2019–20 statewide recreational fishing survey

Key results

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Summary

This report presents the key results from Phase 1 and Phase 2 components of the 2019–20 statewide recreational fishing survey. The social aspects of the washup survey results (Phase 3) will be reported separately. The survey commenced in early 2019 with a screening survey (Phase 1). The screening survey used telephone interviews to speak to over 9000 households in Queensland. Households were selected from landline and mobile phone sampling frames. The screening survey was done to recruit fishing households into a 12-month logbook survey (Phase 2) and estimate the number of fishers in Queensland in the 12 months prior to the survey based on their recalled activity. The logbook survey ran from 29 April 2019 to 28 April 2020 and collected data on catch, effort and expenditure.

This survey estimated that approximately 943 000 Queenslanders went recreational fishing in Queensland in the 12 months prior to the survey based on recalled fishing trips. It also estimated that approximately 660 000 fishers went fishing during the 12 month logbook survey based on reported fishing events. The survey estimated that Queensland residents fished on 2.8 million days (± 158 000 days), most of which occurred in south-east waters. Whiting (sand whiting complex and whiting unspecified) were the most commonly harvested fish. Queensland fishers spent approximately $630 million on recreational fishing items and activities during the 12 month survey. These data will contribute to assessments of the sustainability of fisheries and the economic contribution of recreation fishing by Queenslanders.

Additional information is available on the Fisheries Queensland website.

Glossary

ABS   Australian Bureau of Statistics

CATI   Computer-assisted telephone interviews where the telephone scripts are presented to the interviewer by a computer and responses recorded on a computer

Phase 1   The screening survey—aimed at recruiting fishing households into the 12 month logbook survey and obtaining recalled fishing participation estimates

Phase 2   The logbook survey—aimed to collect catch and effort data from households recruited during phase 1.

Phase 3   The final stage of the survey where fishing households were interviewed for a range of social and attitudinal information[1], as well as expenditure on fishing items not captured in the logbook phase (e.g. vessel purchases)

RSE   The relative standard error is the standard error divided by its respective estimate

RDD   Random digit dialling of phone numbers

SE   The statistical standard error of an estimate

SRC   The Social Research Centre—the organisation that collected the survey data

SRFS   Statewide recreational fishing survey

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[1] Social and attitudinal results will be provided in a separate report.

Introduction

Recreational fishing is enjoyed by many Queenslanders. It contributes to the state's economy through expenditure on items including bait, tackle, travel, accommodation, permits (in stocked impoundments), vessels and fishing gear. There are social benefits too; many fishers report that fishing gives them a chance to relax, unwind and connect with friends and family (Webley et al. 2016). To ensure that recreational fishing is managed sustainably into the future, it is important that accurate data on catch and effort, economic and social factors are routinely collected.

The 2019–20 statewide recreational fishing survey (SRFS) continues the time series that collects statewide and regional data on recreational fishing participation, catch and effort. It is also the second survey to collect data on expenditure. Like the surveys conducted in 2000–01, 2010–11 and 2013–14, the 2019–20 survey comprised three phases: a screening survey (phase 1), a logbook survey (phase 2) and a washup survey (phase 3). The screening survey estimated the number of Queenslanders (aged five years or older) who went fishing in Queensland in the 12 months before the survey (based on memory recall over the previous 12 months). In the logbook survey, recruited fishing households recorded all their fishing activity and associated expenditure for 12 months. The washup survey collected additional information on fishing-related expenditure, bait use and social data on various fisheries topics. Together, these phases provide a comprehensive assessment of recreational fishing in Queensland by Queenslanders.

In addition to the SRFS, Fisheries Queensland uses several other programs to monitor recreational fisheries including a boat ramp survey program. However, the SRFS is the only program that estimates total catch and effort, which is important for fisheries stock assessments. The survey uses probability-based stratified random sampling and demographic weighting, which allows data to be expanded from the survey sample to Queensland's resident population. Although there are minor variations in methods among the states, most fisheries authorities in Australia use the same method to estimate total catch and effort.

This report aims to provide key results from the screening (phase 1) and logbook (phase 2) components of the 2019–20 SRFS. Trip-based expenditure data collected in Phase 2 and additional fishing-related expenditure data from the washup survey (phase 3) are also provided.

Survey aims

The 2019–20 SRFS aimed to provide statewide and regional estimates of:

1. The number of Queensland residents, aged five years or older, who fish recreationally
2. Recreational fishing effort
3. Recreational fishing catch
4. Recreational fishing expenditure

Methods

Survey design and sampling

The survey was conducted by the Social Research Centre (SRC) on behalf of Fisheries Queensland. The survey used a multi-phase telephone-logbook method (Lyle et al. 2010) (Figure 1). The screening survey (phase 1), aimed to recruit fishing households into the 12 month logbook survey (phase 2) and estimate fishing participation among Queensland residents in the 12 months prior to the survey. In the screening survey, households were contacted and recruited into the survey using a tri-frame sampling method. This method sampled households from lists of random digit dialled (RDD) landline numbers, RDD mobile numbers and listed mobile numbers. Lists were generated by SamplePages, a commercial list provider for probability-based surveys. Details on sampling methods are provided in the Screening Survey Technical Report (Misson et al. 2020b). In total, 9257 households were

contacted by telephone to determine their fishing status. Of those households that intended to fish over the next 12 months, 77.3% agreed to take part in the logbook survey.

In the logbook survey (phase 2), recruited households recorded their fishing activity and expenditure for 12 months, beginning 29 April 2019. Households had the option to submit data via an online diary portal or by Computer Assisted Telephone Interview (CATI). Data were routinely inspected for quality by Fisheries Queensland scientists. Where requested by Fisheries Queensland, SRC contacted households to query and correct errors. To aid species identification, households were provided with a guidebook of commonly caught species. Fishers were also encouraged to submit photographs of unidentified species to Fisheries Queensland for identification. Any remaining anomalies, such as species caught outside of their expected distribution, were queried. Where necessary, additional species identification materials were provided to fishers. Further details on data collection methods, including household retention and contact strategies, are provided in the methodological report (Misson et al. 2020a).

In the washup survey (phase 3), fishing households were interviewed for a range of social and attitudinal information[2], as well as expenditure on fishing items not captured in the logbook phase (e.g. vessel purchases). In addition, a follow-up survey of non-fishing households was conducted after the logbook survey (non-intending call back survey) to account for unexpected fishing activity (drop-ins or influx).
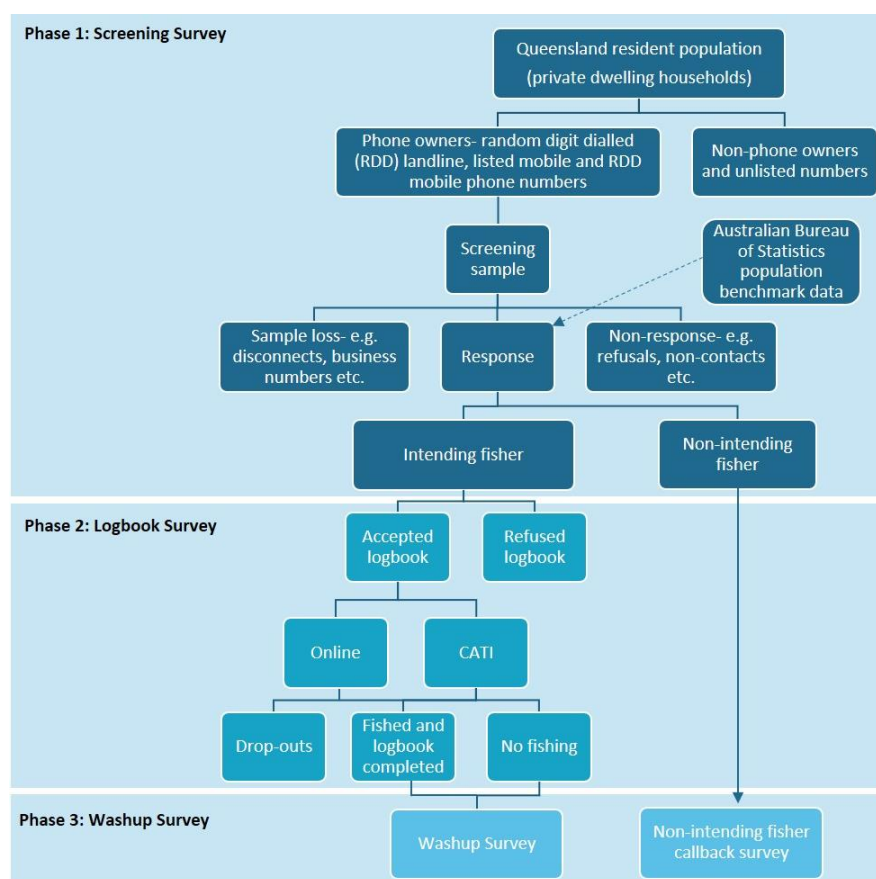

Figure 1 Phases of the 2019–20 statewide recreational fishing survey

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[2] Social and attitudinal results will be provided in a separate report.

Statistical methods

Estimates of total fishing activity and expenditure were calculated by weighting raw data to a household's selection probability and population benchmarks. Selection probability is important to include because mobile-only households are less likely to be sampled than mobile-and-landline households. Demographic variables used were age, sex, residential location, country of birth and education level, and these conformed to benchmarks provided by the Australian Bureau of Statistics (ABS). Weights for the diary data were adjusted to account for further non-response bias and fishing influx and outflux (i.e. non-intending households that reported fishing (influx) and intending fishing households that reported no fishing (outflux)). Data were weighted using a custom function provided by SRC and implemented in R statistical language (R Core Team, 2020). Detailed information on weighting methods is provided in the Methodological Report (Misson et al. 2020a).

Expenditure was estimated from direct trip-based costs (e.g. bait, tackle and fuel) collected during the logbook phase and other fishing-related costs (e.g. boats, other capital items) collected during the washup survey. For vessel-based annual expenditure, vessel owners were asked to estimate the proportion of time that their vessel was used for recreational fishing during the survey. Expenditure on vessels and associated equipment were apportioned accordingly. Trip-based costs were not apportioned, however, trips were excluded from expenditure estimates if they had any accommodation costs or fuel costs over $40 and fishing was not the main purpose of the trip. Total costs were estimated by adding trip-based and other cost estimates.

Comparison with previous surveys

This survey followed a similar methodology to the 2000–01 National Recreational and Indigenous Fishing Survey (Henry and Lyle 2003), the 2010–11 statewide recreational fishing survey (Taylor et al. 2012) and the 2013–14 statewide recreational fishing survey (Webley et al. 2015). However, some methods were changed to improve coverage of the mobile-only population and to allow online data reporting. The key methodological changes in the 2019–20 survey were:

- The use of a tri-frame sampling method (RDD landline numbers, RDD mobile numbers and listed mobile numbers). Previous surveys used listed landline numbers only. While this was considered suitable for the 2013–14 survey (Teixeira et al. 2016), the shrinking coverage of this sample frame was concerning. By mid-2019, only 42% of the Queensland population were estimated to be contactable by landline, compared to 93% contactable by mobile phone. To maximise representativeness, it was important to include mobile phones as a sampling frame. Details on sample frame coverage are provided in the Screen Survey Technical Report (Misson et al. 2020b).
- The use of CATI and online logbooks for data collection. In this survey, households had the option to self-report their fishing data using an online logbook portal or to speak with a telephone interviewer who would follow computer-assisted prompts to record data into a database. In previous surveys, all data were collected by telephone interview, but these did not follow a CATI system. CATI is preferred as it standardises the scripts followed by interviewers which should reduce interviewer-bias. It also reduces the risk of missed data. The online logbook was provided as an option for participants who wanted to self-report their data. The differences in participants among the two data collection methods are described in the Methodological Report (Misson et al. 2020a).
- The use of SMS to remind households to report their data. In this survey, online households who were expected to fish in a given month were sent SMS reminders to log their data. If the household did not report any information (fishing or no fishing), they were telephoned using CATI. CATI households that expected to fish in the month were telephoned each month. This is similar to the approach taken in previous surveys where household were telephoned at least once a month.

- The use of fishing grids instead of catchment-based areas (Figure 2). The new spatial arrangement of fishing regions was amended to better align with commercial fishing grids.
- The use of education level and country of birth in statistical weighting. Previous surveys used only age, gender and residential region. As education level and country of birth may affect recreational activities, the current survey included these as additional variables in weighting. This should improve estimates.

In addition, the current survey was the first to collect expenditure information since the 2000–01 National Recreational and Indigenous Fishing Survey. This included trip-based expenses, collected as part of the logbook phase, and larger or ongoing expenses (annual costs), collected in the washup phase.
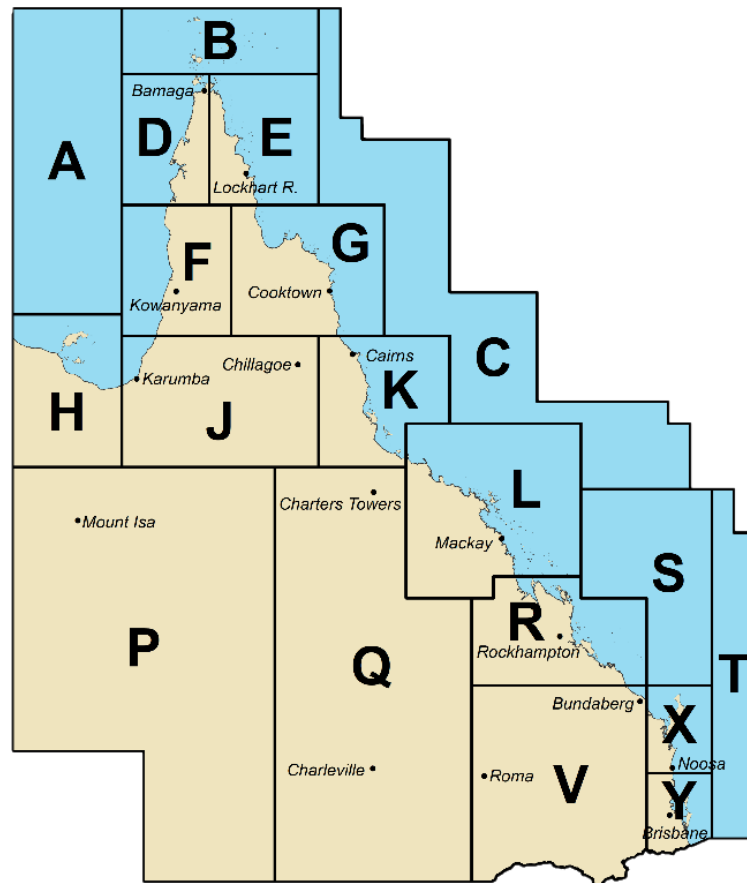

Figure 2 Fishing regions used in the 2019–20 statewide recreational fishing survey

Results

Recreational fishing participation

The screening survey (phase 1) estimated that approximately 943,000 Queenslanders aged 5 years or older went recreational fishing in Queensland in the 12 months before the survey (2018–19) based on recalled fishing trips (Table 1). It also estimated that approximately 660,000 fishers went fishing during the 12 month logbook survey (phase 2, 2019–20) based on reported fishing events. Table 1 presents the estimates of recalled fishing participation from the screening phase and the fishing participation estimate recorded during the logbook survey in each survey year. Estimates made from the data collected at the screening phase relate to the year preceding the survey. Estimates made

from the logbook stages relate to the survey year. The 30-44 years age group had the greatest number of fishers (Figure 3B).

Table 1 Fishing participation (number of fishers) for 2000-01, 2010-11, 2013-14 and 2019-20 statewide surveys.

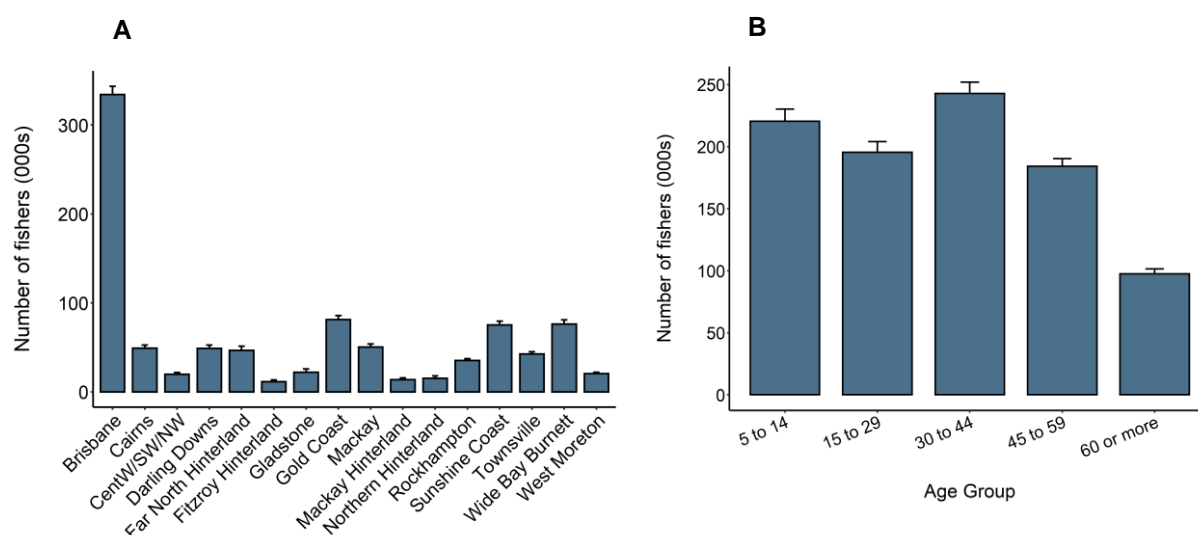| Survey year	Phase	Period estimate relates to	Estimated number of Qld recreational fishers	Standard error	Relative standard error (%)
2000–01	Screening	1999–2000	747 000	20 000	2.7
	Logbook	2000–01	645 000	20 000	3.1
2010–11	Screening	2009–10	703 000	20 000	2.8
	Logbook	2010–11	635 000	23 000	3.6
2013–14	Screening	2012–13	642 000	18 000	2.8
	Logbook	2013–14	701 000	25 000	3.6
2019–20	Screening	2018–19	943 000	16 000	1.7
	Logbook	2019–20	660 000	31 000	4.7

Figure 3 Recreational fishing participation (± SE) by residential region (A) and age group (B).

Fishing effort

Fishing effort was estimated as days, where a day is a person fishing on a day irrespective of the length of time fished. Total fishing effort was 2.8 million days (± 158 000 days) during the logbook survey. On average, fishers went fishing on 4.3 days (± 0.2 days) during the logbook survey. Effort days were greatest in South East Queensland (regions Y and X), followed by the central-north (regions K and L) (Figure 4A). Most fishing occurred inshore (< 5km from coastline) (Figure 4B). Line fishing was the most common method (Figure 4C) and shore-based fishing was more popular than boat-based fishing (Figure 4D).
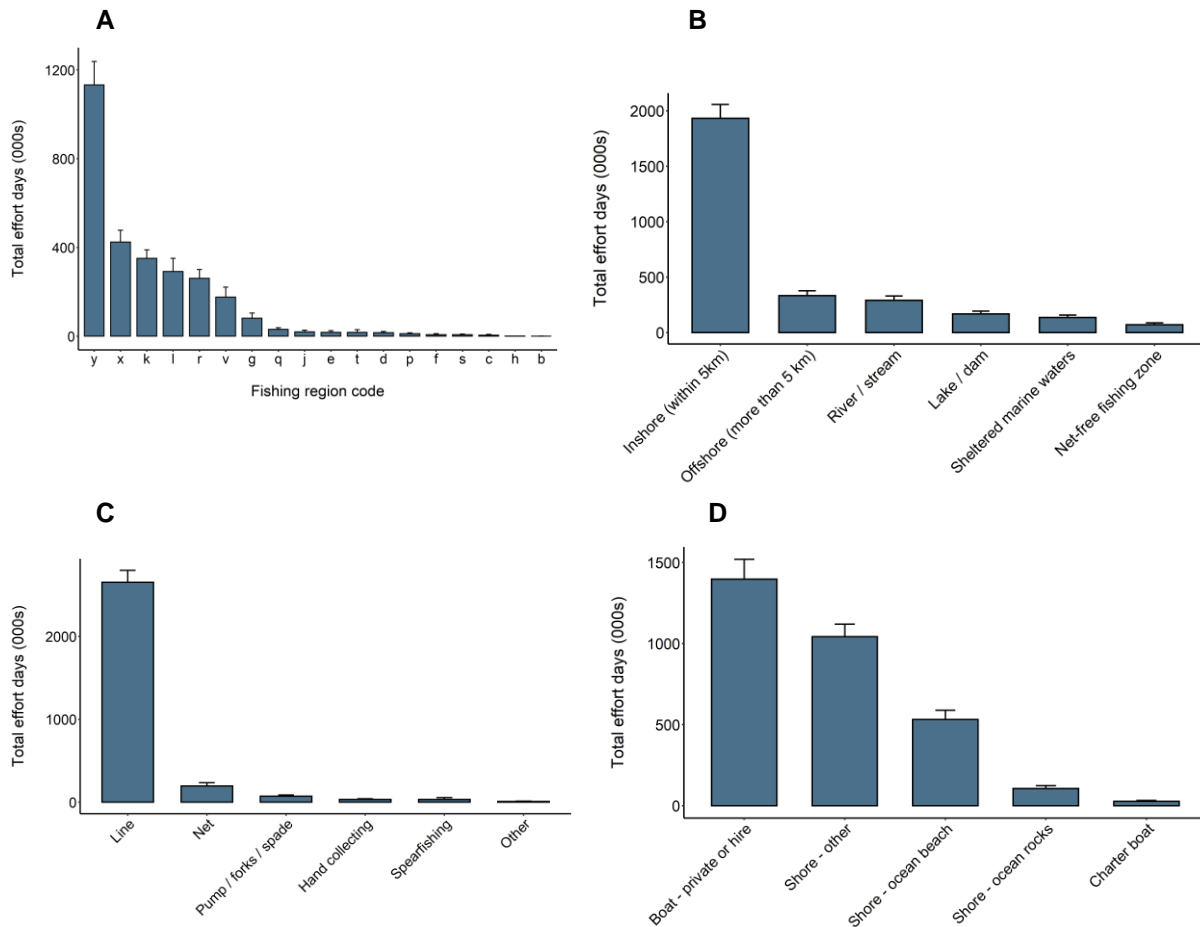
Figure 4 Effort days (± SE) by fishing region (A), waterbody (B), method (C) and platform (D)

Catch

Whiting were the most harvested fish (excluding bait species) during the logbook survey, followed by yellowfin bream (Figure 5). Whiting were categorised as whiting unspecified, which represents the sand whiting complex, and trumpeter whiting (Figure 6A). Other species harvested included tarwhine and pikey bream (Figure 6B). Red claw and mud crab were the most harvested crustaceans (Figure 5). Blue swimmer crab was the most harvested crab species after mud crab (Figure 6C). Coral trout was also among the most harvested species, but most coral trout were unspecified because they could not be confidently assigned to species level (Figure 6D).

Of the mackerel species, school mackerel was the most harvested species, followed by spotted mackerel and Spanish mackerel (Figure 6E). Dusky flathead was the most harvested flathead species (Figure 6F), barred javelin was the most harvested javelin species (Figure 6G) and blue threadfin was the most harvested threadfin species (Figure 6H). Relative to parrotfish, tuskfish were harvested in greater numbers, but most were categorised as unspecified species (Figure 6I).

Snapper was commonly caught, but most fish were released (Figure 6J). Grass emperor was the most caught emperor species, but red throat emperor had a greater harvest (Figure 6K). Likewise, black jewfish were the most caught jewfish species, but jewfish unspecified and teraglin were harvested in greater numbers (Figure 6L).
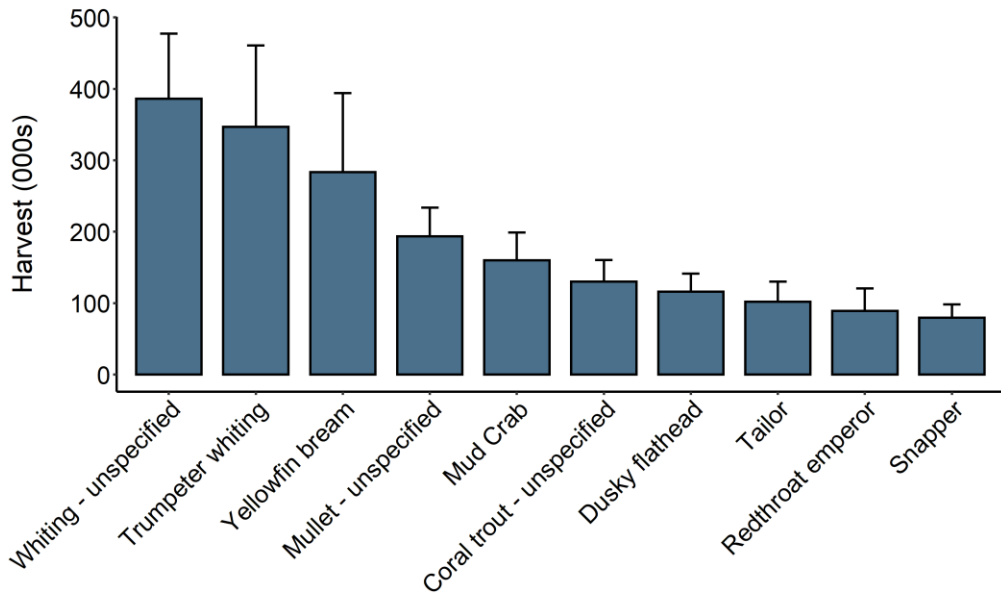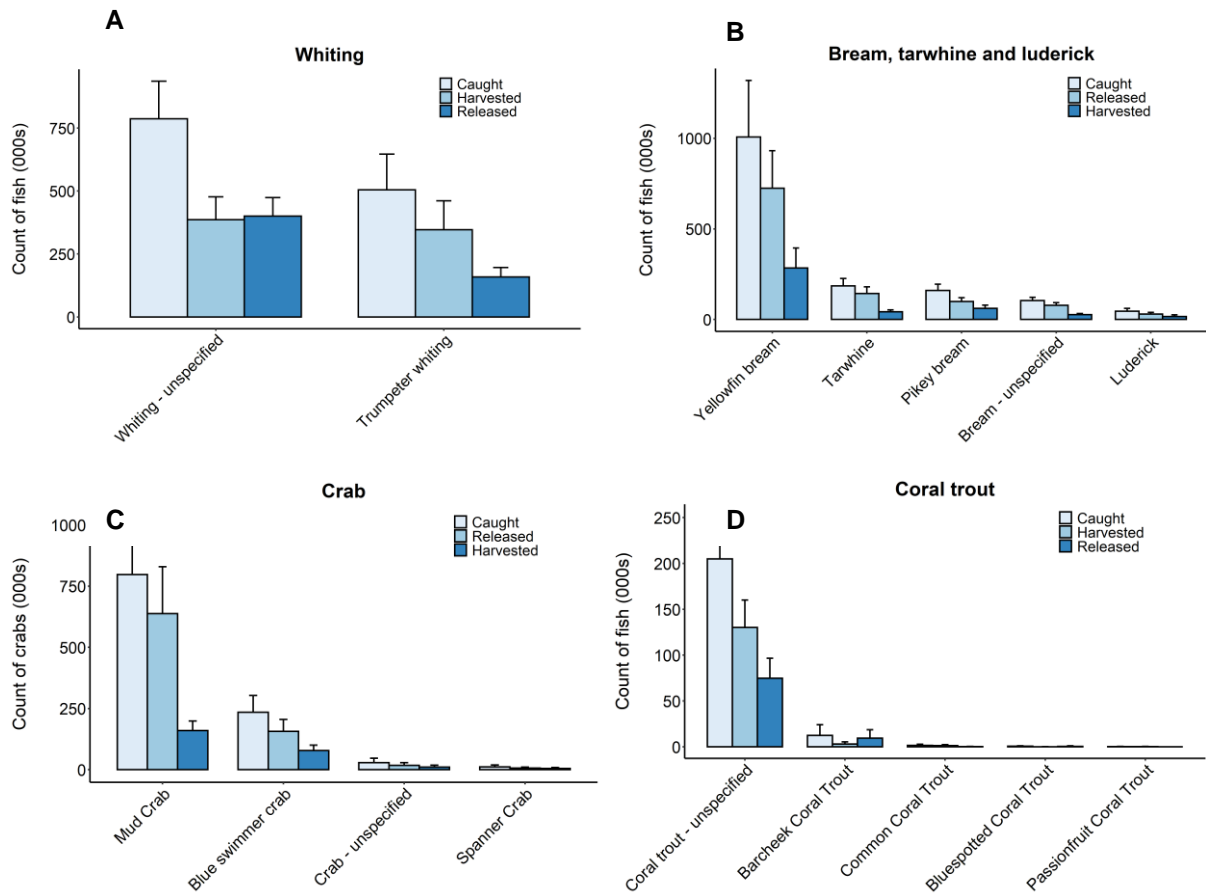
Figure 5 Harvest (± SE) of the top 10 most harvested species during the logbook survey. Bait species and species with high RSE are excluded.
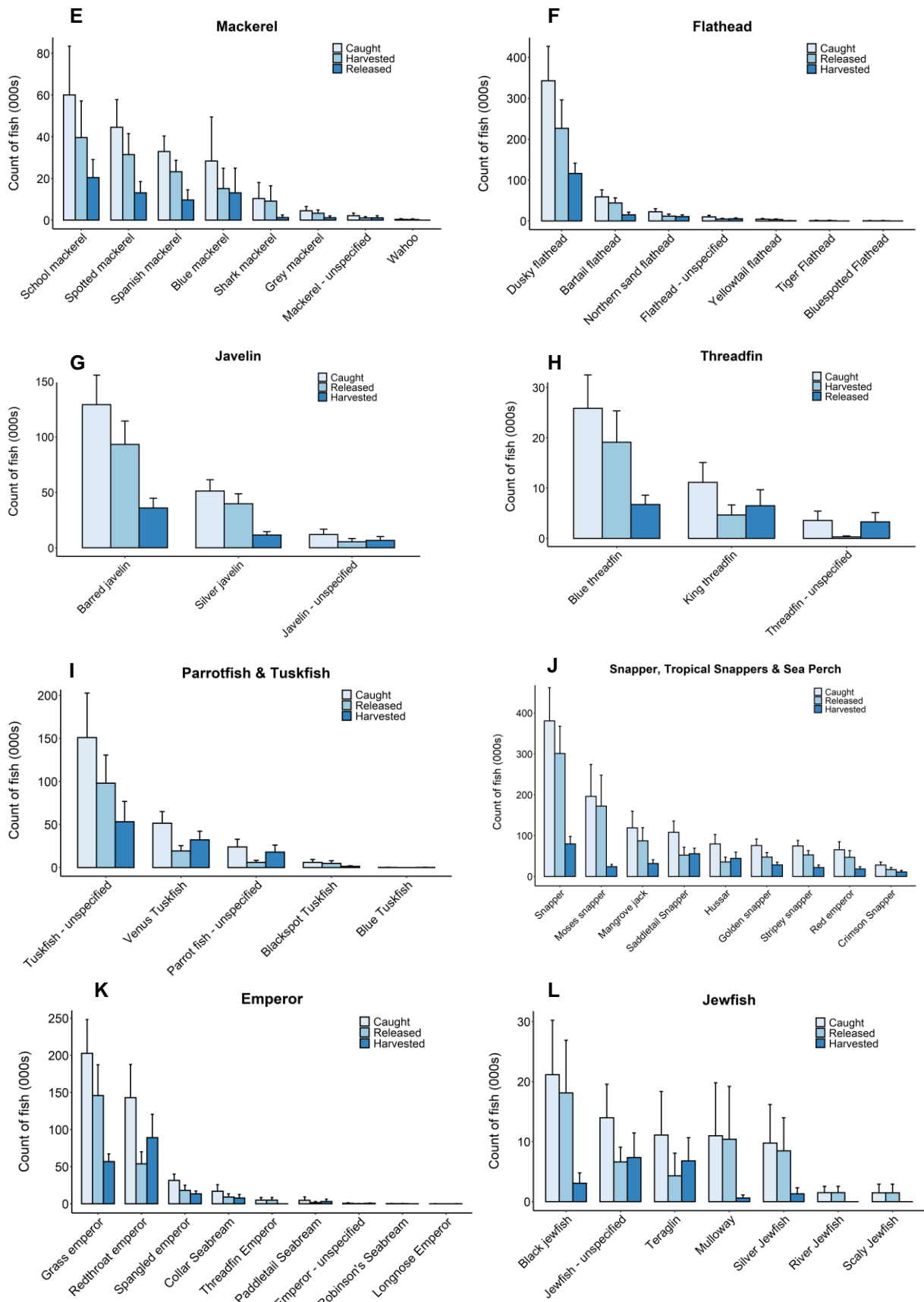
Figure 6 Total number (± SE) of animals caught, harvested and released by commonly used groups (not taxonomic)

Expenditure on recreational fishing

Queensland fishers spent approximately $630 million on recreational fishing between 29 April 2019 and 28 April 2020. Brisbane residents had the greatest expenditure (Figure 7A). Boat fuel was the greatest cost associated with fishing trips (Figure 7B), although bait/tackle/ice and car fuel were similar. The purchase of boats (or other vessels) was the greatest annual cost (Figure 7C), followed by other capital equipment (Figure 7D).
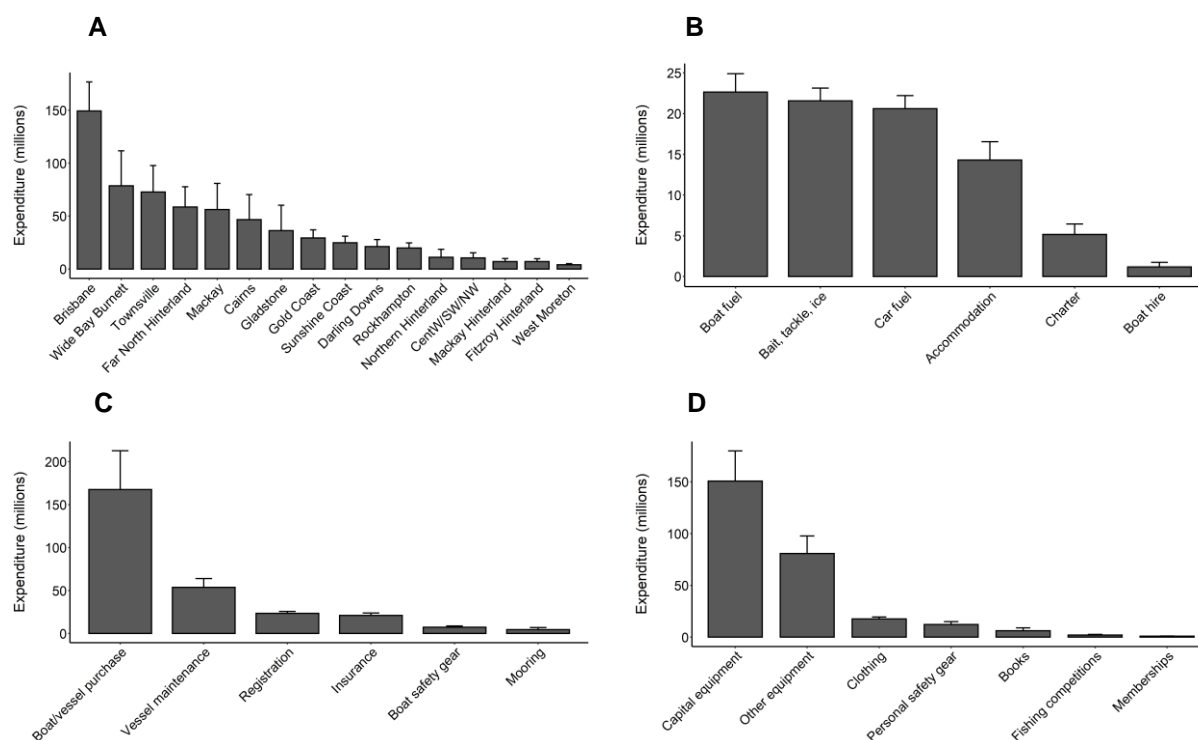

Figure 7 Expenditure (± SE) on recreational fishing by residential region (A), trip costs (B) annual boat costs (C) and other annual cost (D)

Discussion

The 2019–20 statewide recreational fishing survey continues the time series that collects statewide and regional data on recreational fishing participation, catch, and effort, and is the second to collect data on expenditure. This time series is critical to stock assessments of recreationally important species because it provides data on total catch and effort. Other methods, such as the boat ramp survey program, provide temporal indices of catch and effort, which can be calibrated to estimates from statewide surveys to provide annual estimates of total catch and effort.

Total effort was 2.8 million days during the logbook survey, which is the same as that reported in the 2013–14 and 2010–11 surveys but less than the 2000–01 survey (3.6 million days) (Taylor et al. 2012, Webley et al. 2015). Like previous surveys, most effort days were spent line fishing. South East Queensland represented the highest fishing effort—this is particularly important because its spatial area (refer to regions X and Y in figure 2) is smaller than other fishing regions. This high concentration of fishing effort likely translates to substantially greater recreational fishing pressure on fish in this region relative to the rest of the Queensland.

Whiting (unspecified species and trumpeter whiting) were the most harvested fish. Whiting unspecified represents all whiting that could not be identified to species level. We expect that this mostly comprises species of the sand whiting complex. Whiting catch was similar to the 2013–14 and

2010–11 surveys, but less than 2000–01. Similarly, catch of yellowfin bream, the most harvested fish after whiting, was similar to 2013–14, but the catch has decreased since the 2000–01 and 2010–11 surveys. Catch of mulloway, black jewfish and jewfish unspecified was lower in the 2019–20 survey than the 2013–14 survey.

Catch for some species appears to be stable. For example, catch of dusky flathead was similar to that reported in the 2013–14 and 2010–11 surveys, and greater than the 2000–01 survey. Spotted mackerel catch was also similar to the 2013–14 and 2010–11 survey. Conversely, catch of snapper and pearl perch was greater in the 2019–20 survey than the 2013–14 survey. Grass emperor catch was greater in the 2019–20 survey than all previous surveys.

The 2019–20 survey was the first to collect expenditure data since the national survey in 2000–01. During the 12 month logbook survey, recreational fishers spent approximately $630 million on recreational fishing gear, activities, travel and associated items. Boat fuel was the greatest trip-based cost, but bait, tackle, ice and car fuel were also large expenses. For annual costs, the purchases of a boat, other vessel or other capital equipment were the greatest costs. Brisbane residents had the greatest expenditure.

The survey estimated that approximately 943 000 Queenslanders went recreational fishing in Queensland in the 12 months prior to the survey based on recalled fishing trips. This represents 18.7% of the Queensland population. It also estimated that approximately 660,000 fishers went fishing during the 12 month logbook survey (April 2019 to April 2020) based on reported fishing events. The reason why this second estimate is lower than the first is likely to be a combination of the following:

1. In the screening survey, people had to think about their fishing activity over the previous 12 months. For people who don't fish often, it is possible that they thought they went fishing in the 12 months before the survey when the fishing event was before that. This would overestimate the number of fishers in the population.
2. Nearly everyone who reported that they went fishing in the 12 months before the screening survey thought that they would go fishing during the following 12 month logbook survey. Those that thought they would go fishing but actually didn't go fishing make up the 'outflux'. The outflux in the 2019–20 survey was considerably larger than in previous surveys, leading to a lower estimate of recreational fishers than that made by the screening survey. In reviewing the survey data, the reason for the high outflux appears to be that people simply overestimated the likelihood that they would go fishing during the 12 month logbook period.
3. Additionally, the use of SMS reminders in the 2019–20 survey may have artificially inflated outflux, by making it easier to never report any fishing. For example, low activity fishers (e.g. fished for a small amount of time, or did not catch anything) may have reported 'no fishing' in response to an SMS reminder—a telephone interviewer may obtain different data. However, a similar case for the bias working in the opposite direction is also plausible. For example, when called by someone to check in on fishing activity, respondents may report they went fishing when they didn't.
4. The estimates relate to different periods and, likely, would not be exactly the same. Previous surveys have shown that the logbook stage estimates can be higher or lower than screening stage estimates. This variation may be a combination of real changes from year to year and the inevitable statistical sampling variance.

Any self-reported data are inherently subject to biases. However, options to minimise recall bias should be investigated. The discrepancy between estimates derived from the screening phase and the logbook phase may be reduced if estimates were made from monthly or quarterly telephone surveys, such that people only recalled their fishing activity over the previous one to three months. This rolling-style survey could be applied to the logbook survey too, whereby fishing households partook in the survey for one quarter of the survey's duration. This would reduce the respondent

burden and increase survey uptake; however, it may substantially increase the survey's cost and logistics.

Probability-based telephone sampling is becoming increasingly difficult because contact with the target population is impacted by call screening (not answering unknown numbers) and mobile numbers aren't geographically constrained (people may reside outside of Queensland). While landline-only surveys are no longer considered appropriate, the difficulties of mobile-based sampling are important to consider. Alternative probability-based methods, such as doorknocking or mail surveys warrant consideration, but they may be more costly than telephone-based approaches. Unless a comprehensive register of fishers in Queensland becomes available, Fisheries Queensland will need to work closely with survey experts to ensure that the methodology of any future survey is adjusted to match societal and behavioural changes with respect to the voluntary provision of recreational fishing information.

Conclusion

Estimates of total catch and effort are important in stock assessments. Data from the 2019–20 survey will be used in future assessments that incorporate recreational fishing information for decades to come. Additionally, along with those from previous surveys, data provide a reference point with which boat ramp survey data can be calibrated to estimate catch trends in years where the statewide surveys are not conducted—this should improve models and subsequent management decisions. Future surveys must carefully consider sampling methods to ensure that they are representative of Queensland's recreational fishing population and thereby provide robust estimates for species of interest.

More information

The statewide recreational fishing survey dashboard is available on the Fisheries Queensland website. It provides detailed information from all survey years, where available and includes fishing participation, effort, catch for all species, and expenditure. Additional data can be requested by contacting the data coordinator at FishDataCoordinator@daf.qld.gov.au

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