form of data collection, angler diaries may provide a complimentary method of data collection to existing survey methodologies.

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Introduction

Tasmania's recreational fishery

Recreational fishing in Tasmania is a popular past-time. In the 12 months prior to November 2008 it was estimated that over 128,000 Tasmanians fished at least once, accounting for approximately 0.64 million fisher days of effort. The median number of days fished was five days per fisher, though the distribution of effort was highly skewed, with just 20% of fishers contributing over half of the total effort (Lyle et al, 2009). This reflects a high degree of avidity by a minority of fishers. The recreational fishery is also highly dynamic with fishers around the state targeting a wide range of species across a broad spectrum of habitats.

To date most data on recreational fishing activities in Tasmania have been collected from telephone/diary and/or creel surveys (e.g. Lyle et al, 2009; Forbes et al, 2009; Lyle & Tracey, 2010). These methods are implemented every two to five years, depending on the fishery, and provide a snapshot of harvest and size composition information across a range of species. While these methods are recognised internationally as 'world's best practice' for the collection of recreational fishing harvest they generally require a level of investment that makes their implementation impractical (or not cost effective) for continuous monitoring. Additionally, these surveys implemented at the statewide level are generally designed to provide 'big picture' information and may not capture trends in smaller, targeted fisheries or at a fine spatial resolution.

Due to the dynamic nature of Tasmania's recreational fishery the Tasmanian Aquaculture and Fisheries Institute began a pilot study in 2008 to investigate the potential of a voluntary angler logbook program to provide a continuous form of data collection to complement the existing recreational fishing surveys.

Angler diaries

Angler diaries are a potentially desirable assessment tool because they can be used to monitor many fisheries at relatively low cost (Pollock et al., 1994). They have been used by fisheries management agencies both in Australia (Conron & Bridge, 2004; <http://www.fish.wa.gov.au/docs/macs/research/>) and internationally (Anderson and Thompson, 1991, Cooke et al., 2000, Sztramko et al., 1991) to provide information on recreational fisheries for various species, with varying degrees of success (Cooke et al, 2000; Conron & Bridge, 2004).

The term 'angler logbook' is applied to all methods that rely on recreational fishers' voluntarily recording information about their fishing activities. The fact that logbook data are self-reported has both advantages and disadvantages. Angler logbook surveys are cost effective and encourage volunteer participation and resource stewardship through angler involvement in monitoring fisheries. This participation raises public awareness of science and helps volunteers and their peers, through word of mouth, understand how fisheries science feeds into natural resource management. However, Pollock et al., (1994)

recommended against the use of angler logbook programs, unless all other sampling techniques are ruled impractical, owing to large biases that can be introduced into the data by anglers themselves. For example, anglers contribute to these biases by not responding to surveys, by exaggerating the number and size of the fish reported, by not reporting unsuccessful trips or by misinterpreting survey questions and methods. There is also an inherent bias introduced by anglers volunteering to participate rather than a probabilistic based (random) selection of participants.

An Angler logbook program can be designed across a spectrum of control. At one end of the spectrum the program design is fully flexible, encouraging volunteers to follow their typical fishing interests. At the other end of the spectrum the fishing activities of participants are controlled to allow for standardisation of data, this could include, standard gear types, target species, fishing location, etc. There are obvious trade-offs between these approaches. For the pilot study in Tasmania we implemented a flexible design where anglers fished as normal but there was an emphasis on recording a standard set of responses from each fishing event.

Objective

The primary objective was to determine whether an angler logbook is an effective tool for ongoing monitoring of Tasmania's recreational fisheries, by developing a statewide network of avid recreational anglers to provide information about their fishing activities. Of particular interest from a research and management perspective is biological information for a number of key species including bream, flathead, Australian salmon and gamefish.

Materials and methods

Logbook Kit

The 'Research Angler Logbook' was designed to be visually appealing, while containing comprehensive instructions, including an outline of the general purpose of the program, a fish identification guide, and a detailed explanation of how to complete a logsheet (Fig. 1 & Appendix 1). The logbook was designed to be refillable so additional logbook inserts could be sent out to participants as required (Fig. 2). The logbook inserts were presented as a pad of 50 individual logsheets, with each individual sheet designed to record one fishing trip.

In addition to the logbook, participants received a waterproof scribe board, a roll-up fish measure, pre-paid return addressed envelopes, pencils, an eraser and a pencil sharpener.

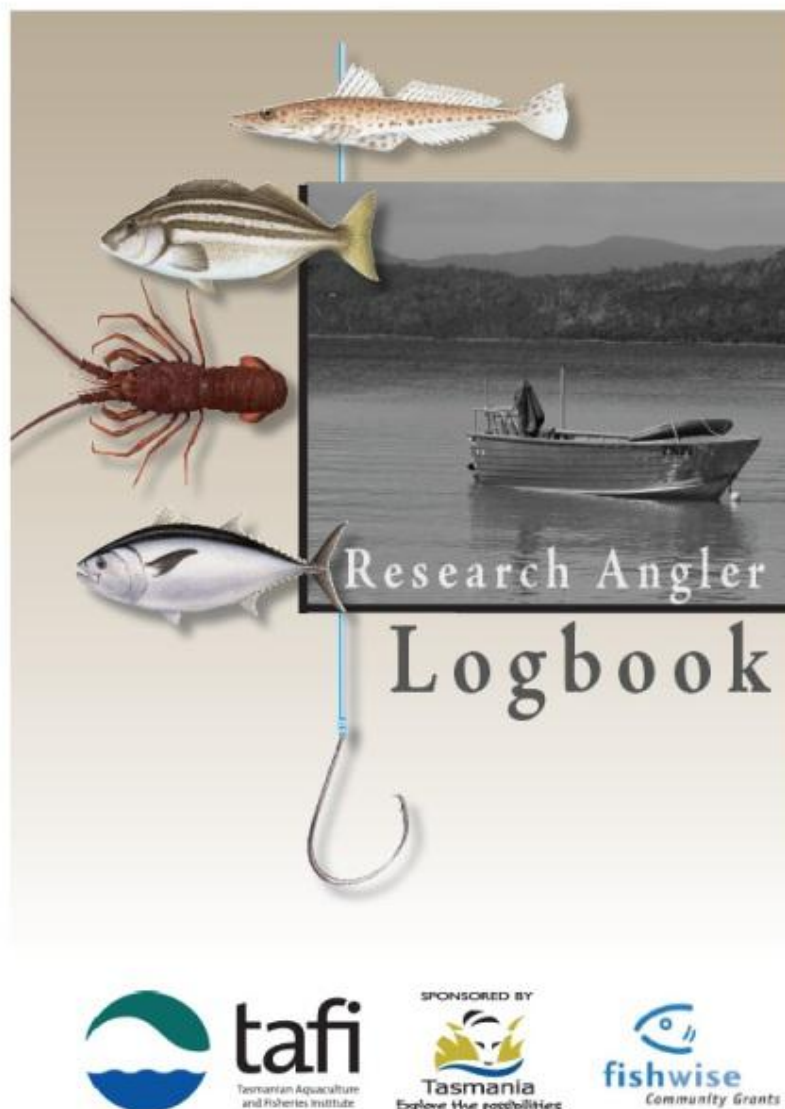


Fig. 1 Cover design of the Recreational Angler Logbook.



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range of potential fishing activities a fisher may engage in, as well as the flexibility to record information across a range of species.

Provisions for recording information on the fishing event included: departure and return times, fishing location (it was requested of the fisher to record the highest resolution of spatial information that they were comfortable providing), the number of fishers in the party, and weather information.

The fishing activities were recorded against general categories, including: pot fishing, diving (scuba, surface supply, snorkel), gillnetting (mullet and/or graball), line fishing (inshore line, offshore line, deepwater line and game fishing) and a provision to record any 'other' form of fishing. Effort was recorded as the activity/gear soak time and the number of 'gear' in use. Fishers also recorded whether they fished from the shore or from a boat.

The catch was recorded by species with provision to identify what 'fishing activity' was used to capture a particular species if multiple activities were undertaken on the same trip. Both the number of individuals kept and released was recorded and fishers were requested to measure (either to the nearest centimeter or kilogram) both the kept and released animals, indicating the size of a released fish in brackets to distinguish this information from the size of retained fish. If a large number of fish were caught fishers were asked to measure a representative sub-sample of the catch.

Another point of interest was the reporting of wildlife interactions with fishing events. Fishers were able to record whether seabirds, seals, dolphins or whales interacted with a fishing event and the nature of that interaction. Provision was also made for any general comments on the day's fishing events.

A strong emphasis was placed on educating participants about the importance of recording all the information on the logsheet, both through the written instructions on the logbook and follow-up phone calls and emails.

Recruitment of participants

The recruitment approach for this program was to target participants who might provide the 'best return on investment'. By taking a quality over quantity approach, the aim was to collect a higher frequency of accurately completed log sheets, ensure the majority of fishing events were recorded and have participants remain with the program long term. With this in mind, anglers whom already keep records of their catch were our prime target.

Before recruitment of participants began in October 2008 key stakeholders and related fishing associations were contacted. This involved sending out requests for expressions of interest to participate in the program. Sources notified included; www.sportsfishtasmania.com, www.gonefishingtas.com, TARFish, RecFishTas, Tasmanian Fishing and Boating News, King Island Courier and Flinders Island News. Beginning in 2009 the program was also advertised in the Recreational Sea Fishing Guide. Word-of-mouth between participants and referrals from TAFI staff members were also a successful source of recruitment. From late

2009 to early 2010, TAFI staff also visited key locations across Tasmania providing advertising material to local businesses and placing posters in areas of high fishing activity.

Diarist management

There was an emphasis placed on engaging with participants throughout the study. Once a new participant had received their 'Research Angler Logbook' kit in the mail a TAFI staff member followed up with a phone call to ensure the participant knew what was required and understood how to complete a logsheet. Intermittent contact was maintained throughout the program to field questions and provide feedback. Annual updates were provided to participants including a customised individual fishing summary and a prize raffle was conducted in early 2010 as an incentive for participants to continue supporting the program.

Regional divisions

The state was divided up into 8 broad regions for reporting (Fig. 3).

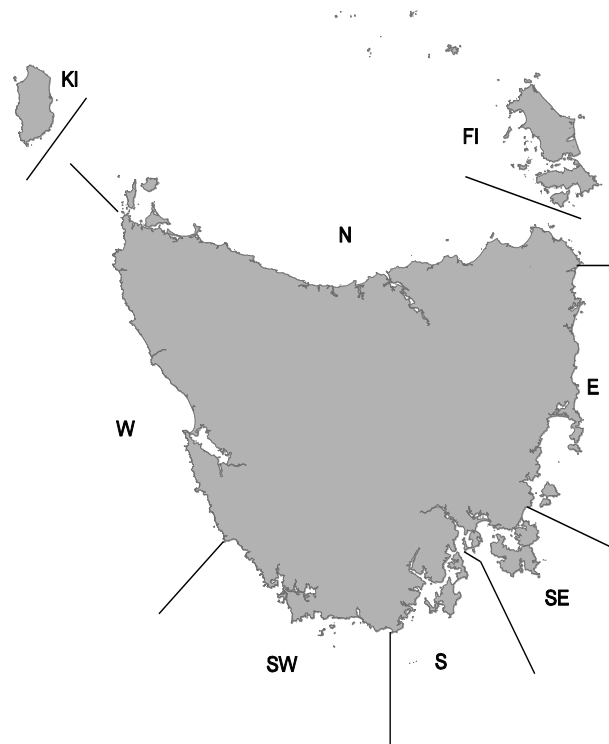


Fig. 3 Map of Tasmania defining the regions used for reporting to the RALP. King Island (KI), north coast (N), Flinders Island (FI), east coast (E), southeast coast (SE), south coast (S), southwest coast (SW) and west coast (W).

Results

Demographics of participants

Between October 2008 and December 2010 a total of 50 participants were recruited into the program, most within the first three months of the study. The initial influx (October 2008) was generated predominately through advertising the program on state based internet fishing

forums. The next influx (late November-early December 2009) was generated mainly by notification to fishers through the TARFish network. A further, smaller surge of participants (February and April 2010) was driven by TAFI staff actively engaging fishers through promotional opportunities (Fig. 4).

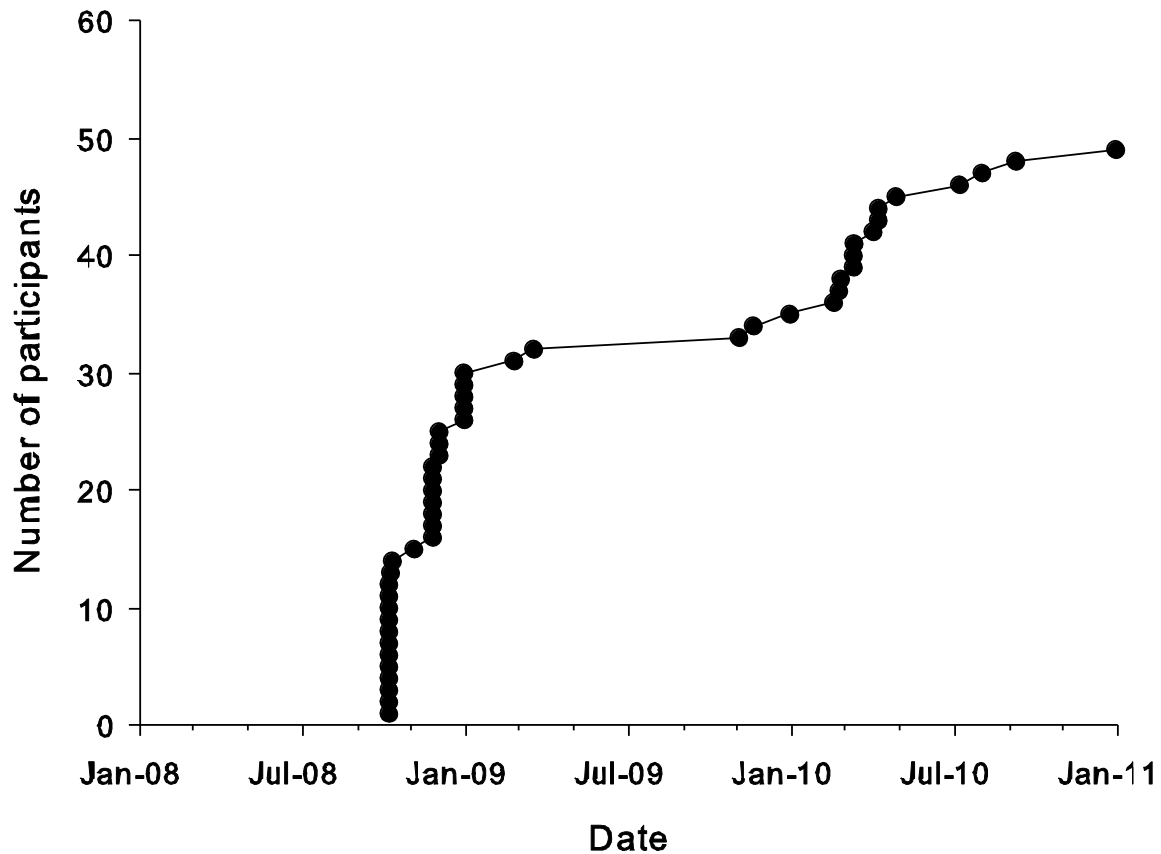


Fig. 4 The number of participants recruited into the Tasmanian 'Research Angler Logbook Program' between October 2008 and December 2010.

The most successful methods of recruitment were direct referral from TAFI staff (24%), followed by web-based advertising on state based fishing forums (22%). The Recreational Sea Fishing Guide (14%) and promotion through TARFish (12%) also contributed significantly (Fig. 5).

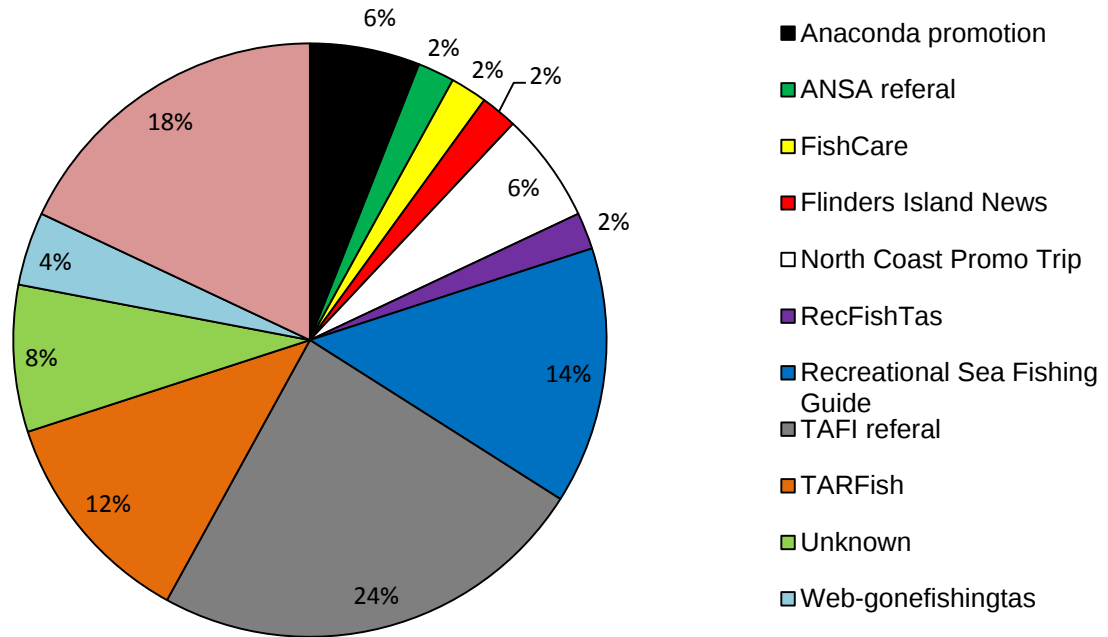


Fig. 5 Breakdown of the source of participants signed into the Tasmanian Research Angler Logbook Program.

Individuals were recruited from most regions around Tasmania with the exception of the west and south coasts. The majority of participants were recruited from the southeast coast (64%), followed by the north coast (28%). Representation from the other areas was low, with just two participants from Flinders Island (4%) and one each from the east coast and King Island (Fig. 6).

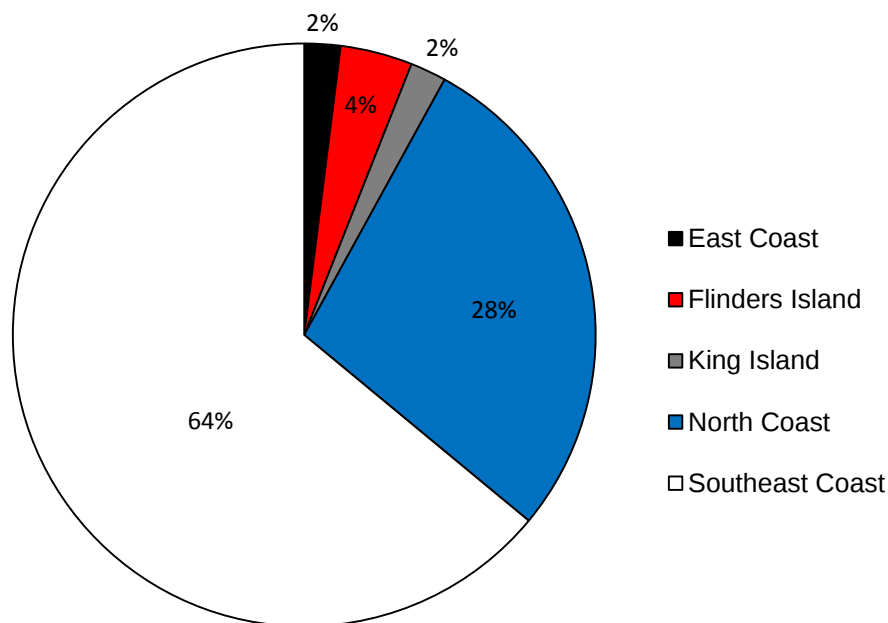


Fig. 6 Regional composition of the primary residence of participants.

All participants reported a high degree of avidity for recreational fishing. The majority classified themselves as fishing on average once per week (56%), while 32% suggested that they fished on average more than once a week. The remaining 12% of participants fished on average once per month (Fig. 7).

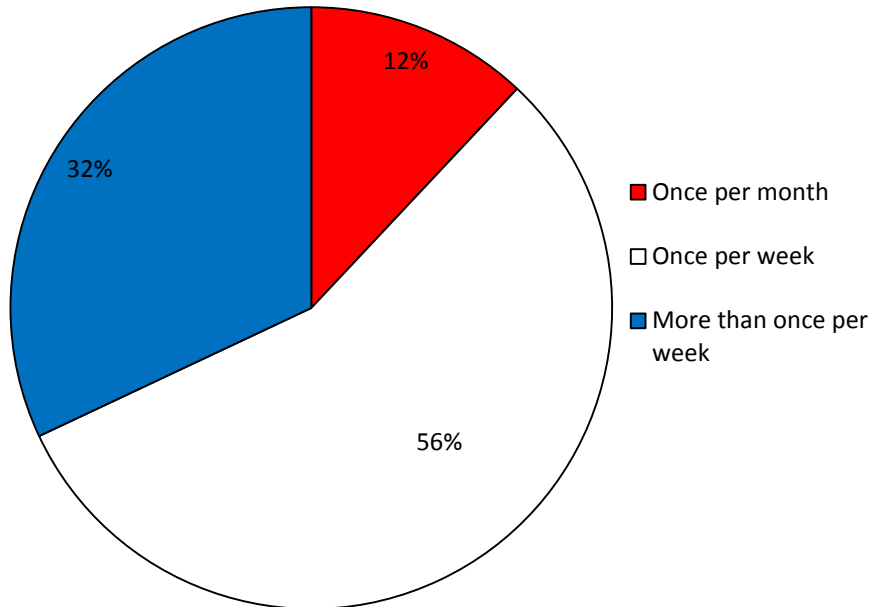


Fig. 7 Composition of how often participants engaged in fishing activities on average.

The majority of participants (62%) classified themselves as ‘all-round’ recreational fishers, defined as fishing in both marine and freshwater, inshore/estuarine areas as well as engaging in offshore fishing. Thirty six percent defined themselves as only fishing in inshore/estuarine areas and one participant was exclusively an offshore/gamefisher (Fig. 8).

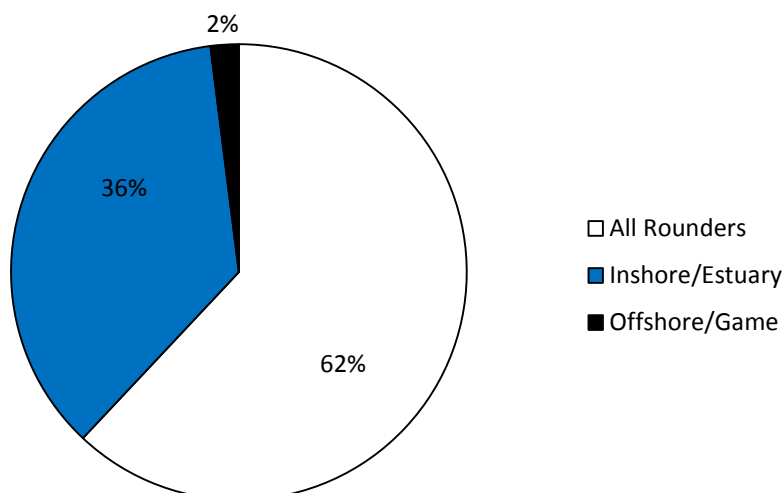


Fig. 8 Composition of fisher categories.

Gender and age

All participants who signed up to participate in the RALP were male. The greatest percentage of participants were 30-44 years of age (38%), followed by 45-59 (22%) and 60+ (20%) (Fig. 9B). Younger fishers (15 to 29 years of age) represented only 20% of participants.

The 60+ age group reported the greatest number of events (Fig. 9A), due mainly to two individuals who returned a large number of logsheets.

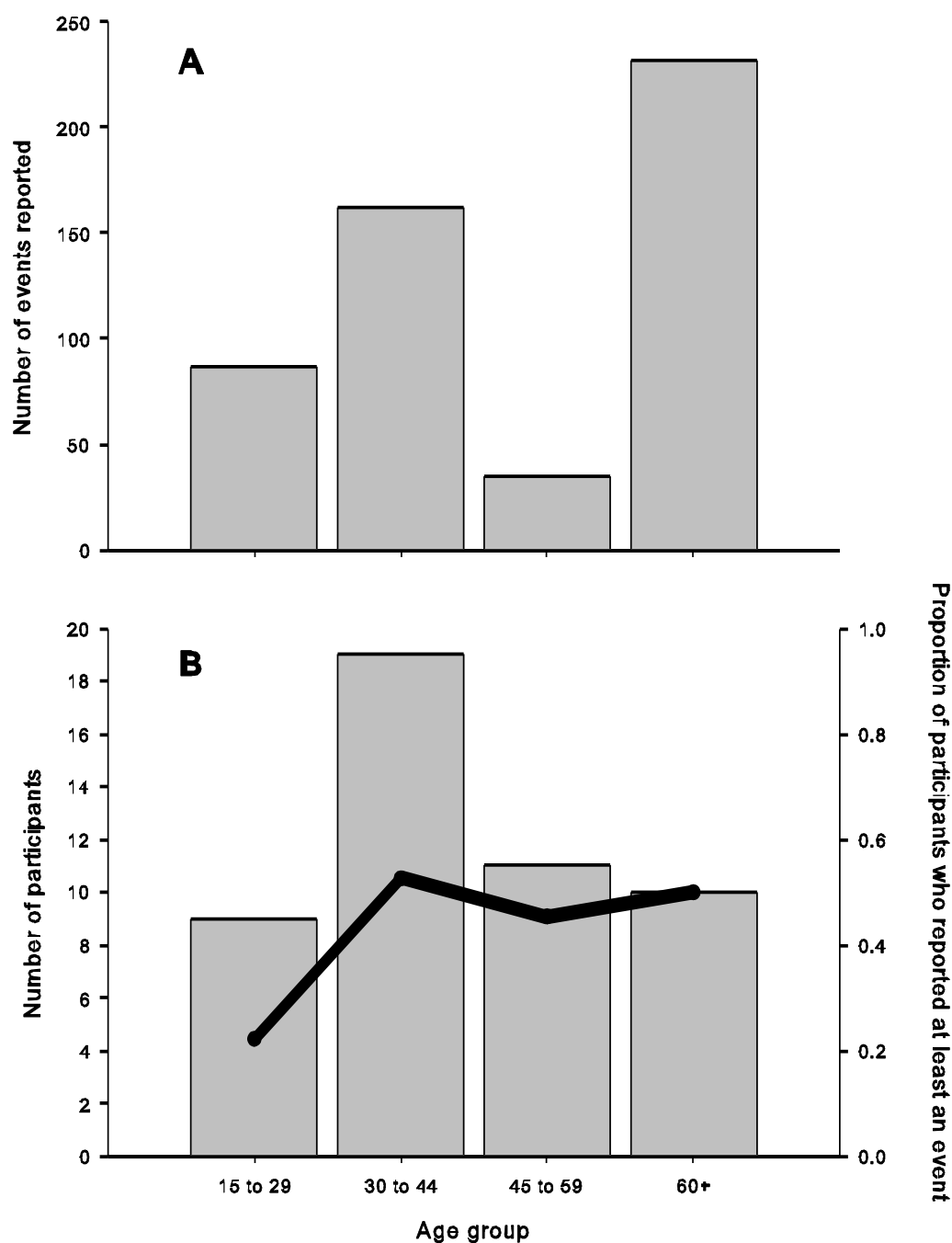


Fig. 9 (A) Total fishing events reported by age group. (B) Number of participants in the program by age group (grey bars) and proportion reporting at least one event (black line).

Individual participation

Since the RALP commenced a total of 516 logsheets were returned. Of the 50 individuals who signed up to participate in the program less than half (22 or 44%) returned at least one logbook sheet (Fig. 10). A few individual contributed disproportionately to the program, with 10 individuals collectively accounting for 84% of all reported events.

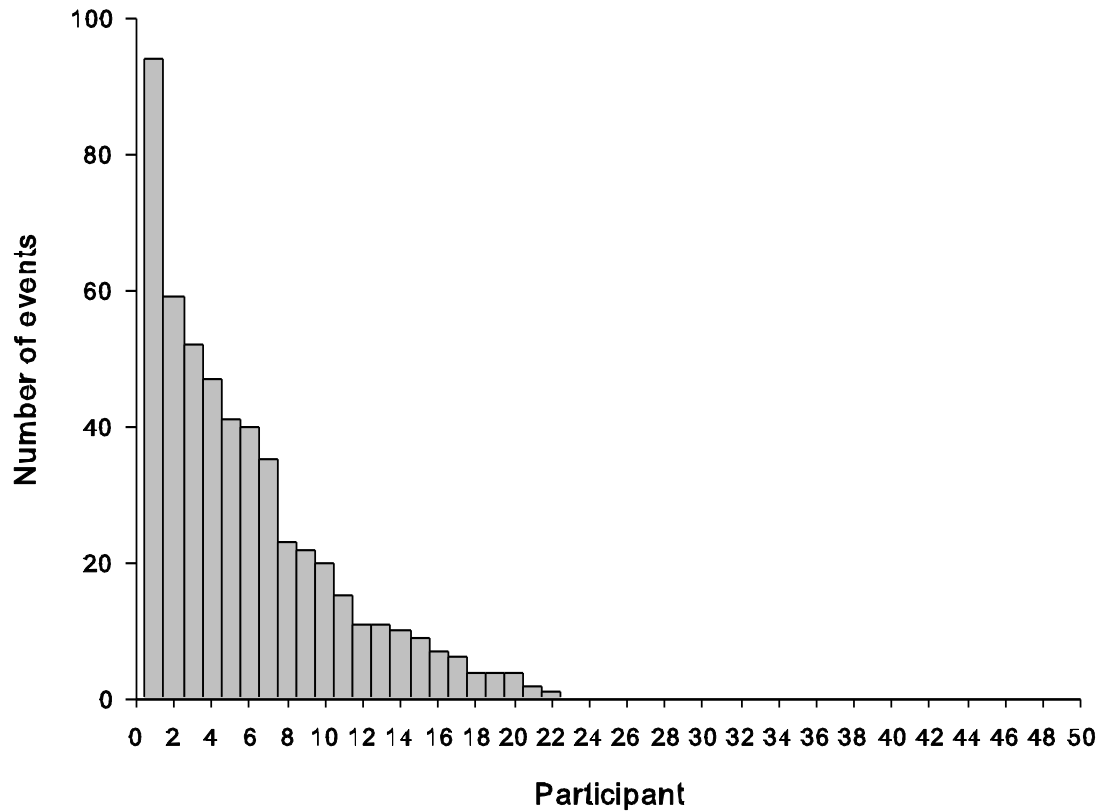


Fig. 10 The number of logsheets returned by participant signed into the logbook program.

Of the 20 top reporting participants only six displayed a high degree of reporting consistency through time (Fig. 11), defined here as a proxy for retention within the project. Eleven participants reported fishing events for a maximum of approximately six months, prior to no further reporting, defined as attrition from the project. The remaining three reported events for over a year before their reporting ceased.

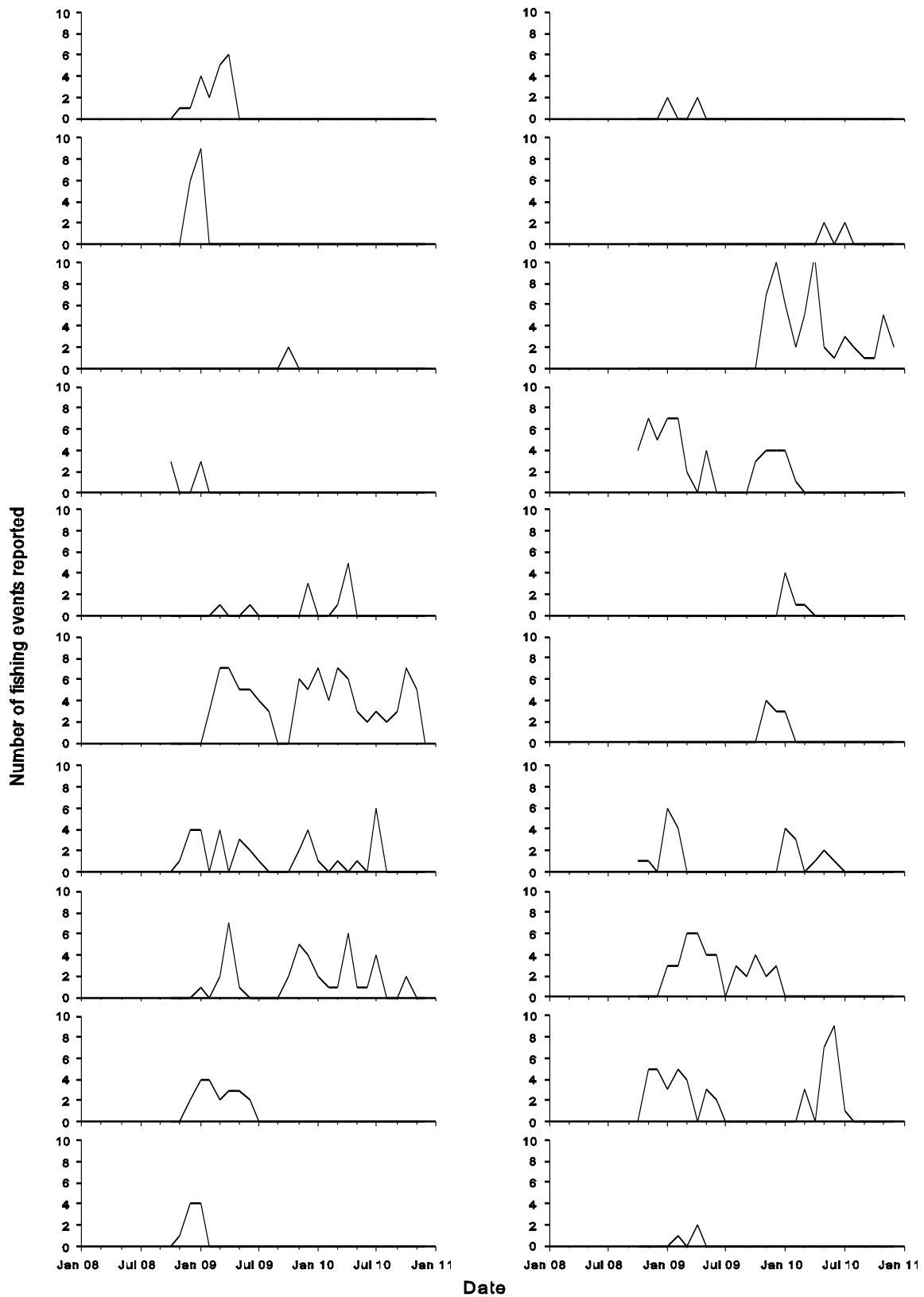


Fig. 11 Event reporting profiles of the 20 individuals reporting at least two events.

Fishing activity

Inshore line fishing was the dominant type of fishing reported 62% of these events occurred from a boat and the remainder from shore. Hand harvesting while diving was the next most reported with over 100 events recorded, 93% occurring from a boat. Dive trips incorporated various target species; including scallop, rock lobster and abalone. All game fishing, offshore line, gillnet, pot fishing, long lining, deepwater line and rock lobster ring events occurred from a boat, while two fly fishing events and a single hand collection and spear fishing event were reported from shore based activity (Fig. 12).

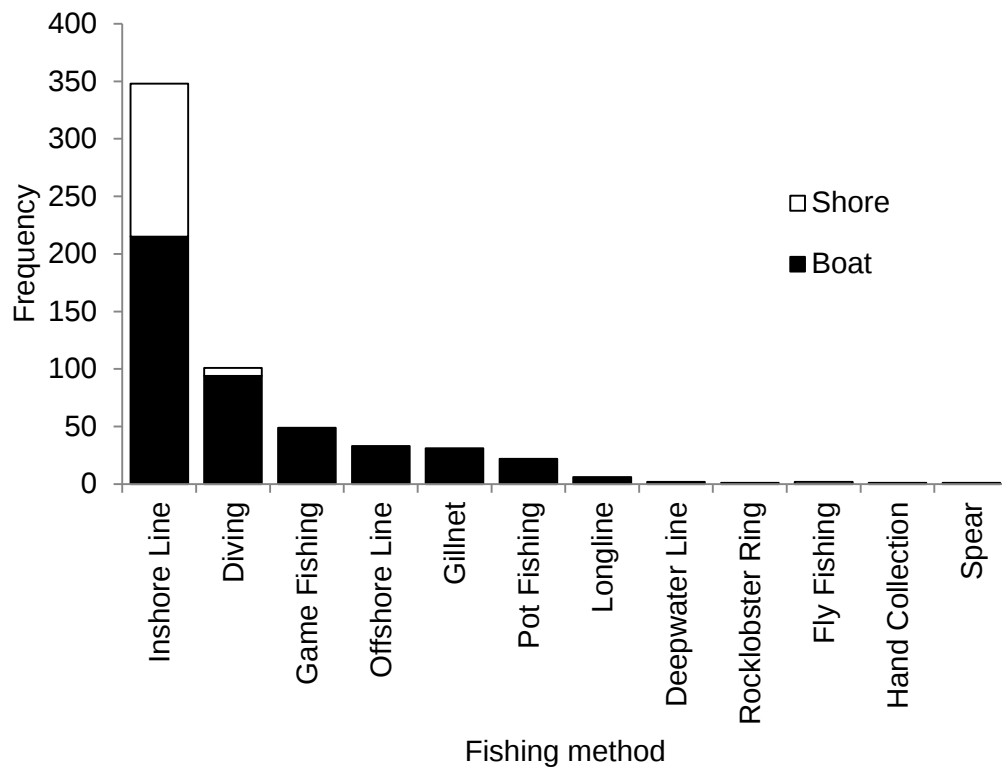


Fig. 12 Number of fishing events reported by participants by fishing type and platform.

A clear seasonal trend in the average number of events reported by participants was identified (Fig. 13). From the inception of the program there was a significant increase in the average number of events reported over the summer, peaking in February 2009. Between the winter months of June and August 2009 the average number of events reported decreased. By October 2009 the average number of events reported again increased significantly, peaking in December 2009. Into 2010 the decrease in the average number of events reported was not as precipitous as that reported for 2009. By July, however the number of events reported had again declined to low levels. Due to the lag in sending in log sheets after the occurrence of a fishing event the seasonal increase in events expected for summer 2010/11 is not evident in Fig. 13.

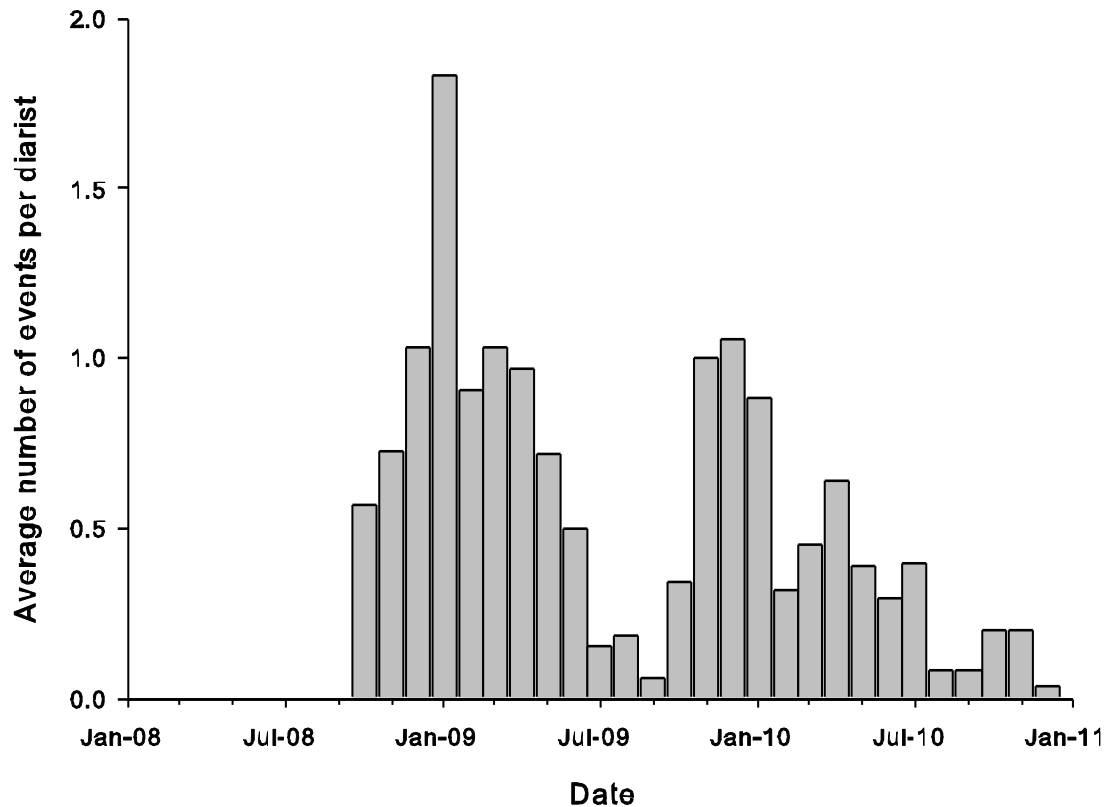


Fig. 13 The average number of events reported per participant signed into the logbook program each month.

Catch composition

Participants reported 8194 individual fish/invertebrates captured representing 92 different taxa. Of these 4904 (60%) were retained and 3290 were released. Size measurements were reported from 4640 individuals.

The overall catch composition reported by RALP participants was similar to that reported by the 2007/08 statewide survey of recreational fishing (Lyle et al. 2009), with a few exceptions (Fig. 14). The most commonly reported species to the RALP was flathead, comprised mainly of sand flathead. Flathead were also the most commonly caught species reported to the statewide survey. The proportion reported to the statewide survey was greater however; we speculate that flathead are one of the most easily accessible fish species to the general recreational fishing population and hence were more prominent in the statewide survey results because the avid RALP participants target a more diverse range of species.

Scallops, southern rock lobster and abalone also featured more prominently in the RALP than the statewide survey, reflecting the disproportionate participation by divers in the RALP.

Other scalefish species that were reported more to the RALP compared to the statewide survey included species considered to be sportfish, including: Australian salmon and black bream as well as species regarded as high quality seafood, including southern calamary, trumpeters and blue warehou.

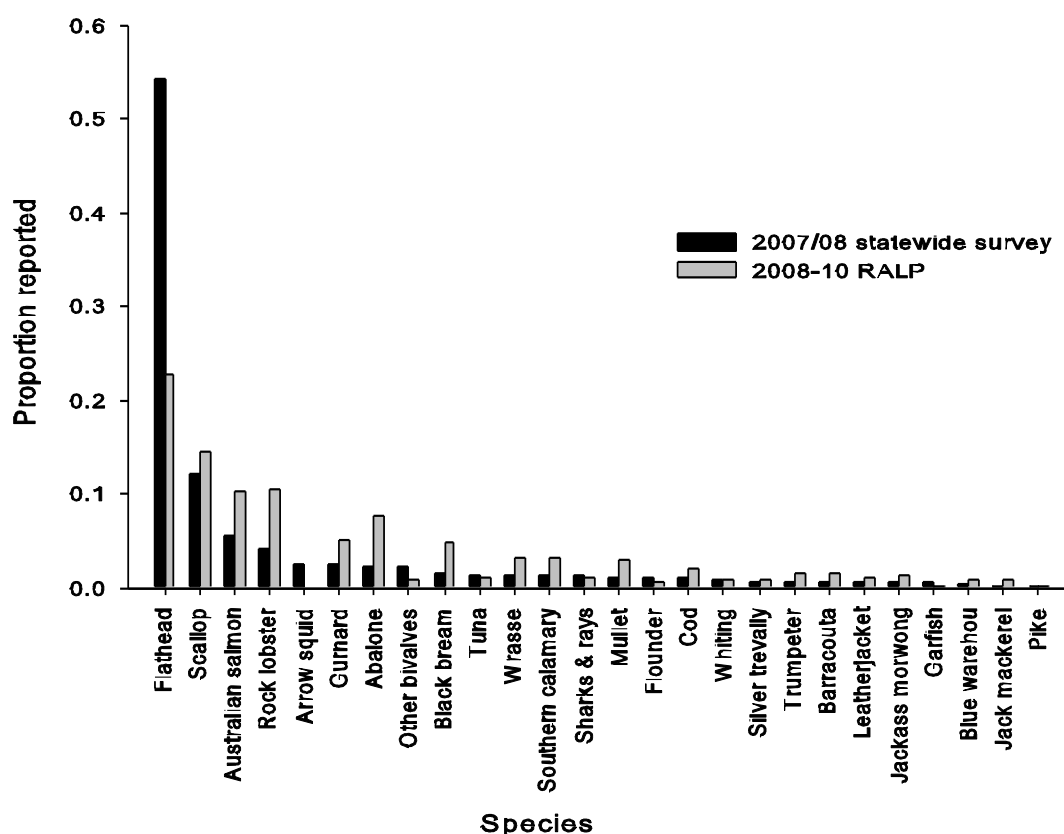


Fig. 14 Catch composition of the main marine species reported to the 2007/08 statewide survey and RALP.

Key species case studies

Sand flathead

Nineteen participants reported 175 fishing events involving the capture of flathead (reported as sand flathead or unspecified flathead). The majority of these events were reported from the south and southeast coasts (52%), presumably influenced by the greater proportion of participants residing in this general region. The remainder of flathead catch were from fishing events on the north/northwest coast (31%) and the east coast, including Flinders Island (17%). For each event the average number of fishers on each trip was 2.1 ± 0.1 s.e.

A total of 1746 sand flathead were caught of which 845 (49%) were retained (65% of which were measured), and 901 were released (51% of which were measured). The average number of fish captured on an event per fisher was 5.3 ± 0.5 s.e., and the average number released was 2.8 ± 0.3 s.e. The proportion of flathead reported released by participants (51%) was higher than that reported by the 2007/08 statewide survey (40%). Interestingly participants in the RALP released a large proportion of fish that were just size: 300 – 320mm (72% released), 320 – 340mm (25% released).

The average size of retained sand flathead was $356 \text{ mm} \pm 2.2$ s.e., the largest reported fish was 549 mm. The size frequency distribution of sand flathead was normally distributed and did not identify any pre-recruitment size classes (Fig. 15), although the under-reporting of

released fish and the selectivity of fishing gear may mask the identification of pre-recruitment pulses for this species.

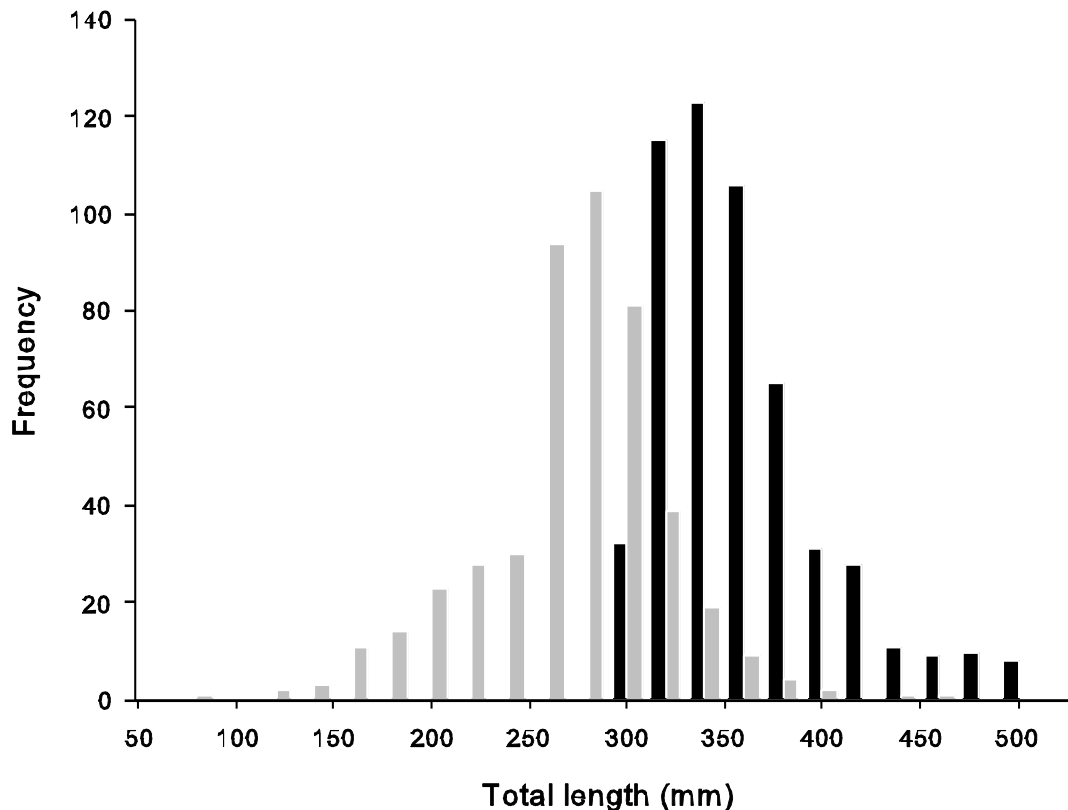


Fig. 15 Size frequency composition of sand flathead reported from participants. Black bars indicate retained catch, grey bars represent released catch. Note: 65 and 51% of retained and released catch were measured, respectively.

Black bream

A total of 58 events were reported by eight participants where black bream were caught. The greatest number of these events took place in the south/southeast (69%), with a further 28% reported from the east/northeast region and the remaining 3% from the northwest coast. The average number of fishers at each event was 1.7 ± 0.1 , and the average number of fish caught per angler during each event was 4.2 ± 0.7 s.e, and the average number released was 4.1 ± 0.7 s.e.

A total of 388 black bream were caught of which 380 were released. The average proportion of black bream released across all events was the highest (98%) of all species reported to the RALP, reinforcing black bream's reputation as predominately a sportfish, particularly amongst avid/specialist anglers. Black bream also had the highest rate of completed length measurements of any species with 372 individual length measurements reported (98%).

The size frequency distribution was negatively skewed illustrating that a greater proportion of larger black bream were reported (Fig. 16). The median size of black bream reported to the

RALP was 350mm fork length, well above the legal minimum size limit (250mm total length).

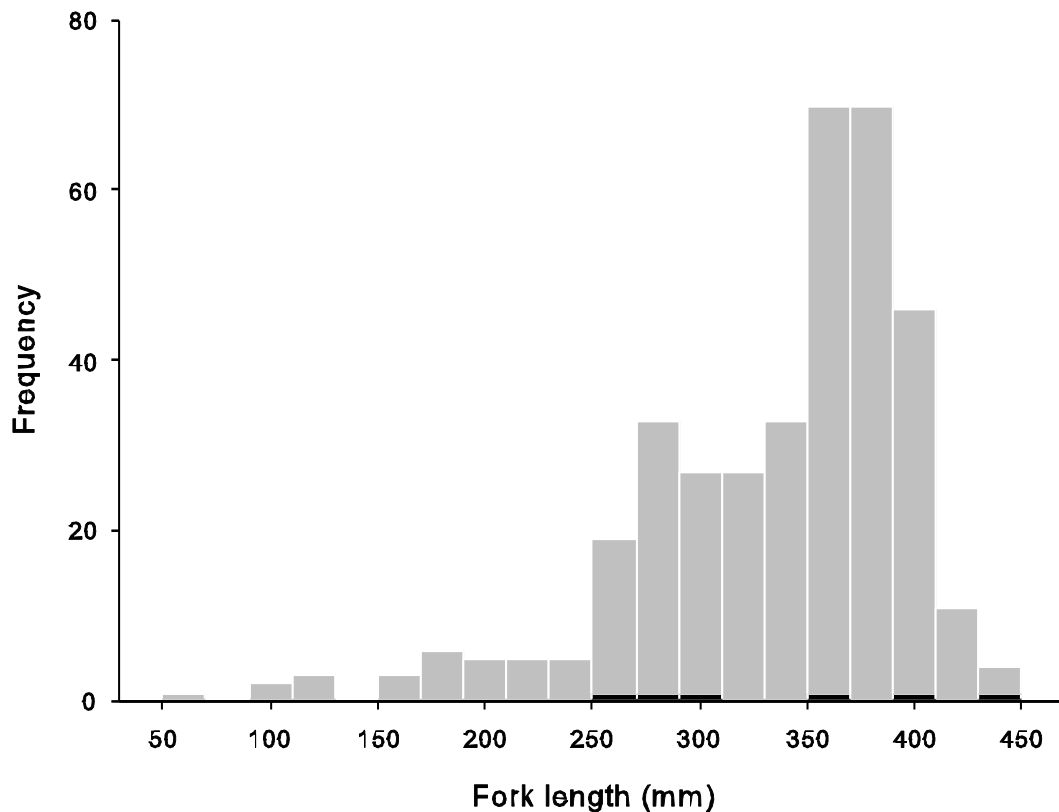


Fig. 16 The size frequency composition of black bream reported from angler diarists fishing around the south, east and northwest coasts of Tasmania. Black bars indicate retained catch, grey bars represent released catch.

Australian salmon

A total of 142 events were reported by 15 participants where Australian salmon were caught. The majority of these events were spread evenly between the north coast and the south/southeast region with 40% each. A further 16% were reported from the east coast and 4% from King Island. The average number of fishers per event was 1.5 ± 0.1 s.e., and the average number of fish caught per angler during each event was 4.5 ± 0.4 s.e., and the average number released was 2.4 ± 0.4 s.e.

A total of 827 Australian salmon were caught of which 435 (53%) were released. Ninety percent of kept fish were measured and 83% of released fish were measured.

The size frequency distribution was positively skewed illustrating that a greater proportion of smaller Australian salmon were reported (Fig. 17). The median size of Australian salmon reported to the RALP was 260mm.

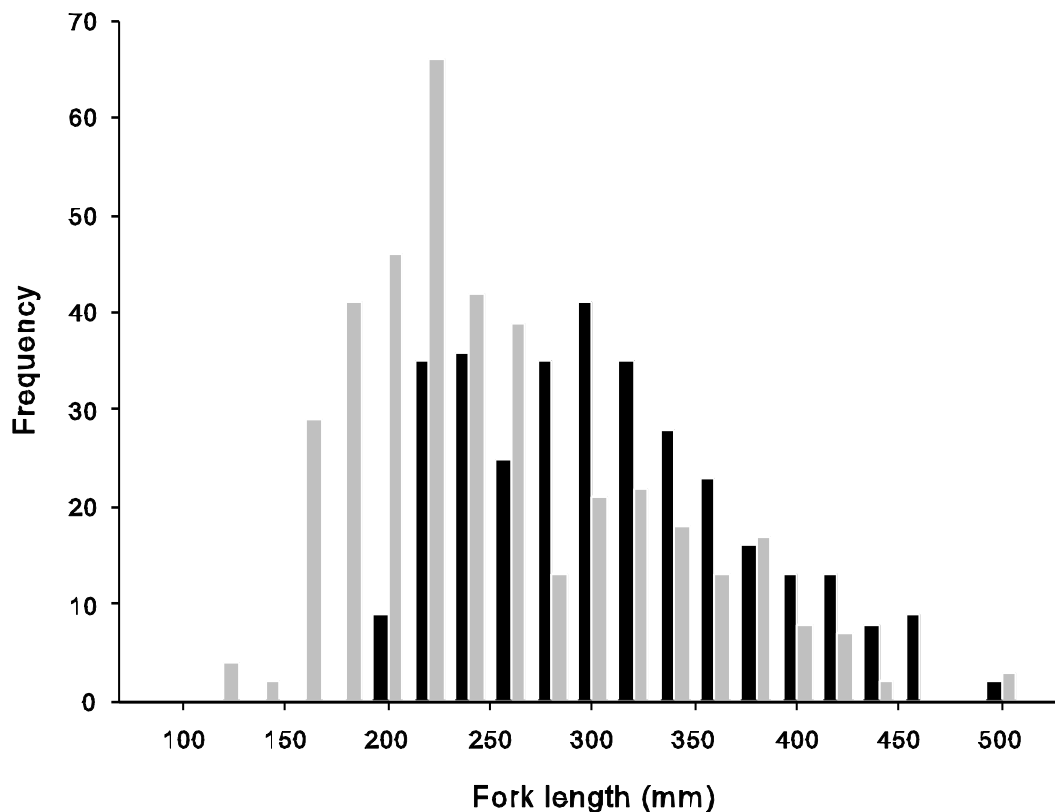


Fig. 17 The size frequency composition of Australian salmon reported from participants fishing around the south, east and north coasts of Tasmania. Black bars indicate retained catch, grey bars represent released catch.

Striped trumpeter

A total of 14 angling events were reported by five angler diarists in which striped trumpeter were caught. Most of these events occurred on the southeast coast (75%) with the remainder occurring on the east coast. The average number of fishers per event was 2.93 ± 0.22 s.e., and the average number of fish caught per angler during each event was 3.55 ± 0.79 s.e., and the average number released was 0.95 ± 0.44 s.e. A total of 130 striped trumpeter were caught of which 32 (25%) were released. Seventy and 62% of the kept and released catch were measured, respectively.

The size frequency distribution was positively skewed illustrating that a greater proportion of smaller striped trumpeter were reported (Fig. 18). The median size of striped trumpeter reported to the RALP was 550mm.

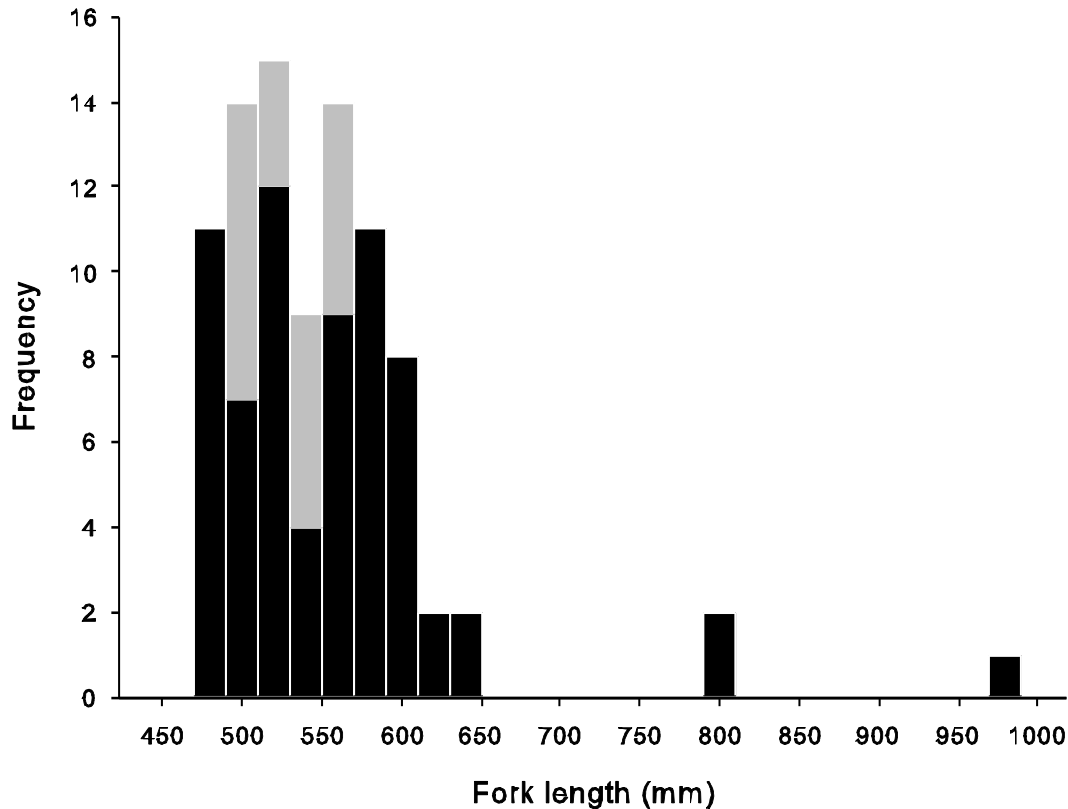


Fig. 18 The size frequency composition of striped trumpeter reported from angler diarists fishing around the southeast and east coasts of Tasmania. Black bars indicate retained catch, grey bars represent released catch.

Southern rock lobster

Between November 2008 and December 2010 nine participants reported on 92 individual fishing events where southern rock lobster were caught. For all but two fishing trips the catch of multiple fishers were reported ($\bar{\mu} = 2.77 \pm 0.11$ s.e.). Of these 92 events the majority were dive trips (84%), followed by pot fishing (15%) and one ring fishing event. Catches were predominately from the east coast including the northeast and Flinders Is (60%) and the south and southeast (39%), with a single trip reported from the west coast. A total of 836 lobster were reported caught of which 702 were retained and 134 were released. The release rate is difficult to assess based on the high proportion of rock lobster harvested by divers, where divers can visually target individuals rather than catch and then release.

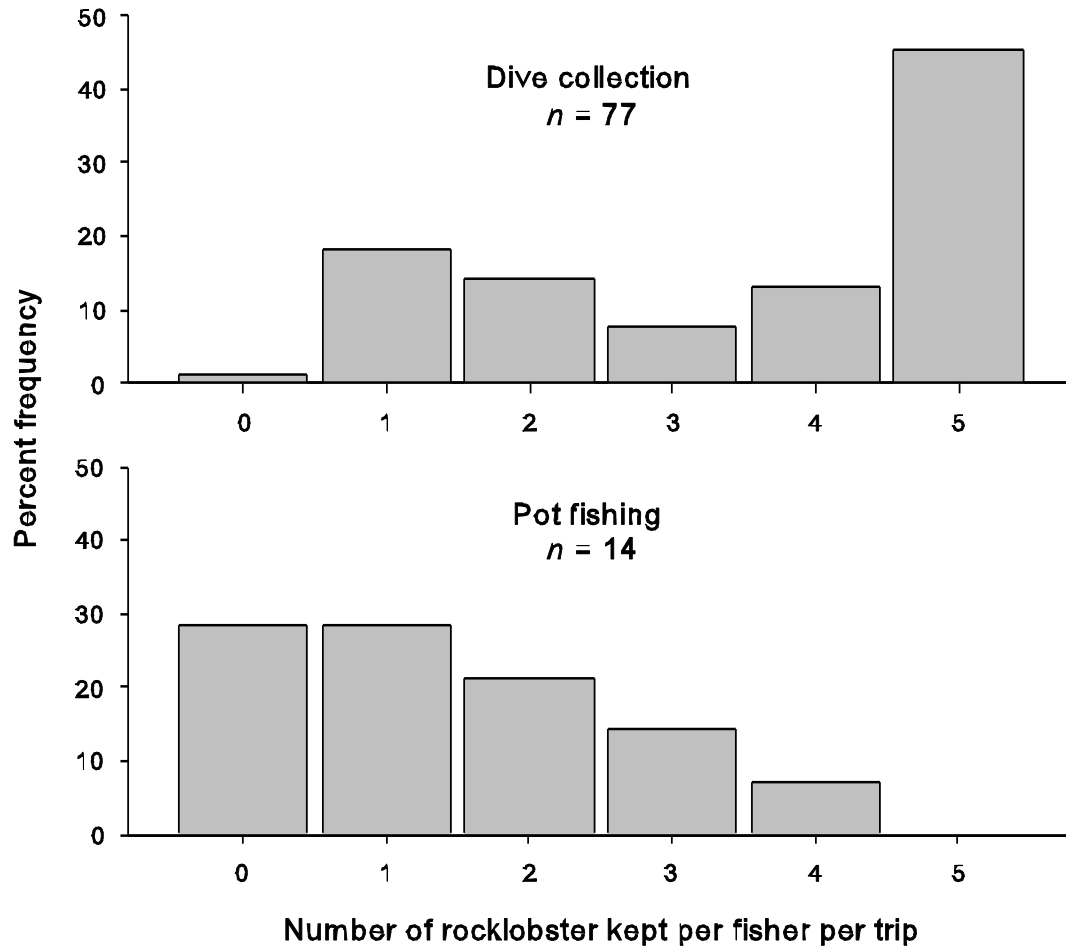


Fig. 19 The percent frequency of the number of southern rock lobster harvested per fisher by dive and pot fishing.

Individuals who fished for rock lobster by dive collection reported catching the bag limit of five individuals on the majority of trips. In contrast, those that fished with pots reported a much lower success rate with 56% of trips resulting in zero or one lobster harvested per individual (Fig. 19).

The carapace length of 738 individuals was recorded (Fig. 20). The average carapace length of retained rock lobster was $143 \text{ mm} \pm 10.2 \text{ s.e.}$

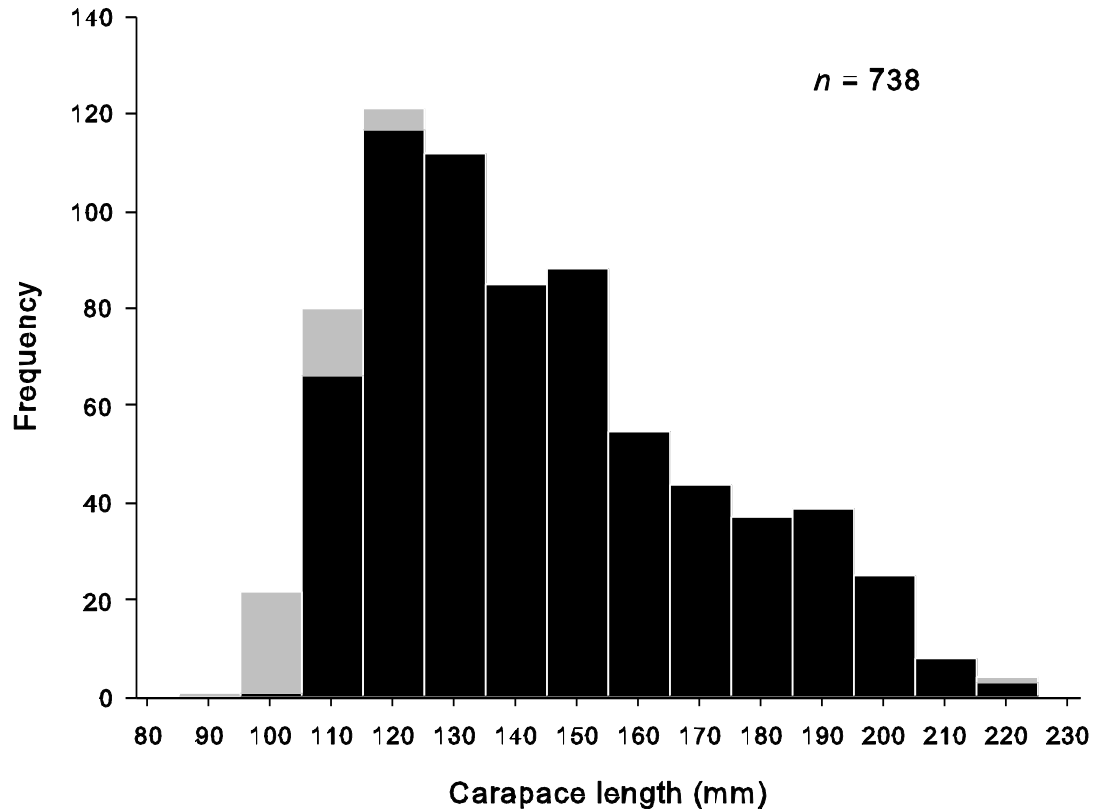


Fig. 20 Size composition of southern rock lobster measured and reported by volunteer angler diarists between November 2008 and December 2010. Black bars indicate retained catch, grey bars indicate released catch.

The number of southern rock lobster reported by RALP participants from Flinders Island caught by dive collection during the 2008/09 season were sufficient to compare the catch size frequency composition with that reported from the same area, based on dive catches for the 2008/09 recreational rock lobster fishery survey (Lyle and Tracey 2010) (Fig. 21). The mean carapace length of rock lobster reported from the RALP program was $146.3 \text{ mm} \pm 3.38 \text{ s.e}$ which compared with $131.2 \text{ mm} \pm 2.34 \text{ s.e.}$ for the 2008/09 survey. The distribution of size reported from the RALP was broader and more normally distributed; indicating that the catch reported from the 2008/09 survey included a greater number of smaller rock lobster.

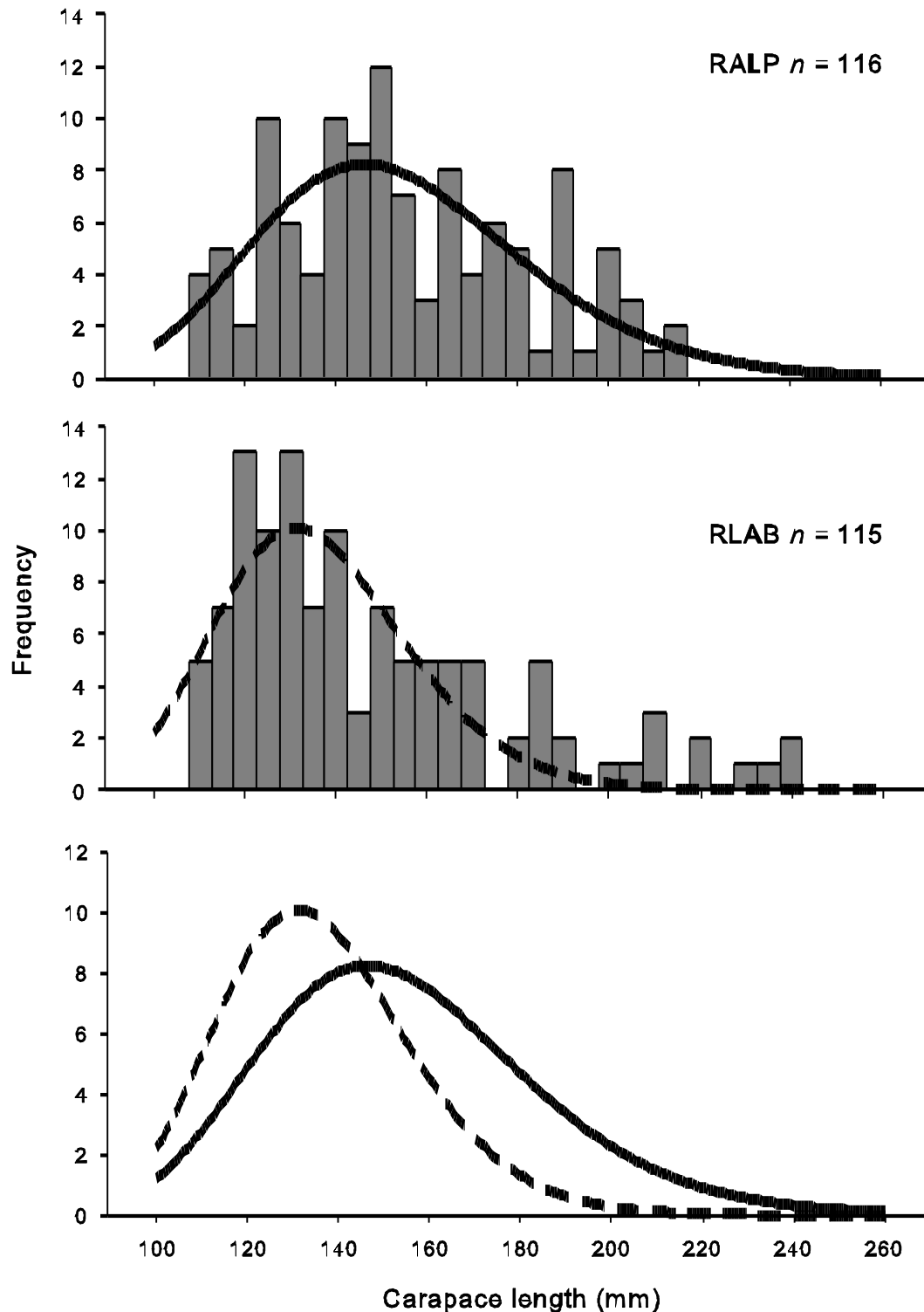


Fig. 21 Comparison of the size composition of southern rock lobster captured around Flinders Island during the 2008/09 season from two survey methods. (A) The size composition reported from the Research Angler Logbook Program (RALP), fitted with a log-normal regression. (B) The size composition reported from the 2008/09 rock lobster recreational fishery survey (RLAB), also fitted with a log-normal regression. (C) Overlaying the two regression lines for comparison.

Wildlife interactions

The mammal that most commonly interacted with reported fishing events were seals. On thirteen of 37 (35%) gamefishing events conducted around the Tasman Peninsula in southeast Tasmania interactions occurred with seals that resulted either in fish loss or fish damage. No interactions were reported however, from seven gamefishing events reported from south of Bruny Island on the south coast or from four gamefishing events on the northeast coast.

Offshore fishing events were also impacted by seal interactions with fish loss or damage occurring on 10 trips; including seven out of 25 events (28%) from the Tasman Peninsula, two out of 4 events (50%) on the northeast coast and one out of two events (50%) from the north coast.

Seal interactions resulting in fish loss or damage were also reported from three inshore fishing events (two at the Tasman Peninsula, southeast Tasmania and one from Southport on the south coast). However, as a proportion of inshore fishing events on the south and southeast coasts the impact of reported seal interactions was negligible.

Seabirds were the only other wildlife reported as interacting with fishing events. Five inshore fishing events reported interactions with seabirds that resulted in fish loss or damage, four on the north coast and one in the southeast. Again, the proportion of inshore fishing events that were impacted by seabird interactions was negligible.

Discussion

This study represents the first implementation of a statewide research angler logbook program (RALP) within Tasmania to report on recreational fishing activity, with a focus on marine fishing. The study was designed as a pilot to assess the suitability of such a program to provide a cost effective means of collecting data suitable for input into scientific assessment of Tasmania's recreational fisheries and ultimately to contribute to the sustainable management of Tasmania's natural marine resources.

Over a period of two years and three months, 22 fishers reported 516 fishing events, many of which involved parties of several fishers. Most of the popular fishing activities participated in by recreational fishers in Tasmania were represented in the data. The reporting participants were distributed around the state with the exception of the west and far south coasts, with the greatest proportion of reporting fishers were based around southeast Tasmania. Close to 8200 individual animals were reported captured representing over 90 taxa. Size measurements were reported from more than 4600 individuals. Based on these metrics the pilot RALP proved successful at collecting information on a range of fishing activities as well as a significant amount of information on the size composition of species captured by recreational fishers in Tasmania. Data from high profile species such as: southern rock lobster, southern bluefin tuna, striped trumpeter, scallops and abalone were collected.

When the data are scrutinised limitations are revealed in the method, in its current form, to provide a robust representation of the recreational fishery, with potentially significant biases

in catch rates and catch composition evident. Two of the major considerations around the use of angler logbook programs are participation and standardisation of the data collected.

Participation

In this study we implemented a specific recruitment strategy where we advertised the program through outlets that were accessed by avid recreational fishers, including: Tasmanian recreational fishing websites, the recreational sea fishing guide, tackle shops, and most effectively through word of mouth referrals. One of the biggest challenges in recruiting participants lies in attempting to involve as many anglers as possible but at the same time screening out those unlikely to report their fishing activities or commit for the long-term. By promoting the program in this way we attempted to target persons with a strong interest in recreational fishing. Additionally, requiring participants to contact the program on their own accord has proven to be a successful strategy, where such individuals have been the most 'faithful' diarists (Cooke & Gurr 1996). Another consideration that has proven effective at increasing response rates and maintaining participation is recruiting fishers who already record or express an interest in recording their fishing activities. One of the most successful angler logbook programs in the international literature monitors the recreational fishery for muskellunge in Ontario, USA. Many of the participants in this project have a long history of keeping careful records of their catches and other observations made during fishing trips (Kerr 2007).

Even with the selective recruitment process adopted, less than half of the participants reported fishing activity. We assume that based on the avidity of participants the lack of catch reporting was due to non-response rather than lack of fishing. The program also experienced a significant rate of attrition over time, which was compensated for, to a degree, by the recruitment of new participants. The degree of commitment and work that is required from participants can dilute the satisfaction of what is ultimately a recreational activity, which in turn effects recruitment and retention of participants. Addressing this issue is a significant issue for implementing a successful research angler program (Connelly & Brown 1996). Considerable effort is required to continually recruit new participants and can lead to significant issues relating to the quality of the data which are discussed in the next section.

There is a spectrum of control that can be implemented by researchers over the data that can be collected, ranging from no control over the anglers fishing activities to completely standardising their activities. As the degree of control increases so does the 'burden' of recording an event, possibly effecting recruitment and more importantly retention rates. The cost benefit of these trade-offs need to be considered. In this study we opted for a minimal level of control, whereby participants were encouraged to fish as they normally would. The only reporting request made was that logsheets were fully completed to reflect the fishing activity and catch information. The high proportion of non-response and rate of attrition amongst active participants would suggest that even this approach posed a sufficient burden to deter the long-term involvement of many participants. Despite similar issues, several Angler logbook programs have successfully developed into long-term data collection projects. For example, Sztramko et al. (1991) was able to increase participation by recognising volunteer contributions, informing anglers about use of the data, and fostering

among them a sense of resource stewardship and public involvement in fisheries management.

In this study we endeavoured to promote a sense of 'team' participation and stewardship among participants as well as providing incentives to remain active in the program. Most participants were contacted by phone soon after signing onto the program by project staff to discuss the program, the logbook and field questions. Participants were also encouraged to contact staff by phone or email if they had questions or feedback. Early in 2010 a lottery of donated prizes (predominately fishing equipment) was implemented whereby each fully completed logsheet constituted an entry into the draw, this event was positively received and resulted in a slight increase in returns. An annual report providing a summary overview of the data collected to date as well as a personalised summary of the individual's fishing activities was also distributed to participants whether they had reported events or not, noting that the individual diaries and summary data were treated as the anglers' personal and confidential property. While feedback from participants was positive regarding these initiatives they did not necessarily translate into an increase in reporting or retention.

It has been suggested that it may take several years to build a program where there is a solid base of anglers who are prepared to participate in the program for an extended period. This is predominately due to the issues outlined above and summarised as the difficulties in recruiting and retaining individuals who will provide accurate, complete and reliable data (Allen 1989). Persisting with personalised annual reporting, securing sponsorship for prizes, promotion for recruitment as well as ongoing management of the project would require funding that was beyond that allocated to the pilot study. The cost of resourcing the program to a degree that would ensure growth in recruitment and an increase in retention would need to be considered against the utility of the data collected.

Data

Several issues have been identified with the use of data collected from angler survey methods in general. These include avidity and conditioning biases (Pollock et al. 1994), exaggeration of catches (prestige bias) and misidentification of fish species, misreporting of lengths and weights of fish, and misunderstanding of questions (Essig & Holliday 1991). Fishers may also be reluctant to accurately report information, especially fishing locations or lure types and techniques used, owing to concerns over confidentiality of data. Some of these potential sources of bias can be reduced by adjustments to survey design and questionnaire (Oehmcke et al., 1986), while others are more difficult to account for.

In this pilot study we have a strong avidity bias, with 88% of participants indicating that they fished at least once a week (i.e > 50 days per year). To put this into context with the statewide survey of recreational fishing in 2007/08, 70% of all fishers were estimated to have fished five or fewer days over the 12-month survey period while just 3% fished more than 20 days (Lyle et al. 2009). The avidity bias in the sample of fishers was a direct consequence of the recruitment strategy that involved contacting avid fishers on the expectation that they would be more committed to the program and provide better quality data. A consequence of this is that results will not necessarily be representative of the general fishery, in terms of the

level of specialisation, fishing practices, catch rates and size composition of the catch. Several programs internationally have identified that angling success rates reported by specialist or avid fishers tend to be higher than average (Schraeder 1989; Foster et al 1999; Mossindy & Duffy 2007). A relevant example from this study was the larger average size in the catch of rock lobster divers from Flinders Island who were RALP participants compared with the average size reported from the same area by divers in the 2008/09 rock lobster survey in which respondents were sampled using probability-based techniques to ensure overall representation of the fishery.

A potential advantage of engaging with avid fishers, however, is that as a group they have the greatest impact in terms of catch and effort in the context of the general recreational fishery.

It was expected that species mis-identification would not be a significant issue due to the fishing experience of participants. To further minimise the chance of mis-identification a fish identification guide of the most common fish and invertebrate species caught by recreational was printed on the cover of the logbook (Appendix 1). The guide also indicated the appropriate places to measure the length of each species to minimise the mis-reporting of fish lengths. There was also clear information on how to complete a logsheet, including two completed example events. A commonly occurring error in reporting occurred where participants recorded the length ranges (e.g. 20 fish kept ranging from 350 – 400mm), rather than individual lengths.

It is also likely that nil catch events were under-reported, with only one event reported that had a zero catch. By only reporting successful fishing trips and ignoring unsuccessful events a significant bias is introduced that contributes to overestimates of angling success rates and catch and could mask declines in abundance. The need to report unsuccessful as well as successful fishing events was emphasised from the onset of involvement in the study but the results imply that this may need to be continually reinforced.

Participants were asked to measure released catch and where possible to do so without impacting on the survival of the animal post-release. For species with generally low catch rates and high release rates, for example black bream, most released fish were measured. Size composition information, including the released component of the catch has the potential to provide information about fish population structure, including year class variability and future recruitment. For other species measuring all of the released fish may not be practical, for example undersized flathead are often caught in relatively large numbers and measuring a significant proportion of the catch may detract from the fishing experience. This can be addressed to some extent by instructing fishers to measure a representative sub-sample of the catch. In practice this is difficult to achieve and fishers will tend to be selective about what they measure or, as experienced in this study, simply report a size range rather than individual lengths, diluting the resolution of new sub-legal recruitment pulses.

Recommendations

Researchers and managers need to consider the biases and limitations associated with volunteer logbook or logbook programs as a form of data collection for recreational fisheries.

The primary value of such approaches is in the monitoring of catch rates over time and the collection of biological information (such as size composition), although such information is unlikely to be representative of the fishery because of the non-representative nature of the participants. However, such information can be informative about stock and fishery status if the underlying characteristics, fishing and reporting behaviour of participants remains consistent or can be standardised across years. An important pre-requisite for the ongoing success of a RALP is that there are appropriate resources and support to effectively manage participants. Ultimately, while data based on such programs can provide a cost-effective and complimentary approach to probability-based survey methods it is important to recognise that they do not provide information that can be expanded to provide estimates of effort or catch for the entire fishery.

The most successful examples of angler logbook programs tend to focus on single species that inhabit semi-closed areas such as estuaries or bays (Conron & Bridge, 2004) or closed areas such as lakes (Anderson and Thompson, 1991, Cooke et al., 2000, Sztramko et al., 1991). They also tend to focus on participants (often few in number) who remain with the program over the long-term to reduce the impacts of individual fisher biases.

The broad statewide ‘pilot’ implementation of this study have allowed for the identification of key fisheries that are well suited to this style of data collection. For example black bream size composition data was collected successfully from the southeast with contributions from multiple diarists and a high proportion of fish measured.

With targeted recruitment, the program could be well suited to monitor comparatively rare or highly specialised activities which are not well represented in the broader statewide surveys. For instance data on activities such as gamefish, off-shore fishing for striped trumpeter or blue eye trevalla, or localised fisheries, such as fishing in Macquarie Harbour or Georges Bay.

For the successful implementation of an on-going angler logbook program for Tasmania it is critical that the project objectives are clearly defined and achievable and that the management of participants needs to be comprehensive and adequately resourced.

Acknowledgements

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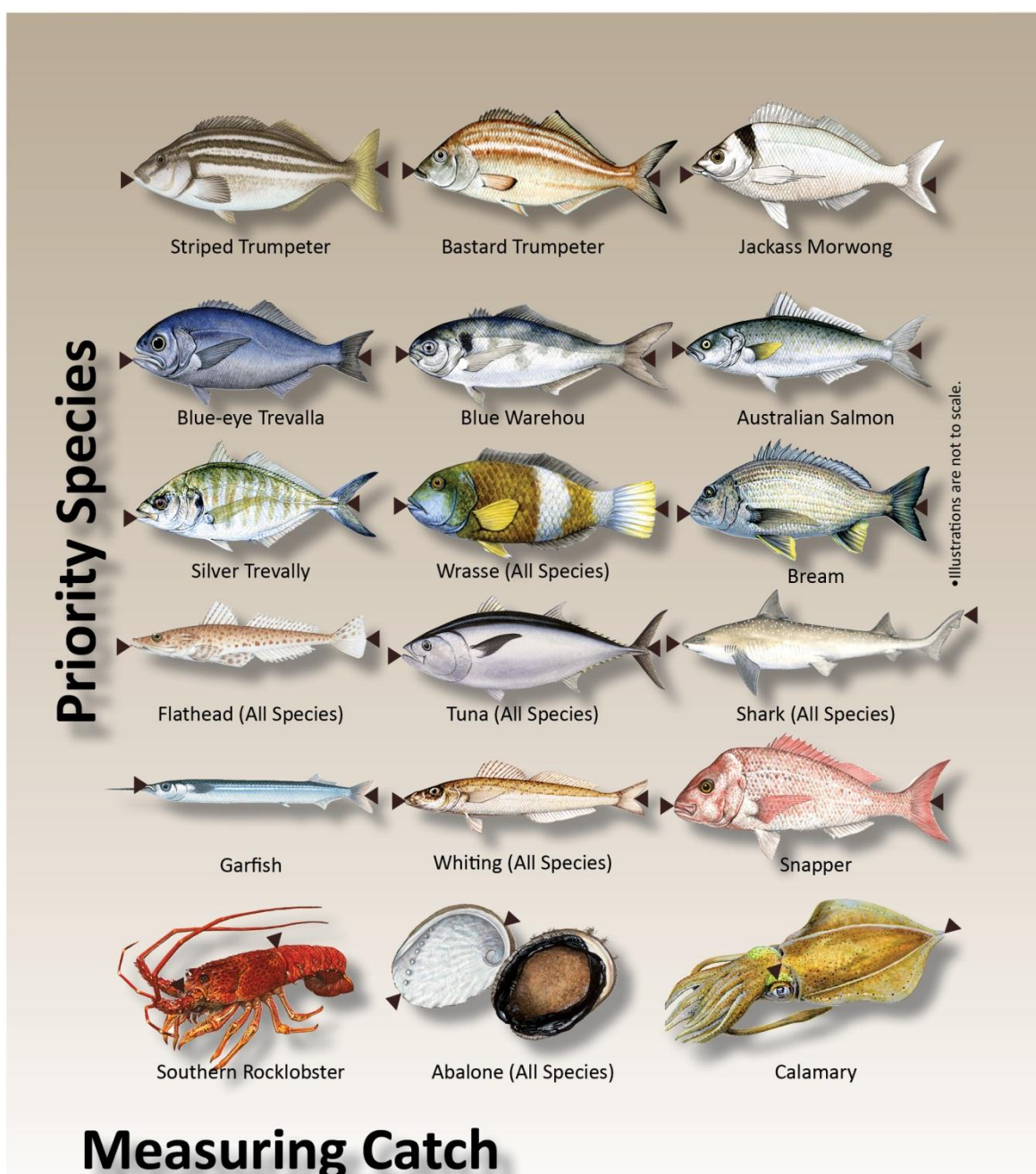
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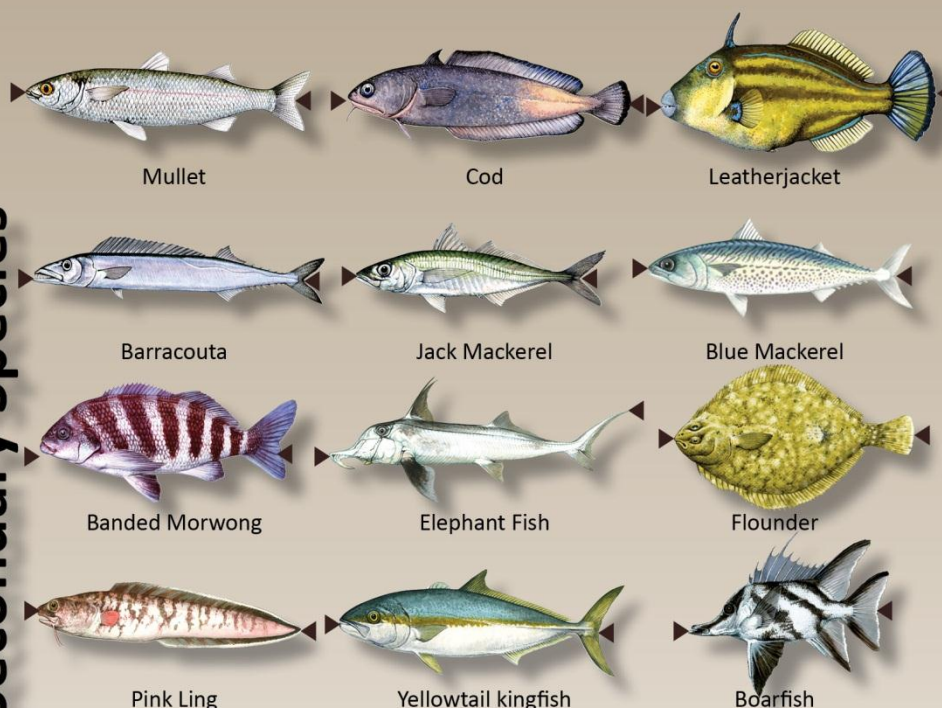
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Appendix 1 The angler logbook jacket design



Measure your catch as soon as possible after capture. Measure between the points indicated (►◄). As a general rule fish are measured from the tip of the snout to the fork of the tail (e.g. Blue Warehou), if the tail does not have a fork then to the middle of the tail, where a fork would occur (e.g. Wrasse). Sharks are measured from the tip of the snout to the tip of the tail. Rock lobster are measured from the point between the antennae to the back of the carapace and abalone are measured across the longest part of the shell. If in doubt record how you have measured your catch on your data sheet.

Secondary Species



Measurements from fish species not listed here still provide important information so, if possible, measure all your catch and if you are unsure about what kind of fish it is record descriptive details (or even better take a photo) and contact TAFI.

Recording location and time

Understanding the relationship between animals and their environment is an important part of fisheries research. Location and time are the two main factors besides what you actually caught to explore this question.

Location information

Accurate location information will help researchers answer questions such as; the number of particular species in different areas, the biodiversity of different areas and even the movement of new species as a result of changes in the environment e.g. water temperature.

Time information

Recording date and time helps researchers address questions on catch rates, changes

in the size composition of species over time, recruitment and seasonal behaviour.

Record all information required on the data sheet, even if you don't feel it is particularly relevant it is extremely beneficial having the complete picture.



General Information

Purpose

Tasmanian waters provide a varied and often spectacular fishing experiences and one in three Tasmanians indulge in some form of recreational fishing each year.

The Angler Logbook Program is your chance to help with research into recreationally important fish species. This research will assist with the development of Tasmania's recreational fisheries in a sustainable manner.

Previous recreational fishing surveys have provided 'snapshots' into various aspects of Tasmania's recreational fisheries. The Research Angler Logbook Program (RALP) aims to complement this information by providing a time series of data that assist in the detection of changes in the biology and stock structure of key species. The program seeks to utilise the people that spend the most time in direct contact with these species - Tasmania's recreational fishers.

The diary program is designed to be flexible, and participants are encouraged to follow their interests and not drastically change their usual fishing habits. Participants will be provided with a summary of research progress and results through an annual newsletter.

Confidentiality

Your completed data sheets will remain strictly confidential. Information about an individual's fishing details will not be released unless prior consent has been given.

Help Available

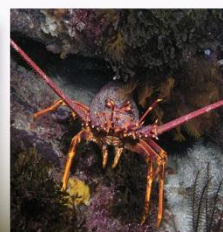
Information about how to complete the data sheets is shown on the inside back cover. If further assistance is required please contact the RALP team, the contact details are listed below.

Returning Completed Log sheets

Please return the original logbook sheets when you have filled your logbook (or every six months if you are not fishing regularly), using the reply paid envelopes. You will be sent additional blank data sheets to insert back in your logbook. The completed data sheets can also be returned upon request for your records.

Contact Details

Research Angler Logbook Program
Marine Research Laboratories
Private Bag 49
Hobart Tasmania 7001
P: 03 6227 7277
E: RALP@utas.edu.au





Research Angler Logbook Program

Private Bag 49, Hobart, TAS, 7001; p: (03) 6227 7286; f: (03) 6227 8035; RALP@utas.edu.au

tafi
Tasmanian Aquaculture and Fisheries Institute

Name: Joe Angler

Date: 12/08/08

Total Trip Time (24 hr Clock)

Depart 08:00

Return 13:00

Fishing Location

Tasman Peninsula

No. of fishers in Party

4

Weather

Overcast, 10-15kts SW wind, 2m S swell and 1.5m SW sea. Water temp 14C

Activity Code (Please circle)	Activity Type	Bait	Lure	Activity/Gear Soak Time	No. of "Gears" in Use	Boat/Shore
IS (0-50m)	Inshore Line				Lines:	
OS (50-250m)	Offshore Line	☒		3:00	Lines: 4	
DS (250+m)	Deepwater Line				Lines:	
GF	Game Fishing		☒	4:30	Lines: 5	Boat
PF	Pot Fishing				Pots:	
D	Diving	Sc ☐	Ho ☐	Sn ☐	Divers:	
GN	Gillnet	Mullet ☐	Graball ☐		Nets:	
OT (other)	Specify:					

Activity Code	Species	No. kept	No. Released	Length (cm) or est. weight (kg)
GF	bluefin tuna	2	2	(W) 68, (92), 27, (32)
OS	striped trumpeter	5	0	56, 49, 64, 72, 59
OS	ocean perch	4	20+	21, (18), (17), 21, (18), 32, 32
OS	jackass morwong	2	0	38, 42

Wildlife Interaction	Gear loss or damage	fish damage	fish loss	Comments:
Seabird				We trolled for tuna around the Hippolytes from 11:30 - 13:30. We had a few issues with seals chasing the tuna. We then bottom fished for striped trumpeter at a reef we found (-42.34156, 148.25411). We kept 4 ocean perch for bait, we didn't measure all we caught, ended up just releasing them straight from the hook. Tuna weighed on spring balance back at boat ramp.
Seal		tuna x 1		
Dolphin				
Whale				

Example 1. A typical day offshore fishing

Trip Date

This is the date of your trip (dd/mm/yy). If you are setting a pot it is the date that you retrieve, but note how many days it was in the water if more than one.

Total Trip Time

Record departure and return times, not including road travel (24hr format is preferable, if not ensure you state AM/PM).

Location

The level of detail provided is up to you, however the closer to the spot the better (even GPS marks), remember this information is confidential. Please provide at least a region (e.g. Bicheno) and try to avoid uncommon names (e.g. Johnno's spot).

No. of fishers in party

This is the total number of people who actually fished with you.

Activity Code & Type

This provides details of the fishing activities participated in on the day. Circle the code for the activity you participated in and tick if you were line fishing with bait, lure or both in the boxes provided. For line fishing mark whether you were using bait, lure or both. For diving indicate whether you used SCUBA (Sc), Hookah (Ho), Snorkel (Sn) or a combination of these. For net fishing indicate whether you used mullet or graball net.

Activity or Gear Soak Time

This is the amount of time in hours & minutes that your gear has been in the water fishing.

No. of "Gears" in use

Number of lines, nets, pots or divers used in a particular fishing activity.

Boat/Shore

Indicate whether you were fishing from a boat or the shore (including jetty, beach, breakwall, etc).

Example 2. A typical day of mixed fishing activities

Research Angler Logbook Program
Private Bag 49, Hobart, TAS, 7001; p: (03) 6227 7286; f: (03) 6227 8035; RALP@utas.edu.au

tafi
Tasmanian Aquaculture and Fisheries Institute

Name: Joe Angler Date: 18/08/08

Activity Code (Please circle)	Activity Type	Bait	Lure	Activity/Gear Soak Time	No. of "Gears" in Use	Boat/Shore
<u>IS</u> (0-50m)	Inshore Line	☒	☒	3:00	Lines: 2	Boat
OS (50-250m)	Offshore Line				Lines:	
DS (250+m)	Deepwater Line				Lines:	
GF	Game Fishing			4:30		
PF	Pot Fishing				Pots:	
<u>D</u>	Diving	☒	☐ Ho ☐ Sn	1:15	Divers: 2	Boat
<u>GN</u>	Gillnet Mullet		☒ Graball	5:00	Nets: 1	
OT (other)	Specify:					

Total Trip Time (24 hr clock)
Depart 07:00
Return 12:40

Fishing Location
Adventure Bay

No. of fishers in Party
2

Weather
Overcast, 10-15kts SW wind, 2m S swell and 1.5m SW sea. Water temp 14C

Activity Code	Species	No. kept	No. Released	Length (cm) or est. weight (kg)
D	Crayfish	5	0	11, 11, 12, 11, 14
D	Blacklip abalone	10	0	14, 14, 14, 14, 14, 15, 15, 15, 15, 16
IS	Sand flathead	8	7	(21), (18), (17), (21), (18), 32, 32
"	"			34, 32, 33, 32, 34, 38, (19), (19)
IS	Gurnard	0	3	(38), (42), (38)
GN	Bastard trumpeter	5	2	38, 39, 38, 40, 41, (28), (30)
GN	Bluethroat wrasse	0	4	(27), (25), (25), (29)
GN	Boarfish	1	1	47, (35)

Wildlife Interaction	Gear loss or damage	fish damage	fish loss	Comments:
Seabird				Set the net first thing, then went for a dive found a great hole with some good crays, one was tagged (no. T12345), kept tag to send to TAFI. After diving had a bottom bounce for flatties, (pretty quiet). Pulled the net at 12:20. Great day.
Seal				
Dolphin				
Whale				

Completing a data sheet

Weather

Record details of the weather on the day of fishing, e.g. wind, sea, swell and even water temperature if you have access to this information from a depth sounder or dive computer.

Species

List the species name to the best of your knowledge. Use the fish ID guide to help correctly identify species. If you need further help contact TAFI.

No. kept & No. released

This is the total number of animals retained and released. Kept; refers to all animals kept for any purpose, including use as bait. Released; refers to all animals returned to the water.

Lengths or estimated weight

Measure your catch to the nearest centimetre; a ruler is provided in the RALP kit. If possible measure released catch (particularly priority species), and to indicate that a measurement is from a released fish

enclose the record in brackets. Length is the default measurement. If you are weighing a particular species put a (W) before the measurements.

Wildlife Interaction

Record in the 'Wildlife Interaction' table if the interaction resulted in gear loss or damage, you observed a fish damaged (whether you landed it or not) or whether you lost a fish due to a particular animal. Also, where practical indicate the fish species that were affected by the interaction.

Comments

Use this section for additional information, remember the more information the better. Of particular interest is information regarding tagged animals. If you do catch a tagged animal record the details of the Tag number, species and size. In addition, contact TAFI to report the tag recapture.

Appendix 2 Summary of all species reported.

Teleost species						
Species/Taxa	Total caught	Number retained	Number released	Number measured	Reported by <i>n</i> fishers	
Flathead	981	527	454	557	16	
Australian salmon	827	392	435	721	15	
Sand flathead	765	318	447	461	11	
Black bream	388	8	380	372	8	
Ocean perch	291	126	165	68	5	
Cod - ALL	158	34	124	49	8	
Striped trumpeter	130	98	32	91	5	
Barracouta	128	94	34	113	13	
Southern bluefin tuna	92	75	17	50	5	
Skipjack tuna	91	23	68	36	4	
Jackass morwong	84	69	15	80	5	
Gurnard - ALL	82	7	75	53	10	
Wrasse	76	1	75	43	10	
Jack mackerel	70	38	32	53	6	
Blue warehou	68	61	7	50	4	
Bastard trumpeter	61	45	16	52	5	
Silver trevally	58	17	41	48	7	
Bluethroat wrasse	55	1	54	39	4	
Rock cod	50	1	49	34	3	
Tiger flathead	48	37	11	38	3	
Flounder	47	28	19	30	5	
Yelloweye mullet	41	36	5	40	3	
Snook	30	13	17	8	3	
Marblefish	26	0	26	6	2	
Mullet	24	13	11	24	3	
Whiting	24	5	19	8	4	
Brown trout	23	7	16	23	2	

The Recreational Angler Logbook Program

Atlantic Salmon	20	20	0	13	4
Leatherjacket	20	10	10	13	6
Albacore	19	19	0	9	3
Southern bluespotted flathead	19	1	18	19	1
Common gurnard perch	18	0	18	18	2
Longfin pike	15	9	6	11	4
Luderick	15	6	9	7	2
Morwong	15	14	1	9	2
Banded morwong	13	4	9	13	3
Snapper	13	11	2	13	3
Garfish	12	12	0	12	1
Yellowtail kingfish	12	12		0	1
Blue mackerel	10	10	0	10	1
Gemfish	10	10	0	5	1
Purple wrasse	9	0	9	9	2
Blue weed-whiting	7	0	7	7	3
Magpie perch	7	5	2	3	1
Six spined leatherjacket	6	6	0	6	2
Tailor	5	4	1	5	2
Blue-eye trevalla	3	3		3	1
Elephantfish	3	2	1	3	3
Common stinkfish	2	0	2	2	1
Dusky flathead	2	2	0	2	1
Red cod	2	0	2	2	2
Southern red scorpionfish	2	0	2	2	1
Stargazer	2	1	1	2	2
Toothbrush leatherjacket	2	0	2	2	1
Trout	2	2	0	2	1
zebrafish	2	0	2	2	1
Blacktip cucumberfish	1	0	1	1	1
Butterfly perch	1	0	1	1	1
Conger eel	1	0	1	0	1

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Latchet	1	0	1	1	1
Little Rock Whiting	1	0	1	1	1
Longsnout Boarfish	1	1	0	1	1
Pink Ling	1	1	0	1	1
Splendid perch	1	1	0	1	1
Trumpeter	1	1	0	1	1
Invertebrate species					
Southern rock lobster	847	702	145	738	10
Scallop	600	600	0	0	1
Commercial scallop	549	499	50	0	2
Greenlip abalone	261	259	2	221	2
Arrow squid	232	193	39	74	10
Abalone	182	132	50	87	5
Blacklip abalone	177	165	12	67	4
Oyster	36	36	0	0	1
Southern calamary	21	18	3	12	7
Octopus	1	0	1	1	1
Elasmobranch species					
Draughtboard shark	81	0	81	42	6
Gummy shark	53	21	32	47	11
Dog shark	39	0	39	32	3
Eagle ray	20	0	20	1	3
Skates & rays	18	0	18	2	4
Port Jackson shark	16	0	16	11	4
Seven gilled shark	15	0	15	14	3
Mako shark	4	3	1	2	2
Whitley's skate	4	0	4	4	1
Smooth stingray	3	0	3	0	1
Fiddler ray	2	0	2	2	1
School shark	2	0	2	2	1
Angelshark	1	0	1	1	1
Sawshark	1	1	0	1	1

