Survey of recreational fishing in the Northern Territory: 2018 to 2019

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Abbreviations	Full form
Fishery Report	Survey of recreational fishing in the Northern Territory: 2018 to 2019
NT	Northern Territory
Territory	Northern Territory
NRFS	National Recreational Fishing Survey
ABS	Australian Bureau of Statistics
GPS	global positioning system
PSU	primary sampling unit
FADs	fish aggregating devices
SE	standard error
RSE	relative standard error
SSU	secondary sampling unit
CPI	consumer price index

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Summary

Background

This study represents the fourth comprehensive assessment of recreational fishing in the Northern Territory, with previous surveys being conducted in 1994 to 1995 (Fishcount), in 2000 to 2001 (National Recreational Fishing Survey (NRFS)) and in 2009 to 2010. In each of these studies, the main survey instrument (an off-site, telephone/diary survey) has been the same, with stratified random sampling from telephone listings and expansion of all survey results to Australian Bureau of Statistics (ABS) estimates of the resident population of the Territory. Fishing activity by interstate and overseas visitors was also assessed in the 3 previous surveys, with comprehensive assessment of interstate fishing activity being a major feature of the NRFS telephone/diary survey. However, in both 1994 to 1995 and 2009 to 2010 surveys, only limited information on visitor fishing activity was obtained through on-site surveys (such as, at boat ramps and accommodation establishments) for selected key catchments. Although fishing activity by interstate and overseas visitors was not covered in the current study, a concurrent and independent study of selected boat ramps and accommodation establishments has been conducted and is expected to provide information on non-resident fishing activity in a separate report.

Survey methods

In the present survey, participation rates and the demographic profiles of resident recreational fishers were assessed through a regionally stratified, random telephone survey of almost 1,900 Territory households, comprising more than 4,500 non-Aboriginal residents aged 5 years and older. This screening survey was followed by a diary survey in which the fishing activities of over 550 households intending to do some recreational fishing in the Territory were monitored in detail between October 2018 and September 2019. Fishing activities were recorded through regular telephone contact with diarists and almost 4,500 person-based fishing events were reported. A wash-up/attitudinal survey was conducted as the final contact with diarists to collect expenditure information, details of boat ownership and examine fishers' opinions and attitudes to various fishing-related matters. Also, a sample of households from the screening survey that reported no intention to fish in the coming year was re-contacted at the end of the diary period in a non-intending fisher follow-up survey to identify and account for any unexpected fishing.

The screening survey response rate was 44%, which, although substantially lower than that achieved in earlier Territory fishing surveys, was comparable to rates achieved in more recent general population fishing surveys conducted in other Australian states. Diary survey uptake and completion rates were exceptionally high (generally in excess of 75%), confirming both the high levels of interest and cooperation by recreational fishers, and the performance standards of the survey instrument. By calibrating against ABS population benchmarks and applying non-response adjustments, all survey results (including participation, effort, catch and expenditure) have been expanded to represent the non-Aboriginal resident population of the Territory, aged 5 years and older.

Key results

Participation

In the 12 months prior to September 2018, an estimated 36,926 non-Aboriginal Territory residents aged 5 years and older fished at least once in the Territory, representing a participation rate of 27%, or more than one in 4 residents. While the majority (83%) of fishers resided in the Darwin stratum, residents of the Other Coastal stratum had the highest participation rate (39%), with the lowest rate in the Hinterland stratum (5%). Males accounted for almost two-thirds of the recreational fishers, with a participation rate of 33%, compared with 20% for females. Although the highest number of recreational fishers were in the 30

to 44 years age group (almost 12,000 persons), children (5 to 14 years) had the highest participation rate (32%). Persons in the 60-plus age group had the lowest rate of participation (14%).

Effort

During the 12 months between October 2018 and September 2019, an estimated 25,460 non-Aboriginal Territory residents fished in the Territory, significantly fewer active fishers than in the previous 12 months. This reduction in the number of active recreational fishers was likely influenced in part by the different survey methods used to produce participation estimates (the screening survey was based on 12-month recall whereas recall bias was less likely to be an issue for the diary survey), and inter-annual variability in actual fishing participation.

During 2018 to 2019 non-Aboriginal residents accounted for nearly 132,000 fisher days of effort, or an annual average of over 5 days per fisher. However, as with most recreational fisheries, the distribution of fishing effort was highly skewed, with a relatively small number of fishers (20%) accounting for a high proportion (almost 60%) of the total effort.

Over 85% of recreational fishing activity occurred in marine waters, primarily estuaries, followed by inshore and offshore waters. Freshwater fishing was primarily restricted to rivers, with limited activity in lakes and dams. Boat-based fishing dominated over shore-based activities in all water body types, with line fishing by far the most common fishing method (94% of fisher days). The use of pots or traps and cast nets were secondary methods. Regionally, Darwin Harbour and Darwin Surrounds attracted over half of the Territory-wide fishing effort, with other adjacent zones (Bynoe/Finniss Area and Mary/Alligator Rivers) attracting a further 27% of the effort. The more remote zones each accounted for less than 10% of the recreational fishing effort.

Catch

Resident recreational fishers captured a diverse range of scalefish, elasmobranchs (sharks and rays), crustaceans, molluscs and other taxa, with over 620,000 organisms caught during the 12-month survey period. Of the total catch numbers, nearly 270,000 (43%) were retained and over 350,000 (57%) were released or discarded. Finfish (scalefish and elasmobranchs) dominated catches (84% of total numbers), followed by crustaceans (15%) and cephalopods (<1%). Barramundi was the most caught fish species (86,255), representing 17% of the total finfish catch. Golden Snapper (64,440), various species of shark (27,444), Forktail Catfish (23,534), rockcod/groupers (20,752), Grass Emperor (19,540) and Stripey Snapper (19,152) followed in importance. As a group, tropical snappers of the genus *Lutjanus* (116,216 captured) accounted for almost one in 4 of all finfish caught by Territory recreational fishers. Mud Crabs (75,109) dominated the catch of crustaceans.

Overall, 62% of all finfish caught by Territory recreational fishers were released or discarded, with:

- low rates of release (<25%) for species such as mullet and small baitfish
- intermediate release rates (25 to 50%) for Jewfish, Blue Threadfin, Red Emperor and Coral Trout
- moderate release rates (51 to 75%) for Golden Snapper, Saddletail/Crimson/Indonesian snappers, Stripey Snapper, Grass Emperor, King Threadfin, rockcod/groupers, Longtail Tuna and Spanish Mackerel
- high release rates (>75%) for Barramundi, batfish, catfish, sharks and rays, and Brassy Trevally.

Small size was a key reason for the release of species such as Barramundi, bream, Jewfish, mullet, various tropical snappers, rockcod/groupers, King Threadfin and trevallys. Catch and release fishing was also cited as an important reason for releasing Barramundi, bream, rockcod/groupers and trevallys and was the primary reason for the release of Queenfish, Blue Threadfin, Northern Saratoga and Oxeye Herring. Batfish, catfish, sweetlips, sharks and rays were most often released or discarded as unwanted or

undesirable species. About 33% of all Mud Crabs caught were released, mostly due to being too small (undersized).

A high level of fishery specialisation emerged for species such as Barramundi and Mud Crabs, with these species taken mostly as targeted rather than non-targeted or incidental catch. By contrast, species such as catfish, rockcod/groupers, sharks and rays and trevallys were rarely reported as target species.

Golden Snapper was the most frequently caught finfish species in offshore and inshore waters, taken along with a range of reef fish, including other tropical snappers, sharks, and rockcod/groupers. Pelagic species, including Longtail and Mackerel Tuna in the offshore and Spanish Mackerel in the inshore, were of secondary importance in terms of catch numbers. Barramundi dominated catches in estuarine waters, with Golden Snapper, catfish and mullet of lesser significance. Barramundi was also the main species caught in freshwater, followed by Oxeye Herring, catfish and bream.

Line fishing accounted for about 75% of total recreational catch (over 465,000 organisms), with pots and traps contributing a further 13% (over 79,000 organisms) and cast nets 7% (almost 70,000 organisms). Barramundi and Golden Snapper were the most common species taken by line fishing, Mud Crabs and to a lesser extent, freshwater prawns were the main components of the pot or trap catch while small baitfish, mullet and prawns dominated catches taken by cast nets.

Catch and effort data for the key species were examined in detail (based on region, method, fishing platform, water body and seasonality) and regional fisheries characterised (effort by where fishers resided, fishing platform, water body and catch composition). The Mary/Alligator Rivers and Darwin Surrounds zones were particularly significant regions for Barramundi, whereas Bynoe/Finniss and Darwin Harbour zones were significant for species such as Golden Snapper, rockcod/groupers and Spanish Mackerel. Of the other key recreational species, the West Coast represented an important zone for Grass Emperor, Bynoe/Finniss Area was important for Saddletail/Crimson/Indonesian snappers and jewfish, highest catches of Blue Threadfin and Mud Crabs were taken in the Darwin Surrounds zone, while the Mary/Alligator Rivers zone was important for King Threadfin. The North Coast was a key area for Spanish Mackerel and also Saddletail/Crimson/Indonesian snappers, while the Central/Inland and Darwin Surrounds zones were important regions for catches of freshwater prawns.

In general, highest catches for many of the key species occurred between April and September (dry season) and were lowest between October and March (wet season). Exceptions to this pattern included Barramundi and King Threadfin, where lowest catches were taken in the July to September period. There was little evidence of seasonality in the fisheries for Golden Snapper and rockcod/groupers. Seasonality in catches reflected the combination of temporal variability in the intensity of fishing effort and presumably, availability of the key species.

Regionally, Darwin residents accounted for most of the fishing effort in areas within close proximity, namely Darwin Harbour, Darwin Surrounds, Bynoe/Finniss Area, West Coast and the Mary/Alligator Rivers zones. Residents of the Other Coastal stratum were the main group contributing to the fisheries in the North Coast, East Coast/Gulf Area and Central/Inland zones.

Fishing activity in the Mary/Alligator Rivers fisheries was concentrated in estuarine waters and freshwater rivers, with Barramundi a common catch. In each of the other regions, apart from the Central/Inland zone (freshwater rivers), fishing was mainly focused in estuarine and inshore waters, with Golden Snapper and/or Barramundi the main species caught. Mud Crabs featured as a key component of catches in the Darwin Harbour and Darwin Surrounds zones.

Expenditure

Territory residents spent an estimated $52 million on goods and services relevant to recreational fishing during the 12-month survey period, of which almost $50 million (95%) was directly attributable to recreational fishing – an average of over $1,950 per fisher. Annual attributable expenditure on boats and

trailers represented the largest expenditure category ($32 million), followed by travel expenses ($5 million) and fishing/diving gear ($3 million). Almost all of the fishing-related expenditure (98%) occurred within the Territory.

Boat ownership

Over half (58%) of all resident fishing households reported boat ownership during 2018 to 2019, representing 9,100 vessels, the majority of which (92%) were used for recreational fishing. Most of the fishing vessels were trailer boats, between 4 and 6m in length, with echo sounders and GPS units. The estimated total market value of the recreational fishing fleet in 2018 to 2019 was $213 million – an average of $23,000 per boat.

Comparison with previous surveys

The 2009 to 2010 and current survey applied consistent survey methodologies and analytical approaches. Consequently, direct comparison of key findings are valid. By contrast, methodological differences with the 2000 to 2001 National Recreational Fishing Survey (NRFS) would necessitate re-analysis of the data to enable direct comparisons. However, such a re-analysis was beyond the scope of this study. Nonetheless, some basic inferences were possible, thereby extending the time series.

Participation

An estimated 31,800 non-Aboriginal Northern Territory residents aged 5 years and older fished in the Territory during 2008-09 while 30,500 persons fished during 2009-10, representing participation rates of 22% and 21%, respectively. By contrast, 37,000 residents fished during 2017-18, equivalent to a participation rate of 27%, declining to 25,500 persons, or 18.4%, of the target population fishing during 2018 to 2019. The reasons for this decline in participation are unclear but appear to indicate some inter-annual volatility in the number of active fishers. Although the NRFS participation data are not directly comparable to the recent surveys since Aboriginal residents were included in the sample population, that survey estimated that 44,000 residents or 32% of the Territory population at the time fished during 1999-2000. Collectively, the 3 surveys imply some decline in fishing participation since 2000, from over 30% to between about 20 and 25% in recent years.

Fishing effort

During 2009 to 2010, non-Aboriginal residents expended 150,500 days of effort in the Territory, slightly not significantly higher than during 2018 to 2019 (132,000 fisher days). Comparatively, boat-based effort was almost 25% lower during 2018 to 2019, offset by a 32% increase in shore-based effort over 2009-10 levels. Recognising the limitations of any direct comparisons with NRFS data, that survey provided an estimate of 198,000 fisher days of effort for Territory residents fishing during 2000 to 2001, about 50% greater than during 2018 to 2019. However, when average days per fisher are considered, there has been a slight but gradual increase over time, 4.5 days in 2000 to 2001, 4.9 days in 2008-09 and 5.2 days in 2018 to 2019.

Catches

During 2009 to 2010, Territory recreational fishers caught an estimated 771,000 organisms, 351,500 (46%) of which were retained, compared with 622,000 organisms caught during 2018 to 2019, of which 270,000 (43%) were retained. Finfish (scalefish, sharks and rays) dominated catches in both survey years, with 691,000 caught in 2009-10 (287,000 or 42% harvested) and 522,000 caught in 2018 to 2019 (196,000 or 38% harvested). Comparatively, this represented a 25% decline in finfish catch numbers and about a 30% decline in harvest for 2018 to 2019. By contrast, catches of crustaceans were higher during

2018 to 2019 than in 2009 to 2010, with 94,000 caught in 2018 to 2019 (68,000 or 73% retained) compared with 57,000 caught in 2009 to 2010 (42,000 or 74% retained).

While there was variation in catches for each of the key species, most of the differences were not significant when underlying statistical uncertainty associated with estimates was considered. The most conspicuous differences between survey years were the significant reduction in the catch and harvest of Barramundi and Saddletail/Crimson/Indonesian snappers, and increase in the catch and harvest of Mud Crabs during 2018 to 2019, compared with 2009 to 2010. Although factors contributing to this variability have not been investigated, it is worth noting the 2018 to 2019 survey coincided with a lower than average wet season, which generally equates to lower effort. Especially in relation to fishing for Barramundi.

Expenditure

Total attributable expenditure on fishing-related goods and services by Territory residents in 2009 to 2010 was $44 million, which was equivalent to $52 million in 2019 terms when adjusted for inflation, only slightly higher than the $50 million determined for 2018 to 2019. For comparison, the inflation adjusted expenditure estimate for the NRFS equated to $41 million in 2019 terms. Inflation adjusted average annual expenditure per fisher in 2000 to 2001 was equivalent to $938, $1,845 in 2009 to 2010 and was $1,950 in 2018 to 2019. These data suggest that expenditure on fishing-related goods and services by Territory recreational fishers was not only substantial but, at the individual level, may have increased over the past 2 decades.

1. Introduction

1.1. Background

Recreational fishing has long been a highly popular activity in the Northern Territory among both residents and visitors. Results from the 2000 to 2001 NRFS (Henry and Lyle 2003) showed that the Territory had the highest participation rate among residents of all states and territories in Australia, and the highest proportions of total catch and effort by interstate visitors.

Catch and effort data are essential pre-requisites for effective research and management of any fishery. Participation assessments, attitudinal and economic information are also important. Typically, core monitoring data are more easily obtained from the commercial fisheries sector due to the smaller, more accessible target audiences involved – and the existence of mandatory reporting requirements.

Over the years, the comparatively high cost of recreational fisheries research has led to a lack of detailed information for this sector and particularly, on a large-scale basis. Recognising this need, the Territory Government commissioned the development and implementation of a survey methodology in 1993 to collect this information – *Fishcount* (Coleman 1998). Conducted in 1994-1995, this was the first study of its kind in Australia to provide detailed estimates of recreational fishing on a state or territory-wide basis, including participation, catch, effort and fishing-related expenditure. The scope of the study was confined to non-Aboriginal residents, with limited assessment of fishing activity by visitors from interstate and overseas.

Around that time, similar concerns in other jurisdictions led to the development of a national policy for recreational fishing in Australia. The policy was released in 1994 and endorsed the principle that "fisheries management decisions should be based on sound information, including fish biology, fishing activity, catches and economic and social values of recreational fishing" (National Recreational Fisheries Working Group, 1994). The policy recommended that a national survey of recreational fishing be undertaken once every 5 years.

Following extensive consultation and development, the Australian, state and territory fisheries agencies implemented the NRFS in 2000. Building on the methodology from the NT *Fishcount* study, the key objectives of the NRFS were to:

- determine participation rates in recreational fishing
- profile the demographic characteristics of recreational fishers
- quantify recreational catch and effort
- collect data on expenditure by the recreational fishing sector
- assess attitudes and awareness of recreational fishers to issues relevant to the fishery (Henry and Lyle, 2003).

The NRFS was implemented as a series of state and territory surveys using a consistent methodology, providing comparable information Australia-wide as well as including the activity of visiting fishers. In addition to nationally aggregated information, Henry and Lyle (2003) provided summary statistics for each of the states and territories. A subsequent report (NRFS-NT, Coleman 2004) provided more detailed analysis of territory-specific results. Also, as an integral part of the NRFS project, a separate survey of Aboriginal fishing activity was conducted in coastal communities across northern Australia (Western Australia, Northern Territory and Queensland) and the results were included in Henry and Lyle (2003).

In the absence of plans to repeat the national survey, most other jurisdictions have successfully conducted multiple state and territory wide surveys to provide more up-to-date 'big-picture' information on recreational fishing (for example,. New South Wales - West *et al.*, 2015; Tasmania - Lyle *et al.*, 2019; South

Australia - Giri and Hall, 2015; Queensland - Teixeira *et al*., 2020; Western Australia - Ryan *et al*., 2019). However, because these states have relatively low levels of fishing activity by interstate visitors, the scope of these surveys has been largely confined to resident fishers. By contrast, visiting fishers have been shown to account for a substantial proportion (well over a third) of total recreational catch and effort in the Territory.

Essentially, the same telephone/diary methodology developed for the NRFS was employed for the resident component of the 2009 to 2010 and current surveys, thereby optimising comparability with information collected in 2000 to 2001 and also the previous *Fishcount* study in 1994-95. This information includes:

- Territory-wide participation rates and demographic profiles of recreational fishers
- catch and effort estimates for key methods, regions and species
- fishing-related expenditure
- fishing boat profiles
- fisher attitudes and opinions.

Since the NRFS, several improvements in statistical analyses have become available through development of a customised analysis package, known as *RecSurvey* (Lyle *et a*l., 2010). This package was employed in the analysis of the resident component of the 2009 to 2010 NT Recreational Fishing Survey and has been applied in the current survey. However, re-analysis of the NRFS data on this basis is yet to be conducted (see further discussion in Sect. 1.2.1). Once completed, this will enable future such studies to form a series of comparable surveys to monitor major developments, trends and the general status of recreational fishing in the Territory.

1.2. Important notes

1.2.1. Comparisons with previous surveys

By design, the 2000 to 2001 NRFS results were expanded to Australian Bureau of Statistics (ABS) benchmarks for the private dwelling, resident population of Australia, aged 5 years and older, after excluding estimates of Aboriginal residents covered by the separate survey of coastal communities in northern Australia (Henry and Lyle 2003, Coleman 2004). For all other jurisdictions (and areas within), inclusion of Aboriginal residents in the NRFS results was considered appropriate and very small proportions of the total population applied (around 2% Australia-wide). However, Aboriginal residents comprise a significant minority (over a quarter) of the Northern Territory population and predominantly, in areas outside Darwin. Therefore, NRFS data for the NT included estimates for Aboriginal residents, not covered by the separate coastal survey – most of whom were residents of hinterland areas.

Consistent with the earliest (1994-95, Coleman, 1998) and most recent (2009 to 2010, West *et al*., 2012) surveys of recreational fishing in the NT, the scope of the current study was confined to non-Aboriginal residents only. A major factor in this decision was the very low proportion of Aboriginal residents with a *White Pages* listed home phone (as shown in the NRFS and confirmed through the 2009 to 2010 survey) and associated uncertainty in terms of behavioural differences between listed and un-listed Aboriginal residents. It should be noted, however, that unlike previous NT surveys for which the sample of the resident population was drawn from the *White Pages* telephone directory, the sample of phone numbers for the current survey was drawn from the *SamplePages* database. With a national trend indicating a move away from landline to mobile phone ownership (ACMA, 2020), the *SamplePages* database, which includes landline and mobile numbers, provides a more extensive (and representative) listing of residential phone numbers for the NT.

In the meantime, comparisons between surveys can be broadly made and to assist with this, the following guideline estimates have been provided. The ultimate exclusion of all Aboriginal residents from the NRFS

data and benchmarks would likely result in a reduction of around 5% in the total number of resident fishers, the majority of whom will refer to residents of the 'Other Coastal' and 'Hinterland' residential strata (see Sect. 2.4.1). A similar reduction in total fishing effort and catch can also be expected, but is likely to be concentrated in coastal fishing areas away from Darwin, for example, fishers residing in hinterland areas tend to fish mainly in their nearest coastal regions.

1.2.2. Report Format

The remainder of this report comprises detailed discussion of study scope, definitions and other methodological issues (Sect. 2), and sampling and response profiles (Sect. 3) with substantive survey results in Sect. 4 onwards. In reviewing these results, the following important aspects should be considered.

- In accordance with the agreed reporting structure, the survey results have generally been presented without interpretation or commentary unless such information refers to important definitions or methodological issues.
- The study findings are presented as detailed tabulations of 'expanded' data, that is, estimates based on relevant ABS benchmark data (households, persons) and, in turn, items including related fishing effort, catch and expenditure.
- However, some results are presented in graphic form (such as histograms or bar charts) where appropriate. In all such cases, relevant data tabulations have been included as appendices.
- In terms of 'non-sample error' (such as non-response and reporting biases), optimum data quality has been achieved through a range of measures and outcomes in the study, including high response rates in key survey components (see Sect. 3). Despite this, minor adjustments or calibrations have been applied through the *RecSurvey* package, in accordance with procedures detailed in Lyle *et a*l. (2010).
- In any sample survey, estimate precision is affected by 'sample error' due to the fact that sampling was employed, as opposed to a total enumeration (or census) of the population concerned. To account for this, standard errors (SEs) have been calculated through the analysis package and included in all substantive figures, data tabulations and appendices.
- However, where high levels of variability occur or small sub-samples are involved, these SEs can be quite large in relation to the estimates concerned. To highlight these, cases where the relative standard error (RSE) is greater than 40% of the estimate have been routinely shown in bold text. Similarly, estimates derived from less than 30 households (in the raw data) have been italicised. Further details on this issue are discussed in Sect. 2.3.4.
- For completeness, all survey estimates from the analyses have been included in the data tabulations, including some very small estimates. Also, 'zero' estimates commonly occur in the tabulations and, importantly, this does not suggest no such occurrence in the population overall, rather, that none was detected within the limits of the survey sample. Therefore, readers should routinely interpret such results as 'nil or negligible'.
- Extensive data tabulations and figures have been included in this report, along with a number of additional analyses provided separately, in anticipation of requests for more detailed data. However, the various survey databases are an output requirement of the project and, subject to error tolerances, considerable further interrogation can be undertaken.
- Further to discussion in Sect. 1.2.1 above, comparisons with previous survey results are provided only in general terms.

1.3. Report Structure Acknowledgment

The resident component of the current survey employed an almost identical methodology to statewide telephone-diary surveys in Tasmania and South Australia (Jones, 2009; Lyle *et al*., 2009; 2014; 2019). These studies were also analysed using the *RecSurvey* package and much of the content and structure of this report has been adapted from the Tasmanian report, especially in the presentation of results in Sections 4 to 8. We sincerely appreciate the contribution of our co-authors in this respect (and many others).

2. Survey methods and analysis

The primary data collection was based on a telephone-diary approach – an off-site methodology developed to provide cost-effective data over large spatial scales, such as for an entire state. A detailed description of the telephone-diary design philosophy and methodology is provided in Lyle *et al*. (2002) and Henry and Lyle (2003). Data analysis procedures are described in detail by Lyle *et al.* (2010) and have been undertaken using the statistical computing language R (Version 3.6.1). An overview of the survey methodology and data analysis is provided below.

2.1. Survey scope

The telephone-diary component of the survey encompassed the private dwelling, non-Aboriginal resident population of the Territory, aged 5 years and older, and their recreational fishing activity. In this context, recreational fishing was defined broadly as the capture or attempted capture of aquatic animals in Territory waters (freshwater, estuarine and marine), excluding for commercial purposes. All recreational fishing techniques and harvesting activities were considered in-scope, including dive and hand collection, the use of pots, nets and spears, and various forms of line fishing.

In contrast to the 2000 to 2001 survey but consistent with the 2009 to 2010 survey, the fishing activities of Territory residents in other states of Australia were considered out-of-scope (other than for broad participation assessment). Likewise, any fishing activities in the Territory by non-Territory residents were excluded. However, a concurrent and independent study of selected boat ramps and accommodation establishments has been conducted and is expected to provide information on non-resident fishing activity in a separate report.

2.2. Survey methods

2.2.1. Survey overview

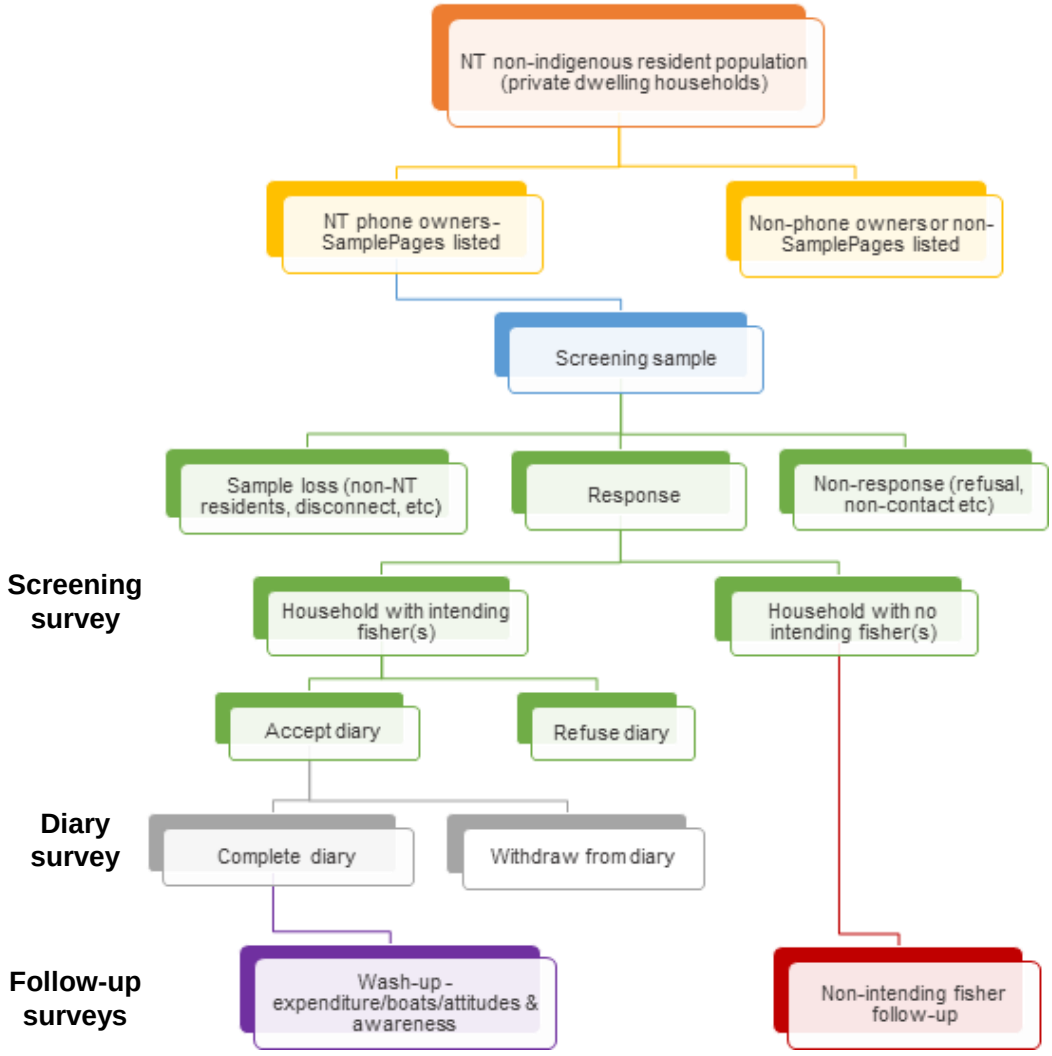
The telephone-diary methodology involved a 2-phase survey design, the principal components being an initial screening phase to gather profiling information from a sample of the resident population and a subsequent, intensive phase, in which respondents provided detailed catch and effort information over a 12-month period (Figure 1). In this second phase, respondents were encouraged to use a simple diary to record key fishing data and were contacted regularly by survey interviewers responsible for collecting this information. The underlying design philosophy is focused on minimising respondent burden and maximising response and data quality.

Additional survey components included a non-intending fisher follow-up survey and a wash-up or attitudinal survey. The non-intending fisher callbacks involved a sample of households that indicated at screening that none of the residents were likely to do any recreational fishing in the Territory during the diary period. This component was designed to identify and account for ‘unexpected fishing’ that may have occurred during the period. The opinions and attitudes of diarists to fishing-related matters were assessed

at the end of the diary period in a wash-up survey, along with boat-profiling information and collection of fishing-related expenditure for the diary period.

Consultant staff of Kewagama Research had primary responsibility for the design and analysis of all survey components, together with interviewing and data processing for the telephone/diary survey components.

Figure 1: Survey components diagram, Survey of Recreational Fishing in the Northern Territory, 2018 to2019



2.2.2. Screening Survey

The primary role of the screening interview was to collect profiling information for all household members (such as sex and age group) and establish eligibility to participate in the following diary phase. Profiling information was important not only to characterise the sample population, but also to examine issues relating to representation and response.

The Screening Survey was administered as a structured interview by telephone with a random sample of Territory households. The commercial sample provider *SamplePages* provided a regionally stratified sample of phone numbers. The *SamplePages* database comprises Australian residential numbers (mobile and

landline) from which customised random samples can be drawn based on specified geographic boundaries. In the present study, the address associated with each phone number was linked to an Australian Bureau of Statistics (ABS) Statistical Area, a classification used to define residential strata for the survey. Stratified random sampling was undertaken with a higher sampling rate for the statistical areas comprising the 'Other Coastal' stratum than for the 'Hinterland' stratum, with the lowest sampling rate in the 'Darwin' stratum (see Sect. 2.4.1). Within each stratum, care was taken to ensure that the proportional breakdown of the sample at the Statistical Area Level 3 (SA3) (Australian Statistical Geography Standard) did not differ significantly from the known proportion of private dwellings based on ABS data. Overall, mobile numbers represented 61% of the selected listings.

To minimise non-contacts, up to 15 calls were made to each 'live' telephone number. In addition to disconnected numbers, business and facsimile numbers, respondents who no longer resided in the Territory were treated as sample loss and not replaced. The Screening Survey was conducted during August and September 2018.

Within each responding household, the demographic profiles (age group, gender and Aboriginal status) of all usual residents were obtained. For residents aged 5 years and older, involvement in recreational fishing over the previous 12 months and likelihood (expectation) of doing any recreational fishing in the following 12 months was established. All respondents who had fished during the 12 months prior to interview were asked whether they had fished interstate, and to estimate how many days they had fished in the previous 12 months, by category (<5 days, 5-9 days, 10-14 days, 15-19 days and 20 days or more). This latter detail was used as an index of avidity rather than a direct or accurate measure of prior fishing activity, allowing fishers to be broadly classified as, for example, infrequent, occasional or frequent based on these categories. Boat ownership was also established for all households, regardless of whether or not they were fishers.

All households in which at least one member (regardless of prior fishing history) expressed a likelihood of going fishing in the Territory during the following 12 months were considered eligible for the second (diary) phase of the study.

2.2.3. Diary survey

All households identified as eligible for the Diary Survey were invited to participate in this phase of the study. Fishing activity of household members aged 5 years and older was monitored between 1 October 2018 and 30 September 2019.

The approach taken in this survey differed to conventional angler diary surveys in 2 important ways. First, the diary was employed more as a 'memory jogger' than a logbook, and second, responsibility for data collection rested with the survey interviewers and not the diarists. Typically, other diary survey response rates are low and data quality can suffer in terms of completeness, generality and consistency. Also, since the burden of maintaining the diary rests with the respondent, instructions may be misinterpreted and data may be incomplete or ambiguous. The need to periodically remind respondents to submit documentation creates a further problem, where information that has not been diarised must be collected based on recall, if at all.

By contrast, the telephone-diary approach employed in the current study (a type of panel survey), effectively transferred the burden of data collection from the respondent to the survey interviewer. Data collection was undertaken by brief telephone interview in which trained interviewers recorded details of any fishing that had occurred since the last contact. The level of fishing activity determined the frequency of such contact but respondents were generally called at least once a month, even if no fishing was planned.

After receiving the diary kit that included the diary, a colour species identification guide to the common species and an official covering letter for the survey, data requirements were explained to respondents in a

brief interview and then the next contact was arranged. Respondents were encouraged to record basic information in their diaries, such as date, location, start and finish times, and catch and release numbers. More detailed information, such as target species, fishing method, platform (boat or shore), water body type (river, lake, estuary, inshore or offshore), and reason(s) for release, for each individual fishing event were collected and recorded during the telephone interview. By maintaining regular contact, usually within a couple of weeks of any fishing activity, details of any non-diarised fishing were obtained with minimal concern in relation to recall bias. Interviewers were also able to immediately clarify ambiguities and ensure completeness of information. This, in turn, provided for greater data utility. For example, fishing effort could be apportioned between target fisheries, methods, fishing platform, and so on.

2.2.4. Non-intending Fisher Follow-up Survey

The objective of this 'call-back' survey was to account for those persons who may have unexpectedly 'dropped-in' to the fishery, providing symmetry for those persons who unexpectedly 'dropped-out' of the fishery – namely, those diarists who did no fishing during the diary period, despite intending to do so.

A random sample of households that had indicated no intention at screening to go fishing during the diary period that is, not eligible for the Diary Survey), was re-contacted shortly after the diary period (October 2019). Whether any fishing had occurred during the diary period was established in a brief telephone interview, with particular care to identify whether there had been a change in the household (such as a re-allocated telephone number) and that household members were the same as those at screening. Further details were collected from those households in which fishing was reported, including demographic profile (age group and gender), whether individual members had fished in the Territory and/or interstate, the number of days fished during the 12 months of the diary period (by 'avidity category') and whether any key species were caught and kept. Respondents identified as not being residents of the household at the time of screening were excluded from the analysis.

2.2.5. Wash-up/Attitudinal Survey

This survey was conducted with diarists at the end of the diary period and was designed to assess a range of information, including confirmation of the completeness of the diary data for each household member (whether they had reported fishing or not) and collection of fishing-related expenditure for the 12-month period.

Although boat ownership was generally assessed for all households in the Screening Survey, detailed boat profiling information (length, main propulsion method, usage for fishing) was collected in the Wash-up Survey for vessels owned by households reporting any fishing activity during the diary period as an assessment of the recreational fishing fleet.

The opinions and attitudes of diarists were also obtained, in terms of various fishing-related matters, from the main/key fisher in each household, aged 15 years and older. Summary results of this latter questioning have been included in this report (see Sect. 11). However, NT Fisheries staff will undertake more detailed analysis and classification of 'verbatim' responses.

2.3. Data expansion and analysis

2.3.1. Telephone/Diary Survey components

Data analysis was based on a stratified random survey design using single stage cluster sampling, with the household representing the primary sampling unit (PSU) and residents within the household, the secondary sampling unit (SSU). In determining household and individual expansion factors, an integrated approach was applied that adjusted for non-response and calibrated against population benchmarks (Lyle *et al.*, 2010).

A non-response adjustment for refusals at screening was undertaken based on fishing propensity (fisher or non-fisher) determined among households that refused to complete the screening interview, but at least answered the question about whether or not any household members had fished in the previous 12 months (Lyle *et al*., 2010). This analysis recognises that fishers are more likely to participate in a survey about recreational fishing than non-fishers. By contrast, no adjustments were made for the non-contact group as it was assumed that survey non-response in this case was unrelated to the subject matter (recreational fishing). Non-response follow-up surveys conducted as part of the NRFS tended to support these assumptions in terms of fishing propensity (Henry and Lyle, 2003).

Calibration against ABS Estimated Resident Population (ERP) data for non-Aboriginal residents in each residential stratum as at June 2018 was implemented, taking account of household and person-based demographics. Using diary phase uptake and completion rates for eligible households, further non-response adjustment was applied to expansion factors in calculating catch and effort information. This adjustment was made sensitive to the avidity classification for the household (the maximum avidity index for a member of the household determined at screening) and region of residence (stratum).

Not all eligible fishers reported fishing during the diary period and, in effect, these represented the unexpected 'drop-outs' from the fishery. To take account of unexpected 'drop-ins' to the fishery, an additional adjustment was necessary and was based on the Non-intending Fisher Follow-up Survey. This adjustment was made sensitive to the avidity index reported for 'drop-ins' and region of residence (stratum). A full account of the analytical process is provided by Lyle *et al*. (2010).

Fishing-related expenditure was assessed in the final Wash-up/Attitudinal survey. Despite high response rates for the latter, an additional adjustment/calibration (by stratum and avidity) was employed to account for non-response among fisher households completing the diary phase. In the database and related outputs, this procedure has been referred to as the Phase 3 calibration, with the screening and diary survey calibrations being Phases 1 and 2, respectively.

Unless otherwise indicated, parameter estimates provided in this report are based on expanded data, scaled-up to represent the population rather than the sample from which they were derived.

2.3.2. Statistical uncertainty

As discussed in Sect. 1.2.2, all parameter estimates have some statistical uncertainty. This can be expressed in terms of standard error (SE), which indicates the extent to which the estimate might have varied from the true population value due to chance and sampling of the population. There are about 2 chances in 3 (67%) that sample estimates will vary by less than one SE, and about 19 chances in 20 (95%) that the difference from the true population value will be less than 2 SEs. It should be noted that as survey data are disaggregated, for example by region or method, SEs expressed as a percentage of the estimate (known as relative standard error or RSE) will increase and there may become a point where the disaggregated estimates become unreliable.

In interpreting survey estimates, consideration needs to be given to:

- the magnitude of the RSE
- the actual number of households that contributed records to the estimate.

Estimates with RSEs of 40% or greater (implying a 95% confidence range of around ± 80% or higher) have been highlighted in the various tables and are regarded as imprecise. Estimates derived from records involving fewer than 30 households have also been highlighted since they may be particularly influenced by the activities of very few fishers and hence may not be representative.

2.4. Regions

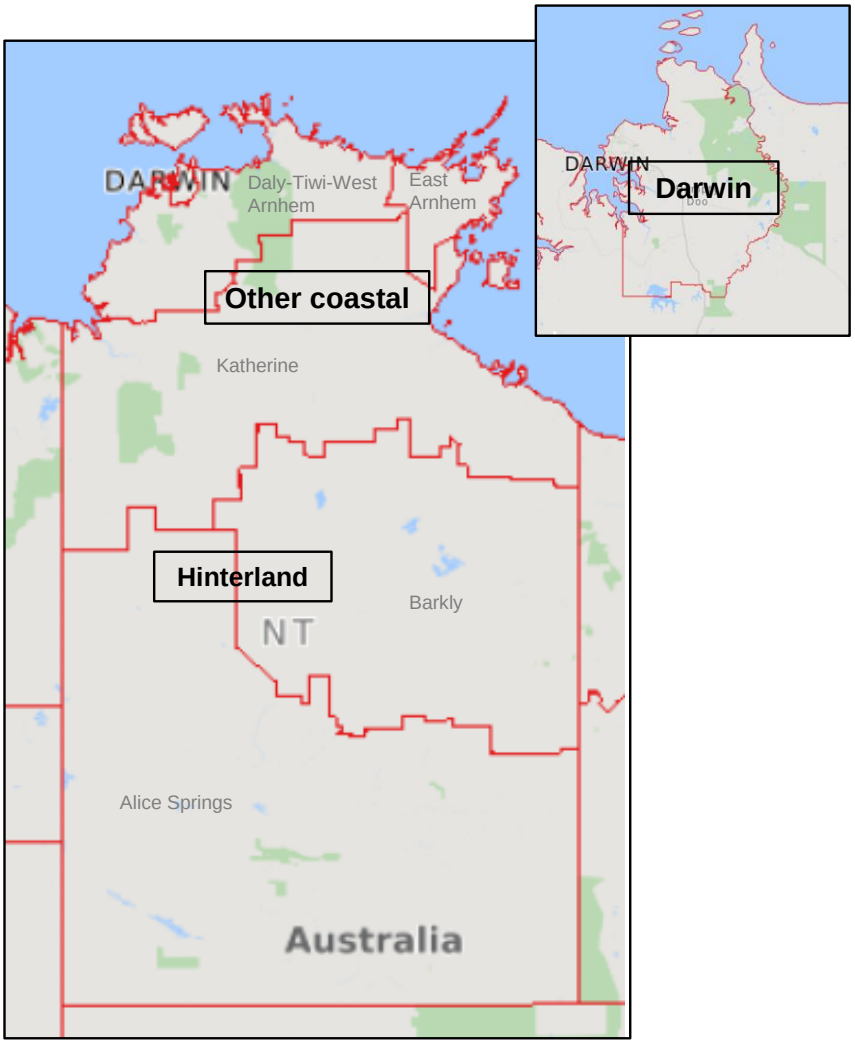
2.4.1. Sampling strata

Initial household selection (that is, telephone number) was based on a stratified random sample design using 3 residential strata, aligning to ABS Statistical Areas in accordance with the Australian Statistical Geography Standard (ASGS) (ABS, 2021).

- Darwin – Statistical Area Level 4 (701), represented by four Statistical Areas Level 3, namely Darwin City (70101), Darwin Suburbs (70102), Litchfield (70103) and Palmerston (70104)
- Other Coastal – comprising three Statistical Areas Level 3 that border the Northern Territory coastline, namely Daly-Tiwi-West Arnhem (70203), East Arnhem (70204) and Katherine (70205)
- Hinterland – comprising the remaining, wholly inland Statistical Areas Level 3 of Alice Springs (70201) and Barkly (70202).

A map of these strata is shown in Figure 2 and in describing household and population characteristics, data have been analysed at stratum and total NT levels.

Figure 2. Northern Territory, showing ABS-based, residential strata used for sample stratification, with SA3 boundaries and names (in grey text) and inset - Darwin (SA4) stratum



Source: https://dbr.abs.gov.au/absmaps/index.html

2.4.2. Fishing regions and zones

During the Diary Survey, interviewers classified the location of each fishing activity (event) into one of 66 fishing regions (Figure 3), which largely conform to the classification employed in the NRFS (61 fishing regions). An additional 5 fishing regions were created for the 2009 to 2010 and current surveys to provide greater resolution of areas within Darwin Harbour, that is, to separate the main body of the harbour from the 3 arms (east, middle and west) and also for 2 offshore fish aggregating devices (FADs) (Figure 4). Also, the reported fishing location (text) was routinely recorded in the database, both as a validation tool and to provide added flexibility in ongoing analysis work.

Although detailed catch and effort information has been separately provided for all 66 fishing regions, for practical reporting purposes, these have been collapsed into 8 fishing zones (Figure 5).

1) West Coast: region codes 1, 2, 3, 4, 40, 41 and 42
2) Bynoe/Finniss area: region codes 6, 7, 43 and 63
3) Darwin Harbour: region codes 10, 10a, 10b, 10c and 12
4) Darwin Surrounds: region codes 8, 9, 11, 13, 44, 45, 46, 60, 61 and 62
5) Mary/Alligator Rivers: region codes 14, 15, 16, 17, 18 and 47
6) North Coast: region codes 19, 20, 21, 22, 23, 24, 25, 26, 48, 49, 50, 51, 52, 53 and 54
7) East Coast/Gulf area: region codes 27, 28, 29, 30, 32, 33, 34, 35, 36, 37, 38, 55, 56, 57, 58 and 59
8) Central/Inland: region codes 5, 31 and 39

Other fishing location information was also collected in the Diary Survey in terms of water body type:

- marine waters greater than or less than 5kms from the coastline (that is, offshore or inshore waters)
- estuarine waters
- freshwater rivers
- freshwater lakes/dams (public or private).

Figure 3. Map of the Northern Territory showing Fishing Regions used for reporting fishing activities

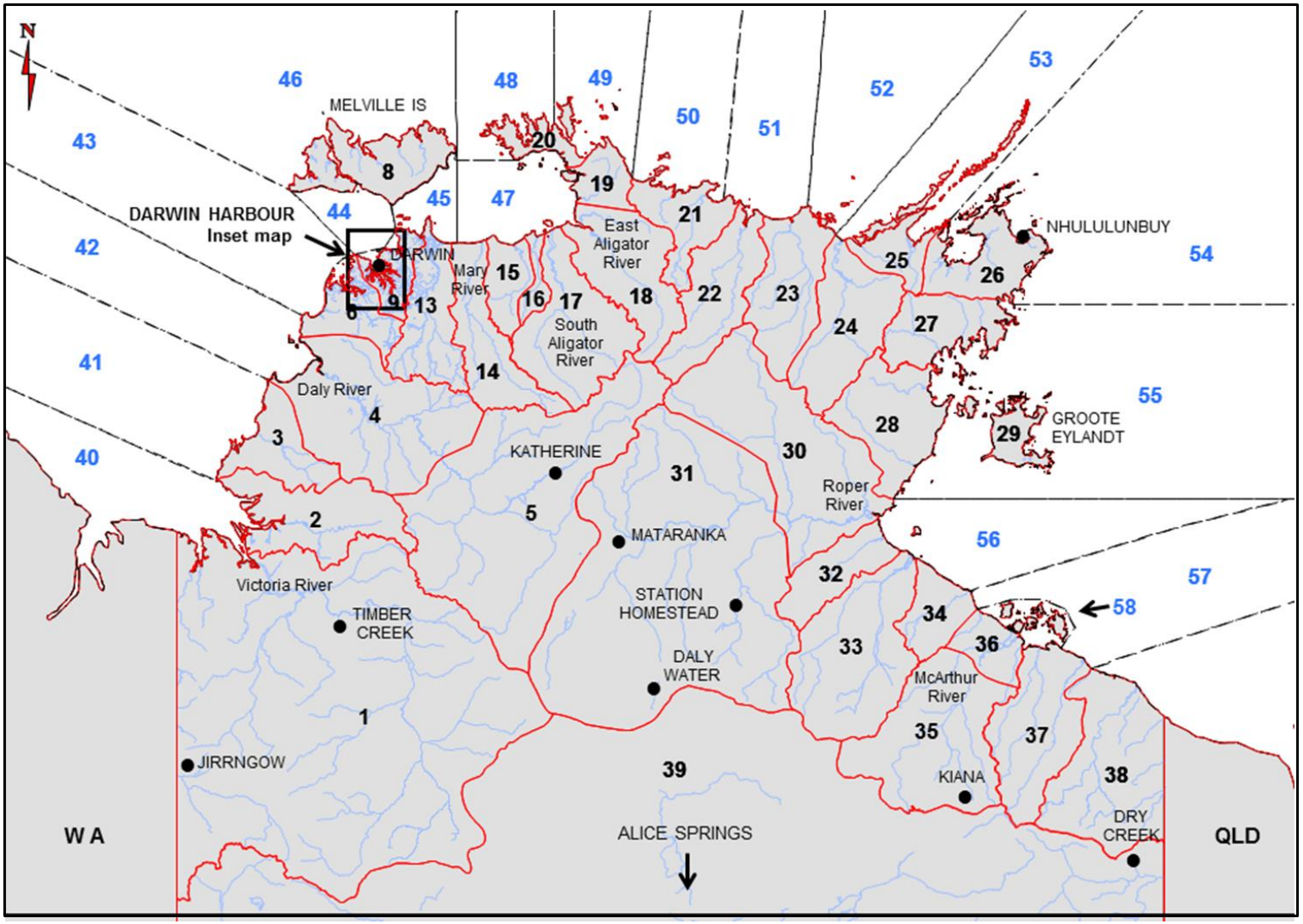


Figure 4. Map of the Darwin Harbour area showing Fishing Regions used for reporting fishing activities

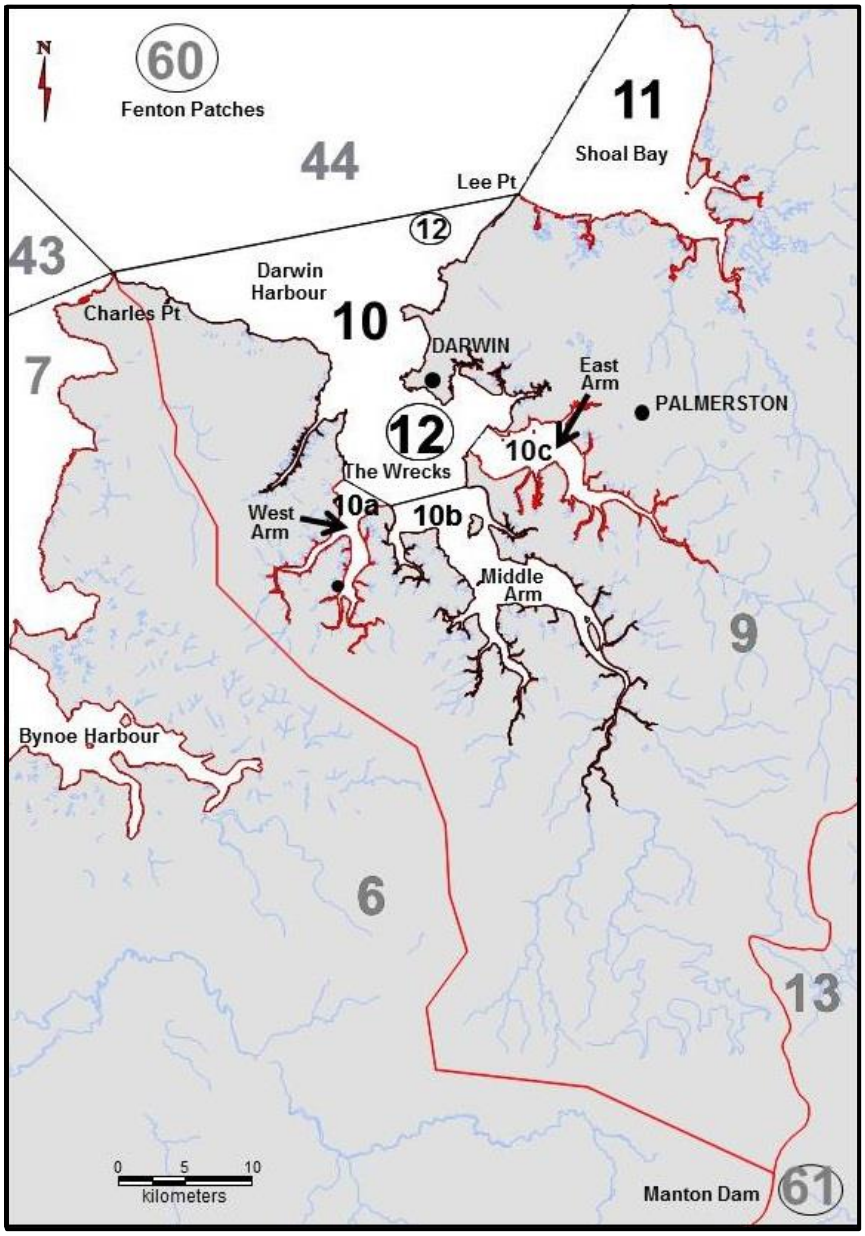
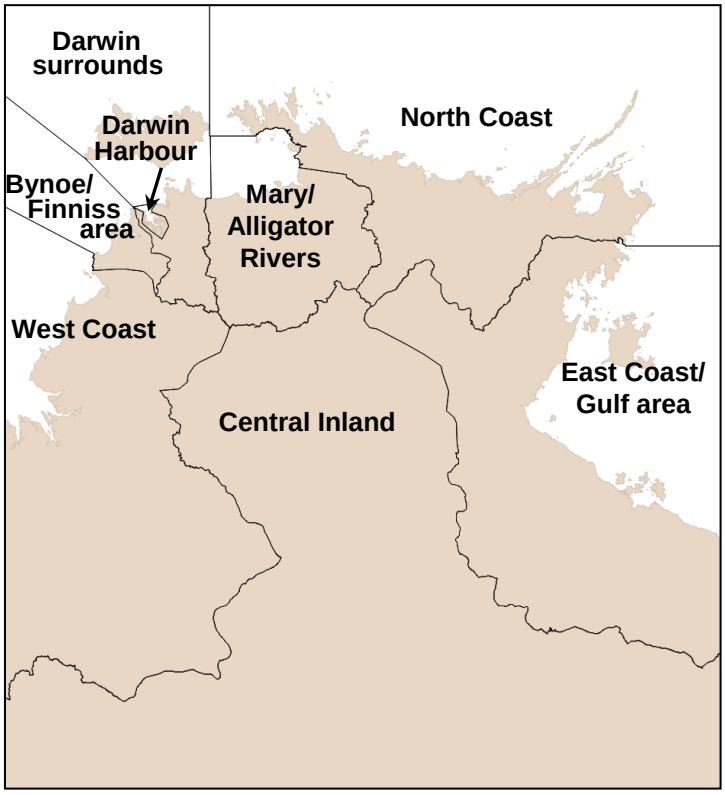


Figure 5. Map of the Northern Territory showing Fishing Zones used for reporting fishing activities



2.5. Fishing effort

Fishing information was collected on an 'event' basis, where an event was defined as a discrete fishing episode and the actual household member(s) involved in the event recorded. Separate fishing events were defined where there was a change in fishing region or water body type, target species and/or fishing method. As a result, a day's fishing trip could comprise more than one event, for instance, fishers may gather bait prior to line fishing for Barramundi. Both the gathering of bait and the subsequent fishing were considered separate events since the effort expended in the capture of bait cannot be attributed to the capture of any Barramundi, and vice versa. Similarly, the use of passive fishing gear, such as crab pots at the same time as line fishing, were recorded as separate fishing events. The delineation of fishing activity in this manner provided an ability to analyse effort (and catch) based on fishing method and target species/fishery. Furthermore, 3 measures of effort have been applied, namely fisher days (that is, separate days on which some form of fishing was undertaken by a fisher), fishing events and hours fished.

2.6. Fishing methods

A variety of fishing/harvesting methods were reported by diarists, but, for most analysis purposes, the following reporting categories have been defined:

- line fishing (using bait and/or lure/jig/fly)
- pot/trap (baited, passive use)
- cast net
- dive collection (including underwater spearfishing and hand collection by snorkel, scuba or hookah)
- other methods (including surface/hand spearing, beach seine and scoop/dip nets, hand collection and the use of hooks, pumps and spades).

2.7. Catch

A Species Identification Guide including clear colour images was provided to all diarists to optimise the accuracy of species identification in the survey. A key factor here is that the resolution required for individual species must recognise the identification capabilities of fishers, on a lowest-common-denominator basis. Although excellent reporting accuracy can be achieved at the species level in some instances, species groupings were required where fishers could not reasonably be expected to delineate particular species, even with the aid of the Species Identification Guide. For example, iconic species such as Barramundi and Golden Snapper were readily recognisable, whereas identification to the species level for all tropical snappers was not always achievable, for example, saddletail snapper vs crimson snapper vs Indonesian snapper (hence their grouping in the analysis).

For the purpose of reporting catches, individual species (such as Barramundi) have been used where appropriate, with broad taxonomic groupings required in some cases (for example, rockcod/groupers, and sharks and rays). However, many species or species groups were represented by very few records, making it necessary to pool these into broader taxonomic categories for analysis (principally, 'Scalefish, other'). Details of taxa reported in catches and the catch analysis groupings are provided in Appendix 2, including Standard Fish Names and Scientific Names for each grouping (SSA 2009).

Catches were reported as numbers of individuals kept (harvested), and numbers released or discarded by species or species groupings.

3. Sample and response profiles

3.1. Screening Survey

Table 1 provides a summary of the numbers of non-Aboriginal, private-dwelling households in the Territory as at June 2018 (based on customised ABS Census and ERP data), along with sampling details and response profiles relating to the Screening Survey. Since sampling was undertaken without replacement for sample loss (for example, non-NT residents, disconnected numbers, non-private dwellings), the net sample was reduced from a gross sample of 5,121 to 4,258, of which 1,871 households (43.9%) fully responded to the Screening Survey. Response rates were generally lower in more remote sampling strata. Overall, information on recreational fishing and demographic profiling was collected for 4,553 non-Aboriginal residents aged 5 years and older.

Among the 863 cases of sample loss (Table 1), two-thirds (578) related to respondents who were no longer residents of the Territory, the remainder were mainly a combination of disconnected (103) and business-only (108) numbers and businesses. Other forms of sample loss included permanent fax/email lines and non-private dwellings, holiday homes and non-functioning/or 'dead' phone lines.

Non-responding households (2,387 in Table 1) accounted for over half (56.1%) of the net sample and are dissected as follows:

- 432 full refusals (10.1%)
- 316 part-refusals (7.4%)
- 1,544 full non-contacts (36.3%)
- 95 other types of non-response, including language/communication difficulties (2.2%).

As noted in Sect. 2.3.1, much of the uncertainty in terms of fishing propensity is assumed to be associated with the refusal (full and part) rather than non-contact group. Therefore, participation rates by stratum for part-refusals have been applied in the non-response adjustment analysis to account for the impact of refusals.

Table 1. Northern Territory non-Aboriginal, private dwelling population (number of occupied households), sample size and sample loss/response profiles for the screening survey, by stratum

Residential stratum	Total households[1]	Initial sample	Sample loss	Net sample	Non-response	Full response	Response rate
Darwin	41,828	3,101	519	2,582	1,389	1,193	46.2%
Other coastal	5,887	1,218	219	999	582	417	41.7%
Hinterland	8,689	802	125	677	416	261	38.6%
Total	56,404	5,121	863	4,258	2,387	1,871	43.9%

1. Households containing one or more non-Aboriginal residents - see Sec. 2.1

3.2. Diary Survey

Table 2 summarises response profiles for the Diary Survey, with 708 households (37.8% of the full response group at screening) identified as having at least one non-Aboriginal resident (aged 5 years and older) with an intention to do some recreational fishing in the Territory during the diary period (October 2018 to September 2019). Of these eligible households, 592 (83.6%) agreed to take part in the Diary Survey.

In total, 555 Territory households, representing 1,416 non-Aboriginal residents aged 5 years and older, completed the Diary Survey, with high response rates across all strata (>93% completion rates, representing >77% of eligible households). Overall, 364 of these households (66%) reported fishing activity during the diary period, representing a total of 4,453 person-based fishing events.

Note: The remaining (34%) non-fishing households comprise the 'drop-outs' from the fishery (see Sect. 2.3.1). However, this proportion was substantially higher than for the 2009 to 2010 diary survey (21%). Reasons for non-fishing were canvassed in the Wash-up/Attitudinal survey (see Sect. 11).

By comparison with traditional mail-back diary studies, response rates achieved in diary component of this study are exceptionally high and thus represent an important performance indicator in terms of the survey instrument.

Table 2. Household response profiles for the diary survey, by stratum

Residential stratum	Eligible for diary survey	Diary uptake	Diary survey completed	Uptake rate ('eligibles')	Completion rate (among uptake)	Completion rate ('eligibles')
Darwin	497	412	384	82.9%	93.2%	77.3%
Other coastal	191	163	154	85.3%	94.5%	80.6%
Hinterland	20	17	17	85.0%	100.0%	85.0%
Total	708	592	555	83.6%	93.8%	78.4%

3.3. Non-intending Fisher Follow-up Survey

Response rates for this 'call-back' survey are presented in Table 3. Nearly half of the 1,163 households that indicated no intention to go fishing during the diary period were selected at random to be followed up at the end of the diary period to ascertain whether any unexpected fishing had occurred. When sample loss (disconnected numbers, different household) is taken into account, an overall response rate of 81% was achieved for this component of the study, with consistently high response rates for each of the strata.

Table 3. Sample size (households) and sample loss/response profiles for the non-intending fisher follow-up survey, by stratum.

Residential stratum	Initial sample	Sample loss	Net sample	Non-response	Full response	Response rate
Darwin	332	24	308	49	259	84.1%
Other Coastal	114	7	107	25	82	76.6%
Hinterland	111	13	98	25	73	74.5%
Total	557	44	513	99	414	80.7%

3.4. Wash-up/Attitudinal Survey

By design, all 555 households completing the Diary Survey were included in the sample with 520 (93.4%) fully responding to the main survey that assessed aspects of boat ownership and attitudes to fishery-related issues. Of those households that reported fishing activity during the diary period, 263 (72%) also completed the expenditure survey.

4. Fisher characteristics

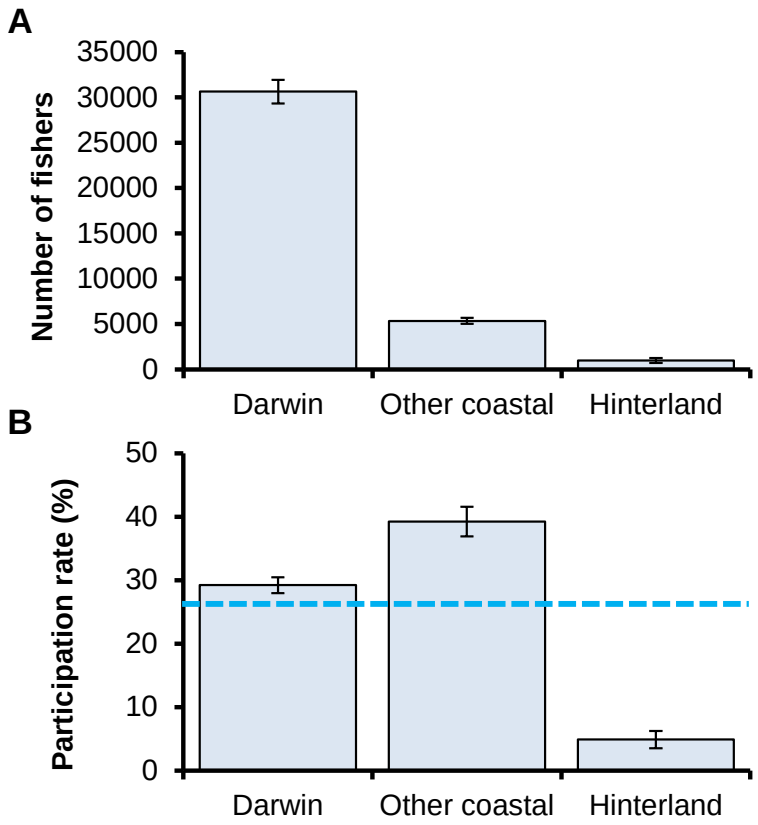
Information presented in this section is based on the Screening Survey and is reported as expanded estimates (adjusted for non-response, after Lyle *et al*., 2010) to represent the non-Aboriginal resident population of the Territory aged 5 years and older. Detailed information about participation by age, gender and residence is provided in Appendix 1.

4.1. Fishing participation

An estimated 36,962 (SE 1,369) non-Aboriginal residents aged 5 years and older fished at least once in the Territory in the 12 months prior to September 2018, representing a participation rate of 26.7% (SE 1.0%) in 2017-18 (Appendix 1). Inclusion of Territory residents who only fished in other states of Australia during that period brought the total number of recreational fishers to 38,196 (SE 1,391), or 27.6% (SE 1.0%) of the non-Aboriginal resident population. Unless stated otherwise, subsequent analyses exclude those residents who fished exclusively outside the Territory.

While the majority (83%) of recreational fishers resided in the Darwin stratum, residents of the Other Coastal stratum had the highest participation rate (39.2%) (Figure 6). The lowest number of fishers (<1000) and lowest participation rate (5%) emerged for residents of the Hinterland stratum.

Figure 6. Estimated number (A) and proportion (B) of the non-Aboriginal resident population of the Territory aged 5 years and older who fished recreationally in the Territory in the 12 months prior to September 2018 by residential stratum



Note: Error bars represent one standard error, and the dotted line represents the participation rate for the Territory as a whole

4.2. Age and Gender

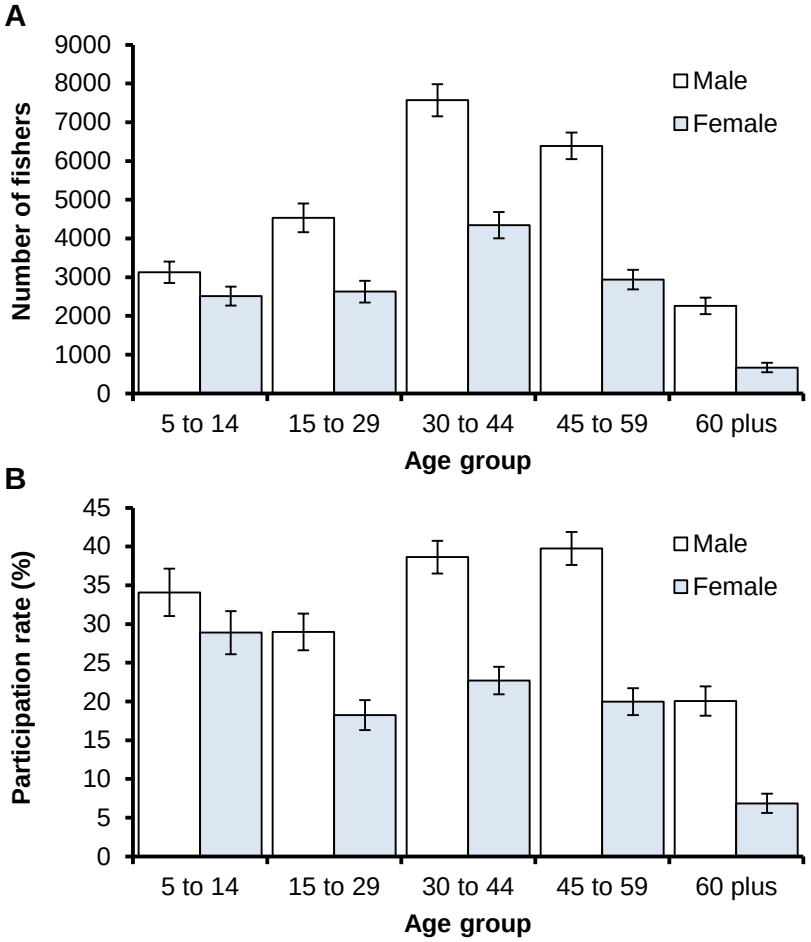
Apart from lower participation rates in the 15 to 29 (24%) and 60-plus (14%) age groups, there was general consistency in participation rates for most age groups (over 30%) (Appendix 1).

By gender, nearly two-thirds of Territory recreational fishers were male, representing a participation rate of 33.3%, compared with 19.6% for females (Appendix 1). The greater popularity of recreational fishing among males was evident across all age groups (Figure 7) and in each of the residential strata (Appendix 1).

Overall, the number of recreational fishers increased with age group to a peak in the 30 to 44 years age group (11,910 persons), before declining, with an especially sharp fall (to 2,927 persons) in the 60 years and older age group. This pattern was generally consistent for males and females, with the exception that the number of female fishers in the youngest age group (5 to 14 years) did not differ significantly from that for the 15 to 29 years age group (Figure 7A).

Male participation rates for the age groups up to 59 years were relatively consistent, ranging between 28.6 and 32.8%, falling to about half this level (15.4%) in the oldest age group (Figure 7B). The trend for females was more variable, with one in 4 females (25.2%) aged 5 to 14 years fishing, followed by 18.0% of 30 to 44 year olds, 14.1% of 15 to 29 year olds and 12.4% of 45 to 59 year olds (Figure 7B). Only 5.6% of females aged 60 years and older participated in recreational fishing.

Figure 7. Estimated number (A) and proportion (B) of the non-Aboriginal resident population of the Territory aged 5 years and older who fished recreationally in the Territory in the 12 months prior to September 2018 by age group and gender



Note: Error bars represent one standard error

5. Fishing effort

In this section, the fishing activities of respondents during the Diary Survey are reported as expanded estimates (adjusted for non-response, after Lyle *et al*., 2010) to represent the activity of the non-Aboriginal resident population of the Territory aged 5 years and older for the period 1 October 2018 to 30 September 2019 (2018 to 2019).

Fishing effort can be expressed in various ways, including the number of persons who fished at least once, the total number of person days spent fishing (fisher days), actual time spent fishing (fisher hours) or as fishing events (as defined in Sect. 2.5). For various analysis purposes, fishing effort has also been considered in relation to the location of the fishing activity (water body type and region), fishing platform, fishing method and time of year (season) (refer Appendices 4 to 8).

5.1. Overview

In total, an estimated 25,460 non-Aboriginal residents aged 5 years and older (18.4% of the target population) fished at least once in the Territory between October 2018 and September 2019, accounting for a total of 131,792 fisher days of effort at an average of 5.2 days per fisher (Table 4). This estimate of active fishers was significantly lower than for the previous 12 months (Sect. 4), a difference that is partially impacted by the different survey methods and associated biases, including recall bias (Screening Survey) which tends to result in an overestimation of recall activities, in addition to actual inter-annual variability in fishing effort levels.

Residents of Darwin represented 84% of the 2018 to 2019 Territory fishers and accounted for 76% of total effort (fisher days), while 15% of the fishers were Other Coastal residents who contributed 20% of the total fishing effort. Although Hinterland residents fished more days on average than those from the other areas, (13.0 days compared with 4.7 and 7.1 days for Darwin and Other Coastal strata, respectively), the low number of persons involved (1.5% of fishers) meant that this group made a very minor contribution (4%) to the Territory-wide fishing effort.

Table 4. Estimated number of persons and days fished by non-Aboriginal residents aged 5 years or older in the Territory during 2018 to 2019, by stratum

Residential stratum	Fishers		Fisher days		
	Number	SE	Total	SE	Mean
Darwin	21,323	1,314	100,163	8,906	4.7
Other coastal	3,765	299	26,783	4,082	7.1
Hinterland	372	142	4,846	2,632	13.0
Total	25,460	1,355	131,792	10,145	5.2

Note: SE is standard error.

Most (73%) fishers reported fishing on 5 or fewer days in the Territory during 2018 to 2019, with a further 16% fishing 6 to 10 days and 5% 11 to 15 days (Figure 8). Just over 3% of fishers reported more than 20 days fishing. The highly skewed nature of the fishing activity is further emphasised when individual fishers are ranked in order of their annual fishing effort (days fished), and the cumulative effect of adding each fisher's effort to the progressive total is assessed (Figure 9). This analysis revealed that 80% of fishers accounted for about 40% of the total fishing effort or, conversely, 20% of fishers accounted for almost 60% of the effort. Such a relationship is common in recreational fisheries and highlights the fact that a relatively small number of recreational fishers have a disproportionately large impact in terms of effort (and catch). Therefore, minor shifts in the dynamics of participation (based on activity levels) at the upper end of the fishery can be expected to have significant implications on effort (and catch) levels on a Territory-wide basis.

Figure 8. Distribution of fishing effort by annual days fished for the non-Aboriginal resident population of the Territory aged 5 years and older who fished recreationally in the Territory during 2018 to 2019.

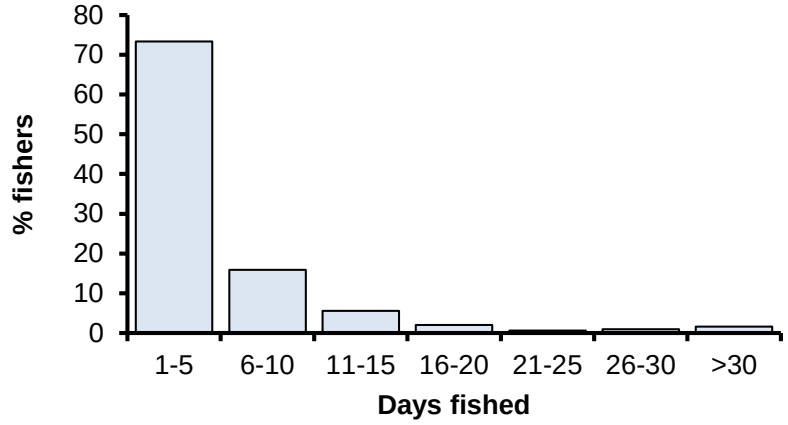
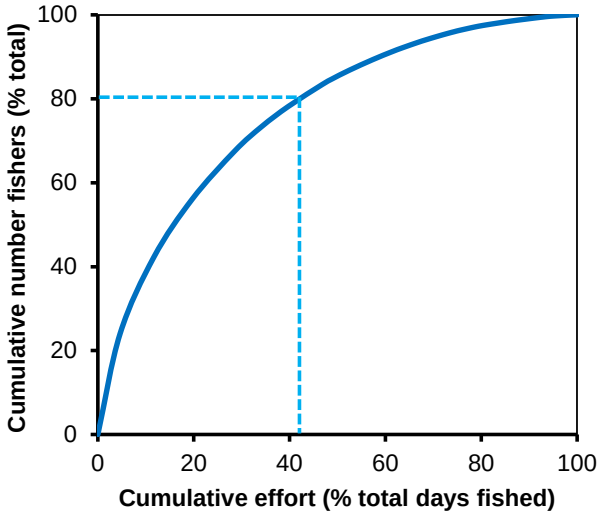


Figure 9. Relationship between the number of fishers and their cumulative fishing effort (days fished) for the non-Aboriginal resident population of the Territory aged 5 years and older who fished recreationally in the Territory during 2018 to 2019



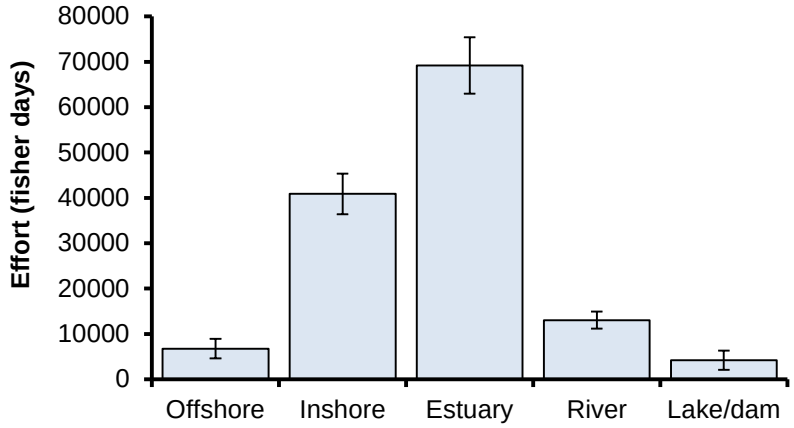
Note: Dotted lines indicate that 80% of the fishers accounted for just over 40% of the total days fished

5.2. Water body

Recreational fishing activity was concentrated in marine waters, estuarine waters in particular, which attracted just over half of the total effort (69,172 fisher days), followed by inshore waters (<5km from the coastline – 31% or 40,886 fisher days) and offshore waters (>5km – 5% or 6,751 fisher days) (Figure 10, Appendix 4A). Fishing in freshwater occurred primarily in the rivers (10% or 13,013 fisher days), while fishing in freshwater lakes and dams was a relatively minor activity (3% or 4,208 fisher days).

In relation to participation, and recognising that individuals may have fished in more than one water body type during the year, it was estimated that almost three-quarters of resident fishers fished at least once in estuarine waters. Half fished in inshore waters, one in 5 fished in freshwater rivers and just under one in 10 fished at least once in offshore waters during 2018 to 2019 (Appendix 4A).

Figure 10. Fishing effort (fisher days) by water body type for the non-Aboriginal resident population of the Territory aged 5 years and older who fished recreationally in the Territory during 2018 to 2019



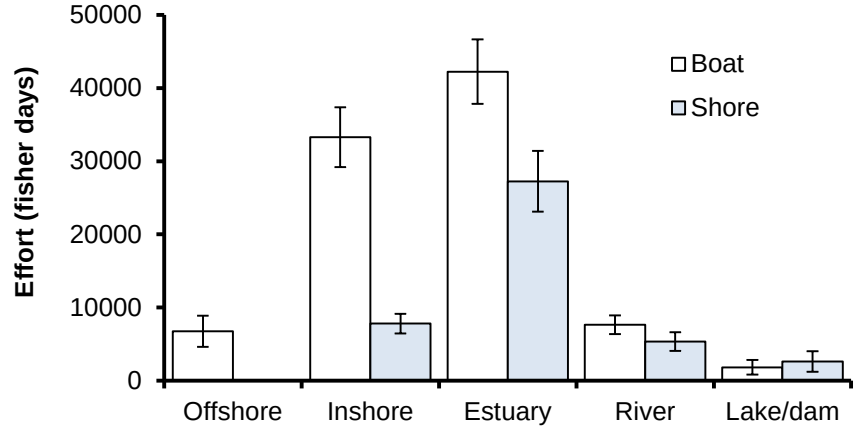
Note: Error bars represent one standard error

5.3. Fishing platform

Overall, almost three-quarters (73%) of recreational fishers fished at least once from a boat, accounting for 69% of the total days fished during 2018 to 2019 (Appendix 5A). Privately-owned boats accounted for the vast majority (98%) of all boat-based fishing effort (days fished), with the remainder shared between charter and hire boats (approximately 1% each). Note: this latter information did not warrant the inclusion of a separate table/appendix.

Boat-based fishing was the dominant activity in marine waters and in freshwater rivers, although shore-based fishing was also relatively important in estuaries and rivers (accounting for 39% and 41% of total fisher days, respectively) (Figure 11). Lake and dam fishing was more or less equally split between boat- and shore-based fishing.

Figure 11. Fishing effort (fisher days) by water body type and fishing platform for the non-Aboriginal resident population of the Territory aged 5 years and older who fished recreationally in the Territory during 2018 to 2019



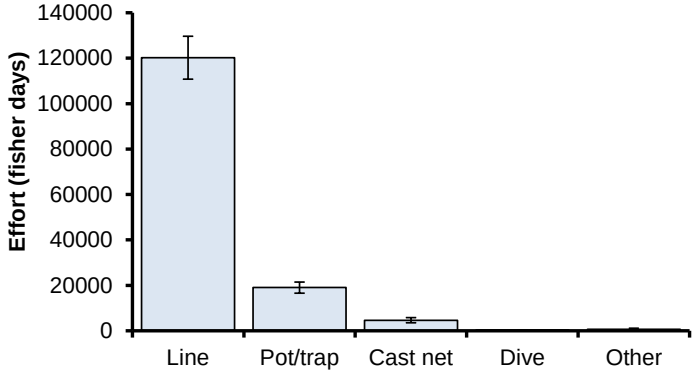
Note: Error bars represent one standard error

5.4. Fishing method

Line fishing was by far the most common method used by Territory recreational fishers, with 98% of fishers line fishing at least once during 2018 to 2019, occurring on 94% of all days fished (Appendix 6A, Figure 12). One in 3 fishers used a pot or trap at least once, with pots or traps used on 15% of the days fished during 2018 to 2019. Cast nets were used by 8% of fishers on 4% of the fisher days, while dive and other methods, including hand collection, were very minor activities.

In total, line fishing accounted for an estimated 664,213 hours of effort (at an average of 5.4 hours per fisher day), pot/trap fishing represented 140,321 hours of effort (an average of 7.2 hours per day) while fishing with cast nets totalled 5,126 hours (an average of 1.1 hours per day) (Appendix 6A).

Figure 12. Fishing effort (fisher days) by fishing method for the non-Aboriginal resident population of the Northern Territory aged five years and older who fished recreationally in the NT during 2018 to 2019

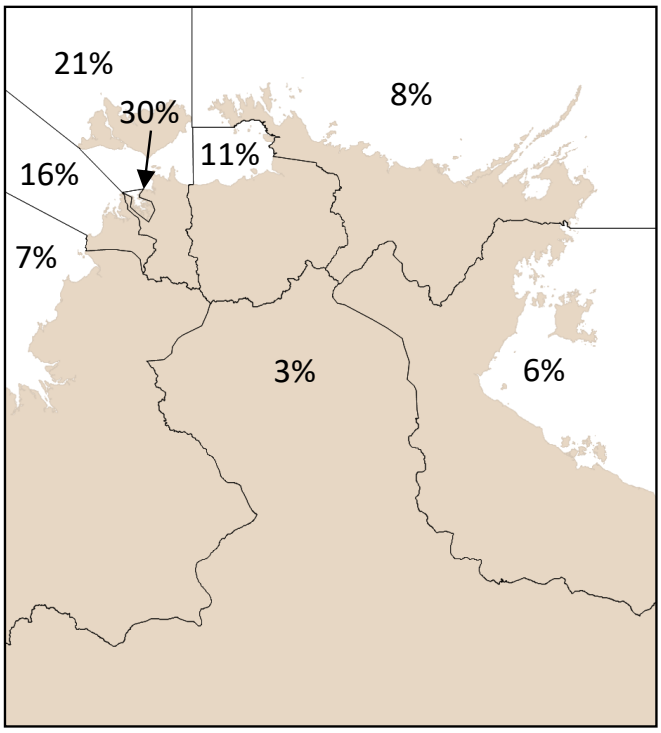


Note: Error bars represent one standard error

5.5. Fishing zones

Regionally, Darwin Harbour together with Darwin Surrounds accounted for over half of the total fishing effort (days fished), followed by the Bynoe/Finniss Area (16%) and Mary/Alligator Rivers (11%) (Figure 13, Appendix 7A). Each of the remaining zones attracted less than 10% of the total fishing effort, with the lowest activity levels occurring in the Central/Inland zone.

Figure 13. Spatial distribution of fishing effort (% total fisher days) by fishing zone for the non-Aboriginal resident population of the Territory aged 5 years and older who fished recreationally in the Territory during 2018 to 2019



The significance of Darwin Harbour to the recreational fishery is further highlighted by the fact that more than half (58%) of all resident fishers fished there at least once during 2018 to 2019 (Appendix 7A). The fishing zones immediately adjacent to Darwin (that is, Darwin Surrounds, Bynoe/Finniss Area, Mary/Alligator Rivers) also attracted large numbers of fishers, with between 20-35% of resident fishers fishing in these zones at least once. The more remote zones (North Coast, East Coast/Gulf Area and Central/Inland) were accessed by between 5 and 6% of resident fishers, while 16% fished at least once in the West Coast zone during 2018 to 2019.

5.6. Seasonal effort

Peak fishing effort (fisher days) was estimated to have occurred from October to December 2018 (36,073 fisher days) and April to June 2019 (34,909 fisher days) periods, with the highest number of individual fishers (14,618) active in the latter period (Appendix 8A). Effort was lowest during July to September 2019 (28,934 fisher days), but this was despite the number of active fishers being very similar to that estimated for October to December 2018.

6. Catch

In this section, catches reported by respondents during the Diary Survey are expressed as expanded estimates (adjusted for non-response, after Lyle *et al*., 2010) of the numbers of aquatic organisms taken by the non-Aboriginal resident population of the Territory aged 5 years and older during the period October 2018 to September 2019. For various analysis purposes, catches are defined in terms of total (kept plus released), kept (retained or harvested) and released components and are considered in relation to targeting practices, capture location (water body type and region), fishing platform, fishing method and time of year (season) (Appendices 2 to 8).

Recreational fishers captured a diverse range of scalefish, elasmobranchs (sharks and rays), crustaceans, molluscs, and other taxa. A detailed listing of species or species groupings is provided in Appendix 2. For

the purposes of reporting and analysis, some species have been grouped in recognition that fishers could not reasonably be expected to delineate to the species level due to taxonomic similarities, or where particular species were rarely reported.

6.1. Total catch, harvest and release/discard estimates

For recreational fisheries assessment, catches are generally divided into the components that are kept or harvested (that is, not returned to the water) and released or discarded (that is, returned to the water whether alive or not). The harvested component may be used for a variety of purposes, most commonly for consumption or for use as bait. The reasons for releasing or discarding catch may include adherence to regulations (such as size and bag limits), ethical reasons (such as catch and release fishing) or undesirability (such as poor eating qualities, damaged or diseased). Catch estimates are provided in detail in Appendix 2 and in Table 5for the main reporting groups.

Successful fishing events (that is, with catches) yielded an estimated 622,282 (SE 67,624) organisms, less than half (269,954; SE 35,937) of which were retained, with the remainder (352,328; SE 39,483) being released or discarded. Finfish (scalefish, sharks and rays) dominated the catch, accounting for 84% of the total numbers (522,437), crustaceans (mainly crabs and prawns) (93,679) were next in importance, contributing a further 15% to the total. A range of other taxa, including cephalopods (squid) and bivalves were caught in low numbers and collectively accounted for less than 1% of the total catch.

Barramundi was the most common fish species caught by Territory recreational fishers during 2018 to 2019 (an estimated 86,255 captured, accounting for 16.5% of all fish caught). Based on catch numbers, Golden Snapper (64,440 or 12.3% of the fish catch), sharks (27,444 or 5.3%), forktail catfish (23,534 or 4.5%), rockcod/groupers (20,752 or 4.0%), Grass Emperor (19,540 or 3.7%) and Stripey Snapper (19,152 or 3.7%) followed in importance (Table 5). Individually, none of the other fish species contributed more than 3.5% to the total catch. However, as a group, tropical snappers of the genus *Lutjanus* (is, Red Emperor, Golden Snapper, Mangrove Jack, Moses Snapper, Stripey Snapper and Saddletail/Crimson/Indonesian snapper grouping) dominated the finfish catch (116,216 captured), equivalent to almost one in 4 of all fish caught by Territory recreational fishers during 2018 to 2019. Mud Crabs, including Orange Mud Crab, accounted for the majority (75,109 or 78.6%) of all crustaceans captured.

Approximately 38% (196,449 fish) of all finfish captured were retained by recreational fishers during 2018 to 2019, this compared with 73% (68,135) of the crustaceans and 100% of the squid catches. Among the finfish, Golden Snapper was the single species retained in the greatest numbers, with an estimated 30,213 kept, representing 15.4% of the total number of retained finfish. Barramundi, with a retained catch of 12,956 was next in importance, accounting for 10.1% of the total, followed by mullet (14,903 or 7.6%), and herring/pilchards (13,723 or 7.0%) (Table 5).

Overall, 62% of all finfish caught by recreational fishers were released or discarded (325,988 fish), the actual release rates varying between species. High rates of release (> 75%) were evident for key species, such as Barramundi, catfish, Queenfish, and sharks and rays, while over half of the catch of species such as bream, Golden Snapper, Grass Emperor, the Saddletail/Crimson/Indonesian snapper grouping, rockcod/groupers and striped snapper were released (Table 5). By contrast, less than half of the jewfish, mullet, small baitfish and Mud Crabs were released. In Table 6, species have been grouped according to release rates, highlighting that some species tend to be released or discarded, where others are more likely to be kept or harvested by recreational fishers.

Table 5. Annual catch (total, kept and released numbers) and proportion released for key species during 2018 to 2019, by non-Aboriginal Territory residents aged 5 years or older

Species/group	Total		Kept		Released		%
	Number	SE	Number	SE	Number	SE	released
Barramundi	86,255	12,956	19,806	2,701	66,449	11,042	77.0
Batfish	10,416	2,766	**2,239**	**1,319**	8,178	2,348	78.5
Bream	12,232	2,612	5,455	1,502	6,777	1,724	55.4
Catfish	27,798	4,587	**1,446**	**871**	26,352	4,272	94.8
Rockcod/grouper	20,752	2,857	8,314	1,508	12,438	1,908	59.9
Coral trouts	6,713	1,693	4,034	990	2,679	939	39.9
Grass Emperor	19,540	6,018	8,086	2,419	11,454	4,226	58.6
Red Emperor	4,555	974	3,188	762	1,367	418	30.0
Golden Snapper	64,440	9,699	30,213	4,741	34,227	5,650	53.1
Mangrove Jack	12,120	4,267	3,758	1,046	**8,361**	**3,655**	69.0
Saddletail/Crimson/Indonesian snappers	11,456	2,223	5,588	1,386	5,867	1,207	51.2
Moses Snapper	*3,591*	*1,133*	*697*	*257*	*2,894*	*1,022*	80.6
Stripey Snapper	19,152	4,147	6,361	2,072	12,791	2,642	66.8
Tropical snappers, other	***902***	***639***	***41***	***28***	***861***	***638***	95.4
Sweetlips	***2,999***	***1,330***	***698***	***435***	***2,301***	***1,222***	76.7
Grunter breams	11,960	4,718	1,096	384	**10,864**	**4,665**	90.8
Jewfish	13,132	2,231	7,317	1,356	5,814	1,190	44.3
Grey Mackerel	*3,722*	*1,436*	*778*	*203*	***2,944***	***1,398***	79.1
Spanish Mackerel	8,232	2,588	3,595	949	4,637	1,831	56.3
Spotted mackerel	***396***	***188***	***227***	***148***	***168***	***117***	42.5
Longtail Tuna	6,547	2,260	2,460	613	**4,087**	**1,797**	62.4
Mackerel Tuna	***4,797***	***2,031***	***1,242***	***354***	***3,555***	***1,828***	74.1
Brassy Trevally	9,261	1,757	2,114	493	7,147	1,574	77.2
Golden Trevally	5,051	1,176	1,814	578	3,237	804	64.1
Trevallys, other	***3,319***	***1,711***	***317***	***169***	***3,002***	***1,702***	90.5
Queenfish	11,677	3,873	2,374	578	**9,303**	**3,813**	79.7
Tuskfish	4,689	964	2,368	581	2,321	533	49.5
Blue Threadfin	5,005	1,088	2,559	711	2,447	749	48.9
King Threadfin	6,812	2,061	2,654	769	4,158	1,467	61.0
Marlin	***611***	***380***	***107***	***85***	***504***	***304***	82.5
Mullet	16,570	4,161	14,903	3,739	**1,666**	**743**	10.1
Sooty Grunter	***1,543***	***785***	***356***	***189***	***1,187***	***739***	76.9
Oxeye Herring	7,050	2,092	**767**	**484**	6,283	2,033	89.1
Northern Saratoga	***1,894***	***896***	***49***	***48***	***1,845***	***892***	97.4
Scalefish, other	36,362	13,831	**21,372**	**12,142**	14,990	4,761	41.2
Small baitfish	*32,044*	*10,587*	*27,282*	*9,456*	***4,761***	***2,845***	14.9
Sharks and rays	28,843	3,897	**772**	**341**	28,071	3,843	97.3
Cephalopods	***1,601***	***862***	***1,601***	***862***	-	-	0.0

Species/group	Total		Kept		Released		%
	Number	SE	Number	SE	Number	SE	released
Mud Crabs	71,486	13,931	49,022	9,488	22,464	4,838	31.4
Orange Mud Crab	*3,623*	*1,258*	*2,320*	*750*	***1,303***	***619***	36.0
Freshwater prawns	***5,757***	***2,778***	***3,980***	***1,715***	***1,777***	***1,206***	30.9
Prawns	***12,813***	***9,718***	***12,813***	***9,718***	-	-	0.0
Bivalves	***2,256***	***1,492***	***2,256***	***1,492***	-	-	0.0

Note: SE is standard error; values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households recorded catches of the species

Table 6. Comparative summary of the proportion of the recreational catch of key species that was released or discarded by non-Aboriginal Territory residents aged 5 years and older during 2018 to 2019.

Proportion released			
> 75%	51-75%	25-50%	< 25%
Barramundi	Bream	Blue Threadfin	Bivalves
Batfish	Golden Snapper	Coral trouts	Cephalopods
Catfish	Golden Trevally	Freshwater prawns	Mullet
Brassy Trevally	Grass Emperor	Jewfish	Prawns
Grey Mackerel	King Threadfin	Mud Crabs	Small baitfish
Grunter breams	Longtail Tuna	Orange Mud Crab	
Moses Snapper	Mackerel Tuna	Red Emperor	
Northern Saratoga	Mangrove Jack	Tuskfish	
Oxeye Herring	Rockcod/grouper		
Queenfish	Saddletail/Crimson/Indonesian snappers		
Sharks and rays	Spanish Mackerel		
Sooty Grunter	Stripey Snapper		
Sweetlips			
Trevallys, other			

6.1.1. Reasons for release

Fishers release or discard catch for a variety of reasons and, in order to better understand this behaviour, respondents were routinely questioned about their reasons for not retaining part or all of their catch. This question about reason(s) for release was asked for each fishing event and specifically for each species where some or all of the catch was not retained. Also, the questioning was sensitive to the fact that individuals of a given species could be released for different reasons. For example, some of the catch could have been small fish (potentially under a legal size limit), while others may have ultimately exceeded the needs of the fisher (or the possession limit). No attempt was made to ask respondents about the condition (alive or dead) of any non-retained catch.

Careful attention was given to the reasons provided by respondents and (by using their terminology and 'neutral' questioning), the following categories were identified and included in Table 7:

- 'catch and release' – implying a voluntary release ethic, typically associated with sport fishing and/or conservation

- 'too small' – implying that the fish was either too small to be retained (personal preference) or under a minimum legal size limit (undersized)
- 'too big' implying too large to be retained (personal preference)
- 'too many' – implying catch in excess of personal needs
- 'bag limit' - indicating release due to bag or possession limits, including prohibited species
- 'not wanted' – implying non-desirability, primarily related to (perceived) poor eating qualities.

For crustaceans, 'berried females' (that is, females carrying eggs) was also cited as a reason for release, noting that it is illegal to harvest some crustaceans while berried.

For many species, 'too small' was an important (if not the primary) reason for their release. These included Barramundi, bream, rockcod/groupers, Grass Emperor, many of the tropical snapper species, mackerels, trevallys, jewfish, King Threadfin and Mud Crabs (Table 7). Catch and release fishing also featured as a relatively important motive for the release of Barramundi, bream, rockcod/groupers and trevallys, and was the primary motive for the release of Queenfish, Blue Threadfin, Sooty Grunter, Northern Saratoga and Oxeye Herring. Batfish, catfish, sweetlips, sharks and rays were mainly released or discarded because they were identified as being unwanted or undesirable species. The only group for which 'too many' was the primary reason for release was small baitfish, although 'too many' was also cited as a secondary reason for release of Grass Emperor, jewfish, mackerels and tunas.

Table 7. Reasons for release – proportions (%) of total numbers for key species released during 2018 to 2019 by non-Aboriginal Territory residents aged 5 years or older

Species/group	Total number released	Reason for release (%)						
		Catch and release	Too small	Too big	Too many	Bag limit	Not wanted	Berried female
Barramundi	66,449	40.3	38.2	1.5	19.9	<0.1	-	-
Batfish	8,178	0.4	17.6	0.6	-	-	81.3	-
Bream	6,777	54.3	34.2	-	4.6	-	6.9	-
Catfish	26,352	7.5	2.1	-	0.9	-	89.4	-
Rockcod/grouper	12,438	36.7	44.9	-.	2.4	0.1	15.9	-
Coral trouts	2,679	35.1	44.7	0.9	19.2	-	-	-
Grass Emperor	11,454	6.2	50.8	-	40.3	2.7	-	-
Red Emperor	1,367	3.7	84.5	-	11.7	-	-	-
Golden Snapper	34,227	12.1	68.4	0.6	13.5	5.1	0.3	-
Mangrove Jack	**8,361**	52.2	22.3	-	25.0	0.5	-	-
Saddletail/Crimson/Indonesian snappers	5,867	9.6	79.0	-	10.5	-	0.9	-
Moses snapper	*2,894*	3.2	74.9	-	11.2	10.8	-	-
Stripey Snapper	12,791	26.5	56.6	-	8.4	-	8.6	-
Sweetlips	***2,301***	23.5	7.3	-	0.9	-	68.3	-
Grunter breams	**10,864**	6.7	20.0	-	1.8	-	71.6	-
Jewfish	5,814	7.3	61.3	-	31.4	-	-	-
Grey Mackerel	***2,944***	8.2	72.1	-	17.5	-	2.2	-
Spanish Mackerel	4,637	9.1	47.6	0.1	41.6	-	1.5	-
Longtail Tuna	**4,087**	25.6	36.6	-	37.3	-	0.5	-
Mackerel Tuna	***3,555***	29.5	11.5	-	35.6	0.2	23.1	-

Species/group	Total number released	Reason for release (%)						
		Catch and release	Too small	Too big	Too many	Bag limit	Not wanted	Berried female
Brassy Trevally	7,147	35.4	32.9	-	1.8	6.2	23.7	-
Golden Trevally	3,237	32.9	34.5	-	5.9	0.7	26.0	-
Trevallys, other	***3,002***	85.6	1.3	-	3.9	-	9.2	-
Queenfish	**9,303**	78.6	12.3	-	1.1	-	8.0	-
Tuskfish	2,321	17.1	60.0	-	12.3	-	10.7	-
Blue Threadfin	2,447	49.4	25.5	-	22.7	-	2.5	-
King Threadfin	4,158	19.1	30.8	12.0	10.8	5.9	21.4	-
Mullet	**1,666**	-	53.8	-	18.5	-	27.8	-
Sooty Grunter	***1,187***	88.6	11.4	-	-	-	-	-
Oxeye Herring	6,283	58.1	3.4	-	0.3	-	38.1	-
Northern Saratoga	***1,845***	79.1	3.9	-	-	-	17.0	-
Scalefish, other	14,990	40.7	26.5	0.7	2.0	0.3	29.7	-
Small baitfish	***4,761***	2.1	-	-	84.9	-	13.0	-
Sharks and rays	28,071	4.5	0.1	-	1.3	0.3	93.9	-
Mud Crabs	22,464	0.1	79.7	-	6.0	-	-	14.3
Orange Mud Crab	***1,303***	-	68.6	-	-	-	31.4	-

Note: Values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households recorded releases of the species

6.1.2. Targeted fishing

Respondents were routinely asked whether they were fishing for particular species or not, thereby enabling the effort and catch for each fishing event to be classified as being either targeted or non-targeted. Respondents were asked to nominate up to 2 target species for each event. Any resultant catch could then be divided into targeted and non-targeted components. An understanding of targeted fishing behaviour provides insight into the level of specialisation and value that recreational fishers attribute to particular species, as well as providing meaningful measures of fishing success, noting that nil catch events are a common characteristic of recreational fisheries.

Targeted and non-targeted catch estimates by species are provided in Appendix 3, and the proportion of the total catch attributed to targeted effort is summarised in Table 8 for each species. Of the major recreational species, the vast majority (> 85%) of the Barramundi, mud crab and prawn catches were derived from targeted fishing effort. By contrast, species such as batfish, catfish, sweetlips, grunter breams, sharks and rays were rarely taken as targeted catch (< 10%), linked no doubt to their general undesirable status ('not wanted') and high rates of release. A range of other species were also rarely targeted (< 10%), they included Blue Threadfin, Grass Emperor, rockcod/groupers, trevallys, Sooty Grunter and Oxeye Herring implying that catches of these species were mostly incidental. A range of other species were captured with varying degrees of reported targeting. Over half the catch of small baitfish, mullet, and cephalopods was attributed to targeted effort, whereas less than half of the bream, jewfish, various species of tropical snapper (including Golden Snapper and Mangrove Jack), Spanish Mackerel, tunas, Queenfish, Northern Saratoga, King Threadfin catches were linked to targeted fishing effort.

Table 8. Comparative summary of the proportion of the recreational catch (kept and released) of key species that was taken by targeted effort during 2018 to 2019, by non-Aboriginal Territory residents aged 5 years and older.

Proportion of catch targeted			
< 10%	10-50%	51-85%	> 85%
Batfish	Bream	Cephalopods	Barramundi
Blue Threadfin	Coral trouts	Mullet	Bivalves
Catfish	Golden Snapper	Small baitfish	Freshwater prawns
Brassy Trevally	Jewfish	Tropical snappers, other	Mud Crabs
Golden Trevally	King Threadfin		Orange Mud Crab
Grass Emperor	Longtail Tuna		Prawns
Grey Mackerel	Mackerel Tuna		
Grunter breams	Mangrove Jack		
Oxeye Herring	Marlin		
Rockcod/groupers	Moses Snapper		
Sharks and rays	Northern Saratoga		
Sooty Grunter	Queenfish		
Spotted mackerel	Red Emperor		
Sweetlips	Saddletail /Crimson /Indonesian snappers		
Trevallys, other	Spanish Mackerel		
Tuskfish	Stripey Snapper		

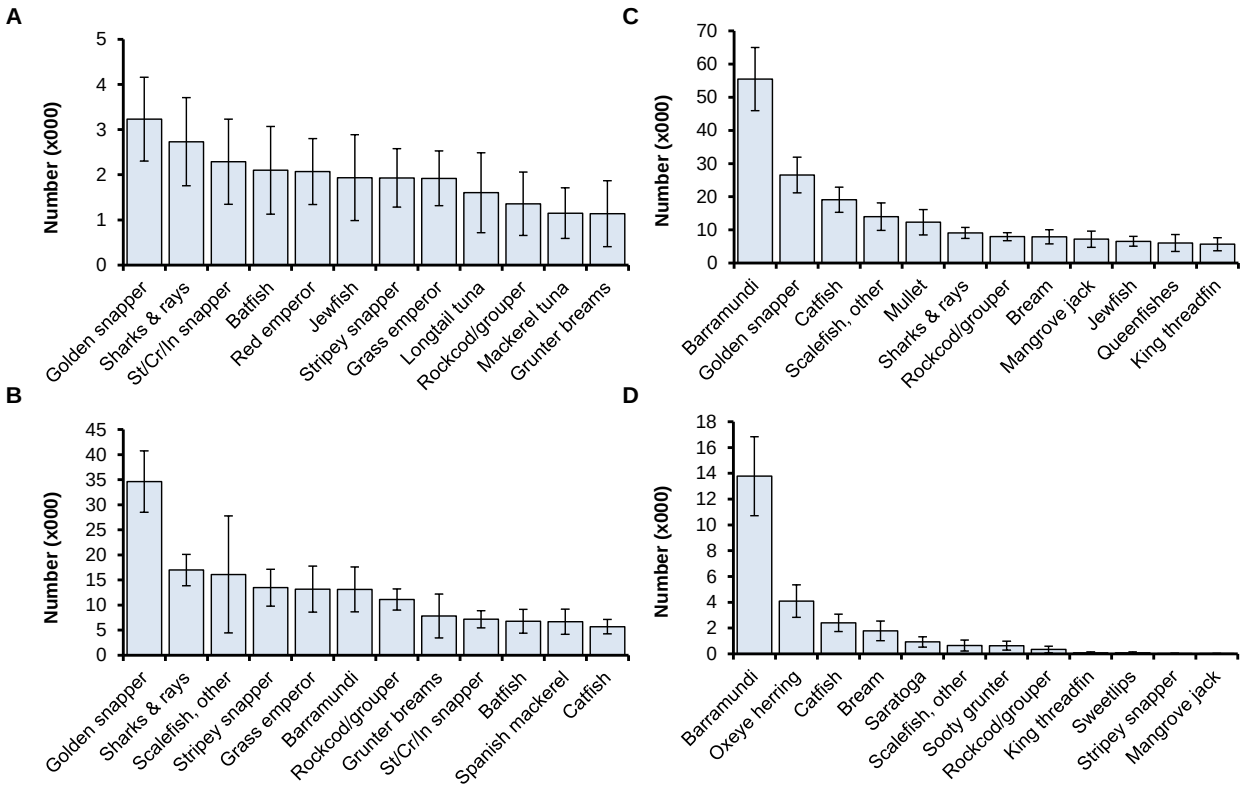
6.2. Catch by water body

Catch details by water body type are provided in Appendix 4 and summarised for key finfish species in Figure 14. Out of the total finfish catch (kept plus released) taken by Territory recreational fishers during 2018 to 2019, 44% was derived from estuarine waters, 42% from inshore waters, 7% from offshore waters and 7% from freshwater systems (rivers and lakes/dams). Crustaceans (mainly crabs and prawns) were predominantly captured in estuarine (68%) and inshore waters (27%), with a relatively minor take (prawns) from freshwater (5%).

Golden Snapper was the most frequently caught finfish species in both offshore and inshore waters, taken along with a range of other reef fish, including various tropical snappers, sharks, and rockcod/groupers (Figures 14A and B). Pelagic species, including longtail and Mackerel Tuna in the offshore and Spanish Mackerel in the inshore, were of secondary importance in terms of catch numbers. Barramundi was the most numerous fish taken in the estuarine fishery and, together with Golden Snapper, represented 36% of the total finfish catch (Figure 14C). Catfish and mullet were also relatively common in estuarine catches. Catches in freshwater were also dominated by Barramundi, the species alone accounting for over half of the total numbers, with Oxeye Herring, catfish, and bream of secondary importance (Figure 14D).

Figure 14. Catch estimates (total numbers caught) of key finfish species (excluding small baitfish) taken by non-Aboriginal Territory residents aged 5 years and older during 2018 to 2019 based on water body:

- A) Offshore
- B) Inshore
- C) Estuary
- D) Freshwater River



Note: Error bars represent one standard error; vertical axis scale is variable

6.3. Catch by Fishing Platform

An estimated 500,324 fish, crustaceans and molluscs, equivalent to 81% of the total recreational catch by number, was taken by boat-based fishers. Shore-based fishing accounted for a combined catch of 118,842 individuals, or 19% of the total.

Catches by fishing platform are provided in detail in Appendix 5 and summarised in Table 9. For many of the key fish species, boat-based fishing activities accounted for the vast majority of the catch (> 90%). They included Golden Snapper, the Saddletail/Crimson/Indonesian snapper group, Grass Emperor, trevallys, and many of the pelagic species. Boat-based fishers also mainly took many of the typically estuarine species, such as Barramundi, catfish, Mangrove Jack, and Mud Crabs. Species for which most of the catch was derived from shore-based fishing included bream, mullet and Sooty Grunter, along with species taken mainly by cast net (small baitfish).

Table 9. Comparative summary of the proportion of the recreational catch (kept plus released) of key species that was taken by boat-based fishers during 2018 to 2019, by non-Aboriginal Territory residents aged 5 years or older

Proportion of catch - boat-based			
30-50%	51-70%	71-90%	> 90%
Bream	Bivalves	Barramundi	Batfish
Mullet	Cephalopods	Blue Threadfin	Coral trouts
Scalefish, other	Northern Saratoga	Catfish	Brassy Trevally
Small baitfish	Oxeye Herring	Freshwater prawns	Golden Snapper
Sooty Grunter		Mangrove Jack	Golden Trevally
		Moses Snapper	Grass Emperor
		Mud Crabs	Grey Mackerel
		Orange Mud Crab	Grunter breams
		Prawns	Jewfish
		Queenfish	King Threadfin
		Rockcod/grouper	Longtail Tuna
		Spanish Mackerel	Mackerel Tuna
			Marlin
			Red Emperor
			Saddletail/Crimson/Indonesian snappers
			Sharks and rays
			Spotted mackerel
			Stripey Snapper
			Sweetlips
			Trevallys, other
			Tropical snappers, other
			Tuskfish

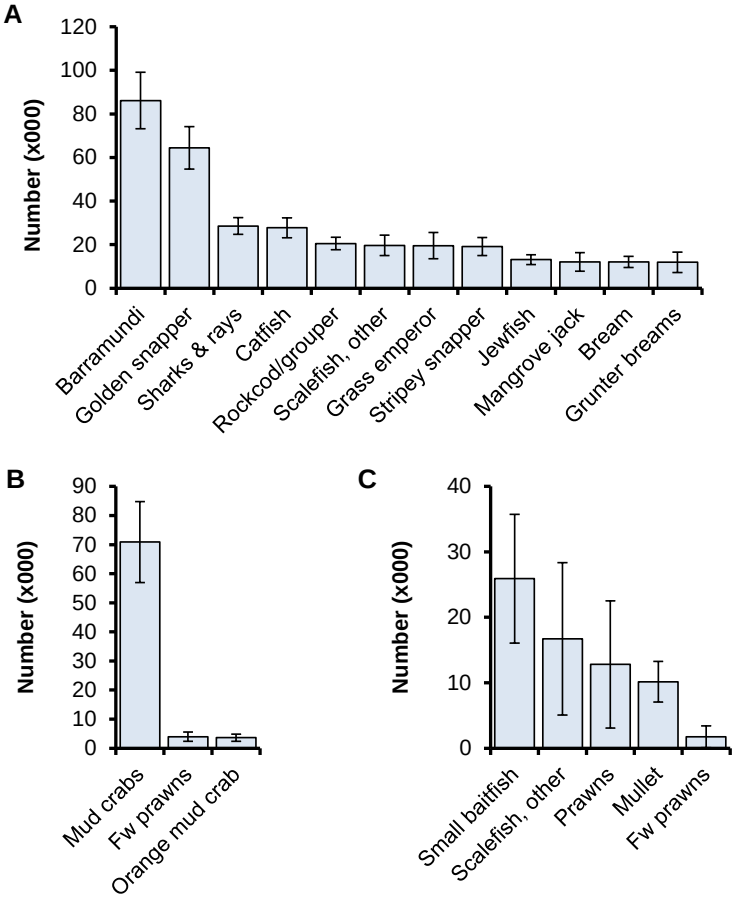
6.4. Catch by method

Catch details by fishing method are provided in Appendix 6 and summarised for key species in Figure 15. Overall, line fishing accounted for a catch of 465,653 finfish, crustaceans and cephalopods, representing 75% of the total number of organisms taken by Territory recreational fishers during 2018 to 2019. Pots and traps contributed a further 13% (79,337 individuals), cast nets 11% (69,757 individuals), and other methods less than 1% of the total catch. Dive collection was an insignificant component of the recreational fishery.

The vast majority of the line catch was finfish, with Barramundi representing 19% of the total number (kept plus released) (Figure 15A). Other species of significance included Golden Snapper, sharks and rays, catfish and rockcod/groupers. By contrast, the catch taken by pots and traps almost exclusively comprised crustaceans, in particular Mud Crabs, but also freshwater prawns (Figure 15B). Cast nets were used to catch a range of fish and invertebrates, with small baitfish, mullet and prawns comprising the bulk of the numbers (Figure 15C).

Figure 15. Catch estimates (kept plus released) of key species taken by non-Aboriginal Territory residents aged 5 years and older during 2018 to 2019 based on fishing method:

- A) Line
- B) Pot/trap
- C) Cast net.



Note: Error bars represent one standard error, vertical axis scale is variable

7. Fisheries for key species

In the following section, the fisheries for key species are described in terms of the regional distribution of the catch (refer Appendix 7), numbers kept and released (Table 5, Appendix 2), catch by fishing platform (Appendix 5), fishing method (Appendix 6), water body type (Appendix 4) and season (Appendix 8). Catch information was provided by fishers during the Diary Survey and is presented as expanded estimates to represent catches taken by the non-Aboriginal resident population of the Territory aged 5 years and older during the period October 2018 to September 2019.

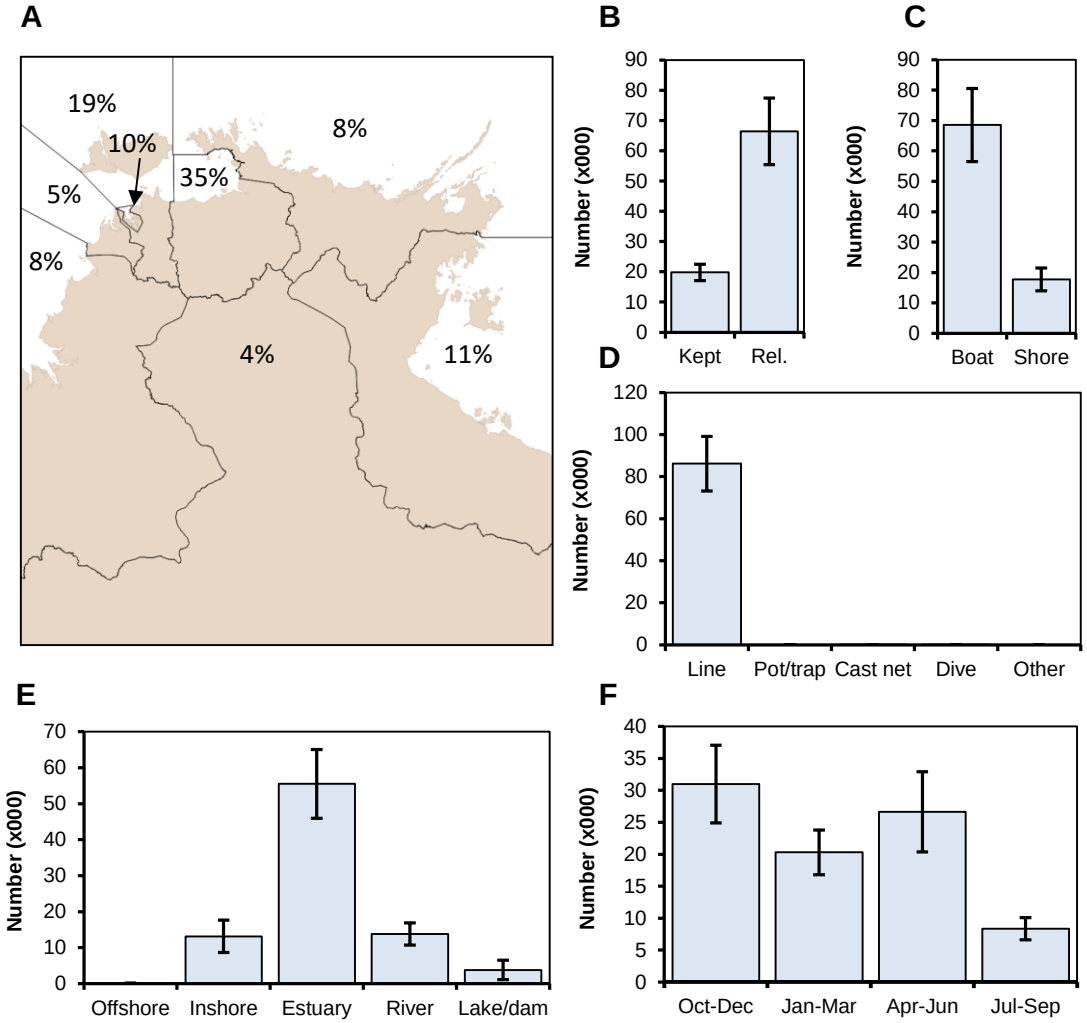
7.1. Barramundi

An estimated 86,255 Barramundi (*Lates calcarifer*) were caught by Territory recreational fishers during 2018 to 2019, more than a third (35%) of which was taken in the Mary/Alligator Rivers zone, followed in importance by Darwin Surrounds (19%), East Coast/Gulf Area (11%) and Darwin Harbour (10%) (Figure 16A). Over three-quarters of the Barramundi catch was released or discarded (Figure 16B). Boat-based fishing accounted for the majority (80%) of the catch (Figure 16C), virtually all of which was taken by line fishing (Figure 16D). Most of the catch was taken in estuarine waters (62%), with freshwater rivers (16%) and inshore waters (15%) accounting for most of the remainder (Figure 16E). The October-December and

April-June periods each accounted for over 30% of the annual catch, with lowest catches (10%) taken in the July-September quarter (Figure 16F).

Figure 16. Characteristics of the recreational fishery for Barramundi in the Northern Territory during 2018 to 2019 by non-Aboriginal Territory residents aged 5 years and older:

- A) proportion (%) of the total catch (numbers) by fishing zone
- B) total numbers kept and released
- C) total catch (numbers) by boat and shore-based fishing activities
- D) total catch (numbers) by fishing method
- E) total catch (numbers) by water body fished
- F) seasonality in the catch (numbers)



Note: Error bars represent one standard error

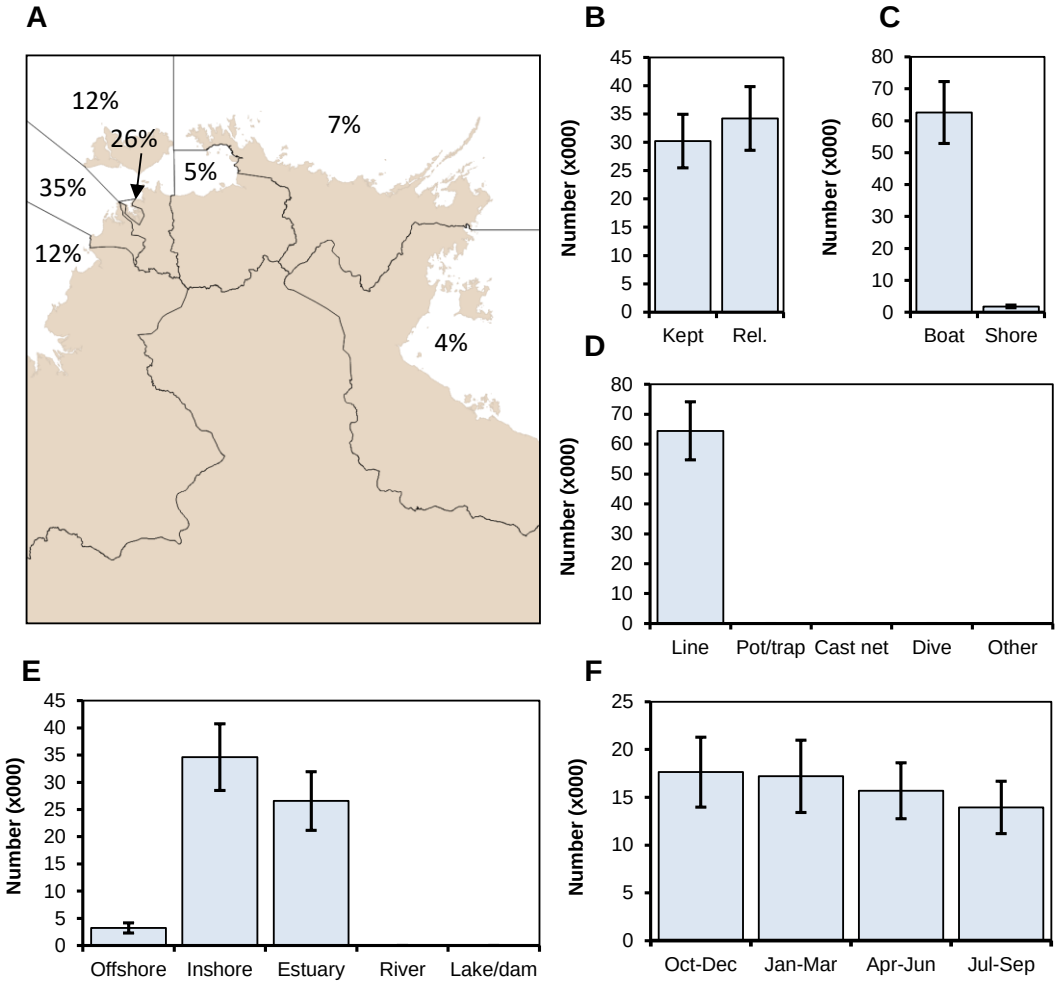
7.2. Golden Snapper

An estimated 64,440 Golden Snapper (*Lutjanus johnii*) were captured by Territory recreational fishers during 2018 to 2019, most of which were taken from the Bynoe/Finniss Area (35%) and Darwin Harbour (26%) areas, followed by catches from the West Coast (12%) and Darwin Surrounds (12%) zones (Figure 17A). Just over half (53%) of all Golden Snapper caught were released or discarded (Figure 17B). The vast majority (97%) of the catch was taken by boat-based fishing activity (Figure 17C), and almost exclusively by line fishing (Figure 17D). Catches were primarily taken in inshore (54%) and estuarine waters (41%)

(Figure 17E). Other than a slight decline in catches throughout the survey period, there was limited evidence for seasonality in catches (Figure 17F).

Figure 17. Characteristics of the recreational fishery for Golden Snapper in the Northern Territory during 2018 to 2019 by non-Aboriginal Territory residents aged 5 years and older:

- A) proportion (%) of the total catch (numbers) by fishing zone
- B) total numbers kept and released
- C) total catch (numbers) by boat and shore-based fishing activities
- D) total catch (numbers) by fishing method
- E) total catch (numbers) by water body fished
- F) seasonality in the catch (numbers)



Note: Error bars represent one standard error

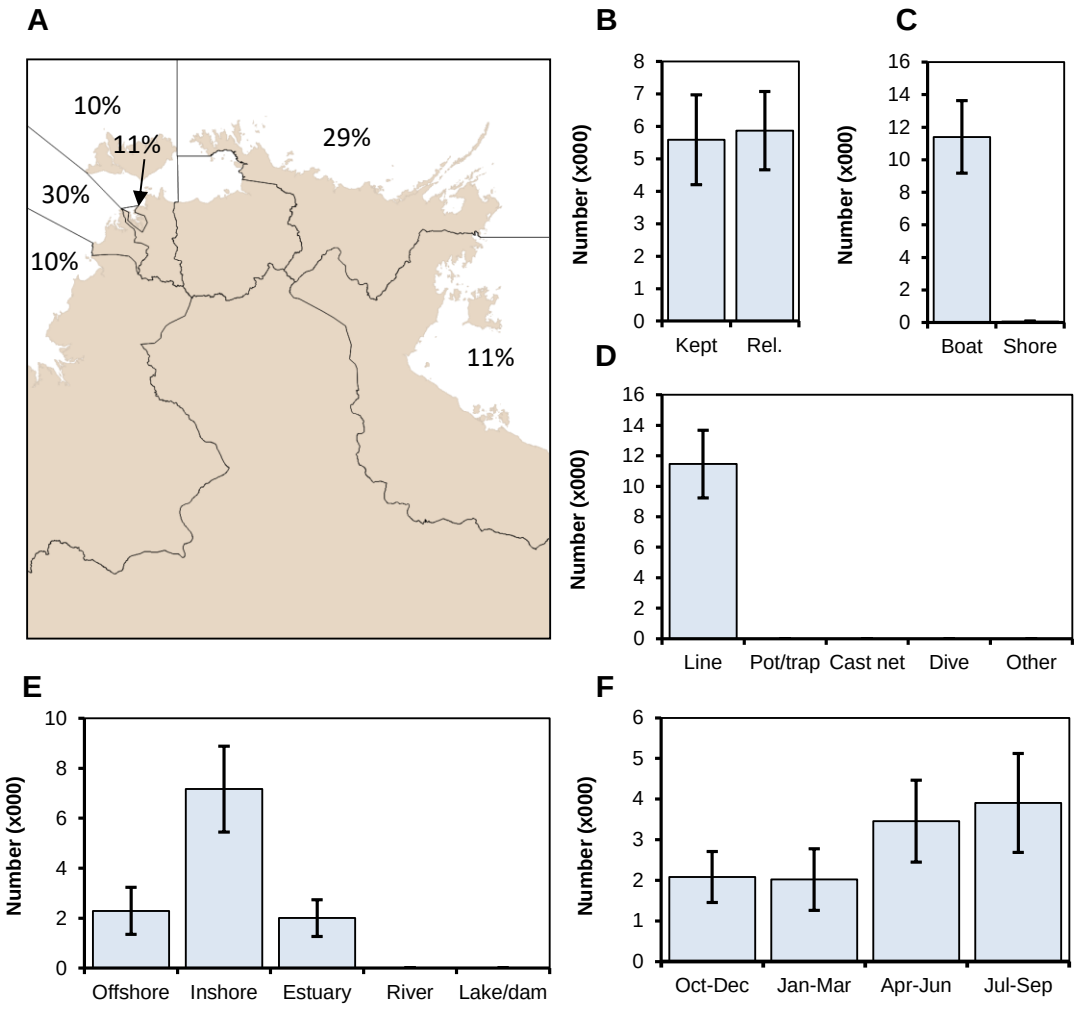
7.3. Saddletail/Crimson/Indonesian snappers

Saddletail snapper (*Lutjanus malabaricus*), Crimson snapper (*L. erythropterus*) and Indonesian snapper (*L. bitaeniatus*) are similar in appearance and have been grouped for analysis, recognising that recreational fishers may not be able to distinguish them readily at the species level. Almost 60% of the estimated 11,456 snappers comprising this group was taken from the Bynoe/Finniss Area and North Coast (Figure 18A). Excluding the Mary/Alligator Rivers, the remainder of the catch was split evenly between the

other marine zones. Just over half of the catch was released or discarded (Figure 18B), with catches taken almost exclusively by boat (Figure 18C) using line fishing methods (Figure 18D). Most of the catch was taken in inshore waters (62%), with the remainder split evenly between offshore and estuarine waters (Figure 18E). Seasonally, the highest catches were taken in the latter two quarters (between April and September) and were lowest in the October- March period (Figure 18F).

Figure 18. Characteristics of the recreational fishery for Saddletail/Crimson/Indonesian snappers in the Northern Territory during 2018 to 2019 by non-Aboriginal Territory residents aged 5 years and older:

- A) proportion (%) of the total catch (numbers) by fishing zone
- B) total numbers kept and released
- C) total catch (numbers) by boat and shore-based fishing activities
- D) total catch (numbers) by fishing method
- E) total catch (numbers) by water body fished
- F) seasonality in the catch (numbers).



Note: Error bars represent one standard error

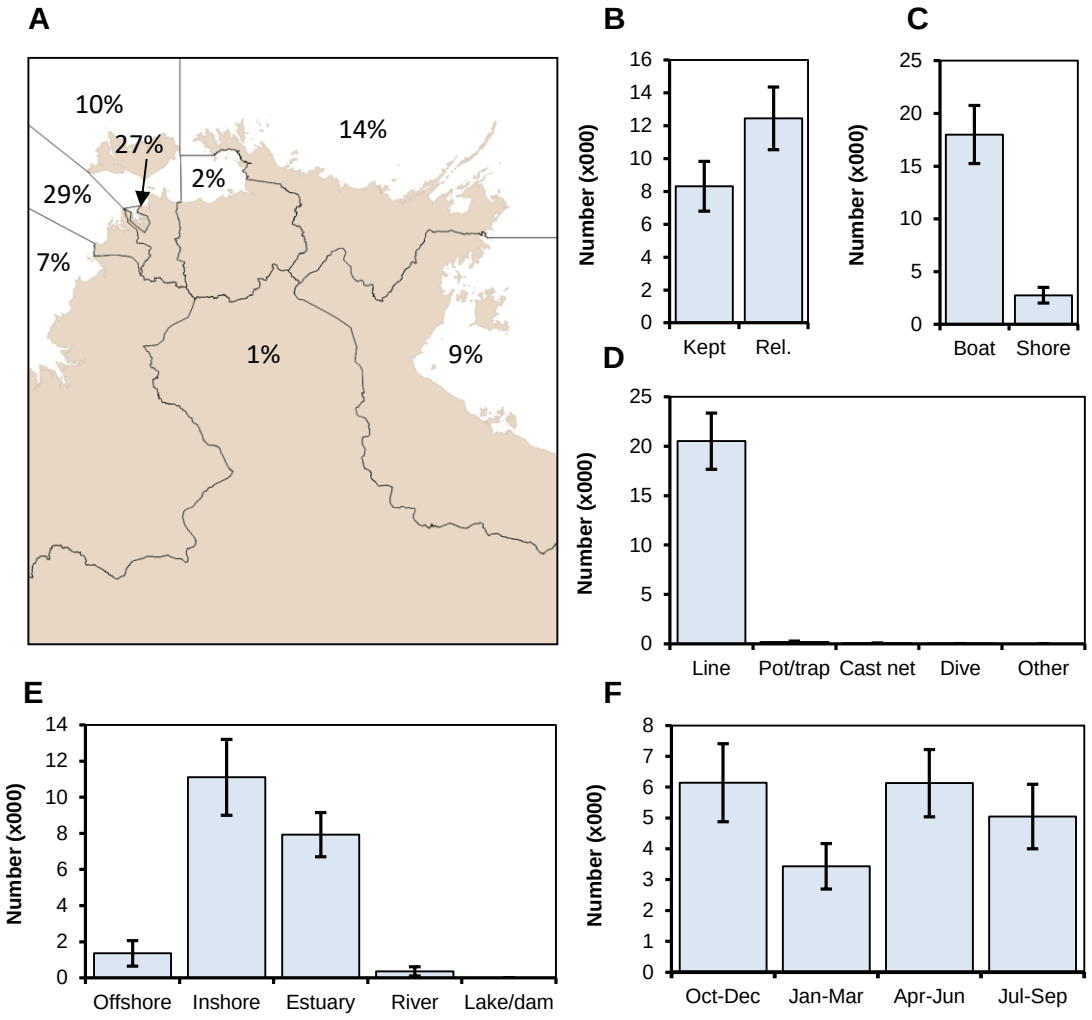
7.4. Rockcod/groupers

This group, commonly identified as rockcods and groupers, comprises a number of species belonging to the family Serranidae (but excluding the coral trouts). Over half (56%) of the estimated 20,752

rockcod/grouper were taken from the Bynoe/Finniss Area and Darwin Harbour zones, with more than 10% also taken in each of the Darwin Surrounds and North Coast zones (Figure 19A). Approximately 60% of the rockcod/groupers were released or discarded (Figure 19B). Boat-based fishing accounted for the vast majority (87%) of the catch (Figure 19C), virtually all of which was taken by line fishing (Figure 19D). Fishing in inshore and estuarine waters collectively accounted for over 90% of the total numbers, most of the remainder being derived from offshore waters (Figure 19E). Apart from a marked decline in the January-March period, catches exhibited relatively limited variability between each of the other quarters (Figure 19F).

Figure 19. Characteristics of the recreational fishery for rockcod/groupers in the Northern Territory during 2018 to 2019 by non-Aboriginal Territory residents aged 5 years and older:

- A) proportion (%) of the total catch (numbers) by fishing zone
- B) total numbers kept and released
- C) total catch (numbers) by boat and shore-based fishing activities
- D) total catch (numbers) by fishing metho
- E) total catch (numbers) by water body fished
- F) seasonality in the catch (numbers).



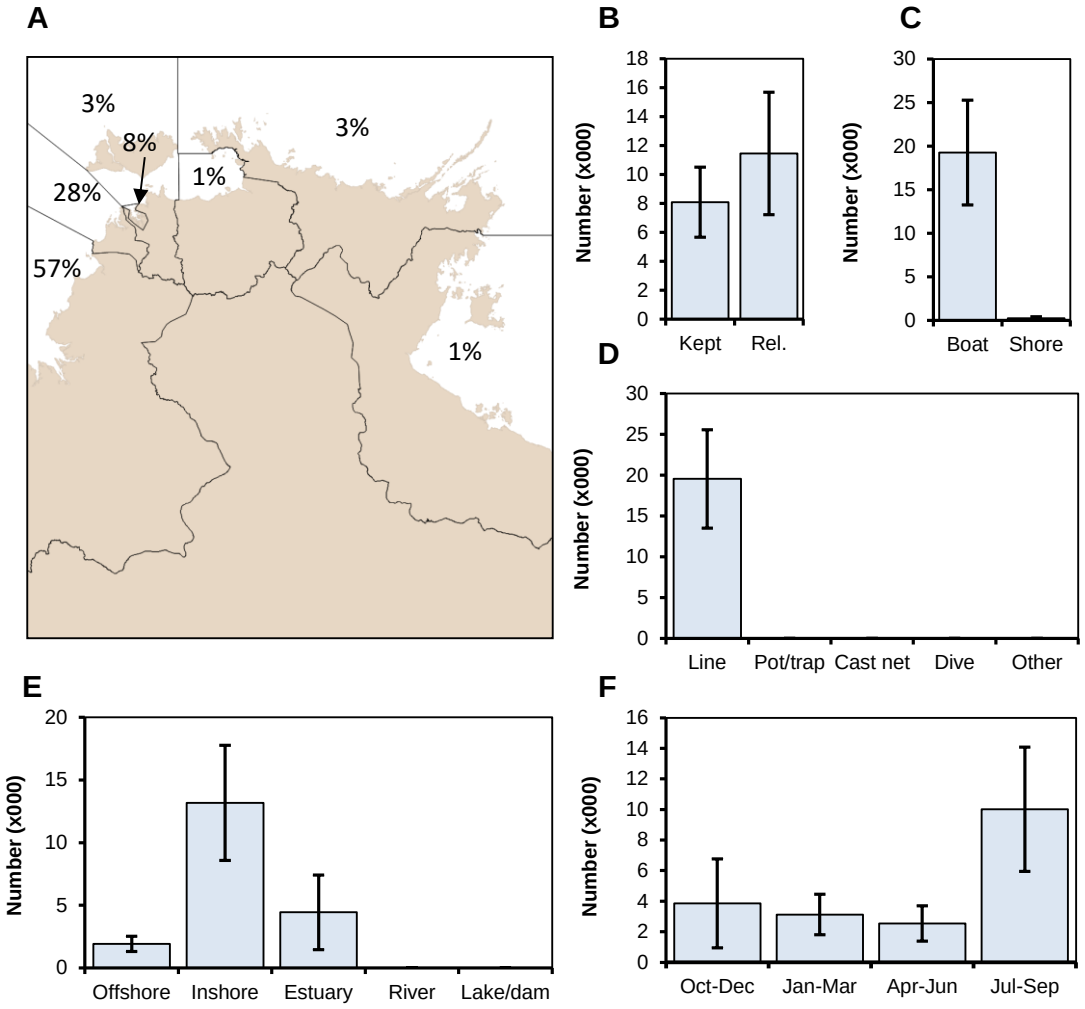
Note: Error bars represent one standard error

7.5. Grass Emperor

An estimated 19,540 Grass Emperor (*Lethrinus laticaudis*) were taken by Territory recreational fishers during 2018 to 2019, with catches concentrated in the West Coast (57%) and Bynoe/Finniss Area (28%) zones (Figure 20A). More than half (59%) of all Grass Emperor caught were released or discarded (Figure 20B). Boat-based fishing (Figure 20C) using lines (Figure 20D) accounted for virtually all the catch. Inshore and, to a lesser extent, estuarine waters accounted for the vast majority (90%) of the catch, with the remainder being taken in offshore waters (Figure 20E). Catches peaked sharply in the July-September quarter (51%), remaining at relatively low levels at other times of the year (Figure 20F).

Figure 20. Characteristics of the recreational fishery for Grass Emperor in the Northern Territory during 2018 to 2019 by non-Aboriginal Territory residents aged 5 years and older:

- A) proportion (%) of the total catch (numbers) by fishing zone
- B) total numbers kept and released
- C) total catch (numbers) by boat and shore-based fishing activities
- D) total catch (numbers) by fishing method
- E) total catch (numbers) by water body fished
- F) seasonality in the catch (numbers).



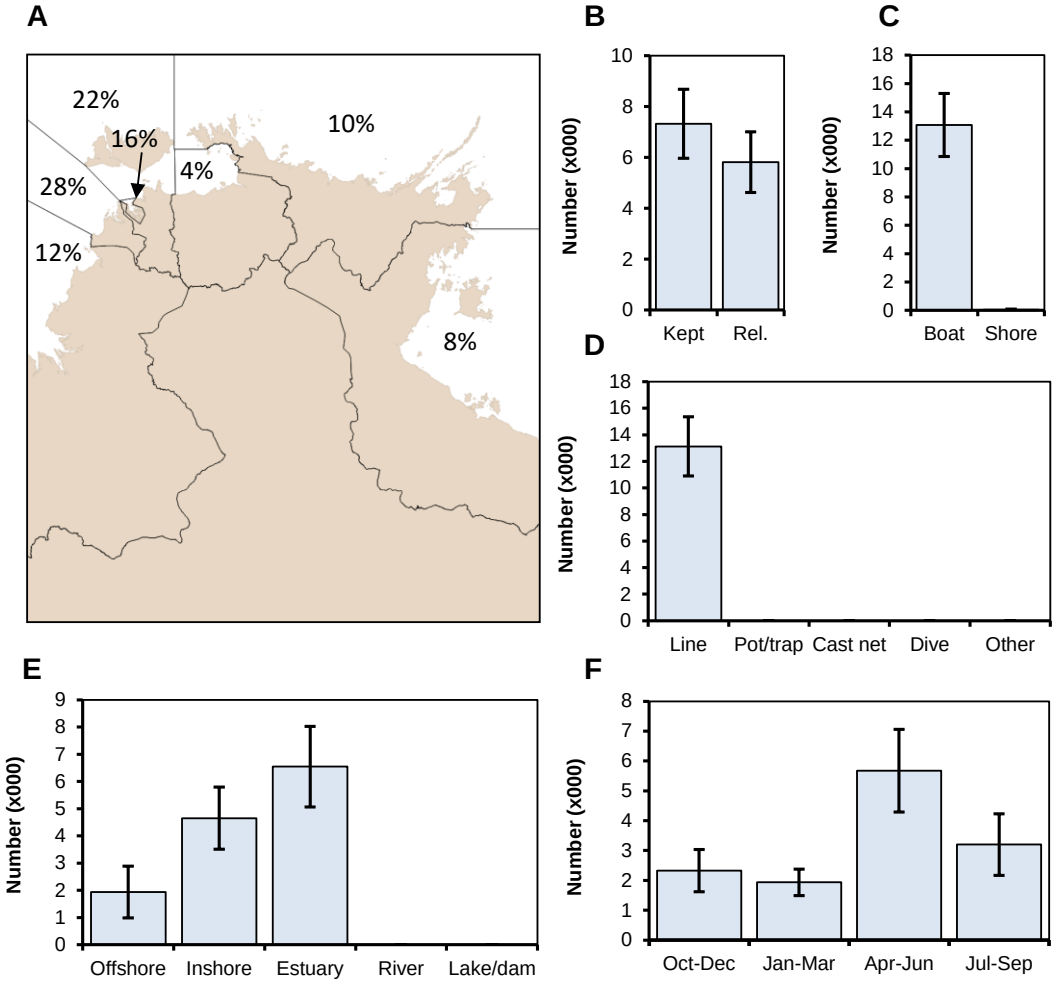
Note: Error bars represent one standard error

7.6. Jewfish

Recreational jewfish catches, including the iconic black jewfish (*Protonibea diacanthus*) and other Sciaenid species, accounted for an estimated 13,132 fish, catches of which were concentrated in the Bynoe/Finniss Area (28%), Darwin Surrounds (22%) and Darwin Harbour (16%) zones (Figure 21A). West Coast and North Coast zones each contributed approximately 10% to the catch total. Over half (56%) the jewfish caught were retained (Figure 21B). Boat-based fishing accounted for virtually all the catch (Figure 21C) that was taken exclusively by line fishing methods (Figure 21D). Catches were mostly taken from estuarine (50%) and inshore (35%) waters (Figure 21E). The April-June quarter accounted for 43% of the catch, with the remainder of the catch divided more or less equally across the other quarters (Figure 21F).

Figure 21. Characteristics of the recreational fishery for jewfish in the Northern Territory during 2018 to 2019 by non-Aboriginal Territory residents aged 5 years and older:

- A) proportion (%) of the total catch (numbers) by fishing zone
- B) total numbers kept and released
- C) total catch (numbers) by boat and shore-based fishing activities
- D) total catch (numbers) by fishing method
- E) total catch (numbers) by water body fished
- F) seasonality in the catch (numbers).



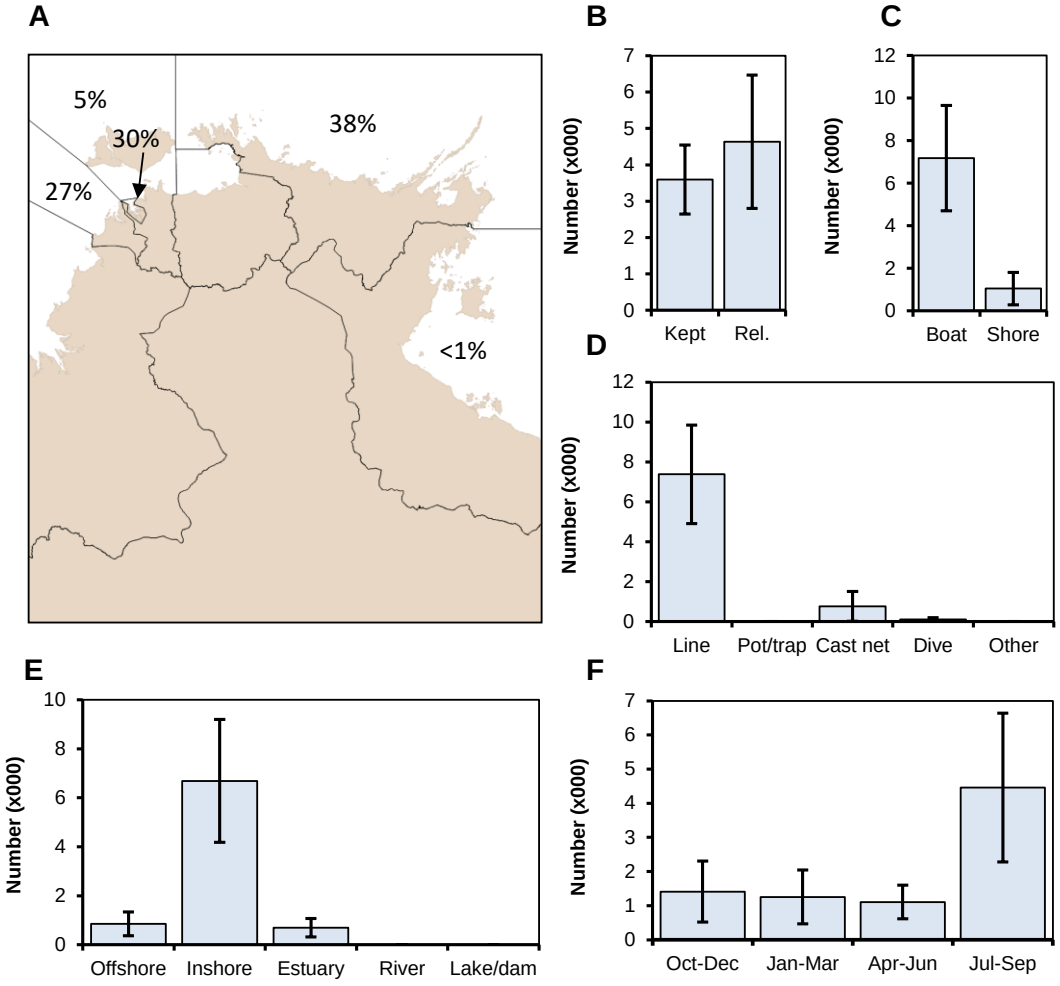
Note: Error bars represent one standard error

7.7. Spanish Mackerel

The estimated recreational catch of 8,232 Spanish Mackerel (*Scomberomorus commerson*) was mainly derived from the North Coast (38%), Darwin Harbour (30%) and Bynoe/Finniss Area (27%) zones (Figure 22A). Just over half (56%) of all Spanish Mackerel caught were released or discarded (Figure 22B). Boat-based fishing accounted for the vast majority (87%) of the catch (Figure 22C), virtually all of which was taken by line fishing (Figure 22D). Inshore waters accounted for 81% of the total catch, with the remainder taken in offshore and estuarine waters (Figure 22E). Catches peaked sharply in the July-September quarter (accounting for over half of the annual total) and remained at relatively low levels in the remaining quarters (Figure 22F).

Figure 22. Characteristics of the recreational fishery for Spanish Mackerel in the Northern Territory during 2018 to 2019 by non-Aboriginal Territory residents aged 5 years and older:

- A) proportion (%) of the total catch (numbers) by fishing zone
- B) total numbers kept and released
- C) total catch (numbers) by boat and shore-based fishing activities
- D) total catch (numbers) by fishing method
- E) total catch (numbers) by water body fished
- F) seasonality in the catch (numbers).



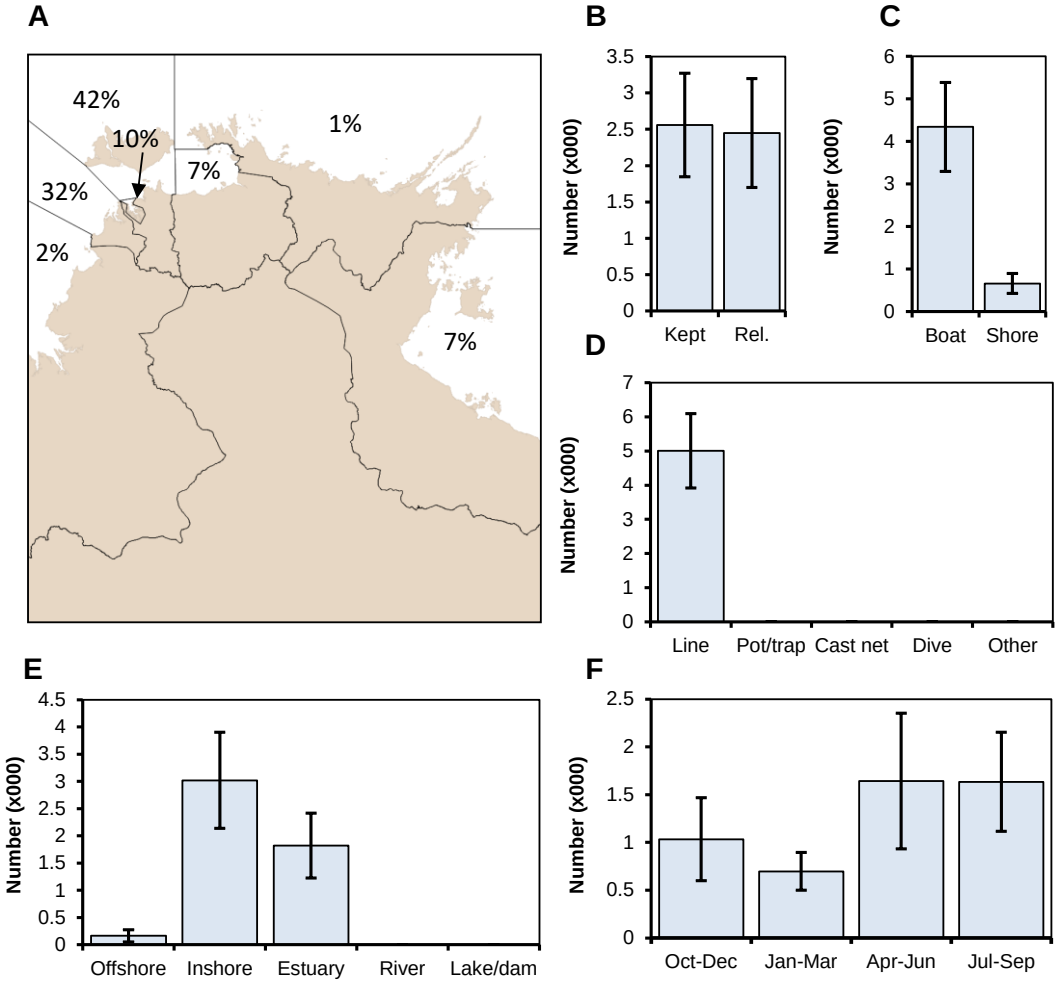
Note: Error bars represent one standard error

7.8. Blue Threadfin

Recreational fishers captured an estimated 5,005 Blue Threadfin (*Eleutheronema tetradaetylum*) during 2018 to 2019, with three-quarters being taken from the Darwin Surrounds and Bynoe/Finniss Area zones combined (Figure 23A). Apart from Darwin Harbour, catches from the other zones accounted for less than 10% of the total. Approximately half of all Blue Threadfin caught were released (Figure 23B). Boat-based fishing accounted for the vast majority (87%) of the catch (Figure 23C), which was taken entirely by line fishing (Figure 23D). Most of the catch was taken from inshore waters (60%), with the bulk of the remainder derived from estuarine waters (Figure 23E). Catches were highest in the April-June and July-September quarters, this period accounting for two-thirds of the annual total (Figure 23F).

Figure 23. Characteristics of the recreational fishery for Blue Threadfin in the Northern Territory during 2018 to 2019 by non-Aboriginal Territory residents aged 5 years and older:

- A) proportion (%) of the total catch (numbers) by fishing zone
- B) total numbers kept and released
- C) total catch (numbers) by boat and shore-based fishing activities
- D) total catch (numbers) by fishing method
- E) total catch (numbers) by water body fished
- F) seasonality in the catch (numbers).



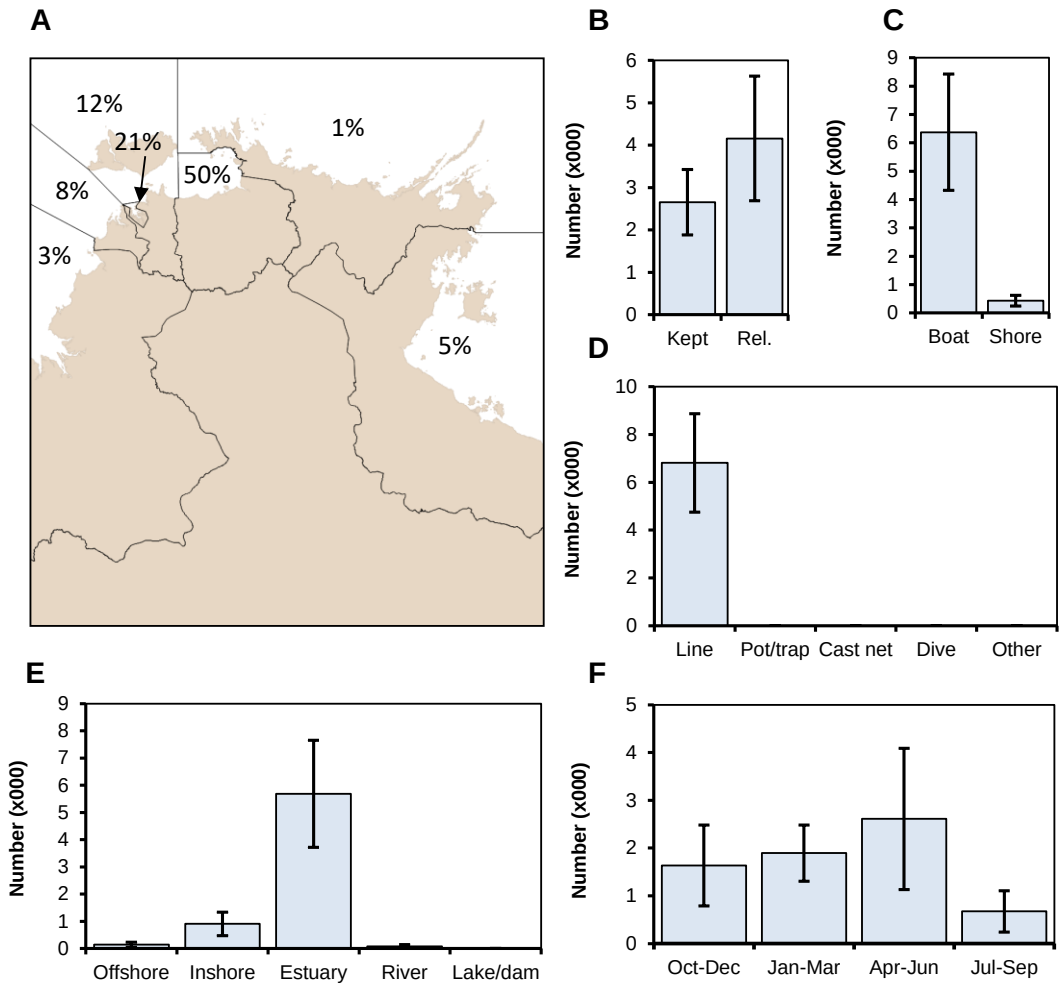
Note: Error bars represent one standard error

7.9. King Threadfin

During 2018 to 2019, Territory recreational fishers captured an estimated 6,812 King Threadfin (*Polydactylus macrochir*), half of which were taken from the Mary/Alligator Rivers zone and a third from the combined Darwin Surrounds and Darwin Harbour zones (Figure 24A). More than half (61%) of all King Threadfin caught were released (Figure 24B). Boat-based fishing accounted for the vast majority (94%) of the catch (Figure 24C), virtually all of which was taken by line fishing (Figure 24D). King Threadfin were taken primarily in estuarine waters (84%), with low catches in inshore waters (Figure 24E). Catches peaked in the April-June quarter before declining to their lowest level in the July-September quarter (Figure 24F).

Figure 24. Characteristics of the recreational fishery for King Threadfin in the Territory during 2018 to 2019 by non-Aboriginal Territory residents aged 5 years and older:

- A) proportion (%) of the total catch (numbers) by fishing zone
- B) total numbers kept and released
- C) total catch (numbers) by boat and shore-based fishing activities
- D) total catch (numbers) by fishing method
- E) total catch (numbers) by water body fished
- F) seasonality in the catch (numbers).



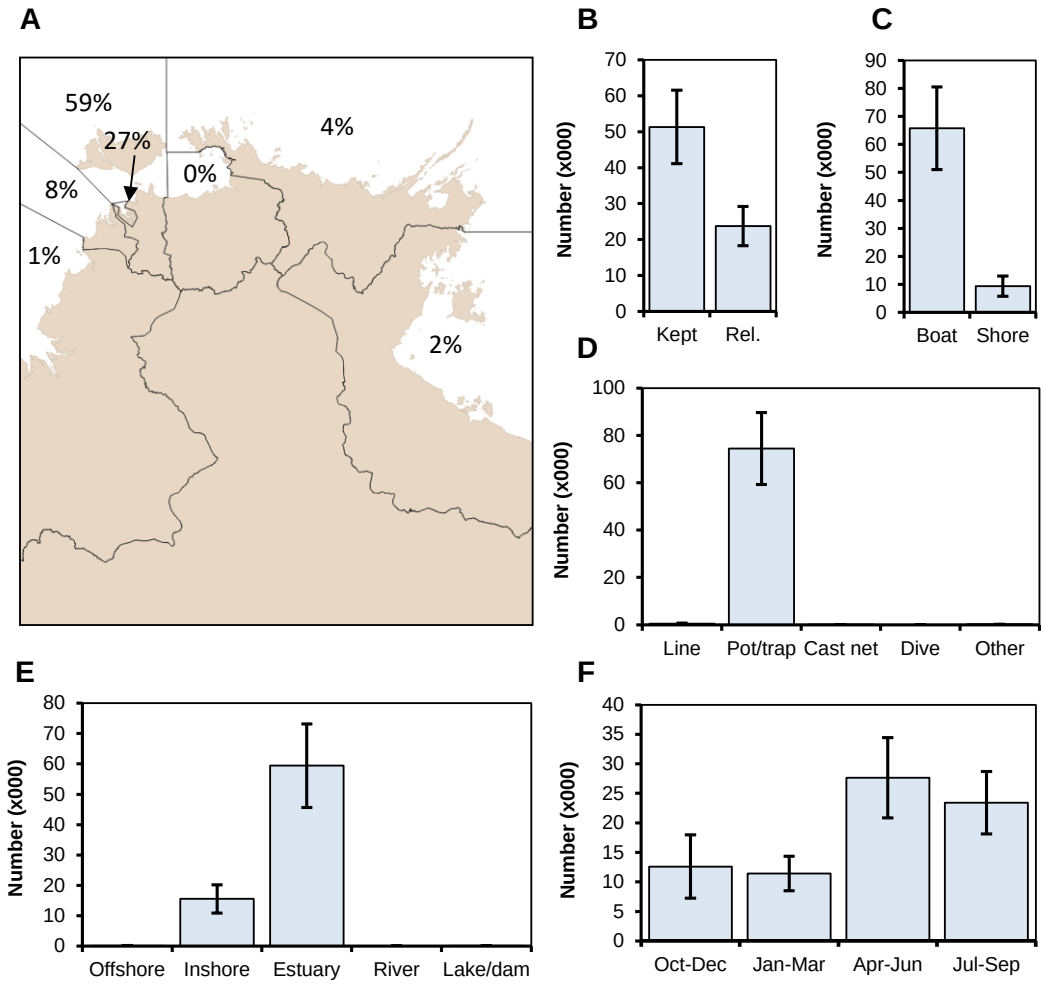
Note: Error bars represent one standard error

7.10. Mud Crabs

Mud Crabs, inclusive of the Orange Mud Crab (*Scylla* spp), were the dominant crustacean group taken by Territory recreational fishers, with an estimated total catch of 75,109 individuals. Catches were concentrated in Darwin Surrounds and Darwin Harbour, these zones collectively accounting for 86% of the total catch (Figure 25A). Over two-thirds of the mud crab catch was retained (Figure 25B). Boat-based fishing accounted for the vast majority (88%) of the catch (Figure 25C), virtually all of which was taken using pots or traps (Figure 25D). The catch was primarily taken in estuarine waters (79%), with inshore waters accounting for the remainder (Figure 25E). Catches peaked in the latter two quarters (April to September), this period accounting for two-thirds of the annual catch (Figure 25F).

Figure 25. Characteristics of the recreational fishery for mud crab in the Territory during 2018 to 2019 by non-Aboriginal Territory residents aged five years and older:

- A) proportion (%) of the total catch (numbers) by fishing zone
- B) total numbers kept and released
- C) total catch (numbers) by boat and shore-based fishing activities
- D) total catch (numbers) by fishing method
- E) total catch (numbers) by water body fished
- F) seasonality in the catch (numbers).



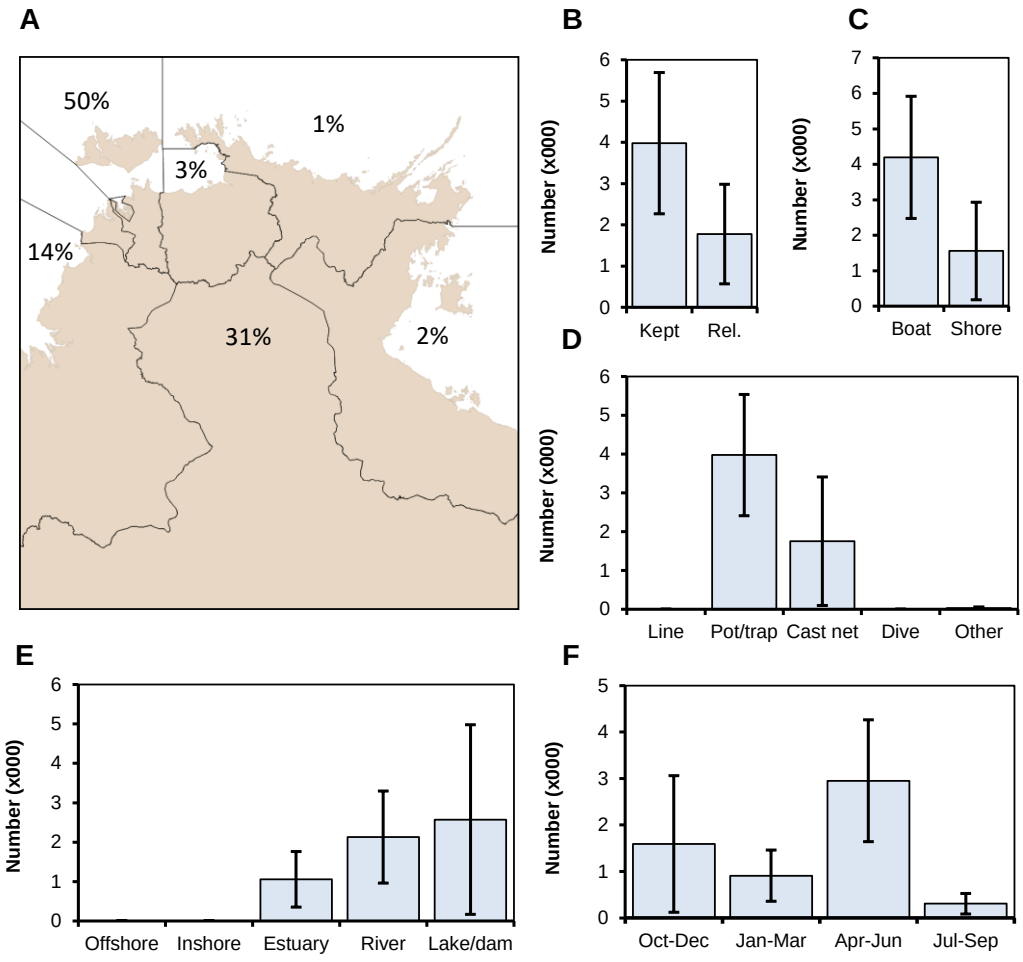
Note: Error bars represent one standard error

7.11. Freshwater prawns

The recreational catch of freshwater prawns (*Macrobrachium* spp), also known as cherabin, was estimated to be 5,757 individuals during 2018 to 2019. However, as the estimate was associated with high relative standard error (48%), it is considered imprecise and should be treated with caution. Most of the reported catch was taken from Darwin Surrounds (50%) and Central Inland (31%) zones. The West Coast (14%) was of secondary importance (Figure 26A). Most (70%) of the freshwater prawns were retained (Figure 26B). Catches were mainly taken by boat-based fishing (73%) (Figure 26C) using pots or traps and cast nets (Figure 26D). Catches were primarily taken in freshwater, more or less equally between rivers and lakes/dams (Figure 26E). Highest catches were taken in the April-June period (51%), with lowest catches reported in the July-September quarter (Figure 26F).

Figure 26. Characteristics of the recreational fishery for freshwater prawns in the Territory during 2018 to 2019 by non-Aboriginal Territory residents aged 5 years and older

- A) proportion (%) of the total catch (numbers) by fishing zone
- B) total numbers kept and released
- C) total catch (numbers) by boat and shore-based fishing activities
- D) total catch (numbers) by fishing method
- E) total catch (numbers) by water body fished
- F) seasonality in the catch (numbers).



Note: Error bars represent one standard error

8. Regional fisheries

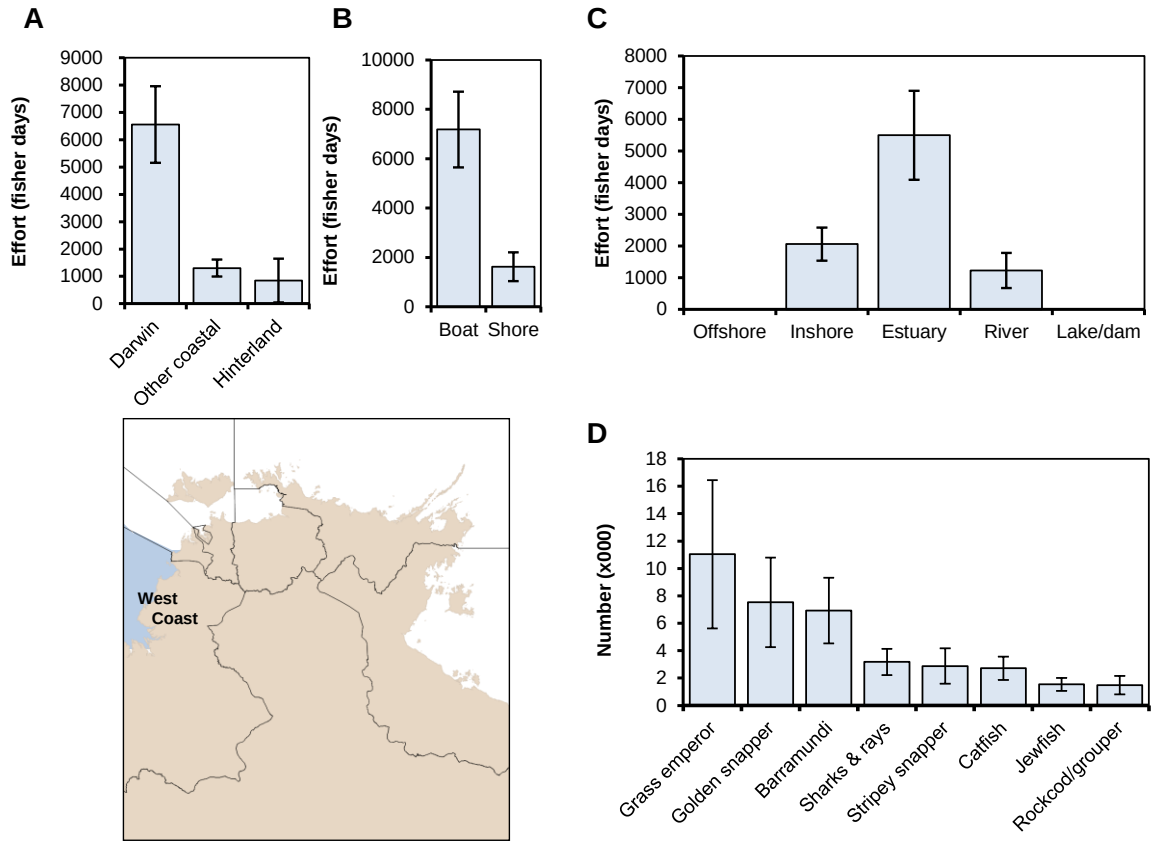
In this section, fishing activity (effort) within the main Fishing Zones (refer Figure 5) is evaluated in the context of where fishers reside (Residential Strata, Figure 2), providing insight into the significance of effort derived from fishers residing outside the areas concerned, along with platform and water body fished, and overall catch composition. Detailed information on catch and effort by Fishing Zone is provided in Appendix 7. Catch and effort information was provided as part of the Diary Survey and has been expanded to represent the fishing activity undertaken by the non-Aboriginal resident population of the Territory aged 5 years and older during the period October 2018 to September 2019.

8.1. West Coast

West Coast fishing activity was primarily attributable to Darwin residents (75%), with Other Coastal residents (15%) accounting for much of the remainder (Figure 27A). Fishing was primarily boat-based (82%) (Figure 27B) and concentrated in estuarine (63%) and inshore waters (23%) (Figure 27C). Grass Emperor, Golden Snapper and Barramundi were the top 3 species by number, with sharks and rays, Stripey Snapper and catfish taken in relatively low numbers (Figure 27D).

Figure 27. Characteristics of the West Coast recreational fishery based on 2018 to 2019 fishing activity by non-Aboriginal Territory residents aged 5 years and older:

- A) fishing effort (fisher days) based on residential stratum
- B) effort (fisher days) by platform
- C) effort (fisher days) by water body type
- D) total catch (numbers) for the key species.



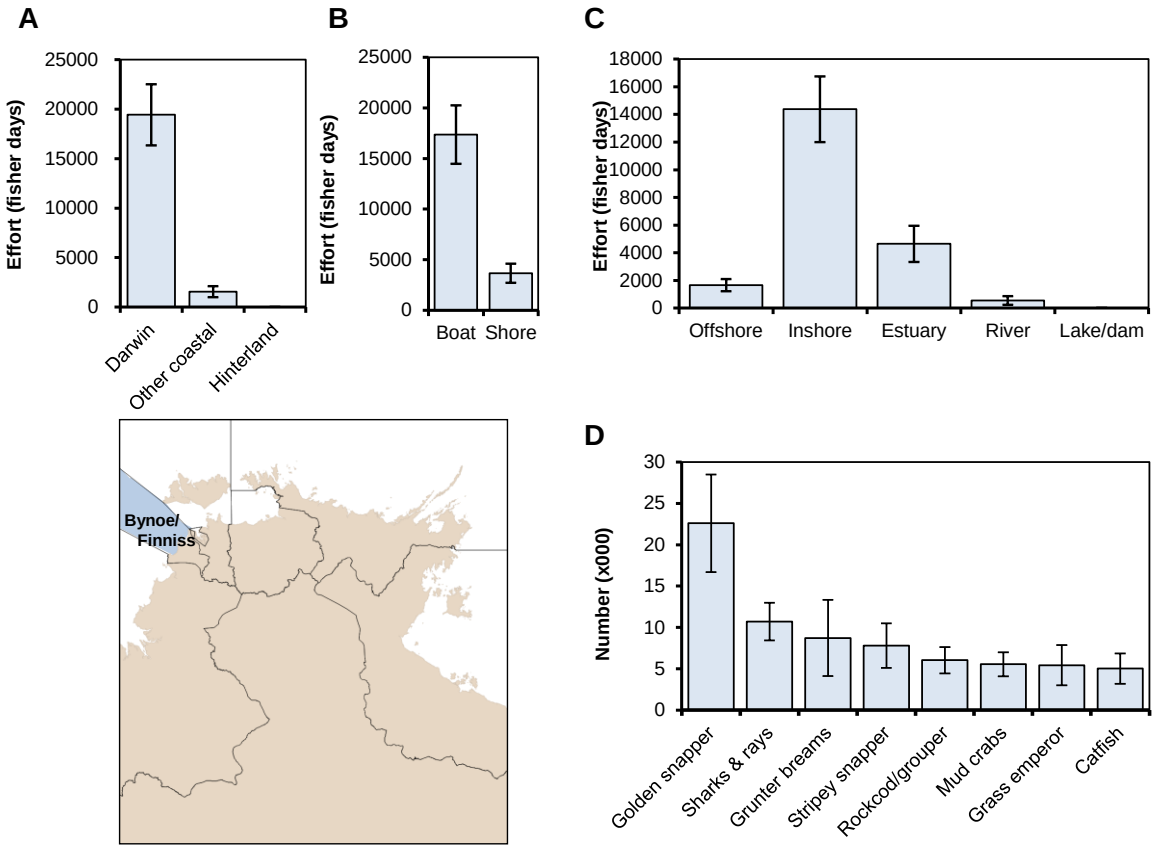
Note: Error bars represent one standard error

8.2. Bynoe/Finniss Area

Darwin residents accounted for the vast majority (93%) of the fishing activity in the Bynoe/Finniss Area, with Other Coastal residents accounting for the remainder (Figure 28A). Boat-based fishing (83%) dominated the effort (Figure 28B), most of which was carried out in inshore waters (68%), with estuarine and offshore waters of secondary importance (Figure 28C). Golden Snapper was the main species caught followed by sharks, grunter breams and Stripey Snapper (Figure 28D).

Figure 28. Characteristics of the Bynoe/Finniss Area recreational fishery based on 2018 to 2019 fishing activity by non-Aboriginal Territory residents aged 5 years and older:

- A) fishing effort (fisher days) based on residential stratum
- B) effort (fisher days) by platform
- C) effort (fisher days) by water body type
- D) total catch (numbers) for the key species.



Note: Error bars represent one standard error

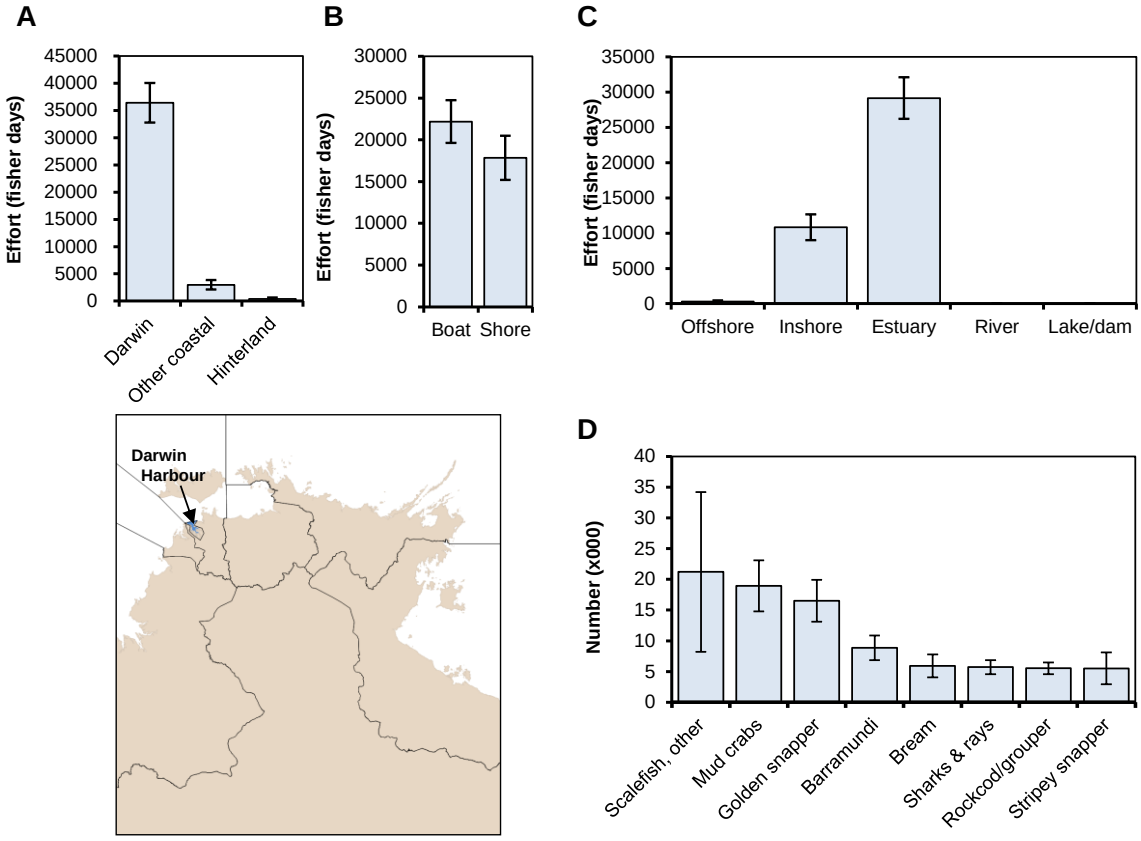
8.3. Darwin Harbour

Darwin residents accounted for almost all (92%) of the fishing effort in Darwin Harbour, with a minor contribution from residents of the Other Coastal stratum (Figure 29A). The split between boat and shore-based effort was relatively close, with slightly more boat-based effort (55%) (Figure 29B). Fishing effort was concentrated in estuarine (72%) and, to a lesser extent (27%), inshore waters (Figure 29C). Mud Crabs and Golden Snapper were the main species caught, followed by Barramundi and a range of other species (Figure 29D). The fact that the 'Scalefish, other' group collectively represented the highest number

of individuals caught (albeit with high uncertainty) suggests a wide diversity of scalefish species are taken by recreational fishers within Darwin Harbour. Garfish were a key contributor to this scalefish group.

Figure 29. Characteristics of the Darwin Harbour recreational fishery based on 2018 to 2019 fishing activity by non-Aboriginal Territory residents aged 5 years and older:

- A) fishing effort (fisher days) based on residential stratum
- B) effort (fisher days) by platform
- C) effort (fisher days) by water body type
- D) total catch (numbers) for the key species.



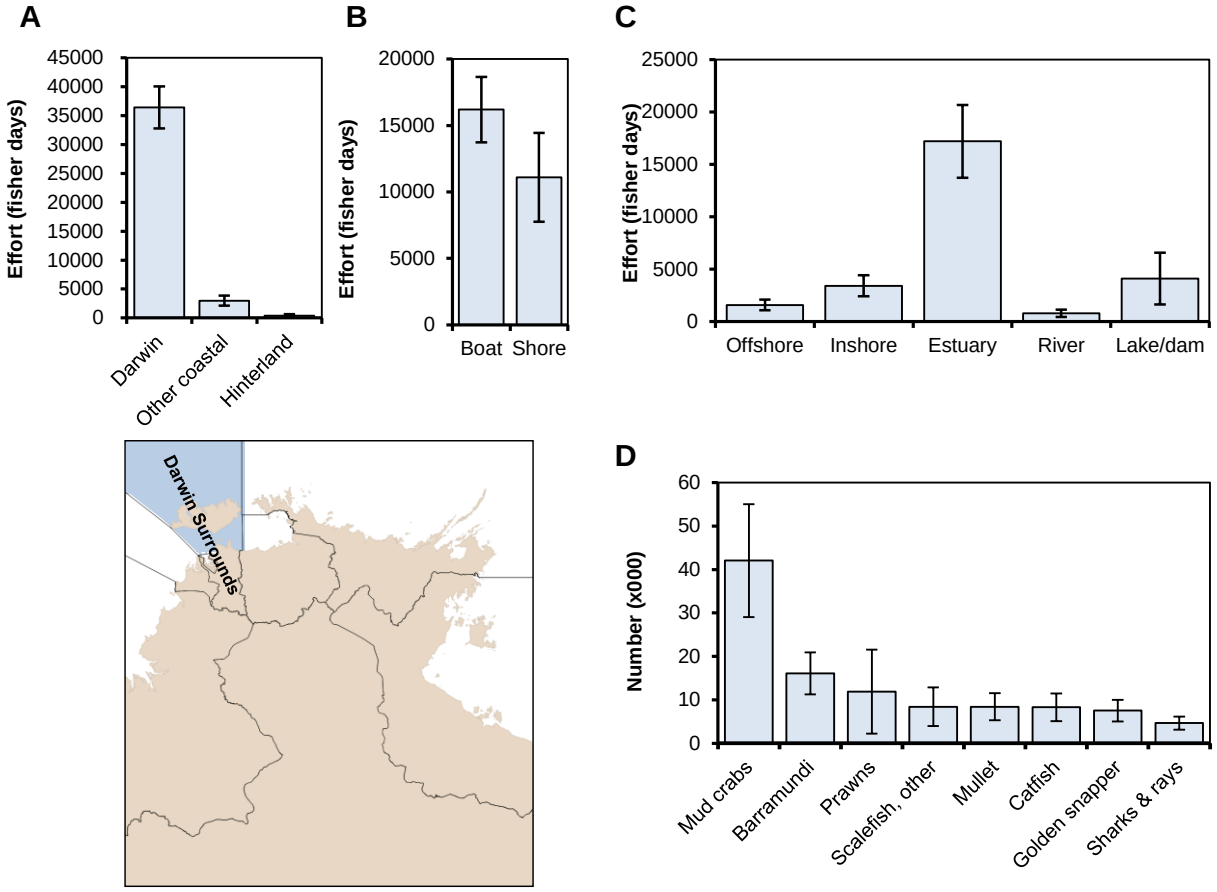
Note: Error bars represent one standard error

8.4. Darwin Surrounds

The vast majority of the fishing effort in the Darwin Surrounds zone was attributable to the activity of Darwin residents (87%), with Other Coastal residents contributing almost all the remainder (Figure 30A). Boat-based effort (55%) dominated (Figure 30B) with estuarine waters attracting the bulk of the effort (63%), followed by lake/dam (15%) and inshore (13%) waters (Figure 30C). Mud Crabs dominated the catch by numbers, with Barramundi, prawns, mullet, catfish and Golden Snapper of secondary importance (Figure 30D).

Figure 30. Characteristics of the Darwin Surrounds recreational fishery based on 2018 to 2019 fishing activity by non-Aboriginal Territory residents aged 5 years and older:

- A) fishing effort (fisher days) based on residential stratum
- B) effort (fisher days) by platform
- C) effort (fisher days) by water body type
- D) total catch (numbers) for the key species.



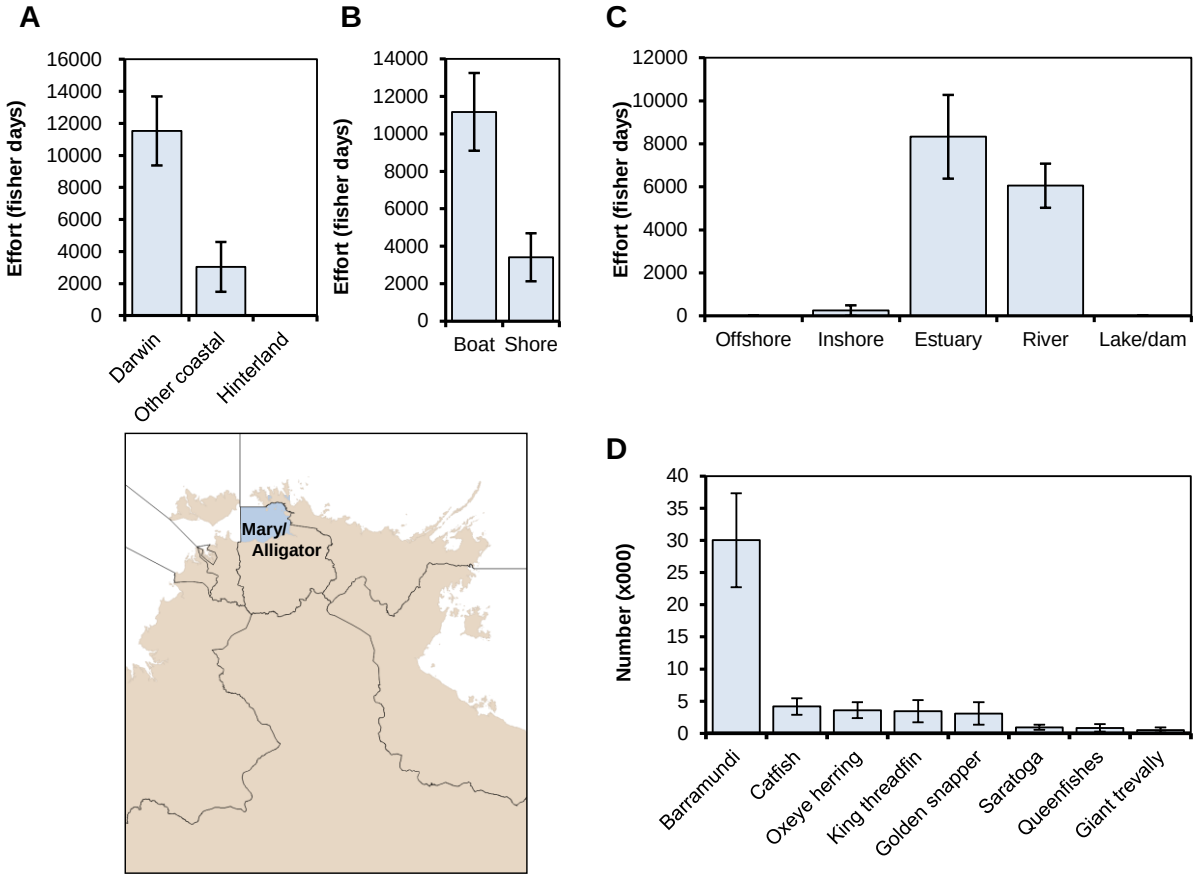
Note: Error bars represent one standard error

8.5. Mary/Alligator Rivers

The bulk (79%) of the Mary/Alligator Rivers zone fishing effort was attributed to the activity of Darwin residents, with Other Coastal residents contributing the remainder (Figure 31A). Fishing was mostly undertaken from boats (77% of the total effort) (Figure 31B) and was primarily directed in estuarine (57%) and freshwater (41%) waters (Figure 31C). Barramundi clearly dominated the catch, with more than 7 times the number of fish caught when compared with the next most common species (catfish) (Figure 31D).

Figure 31. Characteristics of the Mary/Alligator Rivers recreational fishery based on 2018 to 2019 fishing activity by non-Aboriginal NT residents aged five years and older:

- A) fishing effort (fisher days) based on residential stratum
- B) effort (fisher days) by platform
- C) effort (fisher days) by water body type
- D) total catch (numbers) for the key species.



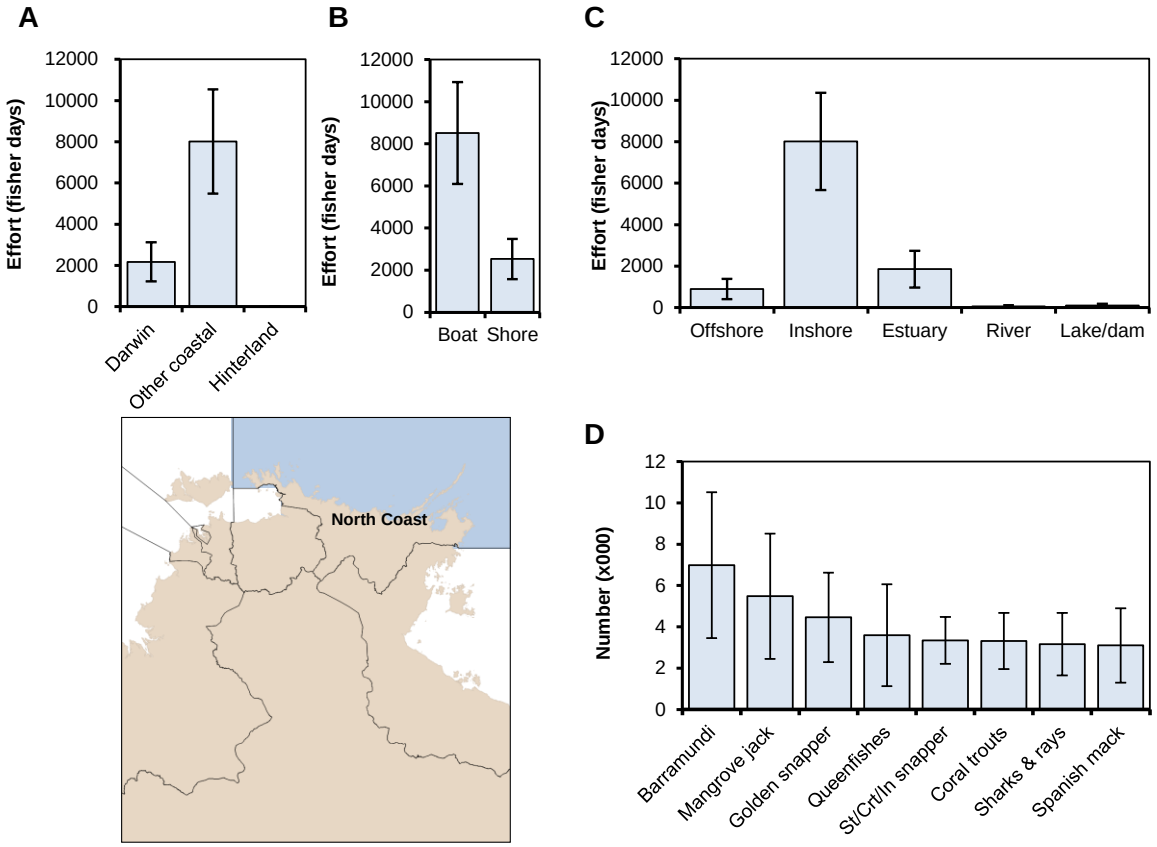
Note: Error bars represent one standard error

8.6. North Coast

Other Coastal stratum residents were responsible for most of the North Coast fishing activity (79%), Darwin residents accounted for the remainder (Figure 32A). Fishing occurred mostly from boats (77%), as opposed to shore-based (Figure 32B), and was concentrated in inshore waters (73%), followed by estuarine (17%) and offshore waters (8%) (Figure 32C). Barramundi was the main species caught, with various tropical snapper species, Queenfish, coral trouts, sharks and rays, and Spanish Mackerel of lesser significance (Figure 32D).

Figure 32. Characteristics of the North Coast recreational fishery based on 2018 to 2019 fishing activity by non-Aboriginal Territory residents aged 5 years and older:

- A) fishing effort (fisher days) based on residential stratum
- B) effort (fisher days) by platform
- C) effort (fisher days) by water body type
- D) total catch (numbers) for the key species.



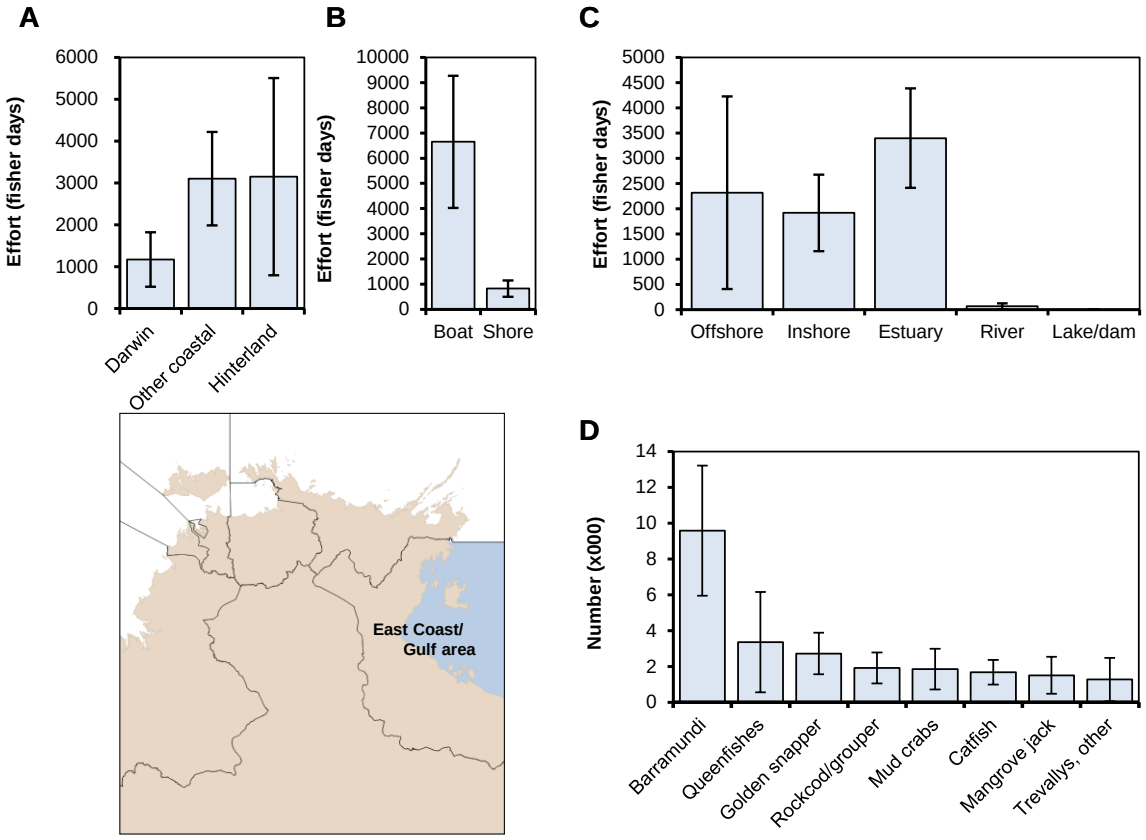
Note: Error bars represent one standard error

8.7. East Coast/Gulf Area

Fishing activity in the East Coast/Gulf Area was mainly due to residents of the Hinterland and Other Coastal (collectively 84%) strata (Figure 33A), primarily from boats (89% of the total fisher days) (Figure 33B). Just under half of the fishing effort occurred in estuarine waters, followed by activity in offshore and inshore waters (Figure 33C). Barramundi dominated the catch, Queenfish, Golden Snapper, rockcod/groupers and Mud Crabs were of secondary importance (Figure 33D).

Figure 33. Characteristics of the East Coast/Gulf Area recreational fishery based on 2018 to 2019 fishing activity by non-Aboriginal Territory residents aged 5 years and older:

- A) fishing effort (fisher days) based on residential stratum
- B) effort (fisher days) by platform
- C) effort (fisher days) by water body type
- D) total catch (numbers) for the key species.



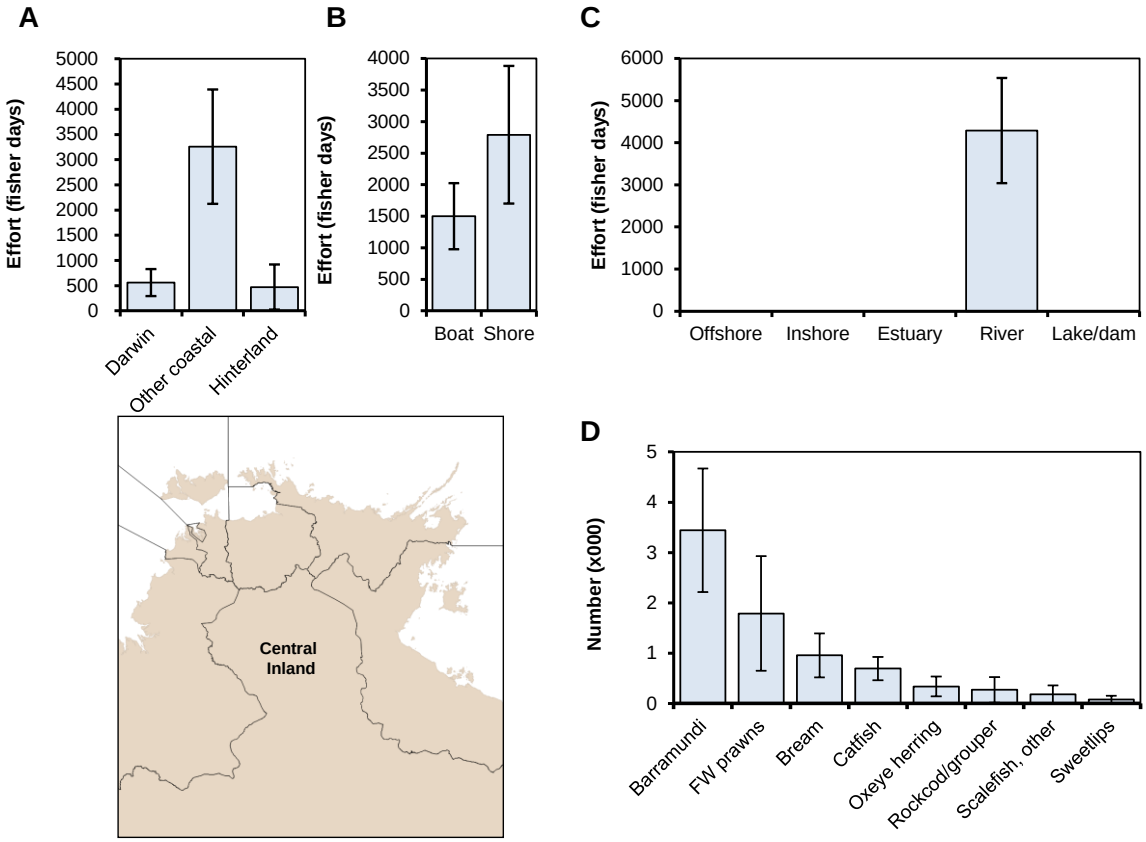
Note: Error bars represent one standard error

8.8. Central/Inland

Residents of the Other Coastal stratum accounted for most (76%) of Central/Inland zone fishing activity (Figure 34A). Fishing effort was mainly shore-based effort (65%) (Figure 34B) and undertaken exclusively in freshwater rivers (Figure 34C). Barramundi was the main species caught, with freshwater prawns, bream and catfish of lesser importance (Figure 34D).

Figure 34. Characteristics of the Central/Inland recreational fishery based on 2018 to 2019 fishing activity by non-Aboriginal Territory residents aged 5 years and older:

- A) fishing effort (fisher days) based on residential stratum
- B) effort (fisher days) by platform
- C) effort (fisher days) by water body type
- D) total catch (numbers) for the key species.



Note: Error bars represent one standard error

9. Expenditure

Fishing-related expenditure for those households that reported recreational fishing activity during the diary phase was collected as part of the Wash-up Survey. Expenditure data are presented as expanded estimates (adjusted for non-response, after Lyle *et al*., 2010, with the inclusion of the Phase 3 calibration for Wash-up Survey data) and represent the fishing-related expenditure of the non-Aboriginal resident population of the Territory aged 5 years and older who *fished* recreationally in the Territory between October 2018 and September 2019.

Fishing-related goods and services were classified into 18 reporting categories. Respondents were asked to estimate the proportion of the expenditure directly attributable to recreational fishing, as opposed to other uses or benefits. Furthermore, expenditure was classified as having occurred within or outside the Territory, based on information provided by respondents.

Territory residents spent an estimated $52 million on goods and services relevant to recreational fishing during 2018 to 2019, of which almost $50 million (95%) was directly attributable to recreational fishing (Table 10). Darwin residents accounted for 75% of the total attributable expenditure, with Other Coastal residents 19% and Hinterland residents 6%. Overall, recreational fishers spent an average of over

$1,950 per person during 2018 to 2019, with higher average expenditure for Other Coastal and Hinterland residents (however, a high standard error applies to the latter). The vast majority of attributable expenditure (over $48 million or 98%) was transacted within the Territory as opposed to interstate or overseas, with an annual average of over $1,900 per fisher spent within the Territory.

Detailed expenditure for the various fishing-related goods and services is provided in Table 11. Annual expenditure on boats and trailers represented the largest expenditure category, accounting for over $32 million of attributable expenditure (65% of the total), equivalent to an average of $1,263 per fisher, per year. Boat and trailer purchases (capital items) and maintenance accounted for 87% of this expenditure. Travel associated with fishing (vehicle travel costs) was the second highest expenditure category at over $5 million (11%) and an average of $211 per fisher per year. Attributable expenditure on fishing and diving gear was in the order of $3.3 million or $122 per fisher, per year.

Expenditure on fishing-related items outside the Territory was highest in absolute terms for boats and trailers at $0.7 million, or 3% of the total expenditure in this category (Table 11). With the exceptions of camping equipment ($104,000 or 17% of attributable expenditure purchased outside the Territory), fishing gear and tackle ($213,000 or 7%) and fishing books and magazines ($11,500 or 11%), virtually all expenditure (> 97%) on other goods and services occurred within the Territory.

Table 10. Annual total and average expenditure (total, attributable and Territory-based) by residential stratum during 2018 to 2019, by non-Aboriginal Territory resident fishers aged 5 years and older

Residential stratum	Number of fishers	Total expenditure		Attributable expenditure				Territory-based (attributable expenditure)			
		Total	SE	Total	SE	% attrib.	Average per fisher	Total	SE	% NT	Average per fisher
Darwin	21,323	37,493,083	8,224,615	37,245,092	8,211,377	99.3	1,747	36,282,402	8,171,077	97.4	1,702
Other coastal	3,765	11,756,703	2,673,743	9,624,506	1,676,759	81.9	2,556	9,517,460	1,654,796	98.9	2,528
Hinterland	372	***2,861,967***	***1,842,344***	***2,770,513***	***1,793,804***	96.8	7,451	***2,689,189***	***1,734,131***	97.1	7,233
Total	25,460	52,111,753	8,842,365	49,640,112	8,570,645	95.3	1,950	48,489,051	8,515,402	97.7	1,905

Note: SE is standard error; values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households recorded expenditure from the stratum

Table 11. Annual total and average expenditure (total, attributable and Territory-based) by expenditure category/item during 2018 to 2019, by non-Aboriginal Territory resident fishers aged 5 years and older

Expenditure category	Expenditure item	Total expenditure		Attributable expenditure				NT-based (attributable expenditure)			
		Total (S)	SE	Total (S)	SE	% attrib.	Average per fisher	Total ($)	SE	% Territory	Average per fisher
Accommodation	Accommodation/camping fees	1,343,630	323,287	1,342,869	323,283	99.9	53	1,342,869	323,283	100.0	53
	Real estate purchase/maintenance (e.g. holiday house)	***172,097***	***111,106***	***172,097***	***111,106***	100.0	7	***172,097***	***111,106***	100.0	7
Bait/berley/ice	Bait/berley	706,177	131,473	706,177	131,473	100.0	28	706,177	131,473	100.0	28
	Ice	423,907	68,101	359,137	56,101	84.7	14	359,137	56,101	100.0	14
Boat/trailer	Boat/motor/trailer purchase and maintenance (incl. equipment, insurance)	27,886,922	7,326,385	27,847,675	7,325,959	99.9	1,094	27,132,620	7,300,389	97.4	1,066
	Boat – fuel /oil	4,138,166	732,597	4,059,642	723,985	98.1	159	4,059,642	723,985	100.0	159
	Boat ramp/other access fees	***259,386***	***170,120***	***259,386***	***170,120***	100.0	10	***259,386***	***170,120***	100.0	10
Camping gear	Caravan/camping equipment purchase and maintenance (incl. insurance)	***2,686,473***	***2,047,603***	*611,659*	*177,904*	22.8	24	*507,126*	*145,129*	82.9	20
Clothing	Specialised clothing (e.g. wet weathers, waders)	1,449,763	205,588	1,407,928	198,798	97.1	55	1,377,331	195,817	97.8	54
Membership fees	Membership fees (fishing club membership, competitions)	***358,924***	***167,551***	***358,037***	***167,529***	99.8	14	***349,546***	***167,339***	97.6	14

Expenditure category	Expenditure item	Total expenditure		Attributable expenditure				NT-based (attributable expenditure)			
		Total ($)	SE	Total ($)	SE	% attrib.	Average per fisher	Total ($)	SE	% Territory	Average per fisher
Fishing/diving gear	Fishing gear/tackle - capital/maintenance	3,255,622	569,821	3,255,622	569,821	100.0	128	3,042,163	533,831	93.4	119
	Dive gear - capital/maintenance	***78,202***	***39,621***	***78,202***	***39,621***	100.0	3	***78,202***	***39,621***	100.0	3
Travel	Vehicle - kms travelled (@ 68 cents/km)	5,532,228	755,298	5,367,633	696,672	97.0	211	5,367,633	696,672	100.0	211
Other	Fishing books/magazines/maps/etc	*104,585*	*30,636*	*102,109*	*30,508*	97.6	4	*90,598*	*29,529*	88.7	4
	Fishing-related gifts (incl vouchers)	1,749,297	593,947	1,748,210	593,927	99.9	69	1,708,406	593,145	97.7	67
	Other fishing-related purchases (e.g. boat hire, charter fees)	**1,063,490**	**490,771**	**1,060,847**	**490,639**	99.8	42	**1,033,236**	**489,863**	97.4	41
	Fishing-related equipment for motor vehicle (e.g. rod racks)	***500,162***	***298,441***	***500,162***	***298,441***	100.0	20	***500,162***	***298,441***	100.0	20
	Contributions (e.g. payments to cover fishing costs)	*402,722*	*136,249*	*402,722*	*136,249*	100.0	16	*402,722*	*136,249*	100.0	16
Total		52,111,753	8,842,365	49,640,112	8,570,645	95.3	1,950	48,489,051	8,515,402	97.7	1,905

SE is standard error; values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households recorded expenditure for the item

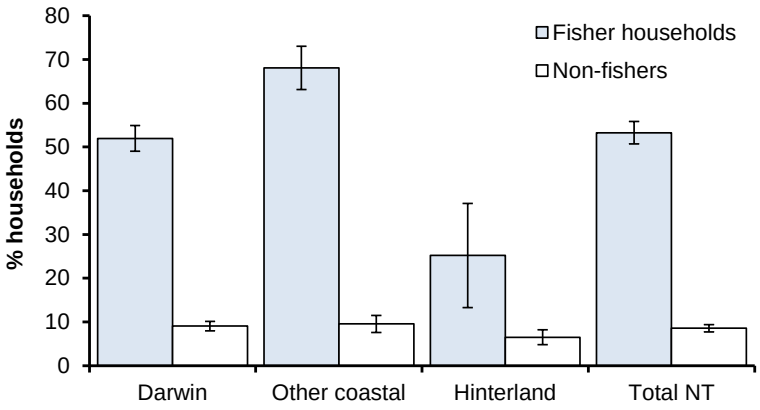
10. Boat ownership and vessel characteristics

Boat ownership has been assessed for all Territory households based on the Screening Survey. However, detailed vessel profiling information (length, main propulsion method, usage for fishing, navigational and fishing aids, mode of storage and market value) was only assessed for households reporting fishing activity during 2018 to 2019, as part of the Wash-up/Attitudinal Survey. The former information has been expanded to represent boat ownership for the resident, non-Aboriginal population as at September 2018, whereas the latter applies to the population of recreational fishers as at October 2019 and provides a detailed assessment of the Territory recreational fishing fleet relevant to 2018 to 2019.

10.1. Household Boat Ownership

Details of boat ownership are provided in Appendix 9 and summarised in Figure 35. As at September 2018, an estimated 13,096 Territory households owned at least one boat, representing an overall household boat ownership rate of 23.2%. Boat ownership rates for households containing fishers were, however, significantly greater than those for non-fisher households, with over half of all fisher households (53.3%; SE 2.6%) owning a boat compared with just 8.6% (SE 0.9%) of non-fisher households. There was some variability in boat ownership based on residential stratum, with over two-thirds of fisher households in the Other Coastal stratum, just over half of the Darwin stratum and only 25% of the Hinterland stratum owning boats. Boat ownership rates amongst non-fisher households were consistently low (6-10%) for each of the residential strata.

Figure 35. Proportion of fisher and non-fisher households reporting boat ownership at September 2018 by residential stratum, that is, households containing one or more non-Aboriginal Territory residents



Note: Error bars represent one standard error

Boat ownership for fisher households' *active* during 2018 to 2019, as determined by the Wash-up Survey, was 57.8% (SE 3.9%). This represented a slight, but non-significant, increase in the boat ownership rate,, compared with households that had fished in 2017-18 (refer Figure 35). However, as there had been an apparent decline in the number of households that fished during 2018 to 2019 (13,104; SE 604), compared with 2017-18 (18,493; SE 598), the actual number of boat-owning (active) fisher households was lower in absolute terms (7,577; SE 507 compared with 9,851; SE 477).

The total number of boats owned by fisher-households as at October 2019 was estimated as 9,138 (SE 689) vessels, equivalent to an average of 1.21 vessels per boat-owning fisher-household. These recreational vessels were estimated to have a total market value of $213,322,396 (SE $25,540,262), an

average of $23,345 per vessel. Based on the proportional use of each vessel for recreational fishing, the attributed value as recreational fishing vessels was determined to be $202,057,409 (SE $24,164,715).

10.2. Vessel characteristics

10.2.1. Size and usage for recreational fishing

Recreational vessels were characterised based on propulsion (that is, powered by a motor, row or paddle only, or mainly sail), vessel size and use for recreational fishing. Almost 95% of all recreational boats owned by active fisher households were powered vessels, two-thirds of which ranged between 4m and 5.9m in length (Table 12). Larger, offshore capable vessels accounted for a further 30% of the powered vessels. Row or paddle and sailing vessels constituted a very minor component of the recreational vessel fleet.

Table 12. Numbers of recreational boats owned by households containing one or more non-Aboriginal Territory resident fishers at October 2019 by overall length (grouped) and main propulsion method

Overall length	Power			Row/paddle			Sail			All boats		
	Number	SE	%	Number	SE	%	Number	SE	%	Number	SE	%
< 4m	*270*	*96*	3.1	***234***	***113***	63.2	***104***	***101***	86.7	608	179	6.6
4-4.9m	2,576	340	29.8	***90***	***59***	24.3			-	2,666	344	29.2
5-5.9m	3,130	360	36.2	***17***	***16***	4.5			-	3,147	361	34.4
6-6.9m	1,881	275	21.7	***21***	***20***	5.6			-	1,901	275	20.8
7m plus	*791*	*187*	9.1	***9***	***9***	2.4	***16***	***15***	13.3	*815*	*188*	8.9
Total	8,649	651		*370*	*130*		***120***	***103***		9,138	689	

Note: SE is standard error; values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households reporting boat ownership

Out of the total number of boats owned by fisher households, an estimated 8,440 (92%) were used for recreational fishing during 2018 to 2019, with 6,606 (72%) used exclusively for fishing (Table 13). Usage rates for recreational fishing were over 95% for powered vessels but below 50% for row/paddle and sail boats. Very few row/paddle boats were used exclusively for recreational fishing.

Table 13. Numbers of recreational boats by propulsion method and proportion of usage for recreational fishing during 2018 to 2019 that were owned by Territory households containing one or more non-Aboriginal resident fisher.

Usage for fishing	Power			Row/paddle			Sail			All boats		
	Number	SE	%	Number	SE	%	Number	SE	%	Number	SE	%
Nil	380	123	4.4	***214***	***105***	57.7	***104***	***101***	86.7	*697*	*217*	7.6
<50%	***61***	***47***	0.7	***55***	***54***	14.9	***16***	***15***	13.3	***132***	***73***	1.4
50-99%	1,666	270	19.3	***36***	***24***	9.8				1,702	271	18.6
100%	6,541	558	75.6	***65***	***50***	17.6				6,606	559	72.3

Note: SE is standard error; values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households reporting boat ownership

10.2.2. Vessel storage

The vast majority (98%) of all powered vessels used for recreational fishing in the Territory during 2018 to 2019 were trailered, whereas most row or paddle boats used for fishing were primarily stored as 'car toppers'. There was only a small number of fishing vessels held in marinas or on moorings or stored on the shore (Table 14).

Table 14. Numbers of recreational fishing owned by households containing one or more non-Aboriginal NT residents who fished in 2018 to 2019 by main mode of storage, and availability of echo sounder/fish finder, global positioning system (GPS) and electric winches.

	Power			Row/Paddle			Sail		
	Number	SE	%	Number	SE	%	Number	SE	%
Storage									
Trailer	8,124	610	98.3			-			
Car topper	15	15	0.2	137	75	87.5			
Mooring/marina	70	66	0.8			-	16	15	100
Shore-based	59	57	0.7	20	19	12.5			
Echo sounder									
Yes	7,485	606	90.5	17	16	10.7			
No	784	172	9.5	140	76	89.3	16	15	100
GPS									
Yes	6,826	550	82.6	17	16	10.7			
No	1,442	258	17.4	140	76	89.3	16	15	100
Electric winches									
Yes	554	184	6.7			-			
No	7,714	581	93.3	156	77	100	16	15	100

Note: SE is standard error; values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households reporting boat ownership

10.2.3. Electronic fishing aids

Of the powered fishing vessels, 90% had echo sounders (fish finders), 83% had global positioning systems (GPS), while electric winches or reels were relatively rare, present on less than 10% of all recreational fishing vessels (Table 14). Echo sounders and GPS electronic aids are used to assist in fish location and navigation while electric winches can be used to assist in retrieving fishing gear from deep water. Not unexpectedly, only a small proportion of the row/paddle boats had echo sounders and GPS units available.

11. Wash-up/attitudinal survey

11.1. Fishing constraints and opportunities

As noted in Sect. 3.2, approximately a third of diarist households reported no fishing activity during the diary period, despite expressing an expectation to go fishing at screening. To gain a better understanding of the reasons or constraints to fishing, these respondents were asked to identify the main reason that their household did not go fishing during 2018 to 2019. Factors related to work/business or home/family (typically associated with lack of time or changed situation) were collectively cited as reasons for 47% of responding households, other personal factors (preference for alternative activities or health/fitness

issues) accounted for a further 21% of responses (Table 15). Location and access factors (such as having relocated to a different area or lost access to a boat) or social (such as fishing partner stopped fishing) together accounted for 17%, while weather, costs and fishing quality each emerged as minor constraints.

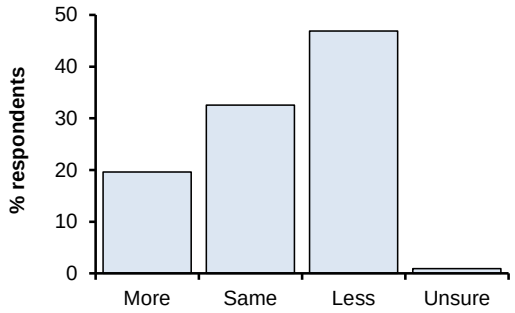
Table 15. Main reasons cited by non-fishing diarist households for not fishing in the Territory during 2018 to 2019, based on 179 responding households

Reason	Number of households	%
Work/business related	60	33.5
Home/family related	24	13.4
Personal preference	24	13.4
Personal health/fitness	13	7.3
Social factors	8	4.5
Location/access related	23	12.8
Weather/environmental factors	12	6.7
Cost related	6	3.4
Fishing quality related	3	1.7
Other	1	0.6
No reason given	5	2.8

For those diarist households that did report recreational fishing during 2018 to 2019, respondents were asked whether they had fished more, less, or about the same number of days during the diary period (2018 to 2019), compared to the previous 12 months (2017-18). This question was posed separately to each member of the household (typically answered by the main fisher on behalf of other household members). For those household members identified as having fished more or fished less than during the previous 12 months, the main reason for this change was also canvassed.

Overall, one-third of diarists reported fishing about the same number of days during 2018 to 2019 as in the previous 12 months (Figure 36). Of the remainder, however, more than twice as many diarists reported fishing less (47%) than those who fished more (20%), relative to 2017-18.

Figure 36. Proportion (%) of diarists who reported fishing more, less, or about the same during 2018 to 2019, relative to 2017-18. Sample based on 657 recreational fishers from 383 responding households



Consistent with the situation for non-fishers, considerations related to work/business or home/family were the most common factors influencing fishing opportunity, identified as key issues for most (58%) respondents who fished less in 2018 to 2019 (Table 16). Issues related to access, social or weather/environment were relatively less influential factors.

By contrast, 38% of respondents who fished more during 2018 to 2019 cited changed circumstances relating to work or family as providing more opportunity to go fishing (Table 16). Changes in personal preference, access or social factors were also identified as enabling factors for nearly half (47%) of the respondents who did more fishing, collectively having greater relative influence for this group than as constraints for those who fished less.

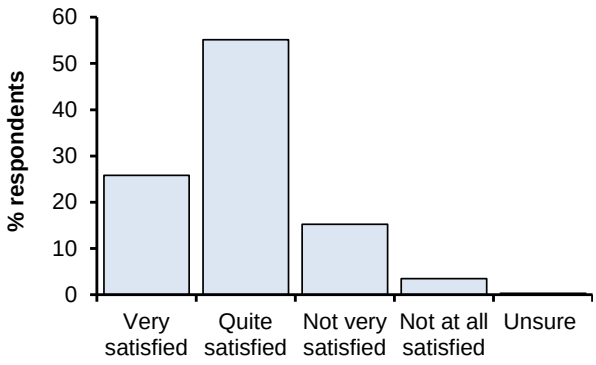
Table 16. Main reasons for fishing less or more during 2018 to 2019 compared to the previous 12 months (2017-18). Sample based on 308 respondents who reported fishing less and 129 who fished more

	Fished less		Fished more	
Reason	Number	%	Number	%
Work/business related	97	31.5	18	14.0
Home/family related	83	26.9	31	24.0
Personal preference	19	6.2	24	18.6
Personal health/fitness	12	3.9	2	1.6
Social factors	22	7.1	15	11.6
Location/access related	37	12.0	22	17.1
Weather/environmental factors	28	9.1	3	2.3
Cost related	6	1.9	2	1.6
Fishing quality related	2	0.6		
Other	1	0.3	8	6.2
No reason given	1	0.3	4	3.1

11.2. Satisfaction with the quality of fishing

Respondents who had fished in the Territory during 2018 to 2019 were asked how satisfied they were with the overall quality of their fishing during that time. Overall, 81% indicated at least some level of satisfaction (very or quite satisfied) with the overall quality of their fishing experiences, whereas 19% indicated general dissatisfaction (not very or not at all satisfied) (Figure 37).

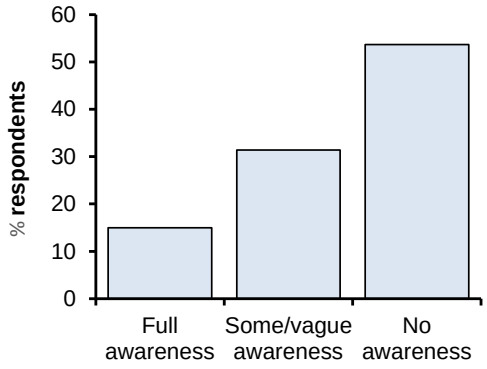
Figure 37. General satisfaction amongst respondents with the quality of their recreational fishing experiences during 2018 to 2019, based on 341 responses



11.3. Australian marine park awareness

Respondents were informed that, in 2018, the Australian Government introduced 6 marine parks in ocean waters more than 5.5km offshore from the Territory coastline, including 3 Habitat Protection Zones. In these zones, certain practices that affect the seafloor are prohibited, such as mining or commercial trawl fishing, but not recreational fishing. More than half (54%) indicated they were unaware of these marine parks, 31% had some vague awareness, while only 15% of respondents reported being fully aware of their existence.

Figure 38 General awareness among respondents of Australian marine parks implemented adjacent to the Territory, based on 341 responses



12. Comparison with previous surveys

12.1. Overview

Information collected in this and the 2009 to 2010 survey (West *et al*., 2012) are comparable since, apart from using different data sources to derive household samples (sourced from the *White Pages* in 2009 and *SamplePages* in 2018), survey methodologies and analytical approaches are consistent. Data are also available from the 2000 to 2001 National Recreational Fishing Survey (NRFS, Henry and Lyle, 2003). However, due to methodological differences, some re-analysis of the latter would be necessary to enable direct comparisons. Specifically, the NRFS data included Aboriginal Territory residents not covered by a separate survey component that assessed Aboriginal fishing activity in coastal communities across northern Australia. Secondly, catch and effort results reported for the Territory include the fishing activity of non-residents as well as residents. Finally, the NRFS, a customised analysis system, has been developed for surveys of this kind and this *RecSurvey* package has been employed in the analysis of subsequent surveys. The NRFS data and population benchmarks would therefore need to be amended to exclude Aboriginal residents, and non-resident fishing activity excluded before re-analysis using the *RecSurvey* package. As discussed in Sect. 1.2 of this report, the amended NRFS data are likely to result in an overall reduction of around 5% in published estimates of the numbers of resident fishers, with follow-on impacts for estimated catch and effort.

Re-analysis of the Territory component of the NRFS is beyond the scope of this study, and, as a consequence, the focus of this section will be a comparison of key data for the 2 most recent surveys unless otherwise indicated.

12.2. Participation

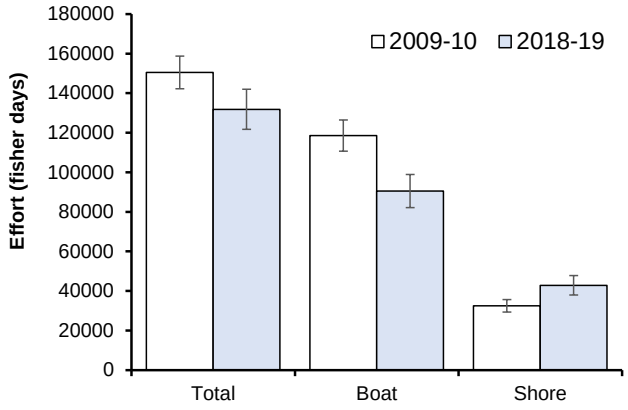
An estimated 31,790 (SE 1211) non-Aboriginal Territory residents aged 5 years and older fished in the Territory during 2008-09 (based on 2009 to 2010 Screening Survey), while 30,538 (SE 1280) persons fished during 2009 to 2010 (based on 2009 to 2010 Diary survey) (West *et al*., 2012). When considered as a proportion of the target population, this represented participation rates of 22.3% in 2008-09 and 21.4% in 2009 to 2010. By contrast, the current survey estimated that 36,962 (SE 1369) residents fished in the Territory during 2017-18 (screening survey), equivalent to 26.7% of the non-Aboriginal resident population, a participation rate almost 20% higher than the equivalent rates for 2008-09 and 2009 to 2010. However, fishing participation during the diary phase was significantly lower, with 25,460 persons or 18.4% of the target population fishing during 2018 to 2019. While reasons for this drop in participation are unclear, there does appear to be some volatility in the numbers of active fishers between years.

Although the NRFS participation data are not directly comparable to the recent surveys since Aboriginal residents were included in the sample population, that survey estimated that 43,932 residents or 31.6% of the Territory population at the time fished during 1999-2000 (Henry and Lyle, 2003). Collectively, the three surveys imply a decline in fishing participation since 2000, from over 30% to about 20% to 25% in recent years. Similar trends in participation have been experienced in most other Australian states, partly linked to important demographic changes (ageing population, urbanisation, and ethnic diversity) that have occurred nationally.

12.3. Fishing effort

During 2009 to 2010 non-Aboriginal residents aged 5 years and older were estimated to have expended 150,502 (SE 8,278) fisher days of effort in the Territory (West *et al*., 2012), slightly, but not significantly, higher (+ 9%) than in 2018 to 2019 (131,792; SE 10,145) (Figure 439). Comparatively, boat-based effort was almost 25% lower during 2018 to 2019, offset by a 32% increase in shore-based effort over 2009 to 2010 levels. Recognising the limitations of any direct comparisons with NRFS data, that survey provided an estimate of 198,256 fisher days of effort for Territory residents fishing in the Territory during 2000 to 2001, about 50% greater than during 2018 to 2019. However, when average days per fisher are considered, there has been a slight but gradual increase over time – 4.5 days in 2000 to 2001, 4.9 days in 2008-09 and 5.2 days in 2018 to 2019.

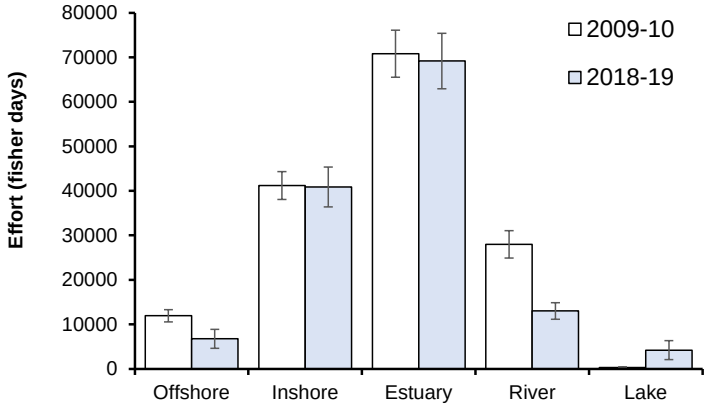
Figure 39. Comparison of fishing effort (fisher days) by platform for the non-Aboriginal resident population of the Territory aged 5 years and older who fished recreationally in the Territory during 2009 to 2010 and 2018 to 2019



Note: Error bars represent one standard error

Considering water body, the main difference in the distribution of fishing effort between 2009 to 2010 and 2018 to 2019 was a reduction both river and offshore effort, otherwise there was very little variation in the effort levels expended in estuarine and inshore waters, the primary focus of the Territory recreational fishery (Figure 40).

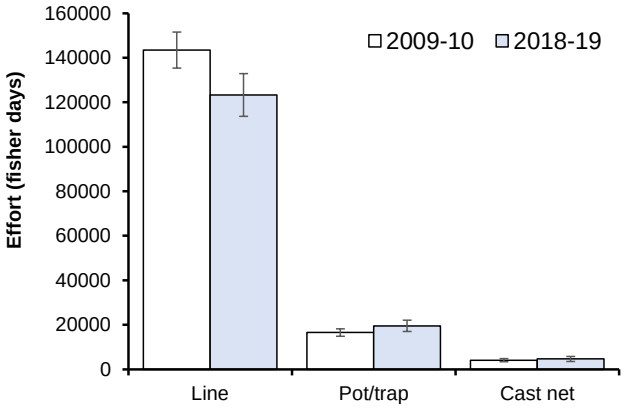
Figure 40. Comparison of fishing effort (fisher days) by water body for the non-Aboriginal resident population of the Territory aged 5 years and older who fished recreationally in the Territory during 2009 to 2010 and 2018 to 2019.



Note: Error bars represent one standard error

Although the difference was non-significant, the main contributor to the lower effort during 2018 to 2019 was lower line fishing activity, there were only minor differences in pot/trap and cast net effort levels (both higher during 2018 to 2019) (Figure 41).

Figure 41. Comparison of fishing effort (fisher days) by method for the non-Aboriginal resident population of the Territory aged 5 years and older who fished recreationally in the Territory during 2009 to 2010 and 2018 to 2019



Note: Error bars represent one standard error

12.4. Catches of key species

During 2009 to 2010 NT recreational fishers caught an estimated 771,126 organisms, 351,539 (46%) of which were retained (West et al., 2012), compared with 622,282 organisms caught during 2018 to 2019, 269,954 (43%) retained. Finfish (scalefish, sharks and rays) dominated catches in both years, with 691,018 caught in 2009 to 2010 (286,941 or 42% harvested) and 522,437 caught in 2018 to 2019 (196,449 or

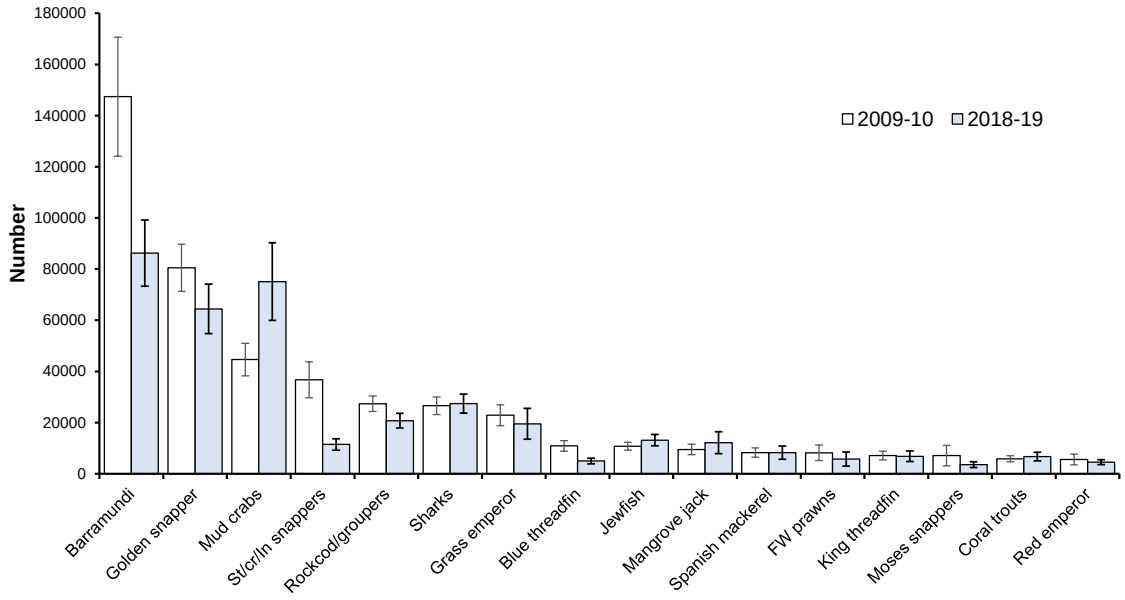
38% harvested). Comparatively, this represented a 25% decline in finfish catch numbers and about a 30% decline in harvest for 2018 to 2019. By contrast, catches of crustaceans were higher during 2018 to 2019 than in 2009 to 2010, with 93,679 caught in 2018 to 2019 (68,135 or 73% retained) compared with 57,387 caught in 2009 to 2010 (42,265 or 74% retained).

Since NRFS catch data for the Territory also include catches taken by interstate visitors, it is not possible to make valid comparisons, other than to note that reported harvests of approximately 715,000 finfish and 125,000 crustaceans during 2000 to 2001 were substantially higher than the more recent surveys.

A consideration in any comparative work is the fact that inter-annual variations naturally occur within fisheries, for example, the availability and abundance of certain species. In the Territory, the magnitude and extent of the 'wet season' has long been acknowledged as a critical factor in this regard and it must be recognised that a typical (or average) year cannot be quantified. However, the 12-month diary period of the NRFS has been acknowledged as one of the 'best' years in terms of catches/availability of many key species. Although based on consistent anecdotal information, this assessment is also supported by independent time-series data from both the commercial sector and fishing tour operators.

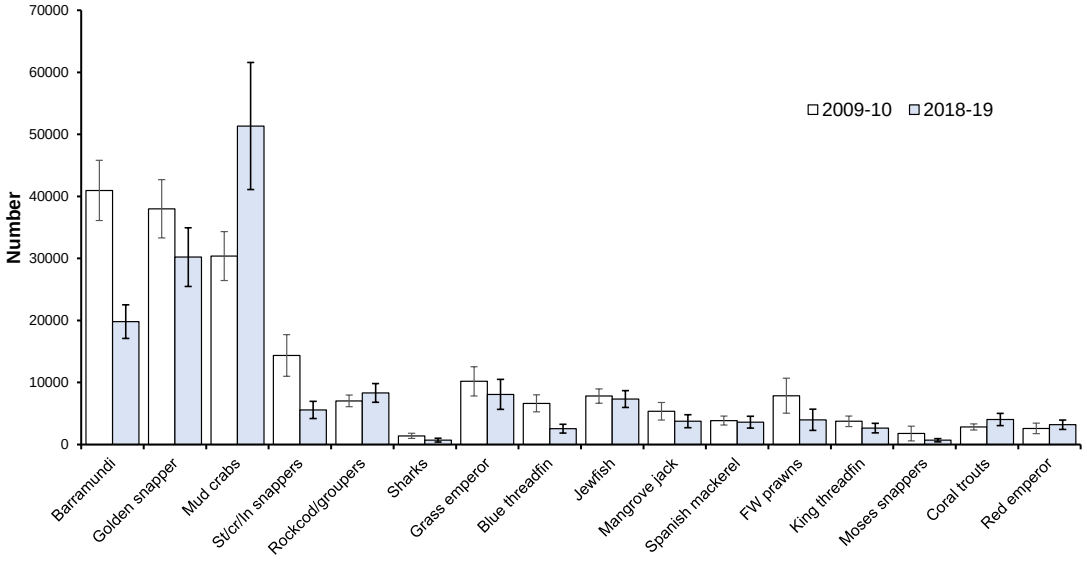
Overall, combined total catch and harvest estimates alone are not fully informative of changes or trends in the fishery occurring at the level that fishers interact with fish stocks. A more relevant comparison is to compare catches at the species or species group level. Figures 42 and 43 provide catch comparisons (total catch and harvest) for the 2 most recent surveys (comparable analyses were not available for NRFS data). While there was variation in catches for each of the key species, most of these differences were not significant when underlying statistical uncertainty (standard errors) associated with estimates were considered. The most conspicuous difference between survey years was the significant reduction in the catch (and harvest) of Barramundi and the Saddletail/Crimson/Indonesian snapper group, and an increase in the catch (and harvest) of Mud Crabs during 2018 to 2019, compared with 2009 to 2010. Although factors contributing to this variability have not been investigated, it is worth noting that the 2018 to 2019 survey coincided with a lower than average wet season, which generally equates to lower effort, especially in relation to fishing for Barramundi within rivers.

Figure 42. Comparison of catch estimates (total numbers caught) for key species taken by non-Aboriginal Territory residents aged 5 years and older during 2009 to 2010 and 2018 to 2019



Note: Error bars represent one standard error

Figure 43. Comparison of harvest estimates (total numbers retained) for key species taken by non-Aboriginal Territory residents aged 5 years and older during 2009 to 2010 and 2018 to 2019



Note: Error bars represent one standard error

12.5. Expenditure

Total attributable expenditure on fishing-related goods and services by Territory residents in 2009 to 2010 was $43.7million (West *et al*., 2012), which, when adjusted for consumer price index (CPI) inflation, was equivalent to $52.3M in 2019 terms, only slightly higher than the $49.6million determined for 2018 to 2019. Similarly, the inflation-adjusted NRFS-attributed expenditure estimate of $26.7M in 2000 to 2001 (Henry and Lyle, 2003) equated to $41.2million in 2019. Average annual expenditure per fisher is also relevant; $608 in 2000 to 2001 or $938 in 2019 terms, $1,540 in 2009 to 2010 or $1,845 in 2019 terms, and $1,950 in 2018 to 2019. These data suggest that expenditure on fishing-related goods and services by Territory recreational fishers was not only substantial but, at the individual level, may have increased over the past 2 decades.

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- our office/data processing staff: Jo-anne Berridge, Tony Ho and Alicia Trinder
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14. References

ABS (2021). Australian Statistical Geography Standard (ASGS), Edition 3. https://www.abs.gov.au/statistics/standards/australian-statistical-geography-standard-asgs-edition-3/jul2021-jun2026

ACMA (2020). Mobile-only Australia. Living without a fixed line at home. Interactive report. Australian Communications and Media Authority.

https://app.powerbi.com/view?r=eyJrIjoiYjI2ODlkZmItZTBkMC00MzQ5LWEzNjUtNzhmZWE1ZjYyYzZmIiwidCI6IjBkYWM3ZjM5LWQyMGMtNGU3MS04YWYzLTcxZWU3ZTI2OGEyYiJ9andpageName=ReportSectiondff65d67d1d1e8766956

Coleman, A.P.M. (1998). Fishcount: A Survey of recreational fishing in the Northern Territory. NT Department of Primary Industry and Fisheries. Fishery Report No: 43

Coleman, A.P.M. (2004). The National Recreational Fishing Survey: The Northern Territory. NT Department of Business, Industry and Resource Development. Fishery Report No: 72

Giri, K. and Hall, K. (2015). South Australian recreational fishing survey 2013/14. Department of Economic Development, Jobs, Transport and Resources, Melbourne. Fisheries Victoria Internal Report Series No. 62.

Henry, G.W. and Lyle, J.M. (2003). The national recreational and indigenous fishing survey. Final Report to the Fisheries Research and Development Corporation, Project 99/158. NSW Fisheries Final Report Series No. 40.

Jones, K. (2009). South Australian Recreational Fishing Survey 2007/08. Fisheries Division, Primary Industries and Resources SA. South Australian Fisheries Management Series, Paper No. 54.

Lyle, J.M., Coleman, A.P.M, West, L., Campbell, D., and Henry, G.W. (2002). An innovative methodology for the collection of detailed and reliable data in large-scale Australian recreational fishing surveys. In: Recreational Fisheries: Ecological, Economic and Social Evaluation, Pitcher, T.J., and Hollingworth, C.E. (eds). pp 207-226. Fish and Aquatic Resources Series No. 8, Blackwell Science, Oxford, UK

Lyle, J.M., Stark, K.E. and Tracey, S.R. (2014). 2012-13 survey of recreational fishing in Tasmania. Institute for Marine and Antarctic Studies, University of Tasmania.

Lyle, J.M., Stark, K.E., Ewing, G.P., and Tracey, S.R. (2019). 2017-18 Survey of Recreational Fishing in Tasmania. Institute for Marine and Antarctic Studies, University of Tasmania.

Lyle, J.M., Tracey, S.R., Stark, K.E., and Wotherspoon, S. (2009). 2007-08 Survey of Recreational Fishing in Tasmania. Tasmanian Aquaculture and Fisheries Institute, University of Tasmania.

Lyle, J.M., Wotherspoon, S., and Stark, K.E. (2010). Developing an analytical module for large-scale recreational fishery data based on phone-diary survey methodology. Tasmanian Aquaculture and Fisheries Institute, FRDC Final Report, Project 2007/064.

NRFWG (National Recreational Fisheries Working Group) (1994). Recreational Fishing in Australia: A National Policy. Department Primary Industries and Energy, Canberra.

Ryan, K.L., Hall, N.G., Lai, E.K., Smallwood, C.B, Tate, A., Taylor, S.M., and Wise, B.S. (2019). Statewide survey of boat-based recreational fishing in Western Australia 2017/18. Department of Primary Industries and Regional Development, Western Australia. Fisheries Research Report No. 297.

SSA (2009). AS SSA S300-2009 Australian Fish Names Standard, 2nd Edition. Seafood Services Australia.

Teixeira, D., Janes, R., and Webley, J. (2020). 2019-29 statewide recreational fishing survey. Key results. Fisheries Queensland, Department of Agriculture and Fisheries.

West, L.D., Lyle, J.M., Matthews, S.R., Stark, K.E., and Steffe, A.S. (2012). Survey of recreational fishing in the Northern Territory, 2009 to 2010. Northern Territory Government, Australia. Fishery Report No. 109.

West, L.D., Stark, K.E., Murphy, J.J., Lyle, J.M., and Ochwada-Doyle, F.A. (2015). Survey of recreational fishing in New South Wales and the ACT, 2013/14. NSW Department of Primary Industries. Fisheries Final Report Series No. 149.

15. Appendices

Appendix 1. Estimated number and proportion of the non-Aboriginal resident population of the Territory aged 5 years or older who fished recreationally in the Territory in the 12 months prior to September 2018, by gender, age and stratum.

Residential stratum	Age group	Pop'n	Male Fishers	SE	% fishers	SE	Pop'n	Female Fishers	SE	% fishers	SE	Pop'n	Total Fishers	SE	% fishers	SE
Darwin																
	5 to 14	7,002	2,431	263	34.7	3.8	6,670	1,965	232	29.5	3.5	13,672	4,396	390	32.2	2.9
	15 to 29	12,377	3,964	359	32.0	2.9	11,207	2,404	274	21.4	2.4	23,584	6,367	505	27.0	2.1
	30 to 44	15,256	6,405	398	42.0	2.6	14,684	3,468	320	23.6	2.2	29,940	9,873	610	33.0	2.0
	45 to 59	11,746	5,283	319	45.0	2.7	10,650	2,381	242	22.4	2.3	22,396	7,663	473	34.2	2.1
	60 plus	8,139	1,828	201	22.5	2.5	7,213	516	113	7.2	1.6	15,352	2,345	267	15.3	1.7
	Total	54,520	19,911	838	36.5	1.5	50,424	10,733	645	21.3	1.3	104,944	30,645	1,304	29.2	1.2
Other coastal																
	5 to 14	944	621	63	65.8	6.7	822	510	60	62.0	7.3	1,766	1,131	97	64.0	5.5
	15 to 29	1,296	501	77	38.7	5.9	1,142	224	50	19.7	4.4	2,438	726	106	29.8	4.3
	30 to 44	1,798	950	83	52.9	4.6	1,795	709	78	39.5	4.3	3,593	1,660	139	46.2	3.9
	45 to 59	1,852	869	77	46.9	4.2	1,555	468	61	30.1	3.9	3,407	1,337	118	39.2	3.5
	60 plus	1,467	363	59	24.7	4.0	967	135	37	14.0	3.8	2,434	498	81	20.5	3.3
	Total	7,357	3,305	195	44.9	2.6	6,281	2,046	159	32.6	2.5	13,638	5,351	316	39.2	2.3
Hinterland																
	5 to 14	1,228	74	70	6.1	5.7	1,204	37	35	3.1	2.9	2,432	112	105	4.6	4.3
	15 to 29	1,979	68	49	3.5	2.5	2,061	-	-	-		4,040	68	49	1.7	1.2
	30 to 44	2,533	212	83	8.4	3.3	2,647	165	80	6.2	3.0	5,180	378	144	7.3	2.8
	45 to 59	2,471	236	99	9.6	4.0	2,482	88	50	3.5	2.0	4,953	324	127	6.5	2.6
	60 plus	1,662	69	35	4.1	2.1	1,557	15	15	1.0	1.0	3,219	84	43	2.6	1.3
	Total	9,873	660	187	6.7	1.9	9,951	305	114	3.1	1.1	19,824	966	273	4.9	1.4

Residential stratum	Age group	Pop'n	Male Fishers	SE	% fishers	SE	Pop'n	Female Fishers	SE	% fishers	SE	Pop'n	Total Fishers	SE	% fishers	SE
Northern Territory																
	5 to 14	9,174	3,127	279	34.1	3.0	8,696	2,512	243	28.9	2.8	17,870	5,639	415	31.6	2.3
	15 to 29	15,652	4,533	370	29.0	2.4	14,410	2,628	279	18.2	1.9	30,062	7,161	518	23.8	1.7
	30 to 44	19,587	7,568	415	38.6	2.1	19,126	4,342	339	22.7	1.8	38,713	11,910	642	30.8	1.7
	45 to 59	16,069	6,388	343	39.8	2.1	14,687	2,936	255	20.0	1.7	30,756	9,325	503	30.3	1.6
	60 plus	11,268	2,260	213	20.1	1.9	9,737	666	120	6.8	1.2	21,005	2,927	282	13.9	1.3
	Total	71,750	23,877	881	33.3	1.2	66,656	13,085	674	19.6	1.0	138,406	36,962	1,369	26.7	1.0

Note: SE is standard error; values in bold indicate relative standard error > 40%

Appendix 2. Annual recreational catch (total, kept and released numbers) during 2018 to 2019 by reporting group and species by non-Aboriginal Territory residents aged 5 years and older

Reporting group	Group taxonomy	Standard fish name	Scientific name/s	Total		Kept		Released	
				Number	SE	Number	SE	Number	SE
Barramundi	*Lates calcarifer*	Barramundi	*Lates calcarifer*	86,255	12,956	19,806	2,701	66,449	11,042
Batfish	Ephippidae and Drepaneidae	Batfish	Ephippidae and Drepaneidae	10,416	2,766	**2,239**	**1,319**	8,178	2,348
Bream	*Acanthopagrus* spp.	Bream	*Acanthopagrus* spp.	12,232	2,612	5,455	1,502	6,777	1,724
Catfish	Plotosidae and Aridae			27,798	4,587	**1,446**	**871**	26,352	4,272
		Eel-tailed catfish	Plotosidae	4,264	1,021	**185**	**164**	4,079	1,009
		Forktail catfish	Aridae	23,534	4,085	**1,261**	**844**	22,272	3,755
Rockcod/groupers	Serranidae			27,465	3,696	12,348	1,884	15,117	2,299
		Rockcod/groupers	Serranidae (excl Coral trouts)	20,752	2,857	8,314	1,508	12,438	1,908
		Coral trouts	*Plectropomus* spp. and *Variola* spp.	6,713	1,693	4,034	990	2,679	939
Emperors	Lethrindae	Grass Emperor	*Lethrinus laticaudis*	19,540	6,018	8,086	2,419	11,454	4,226
Tropical snappers	Lutjanidae			116,216	16,221	49,848	7,896	66,368	9,920
		Red Emperor	*Lutjanus sebae*	4,555	974	3,188	762	1,367	418
		Golden Snapper	*Lutjanus johnii*	64,440	9,699	30,213	4,741	34,227	5,650
		Mangrove Jack	*Lutjanus argentimaculatus*	12,120	4,267	3,758	1,046	**8,361**	**3,655**
		Saddletail/Crimson/Indonesian snappers	*Lutjanus malabaricus/L. erythropterus/L. bitaeniatus*	11,456	2,223	5,588	1,386	5,867	1,207
		Moses Snapper	*Lutjanus russellii* and *Lutjanus* sp.	*3,591*	*1,133*	*697*	*257*	*2,894*	*1,022*
		Stripey Snapper	*Lutjanus carpontatus*	19,152	4,147	6,361	2,072	12,791	2,642
		Tropical snappers, other	*Lutjanus* spp.	***902***	***639***	***41***	***28***	***861***	***638***

Reporting group	Group taxonomy	Standard fish name	Scientific name/s	Total		Kept		Released	
				Number	SE	Number	SE	Number	SE
Sweetlips	Haemulidae except *Pomadasys* spp.	Sweetlips	Haemulidae except *Pomadasys* spp.	***2,999***	***1,330***	***698***	***435***	***2,301***	***1,222***
Grunter breams	*Pomadasys* spp.	Grunter breams	*Pomadasys* spp.	11,960	4,718	1,096	384	**10,864**	**4,665**
Jewfish	Sciaenidae	Jewfish	Sciaenidae	13,132	2,231	7,317	1,356	5,814	1,190
Mackerels	*Scombridae* spp. (tribes Scomberomorini and Scombrini)			12,351	3,074	4,601	1,048	7,750	2,376
		Grey Mackerel	*Scomberomorus semifasciatus*	*3,722*	*1,436*	*778*	*203*	***2,944***	***1,398***
		Spanish Mackerel	*Scomberomorus commerson*	8,232	2,588	3,595	949	4,637	1,831
		Spotted mackerel	*Scomberomorus munroi*	***396***	***188***	***227***	***148***	***168***	***117***
Tunas	*Scombridae* spp. (tribes Sardini and Thunnini)			11,473	4,090	3,761	889	**7,712**	**3,433**
		Longtail Tuna	*Thunnus tonggol*	6,547	2,260	2,460	613	**4,087**	**1,797**
		Mackerel Tuna	*Euthynnus affinis*	***4,797***	***2,031***	***1,242***	***354***	***3,555***	***1,828***
		Tuna, other	*Scombridae* spp. (tribes Sardini and Thunnini)	***129***	***64***	***59***	***41***	***70***	***49***
Trevallys	Carangidae: Caranginae - undifferentiated			17,631	3,523	4,244	834	13,387	3,254
		Brassy Trevally	*Caranx ignobilis*	9,261	1,757	2,114	493	7,147	1,574
		Golden Trevally	*Gnathanodon speciosus*	5,051	1,176	1,814	578	3,237	804
		Trevallys, other	Carangidae: Caranginae - undifferentiated	***3,319***	***1,711***	***317***	***169***	***3,002***	***1,702***
Queenfish	*Scomberoides* spp.	Queenfish	*Scomberoides* spp.	11,677	3,873	2,374	578	**9,303**	**3,813**
Tuskfishs	*Choerodon* spp.	Tuskfish	*Choerodon* spp.	4,689	964	2,368	581	2,321	533

Reporting group	Group taxonomy	Standard fish name	Scientific name/s	Total		Kept		Released	
				Number	SE	Number	SE	Number	SE
Threadfin	Ploynemidae			11,818	2,498	5,213	1,103	6,605	1,772
		Blue Threadfin	*Eleutheronema tetradactylum*	5,005	1,088	2,559	711	2,447	749
		King Threadfin	*Polydactylus macrochir*	6,812	2,061	2,654	769	4,158	1,467
Marlin	Istiophoridae			***611***	***380***	***107***	***85***	***504***	***304***
		Marlin	*Istiophoridae*	***386***	***336***	***94***	***84***	***292***	***252***
		Sailfish	*Istiophorus platypterus*	***225***	***145***	***13***	***12***	***212***	***144***
Mullet	Mugilidae	Mullet	Mugilidae	16,570	4,161	14,903	3,739	**1,666**	**743**
Sooty Grunter	*Hephaestus fuliginosus*	Sooty Grunter	*Hephaestus fuliginosus*	***1,543***	***785***	***356***	***189***	***1,187***	***739***
Oxeye Herring	*Megalops cyprinoides*	Oxeye Herring	*Megalops cyprinoides*	7,050	2,092	**767**	**484**	6,283	2,033
Northern Saratoga	*Scleropages jardinii*	Northern Saratoga	*Scleropages jardinii*	***1,894***	***896***	***49***	***48***	***1,845***	***892***
Scalefish, other	Various families			36,362	13,831	**21,372**	**12,142**	14,990	4,761
		Archer fish	Toxotidae	***2,058***	***1,429***	***382***	***258***	***1,676***	***1,406***
		Bony bream	*Nematalosa erebi*	***84***	***79***	***84***	***79***	-	-
		Threadfin bream	Nemipteridae	***676***	***356***	***299***	***206***	***377***	***291***
		Cobia	*Rachycentron canadum*	*170*	*57*	*150*	*54*	***21***	***21***
		Eels	Various families	***316***	***192***	-	-	***316***	***192***
		Flathead	Platycephalidae	*1,336*	*476*	***915***	***440***	***421***	***182***
		Flounder/sole/flatfish	Bothidae and *Pleuronectidae* spp.	***44***	***43***	-	-	***44***	***43***
		Flying Fish	Exocoetidae	***87***	***85***	***87***	***85***	-	-
		Garfish	Hemiramphidae	***13,465***	***8,617***	***12,855***	***8,455***	***610***	***466***
		Leatherjackets	Monacanthidae	***41***	***41***	-	-	***41***	***41***
		Longtom	Belonidae	***1,159***	***518***	***100***	***59***	***1,058***	***502***

Reporting group	Group taxonomy	Standard fish name	Scientific name/s	Total		Kept		Released	
				Number	SE	Number	SE	Number	SE
		Rainbow runner	*Elagatis bipinnulata*	***86***	***59***	-	-	***86***	***59***
		Rainbowfish	Melanotaeniidae	***2,206***	***2,041***	-	-	***2,206***	***2,041***
		Remoras	Echeneidae	***142***	***66***	-	-	***142***	***66***
		Sand bass	*Psammoperca waigiensis*	***825***	***541***	***64***	***64***	***760***	***537***
		Seahorse	*Hippocampus* spp.	***37***	***37***	-	-	***37***	***37***
		Sleepy cod	*Oxyeleotris lineolata*	***666***	***464***	-	-	***666***	***464***
		Stargazer	Uranoscopidae	***21***	***21***	-	-	***21***	***21***
		Stonefish	*Synanceia horrida*	***50***	***29***	-	-	***50***	***29***
		Striped seapikes	*Sphyraena* spp.	*3,560*	*1,035*	*939*	*319*	*2,621*	*920*
		Toadfishes/Pufferfishes	Various families	***2,959***	***1,407***	-	-	***2,959***	***1,407***
		Unidentified fish	Various families	***33***	***33***	-	-	***33***	***33***
		Whiting	Sillaginidae	***6,340***	***4,150***	***5,497***	***3,450***	***842***	***745***
Small baitfish	Various families			*32,044*	*10,587*	*27,282*	*9,456*	***4,761***	***2,845***
		Baitfish	Various families	*15,135*	*4,696*	*13,560*	*4,199*	***1,575***	***1,125***
		Herring/pilchards	Clupeidae	***16,909***	***7,342***	***13,723***	***6,056***	***3,186***	***2,590***
Sharks and rays	Various families			28,843	3,897	**772**	**341**	28,071	3,843
		Rays	Various families	*1,092*	*429*	***58***	***49***	***1,034***	***426***
		Sawfishes	Pristidae	***307***	***223***	-	-	***307***	***223***
		Sharks	Various families	27,444	3,729	**714**	**300**	26,730	3,681
Cephalopods	Loliginidae	Loligo squid	Loliginidae	***1,601***	***862***	***1,601***	***862***	-	-
Crabs and Lobsters	Brachyura and Palinuridae			76,193	14,433	51,969	9,806	24,224	5,091
		Mud Crabs	*Scylla* spp.	71,486	13,931	49,022	9,488	22,464	4,838
		Orange Mud Crab	*Scylla olivacea*	*3,623*	*1,258*	*2,320*	*750*	***1,303***	***619***
		Crab, other	Brachyura	***154***	***152***	-	-	***154***	***152***

Reporting group	Group taxonomy	Standard fish name	Scientific name/s	Total		Kept		Released	
				Number	SE	Number	SE	Number	SE
		Tropical rock lobsters	Palinuridae	***99***	***64***	***99***	***64***	-	-
		Blue swimmer crabs	*Portunus* spp.	*832*	*268*	*528*	*194*	***303***	***149***
Prawns and yabbies	Penaeoidea and Caridea			***19,397***	***10,366***	***17,620***	***10,075***	***1,777***	***1,206***
		Freshwater prawns	*Macrobrachium* spp.	***5,757***	***2,778***	***3,980***	***1,715***	***1,777***	***1,206***
		Prawns	Penaeoidea and Caridea	***12,813***	***9,718***	***12,813***	***9,718***	-	-
		Red claw	*Cherax quadricarinatus*	***827***	***551***	***827***	***551***	-	-
Bivalves	Ostreidae and Pteriidae	Oysters	Ostreidae and Pteriidae	***2,256***	***1,492***	***2,256***	***1,492***	-	-
Other taxa	Various groups			***269***	***186***	-	-	***269***	***186***
		File snake	File snake	***17***	***16***	-	-	***17***	***16***
		Freshwater turtle	Turtle	***64***	***36***	-	-	***64***	***36***
		Sea turtle	Cheloniidae	***188***	***182***	-	-	***188***	***182***

Note: SE is standard error, values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households recorded catches of the species

Appendix 3A. Annual recreational catch (kept plus released) numbers of key species by targeted and non-targeted effort during 2018 to 2019, by non-Aboriginal Territory residents aged 5 years and older

Species/group	Targeted		Non-targeted		%
	Number	SE	Number	SE	targeted
Barramundi	76,027	12,276	10,228	3,443	88.1
Batfish			10,416	2,766	0.0
Bream	***1,452***	***763***	10,780	2,353	11.9
Catfish	***38***	***36***	27,760	4,585	0.1
Rockcod/grouper	***899***	***366***	19,853	2,816	4.3
Coral trouts	***2,531***	***1,118***	4,182	970	37.7
Grass Emperor	***107***	***93***	19,433	6,013	0.5
Red Emperor	***1,377***	***605***	3,178	710	30.2
Golden Snapper	19,084	4,859	45,356	7,129	29.6
Mangrove Jack	***3,936***	***1,940***	8,184	2,705	32.5
Saddletail/Crimson/Indonesian snappers	*3,455*	*979*	8,001	1,732	30.2
Moses Snapper	***552***	***341***	*3,039*	*1,065*	15.4
Stripey Snapper	*6,145*	*2,230*	13,007	3,232	32.1
Tropical snappers, other	***652***	***607***	***250***	***197***	72.3
Sweetlips			***2,999***	***1,330***	0.0
Grunter breams			11,960	4,718	0.0
Jewfish	*2,664*	*799*	10,468	1,835	20.3
Grey Mackerel	***312***	***225***	***3,411***	***1,414***	8.4
Spanish Mackerel	***2,293***	***1,742***	5,939	1,883	27.9
Spotted mackerel	***38***	***37***	***358***	***170***	9.7
Longtail Tuna	***1,749***	***780***	*4,799*	*1,647*	26.7
Mackerel Tuna	***1,293***	***661***	***3,504***	***1,552***	27.0
Brassy Trevally	***139***	***83***	9,122	1,723	1.5
Golden Trevally	***75***	***55***	4,975	1,166	1.5
Trevallys, other			***3,319***	***1,711***	0.0
Queenfish	***2,988***	***2,085***	8,689	2,754	25.6
Tuskfish	***248***	***220***	4,441	862	5.3
Blue Threadfin	***180***	***104***	4,825	1,077	3.6
King Threadfin	***1,192***	***719***	5,620	1,540	17.5
Marlin	***146***	***103***	***465***	***344***	23.9
Mullet	*10,371*	*3,298*	*6,198*	*2,048*	62.6
Sooty Grunter	***101***	***96***	***1,442***	***701***	6.6
Oxeye Herring	***566***	***422***	6,484	2,051	8.0
Northern Saratoga	***330***	***229***	***1,564***	***867***	17.4
Scalefish, other	***19,365***	***12,700***	16,997	4,600	53.3
Small baitfish	*26,390*	*8,517*	***5,654***	***3,294***	82.4
Sharks and rays			28,843	3,897	0.0
Cephalopods	***1,238***	***785***	***363***	***358***	77.3

Species/group	Targeted		Non-targeted		%
	Number	SE	Number	SE	targeted
Mud Crabs	70,659	13,910	*827*	*329*	98.8
Orange Mud Crab	*3,623*	*1,258*			100.0
Freshwater prawns	***5,373***	***2,621***	***384***	***244***	93.3
Prawns	***12,427***	***9,714***	***386***	***266***	97.0
Bivalves	***2,256***	***1,492***			100.0

Note: SE is standard error; values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households recorded catches of the species

Appendix 3B. Annual recreational harvest (kept numbers) of key species by targeted and non-targeted effort during 2018 to 2019, by non-Aboriginal Territory residents aged 5 years and older

	Targeted		Non-targeted		%
Species/group	Number	SE	Number	SE	targeted
Barramundi	17,920	2,632	1,886	401	90.5
Batfish			***2,239***	***1,319***	0.0
Bream	***586***	***420***	4,869	1,274	10.7
Catfish	***38***	***36***	***1,408***	***859***	2.6
Rockcod/grouper	***263***	***152***	8,051	1,492	3.2
Coral trouts	***1,820***	***803***	2,214	475	45.1
Grass Emperor	***94***	***92***	7,992	2,407	1.2
Red Emperor	***970***	***404***	*2,218*	*607*	30.4
Golden Snapper	8,275	1,788	21,938	3,959	27.4
Mangrove Jack	*1,095*	*360*	2,663	906	29.1
Saddletail/Crimson/Indonesian snappers	*1,497*	*458*	4,091	1,187	26.8
Moses Snapper	***128***	***99***	*570*	*212*	18.3
Stripey Snapper	***2,507***	***1,338***	3,854	1,463	39.4
Tropical snappers, other	-	-	***41***	***28***	0.0
Sweetlips			***698***	***435***	0.0
Grunter breams			*1,096*	*384*	0.0
Jewfish	*1,711*	*450*	5,607	1,048	23.4
Grey Mackerel	***137***	***81***	*642*	*177*	17.6
Spanish Mackerel	***923***	***522***	2,672	736	25.7
Spotted mackerel	-	-	***227***	***148***	0.0
Longtail Tuna	*784*	*302*	*1,676*	*454*	31.9
Mackerel Tuna	***304***	***141***	*938*	*270*	24.5
Brassy Trevally	***49***	***48***	2,064	486	2.3
Golden Trevally	***75***	***55***	*1,738*	*575*	4.2
Trevallys, other			***317***	***169***	0.0
Queenfish	***655***	***324***	1,720	414	27.6
Tuskfish	***174***	***147***	2,194	493	7.3
Blue Threadfin	***62***	***37***	2,496	707	2.4
King Threadfin	***605***	***321***	2,049	535	22.8
Marlin	***9***	***9***	***98***	***84***	8.8
Mullet	*9,411*	*2,870*	*5,492*	*2,011*	63.1
Sooty Grunter	-	-	***356***	***189***	0.0
Oxeye Herring	***396***	***390***	***371***	***286***	51.7
Northern Saratoga	-	-	***49***	***48***	0.0
Scalefish, other	***17,992***	***11,813***	3,380	743	84.2
Small baitfish	*22,365*	*7,163*	***4,917***	***3,217***	82.0
Sharks and rays			***772***	***341***	0.0
Cephalopods	***1,238***	***785***	***363***	***358***	77.3

	Targeted		Non-targeted		%
Mud Crabs	48,343	9,470	***679***	***302***	98.6
Orange Mud Crab	*2,320*	*750*			100.0
Freshwater prawns	***3,781***	***1,707***	***199***	***170***	95.0
Prawns	***12,427***	***9,714***	***386***	***266***	97.0
Bivalves	***2,256***	***1,492***			100.0

Note: SE is standard error; values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households recorded catches of the species

Appendix 4A. Annual recreational effort (numbers of fishers and fisher days) and total catch (kept plus released) numbers of key species by water body type during 2018 to 2019, by non-Aboriginal Territory residents aged 5 years and older.

Species/group	Offshore		Inshore		Estuary		River		Lake/dam	
	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE
Effort										
Fishers	2,603	470	13,449	1,052	18,979	1,225	5,229	629	*1,231*	*331*
Fisher days	6,751	2,134	40,886	4,476	69,172	6,227	13,013	1,875	***4,208***	***2,119***
Catch										
Barramundi	***65***	***49***	13,128	4,478	55,498	9,522	13,780	3,060	***3,784***	***2,729***
Batfish	***2,100***	***972***	*6,779*	*2,368*	*1,537*	*496*				
Bream	***160***	***95***	*1,113*	*421*	7,920	2,149	**1,785**	***756***	***1,272***	***1,204***
Catfish	***584***	***349***	5,688	1,458	19,101	3,817	*2,408*	*670*	***17***	***16***
Rockcod/grouper	***1,356***	***702***	11,100	2,096	7,951	1,223	***344***	***259***		
Coral trouts	***537***	***303***	4,893	1,344	***1,282***	***794***				
Grass Emperor	*1,921*	*607*	*13,172*	*4,584*	***4,447***	***2,973***				
Red Emperor	*2,071*	*731*	*1,976*	*512*	***509***	***355***				
Golden Snapper	*3,233*	*927*	34,639	6,117	26,569	5,382				
Mangrove Jack	***546***	***249***	***4,354***	***2,192***	7,200	2,448	***20***	***19***		
Saddletail/Crimson/Indonesian snappers	***2,290***	***945***	7,163	1,723	*2,002*	*735*				
Moses Snapper	***368***	***219***	***1,863***	***915***	***1,361***	***572***				
Stripey Snapper	*1,931*	*646*	13,462	3,677	*3,727*	*1,302*	***32***	***31***		
Tropical snappers, other	***686***	***608***	***19***	***18***	***197***	***193***				
Sweetlips	***1,032***	***543***	***1,299***	***858***	***588***	***261***	***79***	***75***		
Grunter breams	***1,135***	***731***	***7,807***	***4,383***	*2,765*	*1,044*			***253***	***239***
Jewfish	***1,936***	***952***	4,650	1,141	6,546	1,485				
Grey Mackerel	***832***	***481***	***2,566***	***1,339***	***325***	***179***				
Spanish Mackerel	***852***	***482***	*6,689*	*2,510*	***692***	***378***				

Species/group	Offshore		Inshore		Estuary		River		Lake/dam	
	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE
Spotted mackerel	***5***	***5***	***368***	***186***	***23***	***17***				
Longtail Tuna	***1,602***	***887***	***4,384***	***1,953***	***561***	***398***				
Mackerel Tuna	***1,149***	***561***	***3,329***	***1,921***	***319***	***232***				
Brassy Trevally	***861***	***356***	4,863	1,187	3,537	1,077				
Golden Trevally	***626***	***254***	*2,467*	*855*	*1,958*	*670*				
Trevallys, other	***498***	***266***	***1,308***	***1,105***	***1,514***	***1,186***				
Queenfish	***1,032***	***794***	***4,593***	***2,148***	**6,052**	**2,555**				
Tuskfish	*587*	*195*	2,951	839	*1,152*	*417*				
Blue Threadfin	***164***	***112***	3,021	882	*1,821*	*595*				
King Threadfin	***140***	***90***	***905***	***434***	5,686	1,965	***81***	***63***		
Marlin	***235***	***179***	***376***	***335***						
Mullet	***137***	***131***	*4,135*	*1,437*	*12,298*	*3,815*				
Sooty Grunter			***90***	***86***	***73***	***62***	***639***	***340***	***741***	***702***
Oxeye Herring			***492***	***395***	***779***	***349***	*4,091*	*1,255*	***1,687***	***1,563***
Northern Saratoga			***2***	***2***	***97***	***80***	***931***	***401***	***864***	***797***
Scalefish, other	*987*	*360*	**16,083**	**11,670**	14,004	4,135	***649***	***428***	***4,640***	***4,243***
Small baitfish	***356***	***327***	***9,617***	***5,505***	***20,664***	***8,896***	***1,339***	***908***	***67***	***66***
Sharks and rays	*2,732*	*977*	16,984	3,125	9,102	1,667	***8***	***8***	***17***	***16***
Cephalopods	***84***	***83***	***693***	***682***	***825***	***477***				
Mud Crabs	***111***	***85***	13,429	3,563	57,929	13,205			***17***	***16***
Orange Mud Crab			***2,097***	***1,072***	*1,526*	*564*				
Freshwater prawns					***1,056***	***706***	***2,129***	***1,168***	***2,572***	***2,408***
Prawns			***9,967***	***9,545***	***2,846***	***1,851***				
Bivalves			***2,256***	***1,492***						

Note: SE is standard error; values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households recorded catches of the species

Appendix 4B. Annual recreational harvest (kept numbers) of key species by water body type during 2018 to 2019, by non-Aboriginal Territory residents aged 5 years and older

Species/group	Offshore		Inshore		Estuary		River		Lake/dam	
	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE
Barramundi	***65***	***49***	3,506	693	12,272	1,933	3,552	772	***411***	***254***
Batfish	***141***	***115***	***1,852***	***1,274***	*245*	*94*				
Bream	***111***	***67***	***534***	***239***	*4,380*	*1,470*	***430***	***192***	-	-
Catfish	-	-	***80***	***79***	***1,350***	***799***	***16***	***16***	-	-
Rockcod/grouper	***881***	***484***	4,105	917	3,126	632	***202***	***192***		
Coral trouts	*337*	*133*	*3,334*	*943*	***363***	***207***				
Grass Emperor	*914*	*317*	*5,591*	*1,753*	***1,581***	***1,193***				
Red Emperor	*1,481*	*519*	*1,254*	*408*	***453***	***352***				
Golden Snapper	*2,227*	*589*	15,819	2,849	12,167	2,407				
Mangrove Jack	***319***	***145***	*1,046*	*315*	*2,373*	*843*	***20***	***19***		
Saddletail/Crimson/Indonesian snappers	***1,336***	***584***	*3,680*	*1,124*	***572***	***240***				
Moses Snapper	***130***	***91***	***200***	***144***	***368***	***184***				
Stripey Snapper	*747*	*267*	***4,373***	***1,860***	***1,208***	***587***	***32***	***31***		
Tropical snappers, other	***22***	***22***	***19***	***18***	-	-				
Sweetlips	***287***	***280***	***190***	***126***	***220***	***169***	-	-		
Grunter breams	***203***	***155***	***286***	***121***	***606***	***258***			-	-
Jewfish	***1,374***	***597***	2,703	570	3,240	922				
Grey Mackerel	***202***	***90***	*373*	*112*	***204***	***132***				
Spanish Mackerel	***726***	***392***	*2,572*	*838*	***297***	***148***				
Spotted mackerel	***5***	***5***	***200***	***147***	***23***	***17***				
Longtail Tuna	***619***	***285***	*1,492*	*479*	***348***	***201***				
Mackerel Tuna	***518***	***235***	*602*	*225*	***122***	***116***				
Brassy Trevally	***385***	***193***	*900*	*266*	*829*	*312*				

Species/group	Offshore		Inshore		Estuary		River		Lake/dam	
	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE
Golden Trevally	***217***	***132***	***848***	***413***	***749***	***372***				
Trevallys, other	***76***	***53***	***95***	***93***	***146***	***130***				
Queenfish	***66***	***46***	*744*	*257*	*1,565*	*515*				
Tuskfish	*232*	*78*	*1,865*	*561*	***271***	***118***				
Blue Threadfin	***102***	***59***	*1,187*	*391*	***1,270***	***559***				
King Threadfin	***109***	***69***	*398*	*134*	*2,087*	*698*	***60***	***59***		
Marlin	***9***	***9***	***98***	***84***						
Mullet	***137***	***131***	*3,543*	*1,296*	*11,224*	*3,415*				
Sooty Grunter			***75***	***72***	***8***	***8***	***273***	***174***	-	-
Oxeye Herring			***396***	***390***	***62***	***59***	***309***	***280***	-	-
Northern Saratoga			-	-	-	-	***49***	***48***	-	-
Scalefish, other	***92***	***49***	***12,718***	***10,839***	***8,305***	***3,783***	***172***	***132***	***86***	***84***
Small baitfish	***356***	***327***	***6,510***	***3,407***	***19,112***	***8,683***	***1,237***	***857***	***67***	***66***
Sharks and rays	***121***	***81***	***303***	***164***	***348***	***289***	-	-	-	-
Cephalopods	***84***	***83***	***693***	***682***	***825***	***477***				
Mud Crabs	***77***	***54***	9,413	2,488	39,532	8,934			-	-
Orange Mud Crab			***1,235***	***634***	*1,085*	*366*				
Freshwater prawns					***1,056***	***706***	***1,514***	***841***	***1,410***	***1,308***
Prawns			***9,967***	***9,545***	*2,846*	*1,851*				
Bivalves			***2,256***	***1,492***						

Note: SE is standard error; values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households recorded catches of the species

Appendix 5A. Annual recreational effort (numbers of fishers and fisher days) and total catch (kept plus released) numbers of key species by fishing platform during 2018 to 2019, by non-Aboriginal Territory residents aged 5 years or older.

Species/group	Boat		Shore		%
	Number	**SE**	**Number**	**SE**	**boat**
Effort					
Fishers	18,610	1,212	13,607	1,019	73.1
Fisher days	90,506	8,411	42,816	4,927	68.7
Catch					
Barramundi	68,519	12,064	17,713	3,779	79.5
Batfish	9,957	2,749	***459***	***184***	95.6
Bream	4,539	1,308	7,693	2,107	37.1
Catfish	23,560	4,154	***4,238***	***1,970***	84.8
Rockcod/grouper	17,994	2,752	*2,758*	*741*	86.7
Coral trouts	6,543	1,676	***170***	***132***	97.5
Grass Emperor	19,288	6,015	***252***	***183***	98.7
Red Emperor	4,483	972	***72***	***54***	98.4
Golden Snapper	62,586	9,671	*1,803*	*424*	97.2
Mangrove Jack	10,294	4,102	*1,825*	*643*	84.9
Saddletail/Crimson/Indonesian snappers	11,401	2,223	***55***	***42***	99.5
Moses Snapper	*3,198*	*1,119*	***393***	***183***	89.0
Stripey Snapper	18,723	4,138	***429***	***203***	97.8
Tropical snappers, other	***902***	***639***			100.0
Sweetlips	***2,867***	***1,326***	***132***	***91***	95.6
Grunter breams	**11,464**	**4,703**	***496***	***357***	95.9
Jewfish	13,078	2,231	***53***	***43***	99.6
Grey Mackerel	*3,653*	*1,435*	***69***	***38***	98.1
Spanish Mackerel	7,178	2,477	***1,054***	***762***	87.2
Spotted mackerel	***396***	***188***			100.0
Longtail Tuna	*6,480*	*2,260*	***67***	***42***	99.0
Mackerel Tuna	***4,760***	***2,031***	***36***	***36***	99.2
Brassy Trevally	8,696	1,741	***565***	***261***	93.9
Golden Trevally	4,647	1,158	***404***	***214***	92.0
Trevallys, other	***3,154***	***1,706***	***166***	***133***	95.0
Queenfish	9,915	3,821	*1,762*	*568*	84.9
Tuskfish	4,260	939	***429***	***225***	90.8
Blue Threadfin	4,343	1,048	*662*	*235*	86.8
King Threadfin	6,375	2,052	***437***	***191***	93.6
Marlin	***611***	***380***			100.0
Mullet	*7,949*	*2,789*	*8,621*	*3,087*	48.0
Sooty Grunter	***580***	***307***	***963***	***556***	37.6
Oxeye Herring	*4,381*	*1,305*	***2,669***	***1,359***	62.1

Species/group	Boat		Shore		%
	Number	SE	Number	SE	boat
Northern Saratoga	*1,232*	*451*	***645***	***590***	65.6
Scalefish, other	11,758	2,513	**24,452**	**13,263**	32.5
Small baitfish	***11,350***	***5,592***	***20,694***	***8,969***	35.4
Sharks and rays	26,132	3,747	*2,712*	*901*	90.6
Cephalopods	***1,056***	***770***	***546***	***390***	65.9
Mud Crabs	62,506	13,523	*8,980*	*3,284*	87.4
Orange Mud Crab	*3,212*	*1,225*	***411***	***303***	88.7
Freshwater prawns	***4,199***	***1,721***	***1,557***	***1,372***	72.9
Prawns	***10,977***	***9,576***	***1,836***	***1,682***	85.7
Bivalves	***1,129***	***1,080***	***563***	***531***	66.7

Note: SE is standard error; values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households recorded catches of the species

Appendix 5B. Annual recreational harvest (kept numbers) of key species by fishing platform during 2018 to 2019, by non-Aboriginal Territory residents aged 5 years or older

Species/group	Boat		Shore		%
	Number	SE	Number	SE	boat
Barramundi	14,882	2,465	4,924	871	75.1
Batfish	***2,082***	***1,310***	***157***	***78***	93.0
Bream	*1,791*	*522*	*3,665*	*1,411*	32.8
Catfish	***1,430***	***870***	***16***	***16***	98.9
Rockcod/grouper	7,521	1,474	*794*	*297*	90.5
Coral trouts	3,937	970	***97***	***67***	97.6
Grass Emperor	7,984	2,417	***102***	***81***	98.7
Red Emperor	*3,128*	*760*	***60***	***52***	98.1
Golden Snapper	29,265	4,729	*897*	*261*	97.0
Mangrove Jack	3,228	1,009	***530***	***220***	85.9
Saddletail/Crimson/Indonesian snappers	5,533	1,386	***55***	***42***	99.0
Moses Snapper	*658*	*254*	***40***	***39***	94.3
Stripey Snapper	6,204	2,068	***157***	***84***	97.5
Tropical snappers, other	***41***	***28***			100.0
Sweetlips	***698***	***435***	-	-	100.0
Grunter breams	*1,066*	*383*	***30***	***29***	97.3
Jewfish	7,264	1,356	***53***	***43***	99.3
Grey Mackerel	*709*	*191*	***69***	***38***	91.1
Spanish Mackerel	3,250	932	***345***	***185***	90.4
Spotted mackerel	***227***	***148***			100.0
Longtail Tuna	*2,393*	*612*	***67***	***42***	97.3
Mackerel Tuna	*1,205*	*351*	***36***	***36***	97.1
Brassy Trevally	*1,642*	*444*	***472***	***216***	77.7
Golden Trevally	*1,664*	*574*	***150***	***76***	91.8
Trevallys, other	***181***	***108***	***136***	***130***	57.2
Queenfish	*1,157*	*331*	*1,217*	*452*	48.7
Tuskfish	2,205	577	***163***	***81***	93.1
Blue Threadfin	*2,149*	*654*	***409***	***216***	84.0
King Threadfin	2,321	747	***333***	***174***	87.5
Marlin	***107***	***85***			100.0
Mullet	*7,405*	*2,670*	*7,498*	*2,618*	49.7
Sooty Grunter	***83***	***72***	***273***	***174***	23.4
Oxeye Herring	***371***	***286***	***396***	***390***	48.3
Northern Saratoga	***49***	***48***	-	-	100.0
Scalefish, other	2,357	797	***19,015***	***12,089***	11.0
Small baitfish	***7,129***	***2,989***	***20,154***	***8,953***	26.1
Sharks and rays	***449***	***182***	***323***	***289***	58.2
Cephalopods	***1,056***	***770***	***546***	***390***	65.9

Species/group	Boat		Shore		%
	Number	SE	Number	SE	boat
Mud Crabs	42,923	9,210	*6,099*	*2,173*	87.6
Orange Mud Crab	*1,949*	*703*	***371***	***268***	84.0
Freshwater prawns	*3,103*	*1,229*	***877***	***766***	78.0
Prawns	***10,977***	***9,576***	***1,836***	***1,682***	85.7
Bivalves	***1,129***	***1,080***	***563***	***531***	66.7

Note: SE is standard error; values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households recorded catches of the species

Appendix 6A. Annual recreational effort (number of fishers, fisher days and hours fished) and total catch (kept plus released) numbers of key species by fishing method during 2018 to 2019, by non-Aboriginal Territory residents aged 5 years and older

Species/group	Line		Pot/trap		Cast net		Seine		Other net		Dive		Other	
	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE
Effort														
Fishers	24,881	1,322	8,374	892	2,080	437	***64***	***47***	***70***	***41***	***98***	***76***	***388***	***194***
Fisher days	123,272	9,617	19,516	2,534	4,668	1,149	***64***	***47***	***225***	***167***	***231***	***201***	***412***	***206***
Hours fished	664,213	61,620	140,321	21,358	5,126	1,940								
Catch														
Barramundi	86,164	12,954			***15***	***15***					***76***	***73***		
Batfish	10,416	2,766												
Bream	12,066	2,596	***82***	***60***	***83***	***58***								
Catfish	27,751	4,587	***28***	***20***	***10***	***9***			***8***	***8***				
Rockcod/grouper	20,519	2,850	***172***	***93***	***42***	***41***					***19***	***18***		
Coral trouts	6,390	1,643									***323***	***309***		
Grass Emperor	19,540	6,018												
Red Emperor	4,517	969									***38***	***36***		
Golden Snapper	64,440	9,699												
Mangrove Jack	12,101	4,266									***19***	***18***		
Saddletail/Crimson/Indonesian snappers	11,456	2,223												
Moses Snapper	*3,591*	*1,133*												
Stripey Snapper	19,152	4,147												
Tropical snappers, other	***883***	***639***									***19***	***18***		
Sweetlips	***2,977***	***1,329***									***22***	***21***		
Grunter breams	11,909	4,716			***51***	***48***								
Jewfish	13,132	2,231												
Grey Mackerel	*3,722*	*1,436*												
Spanish Mackerel	7,383	2,474			***754***	***742***					***95***	***91***		

Species/group	Line		Pot/trap		Cast net		Seine		Other net		Dive		Other	
	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE
Spotted mackerel	***396***	***188***												
Longtail Tuna	6,547	2,260												
Mackerel Tuna	***4,797***	***2,031***												
Brassy Trevally	9,261	1,757												
Golden Trevally	5,051	1,176												
Trevallys, other	***3,319***	***1,711***												
Queenfish	11,426	3,862			***251***	***247***								
Tuskfish	4,537	947									**152**	**145**		
Blue Threadfin	5,005	1,088												
King Threadfin	6,812	2,061												
Marlin	***611***	***380***												
Mullet	***6,027***	***2,717***	***323***	***315***	*10,162*	*3,098*	***58***	***57***						
Sooty Grunter	***1,442***	***701***			***101***	***96***								
Oxeye Herring	6,422	2,050			***458***	***394***			**170**	**162**				
Northern Saratoga	***1,894***	***896***												
Scalefish, other	19,642	4,693			***16,720***	***11,638***								
Small baitfish	***4,339***	***2,067***	***18***	***18***	*25,904*	*9,835*	***443***	***339***	**1,339**	**908**				
Sharks and rays	28,570	3,846	***243***	***239***			***10***	***9***					***20***	***20***
Cephalopods	***987***	***717***			***615***	***430***								
Mud Crabs	***461***	***249***	70,870	13,923	***26***	***18***							***129***	***122***
Orange Mud Crab			*3,623*	*1,258*										
Prawns					***12,813***	***9,718***								
Freshwater prawns			*3,977*	*1,563*	***1,752***	***1,658***							***28***	***26***
Bivalves													***2,256***	***1,492***

Note: SE is standard error; values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households recorded catches of the species

Appendix 6B. Annual recreational harvest (kept numbers) of key species by fishing method during 2018 to 2019, by non-Aboriginal Territory residents aged 5 years and older

Species/group	Line		Pot/trap		Cast net		Seine		Other net		Dive		Other	
	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE
Barramundi	*19,730*	*2,697*			-	-					***76***	***73***		
Batfish	**2,239**	**1,319**												
Bream	*5,359*	*1,485*	***13***	***13***	***83***	***58***								
Catfish	**1,438**	**870**	-	-	-	-			***8***	***8***				
Rockcod/grouper	*8,236*	*1,505*	***59***	***42***	-	-					***19***	***18***		
Coral trouts	*3,711*	*925*									***323***	***309***		
Grass Emperor	*8,086*	*2,419*												
Red Emperor	*3,150*	*756*									***38***	***36***		
Golden Snapper	*30,213*	*4,741*												
Mangrove Jack	*3,739*	*1,046*									***19***	***18***		
Saddletail /Crimson/Indonesian snappers	*5,588*	*1,386*												
Moses Snapper	697	257												
Stripey Snapper	*6,361*	*2,072*												
Tropical snappers, other	**22**	**22**									***19***	***18***		
Sweetlips	**676**	**435**									***22***	***21***		
Grunter breams	1,096	384			-	-								
Jewfish	*7,317*	*1,356*												
Grey Mackerel	778	203												
Spanish Mackerel	*3,416*	*922*			***84***	***82***					***95***	***91***		
Spotted mackerel	**227**	**148**												
Longtail Tuna	*2,460*	*613*												
Mackerel Tuna	1,242	354												
Brassy Trevally	*2,114*	*493*												

Species/group	Line		Pot/trap		Cast net		Seine		Other net		Dive		Other	
	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE
Golden Trevally	1,814	578												
Trevallys, other	**317**	**169**												
Queenfish	*2,165*	*541*			***210***	***206***								
Tuskfish	*2,216*	*558*									***152***	***145***		
Blue Threadfin	*2,559*	*711*												
King Threadfin	*2,654*	*769*												
Marlin	**107**	**85**												
Mullet	**4,720**	**2,206**	***323***	***315***	*9,802*	*2,964*	***58***	***57***						
Sooty Grunter	**356**	**189**			-	-								
Oxeye Herring	**309**	**280**			***458***	***394***			-	-				
Northern Saratoga	**49**	**48**												
Scalefish, other	*6,045*	*1,878*			***15,328***	***10,874***								
Small baitfish	**3,721**	**1,960**	***18***	***18***	*21,863*	*8,690*	***443***	***339***	***1,237***	***857***				
Sharks and rays	**752**	**340**	-	-			-	-					***20***	***20***
Cephalopods	**987**	**717**			***615***	***430***								
Mud Crabs	**324**	**213**	48,543	9,480	***26***	***18***							***129***	***122***
Orange Mud Crab			*2,320*	*750*										
Freshwater prawns			*3,362*	*1,335*	***590***	***558***							***28***	***26***
Prawns					***12,813***	***9,718***								
Bivalves													***2,256***	***1,492***

Note: SE is standard error; values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households recorded catches of the species

Appendix 7A. Annual recreational effort (numbers of fishers and fisher days) and total catch (kept plus released) numbers of key species by fishing zone during 2018 to 2019, by non-Aboriginal Territory residents aged 5 years and older

Species/group	West coast		Bynoe/Finniss area		Darwin Harbour		Darwin surrounds		Mary/Alligator Rivers		North coast		East coast/Gulf area		Central/Inland	
	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE
Effort																
Fishers	3,975	588	8,028	836	14,757	1,142	8,894	879	5,148	629	1,475	294	1,185	239	1,140	226
Fisher days	8,708	1,645	21,005	3,136	39,793	3,743	26,977	4,355	14,574	2,662	10,191	2,701	7,428	2,684	4,290	1,250
Catch																
Barramundi	6,926	2,397	*4,327*	*1,170*	8,866	2,012	16,076	4,842	30,049	7,318	***6,985***	***3,526***	*9,582*	*3,628*	*3,443*	*1,231*
Batfish	***566***	***481***	***4,204***	***1,685***	***4,454***	***1,944***	***1,193***	***684***								
Bream	***671***	***602***	***1,920***	***1,088***	*5,923*	*1,865*	***1,894***	***1,232***	***213***	***160***	***547***	***359***	***106***	***56***	***956***	***438***
Catfish	*2,716*	*857*	*5,023*	*1,847*	4,820	1,288	*8,296*	*3,203*	*4,171*	*1,274*	***404***	***312***	***1,674***	***692***	*694*	*232*
Rockcod/grouper	***1,488***	***670***	6,039	1,594	5,535	956	*2,021*	*606*	***477***	***249***	*3,006*	*1,137*	***1,917***	***871***	***270***	***256***
Coral trouts	***674***	***322***	*988*	*362*	***605***	***293***	***11***	***10***	***19***	***18***	***3,318***	***1,359***	***1,098***	***839***		
Grass Emperor	***11,043***	***5,415***	***5,432***	***2,449***	***1,530***	***748***	***620***	***370***	***110***	***108***	***644***	***433***	***162***	***121***		
Red Emperor	***338***	***161***	*2,186*	*723*	***458***	***351***	***663***	***336***			***605***	***254***	***305***	***250***		
Golden Snapper	***7,529***	***3,273***	22,604	5,906	16,520	3,424	7,517	2,478	***3,088***	***1,764***	***4,460***	***2,162***	***2,723***	***1,164***		
Mangrove Jack	***17***	***16***	*698*	*254*	*1,861*	*541*	***2,387***	***1,255***	***168***	***117***	***5,483***	***3,036***	***1,507***	***1,033***		
Saddletail/Crimson/Indonesian snappers	***1,090***	***689***	*3,462*	*1,202*	***1,211***	***510***	***1,143***	***591***			*3,346*	*1,138*	***1,205***	***814***		
Moses Snapper			***1,198***	***726***	***1,170***	***664***	***141***	***125***	***412***	***404***	***417***	***345***	***253***	***164***		
Stripey Snapper	***2,873***	***1,293***	7,805	2,694	***5,500***	***2,590***	***583***	***312***			***1,746***	***902***	***613***	***432***	***32***	***31***
Tropical snappers, other							***655***	***607***			***216***	***194***	***31***	***31***		
Sweetlips	***3***	***3***	***1,500***	***1,182***	***408***	***206***	***45***	***33***			***368***	***247***	***595***	***513***	***79***	***75***
Grunter breams			***8,723***	***4,608***	*1,317*	*482*	***1,590***	***806***	***262***	***258***	***23***	***22***	***44***	***25***		
Jewfish	*1,541*	*475*	3,708	1,112	***2,044***	***836***	*2,918*	*897*	***506***	***340***	***1,321***	***684***	***1,093***	***959***		
Grey Mackerel	***1,306***	***1,257***	***1,026***	***439***	***409***	***193***	***94***	***65***			***426***	***182***	***462***	***440***		

Species/group	West coast		Bynoe/Finniss area		Darwin Harbour		Darwin surrounds		Mary/Alligator Rivers		North coast		East coast/Gulf area		Central/Inland	
	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE
Spanish Mackerel			**2,189**	**1,356**	**2,475**	**1,198**	**430**	**268**			**3,100**	**1,803**	**38**	**27**		
Spotted mackerel			**23**	**21**	**28**	**28**	**57**	**42**			**17**	**13**	**270**	**179**		
Longtail Tuna	**231**	**150**	**2,242**	**1,749**	**2,121**	**896**	**1,109**	**710**			**323**	**218**	**521**	**477**		
Mackerel Tuna	**796**	**784**	**2,718**	**1,774**	**428**	**256**	**601**	**343**			**228**	**146**	**25**	**21**		
Brassy Trevally	**469**	**323**	*2,504*	*754*	*1,982*	*696*	**1,153**	**633**	**516**	**398**	**2,261**	**959**	**376**	**280**		
Golden Trevally	**310**	**197**	**1,108**	**688**	*1,703*	*632*	**479**	**196**	**71**	**62**	**954**	**445**	**425**	**317**		
Trevallys, other			**218**	**188**	**319**	**168**	**10**	**10**			**1,503**	**1,188**	**1,270**	**1,211**		
Queenfish	**40**	**28**	**768**	**315**	*2,550*	*655*	**529**	**253**	**842**	**573**	**3,596**	**2,466**	**3,352**	**2,799**		
Tuskfish	**799**	**442**	*1,779*	*577*	*1,433*	*445*	**141**	**78**			**278**	**193**	**259**	**185**		
Blue Threadfin	**77**	**60**	**1,579**	**671**	**509**	**235**	*2,077*	*735*	**375**	**286**	**43**	**29**	**344**	**181**		
King Threadfin	**173**	**127**	**513**	**217**	**1,445**	**857**	*822*	*276*	**3,434**	**1,714**	**62**	**42**	**363**	**184**		
Marlin	**12**	**12**	**449**	**343**			**107**	**104**			**43**	**26**				
Mullet			**1,813**	**948**	**5,283**	**2,156**	*8,397*	*3,115*			**217**	**145**	**859**	**488**		
Sooty Grunter	**8**	**9**	**208**	**190**	**98**	**87**	**853**	**705**	**319**	**275**					**56**	**40**
Oxeye Herring	**527**	**410**	**240**	**121**	**455**	**326**	**1,784**	**1,565**	*3,597*	*1,226*			**109**	**74**	**337**	**197**
Northern Saratoga							**943**	**801**	**936**	**401**	**2**	**2**			**12**	**12**
Scalefish, other	**575**	**444**	*2,513*	*968*	**21,211**	**13,012**	**8,405**	**4,444**	**109**	**71**	**2,312**	**981**	**1,054**	**443**	**184**	**174**
Small baitfish	**102**	**101**	**1,999**	**1,962**	**22,154**	**9,215**	**6,094**	**4,714**			**1,153**	**822**			**543**	**518**
Sharks and rays	*3,178*	*957*	10,692	2,273	5,719	1,143	4,647	1,517	**294**	**128**	**3,163**	**1,512**	**1,142**	**684**	**8**	**8**
Cephalopods	**693**	**682**	**84**	**83**	**546**	**390**	**279**	**275**								
Mud Crabs	**432**	**279**	*5,543*	*1,445*	18,936	4,165	42,073	12,992			**2,647**	**1,381**	**1,854**	**1,140**		
Orange Mud Crab			**484**	**271**	**1,202**	**657**	**1,899**	**1,035**			**38**	**36**				
Freshwater prawns	**791**	**680**					**2,873**	**2,421**	**171**	**168**	**40**	**37**	**94**	**93**	**1,789**	**1,138**
Prawns					**751**	**743**	**11,879**	**9,689**					**182**	**175**		
Bivalves											**2,256**	**1,492**				

Note: SE is standard error; values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households recorded catches of the species

Appendix 7B. Annual recreational harvest (numbers kept) of key species by fishing zone during 2018 to 2019, by non-Aboriginal Territory residents aged 5 years and older

Species/group	West coast		Bynoe/Finniss area		Darwin Harbour		Darwin surrounds		Mary/Alligator Rivers		North coast		East coast/ Gulf area		Central/Inland	
	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE
Barramundi	1,662	435	1,539	537	3,181	613	2,550	592	5,091	1,249	1,110	409	3,349	1,280	1,325	546
Batfish	-	-	**390**	**268**	**1,714**	**1,268**	**134**	**83**								
Bream	-	-	**763**	**418**	3,524	1,403	**362**	**213**	**151**	**149**	**190**	**128**	**83**	**53**	**382**	**187**
Catfish	-	-	**104**	**95**	**304**	**284**	**853**	**790**	**169**	**164**	-	-	-	-	16	16
Rockcod/grouper	**835**	**421**	2,801	907	1,866	461	823	282	-	-	682	263	**1,105**	**625**	**202**	**192**
Coral trouts	**407**	**210**	796	295	**281**	**165**	**11**	**10**	**19**	**18**	**2,107**	**875**	**414**	**247**		
Grass Emperor	**4,074**	**1,929**	**3,110**	**1,441**	**390**	**197**	**229**	**166**	-	-	**244**	**177**	**38**	**37**		
Red Emperor	**195**	**111**	1,289	510	**391**	**348**	**624**	**311**			**482**	**234**	**207**	**155**		
Golden Snapper	2,820	1,073	12,237	3,388	8,407	1,791	3,068	1,043	**996**	**554**	1,207	447	**1,477**	**604**		
Mangrove Jack	**17**	**16**	**320**	**182**	1,229	361	**1,136**	**739**	-	-	**853**	**360**	**205**	**87**		
Saddletail/Crimson/Indonesian snappers	**289**	**234**	**2,119**	**951**	**178**	**88**	**589**	**353**			1,486	540	**927**	**633**		
Moses Snapper			**186**	**139**	**62**	**42**	**32**	**31**	**99**	**97**	**148**	**145**	**171**	**119**		
Stripey Snapper	**853**	**527**	**2,638**	**1,385**	**2,108**	**1,402**	**143**	**138**			**436**	**265**	**151**	**98**	**32**	**31**
Tropical snappers, other							**22**	**22**			**19**	**18**	-	-		
Sweetlips	-	-	**19**	**19**	**228**	**169**	**45**	**33**			-	-	**406**	**400**	-	-
Grunter breams			**755**	**342**	**76**	**57**	**221**	**142**	-	-	-	-	**44**	**25**		
Jewfish	1,218	387	2,135	576	**1,423**	**669**	969	306	**331**	**259**	**518**	**304**	**724**	**609**		
Grey Mackerel	**28**	**27**	279	106	**302**	**158**	-	-			**151**	**66**	**19**	**18**		
Spanish Mackerel			**850**	**474**	**939**	**382**	**430**	**268**			**1,339**	**615**	**38**	**27**		
Spotted mackerel			**23**	**21**	**28**	**28**	**16**	**16**			**5**	**5**	**155**	**143**		
Longtail Tuna	**224**	**150**	**796**	**404**	836	323	**242**	**149**			**320**	**218**	**40**	**27**		
Mackerel Tuna	-	-	621	227	**273**	**157**	**305**	**184**			**22**	**22**	**21**	**20**		

Species/group	West coast		Bynoe/Finniss area		Darwin Harbour		Darwin surrounds		Mary/Alligator Rivers		North coast		East coast/ Gulf area		Central/Inland	
	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE	Number	SE
Brassy Trevally	-	-	***585***	***252***	*802*	*272*	***463***	***253***	-	-	***214***	***109***	***49***	***37***		
Golden Trevally	***104***	***63***	***460***	***327***	***768***	***409***	***347***	***169***	-	-	***92***	***63***	***42***	***41***		
Trevallys, other			***29***	***29***	***231***	***160***	***10***	***10***			***47***	***44***	-	-		
Queenfish	***16***	***15***	***271***	***151***	*1,634*	*512*	***80***	***43***	-	-	***172***	***89***	***201***	***143***		
Tuskfish	***503***	***270***	*1,014*	*341*	***505***	***214***	***47***	***30***			***199***	***164***	***99***	***81***		
Blue Threadfin	***77***	***60***	***559***	***251***	***385***	***226***	***1,340***	***604***	***29***	***29***	***20***	***19***	***147***	***83***		
King Threadfin	***114***	***95***	***288***	***139***	***305***	***154***	*556*	*209*	***1,068***	***603***	***62***	***42***	***260***	***144***		
Marlin	-	-	***107***	***85***			-	-			-	-				
Mullet			***1,269***	***714***	***4,761***	***2,017***	*7,797*	*2,787*			***217***	***145***	***859***	***488***		
Sooty Grunter	-	-	-	-	***83***	***72***	***48***	***45***	***169***	***164***					*56*	*40*
Oxeye Herring	***396***	***390***	-	-	-	-	-	-	***309***	***280***			***62***	***59***	-	-
Northern Saratoga							-	-	***49***	***48***	-	-			-	-
Scalefish, other	***100***	***86***	***455***	***207***	***18,578***	***12,127***	***776***	***395***	***38***	***36***	***766***	***435***	***524***	***256***	***134***	***126***
Small baitfish	***102***	***101***	***1,488***	***1,461***	***20,675***	***9,012***	***3,424***	***2,277***			***1,153***	***822***			*441*	*421*
Sharks and rays	***87***	***74***	***89***	***68***	***223***	***119***	***222***	***192***	-	-	***132***	***130***	***21***	***20***	-	-
Cephalopods	***693***	***682***	***84***	***83***	***546***	***390***	***279***	***275***								
Mud Crabs	***254***	***180***	*3,612*	*906*	14,141	2,967	28,043	8,826			***1,727***	***845***	***1,244***	***800***		
Orange Mud Crab			***373***	***201***	*702*	*274*	***1,208***	***657***			***38***	***36***				
Freshwater prawns	***791***	***680***					***1,670***	***1,332***	***171***	***168***	***40***	***37***	***94***	***93***	***1,215***	***800***
Prawns					***751***	***743***	***11,879***	***9,689***					***182***	***175***		
Bivalves											***2,256***	***1,492***				

Note: SE is standard error; values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households recorded catches of the species

Appendix 8A. Recreational effort (numbers of fishers and fisher days) and total catch (kept plus released) numbers of key species by season during 2018 to 2019, by non-Aboriginal Territory residents aged 5 years or older

Species/group	Oct-Dec		Jan-Mar		Apr-Jun		Jul-Sep	
	Number	SE	Number	SE	Number	SE	Number	SE
Effort								
Fishers	12,560	986	11,805	938	14,618	1,073	12,595	1,020
Fisher days	36,073	3,654	31,876	3,204	34,909	3,153	28,934	3,214
Catch								
Barramundi	30,990	6,068	20,295	3,483	26,629	6,263	8,341	1,719
Batfish	*3,369*	*1,148*	***656***	***459***	*2,814*	*1,022*	***3,576***	***1,628***
Bream	*3,942*	*1,468*	*2,054*	*664*	*2,661*	*779*	*3,576*	*1,022*
Catfish	7,266	1,853	7,930	1,917	8,335	1,636	*4,266*	*1,542*
Rockcod/grouper	6,143	1,263	3,432	740	6,131	1,091	5,046	1,049
Coral trouts	***1,224***	***564***	***2,461***	***1,023***	***1,797***	***843***	*1,232*	*358*
Grass Emperor	***3,855***	***2,904***	***3,127***	***1,325***	***2,546***	***1,154***	***10,011***	***4,059***
Red Emperor	*881*	*326*	***1,247***	***610***	*1,224*	*470*	*1,203*	*344*
Golden Snapper	17,629	3,644	17,198	3,775	15,672	2,922	13,940	2,747
Mangrove Jack	***3,922***	***1,711***	*2,998*	*1,167*	***2,538***	***1,340***	***2,662***	***1,562***
Saddletail/Crimson/Indonesian snappers	*2,081*	*627*	*2,018*	*755*	*3,455*	*1,010*	*3,902*	*1,219*
Moses Snapper	***1,148***	***501***	***789***	***627***	***1,032***	***703***	*622*	*248*
Stripey Snapper	*6,495*	*2,375*	*3,888*	*1,362*	*4,258*	*1,567*	*4,511*	*1,348*
Tropical snappers, other	***621***	***607***	***19***	***18***	***228***	***196***	***34***	***33***
Sweetlips	***646***	***394***	***272***	***125***	***409***	***202***	***1,671***	***958***
Grunter breams	***4,319***	***2,410***	***3,053***	***1,664***	*2,535*	*936*	*2,053*	*718*
Jewfish	2,328	705	*1,934*	*444*	5,670	1,385	*3,200*	*1,028*
Grey Mackerel	***808***	***438***	***1,827***	***1,283***	***614***	***332***	***474***	***288***
Spanish Mackerel	***1,412***	***896***	***1,255***	***790***	***1,105***	***494***	***4,460***	***2,178***
Spotted mackerel	***45***	***37***	***139***	***87***	***161***	***143***	***51***	***35***

Species/group	Oct-Dec		Jan-Mar		Apr-Jun		Jul-Sep	
	Number	SE	Number	SE	Number	SE	Number	SE
Longtail Tuna	***308***	***152***	***579***	***247***	***3,673***	***1,926***	***1,987***	***822***
Mackerel Tuna	***209***	***125***	***795***	***363***	***2,430***	***1,755***	***1,363***	***877***
Brassy Trevally	*2,225*	*864*	*1,727*	*605*	*2,273*	*860*	*3,035*	*946*
Golden Trevally	*1,377*	*457*	***389***	***163***	*1,551*	*547*	*1,734*	*664*
Trevallys, other	***395***	***223***	***180***	***119***	***2,676***	***1,598***	***69***	***47***
Queenfish	*1,588*	*384*	***1,861***	***971***	***4,996***	***2,653***	*3,232*	*1,183*
Tuskfish	*886*	*259*	***953***	***386***	***1,203***	***528***	*1,647*	*512*
Blue Threadfin	***1,033***	***435***	*697*	*198*	***1,642***	***710***	*1,634*	*518*
King Threadfin	***1,636***	***846***	*1,893*	*586*	***2,610***	***1,481***	***673***	***432***
Marlin	***11***	***11***	***372***	***335***	***28***	***27***	***200***	***151***
Mullet	*9,335*	*3,259*	*2,667*	*913*	***2,475***	***1,526***	***2,093***	***1,244***
Sooty Grunter	***1,034***	***630***	***205***	***124***	***281***	***273***	***23***	***17***
Oxeye Herring	***3,212***	***1,565***	*646*	*252*	*2,857*	*977*	***334***	***182***
Northern Saratoga	***884***	***593***	***162***	***130***	***553***	***284***	***295***	***148***
Scalefish, other	**8,401**	**3,455**	***10,585***	***8,579***	13,399	4,768	3,977	1,158
Small baitfish	***8,256***	***4,088***	***14,105***	***6,113***	***4,619***	***2,096***	***5,063***	***2,266***
Sharks and rays	6,204	1,286	4,254	1,027	7,712	1,590	10,674	2,085
Cephalopods					***363***	***358***	***1,238***	***785***
Mud Crabs	***12,016***	***5,028***	11,067	2,698	25,563	5,838	22,841	4,932
Orange Mud Crab	***587***	***337***	***364***	***209***	***2,092***	***949***	***581***	***359***
Freshwater prawns	***1,591***	***1,467***	***909***	***554***	***2,951***	***1,311***	***307***	***222***
Prawns	***10,591***	***9,572***	***1,891***	***1,686***	***331***	***236***		
Bivalves	***563***	***531***	***563***	***531***	***1,129***	***1,080***		

Note: SE is standard error; values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households recorded catches of the species

Appendix 8B. Recreational harvest (numbers kept) of key species by season during 2018 to 2019, by non-Aboriginal Territory residents aged 5 years or older

Species/group	Oct-Dec		Jan-Mar		Apr-Jun		Jul-Sep	
	Number	**SE**	**Number**	**SE**	**Number**	**SE**	**Number**	**SE**
Barramundi	5,594	899	5,138	996	5,858	1,075	3,217	855
Batfish	***415***	***245***	***459***	***445***	***765***	***572***	***599***	***405***
Bream	***1,056***	***648***	***767***	***379***	*1,603*	*582*	*2,030*	*678*
Catfish	***112***	***96***	***88***	***80***	***729***	***414***	***517***	***459***
Rockcod/grouper	*1,952*	*644*	*837*	*311*	2,956	632	2,570	670
Coral trouts	*632*	*224*	***1,575***	***724***	*1,022*	*339*	*804*	*231*
Grass Emperor	***1,744***	***1,204***	***1,223***	***599***	***1,377***	***653***	*3,741*	*1,202*
Red Emperor	***706***	***286***	***803***	***436***	***769***	***365***	*911*	*299*
Golden Snapper	8,812	1,771	7,059	1,560	6,189	1,189	8,152	1,690
Mangrove Jack	*1,301*	*392*	*895*	*256*	*523*	*172*	***1,040***	***857***
Saddletail/Crimson/Indonesian snappers	*1,134*	*394*	*786*	*295*	*1,378*	*494*	***2,290***	***927***
Moses Snapper	***204***	***119***	***14***	***13***	***212***	***158***	***268***	***138***
Stripey Snapper	***1,536***	***845***	*1,113*	*437*	***2,072***	***1,038***	*1,639*	*600*
Tropical snappers, other	-	-	***19***	***18***	-	-	***22***	***22***
Sweetlips	***20***	***14***	***82***	***46***	***111***	***75***	***485***	***366***
Grunter breams	***41***	***32***	***271***	***158***	***372***	***220***	***413***	***181***
Jewfish	*946*	*268*	*1,238*	*350*	3,196	806	*1,938*	*597*
Grey Mackerel	***193***	***86***	*240*	*90*	***209***	***134***	***136***	***70***
Spanish Mackerel	***657***	***342***	***533***	***277***	***437***	***196***	*1,968*	*691*
Spotted mackerel	***6***	***6***	***22***	***17***	***149***	***142***	***51***	***35***
Longtail Tuna	***146***	***76***	***442***	***225***	*1,119*	*433*	*754*	*290*
Mackerel Tuna	***122***	***67***	***269***	***122***	*639*	*254*	***212***	***112***
Brassy Trevally	***327***	***151***	*384*	*138*	***390***	***166***	***1,013***	***410***
Golden Trevally	***256***	***108***	***135***	***108***	***645***	***272***	***779***	***416***
Trevallys, other	***278***	***166***	***29***	***29***	***10***	***10***	-	-

Species/group	Oct-Dec		Jan-Mar		Apr-Jun		Jul-Sep	
	Number	**SE**	**Number**	**SE**	**Number**	**SE**	**Number**	**SE**
Queenfish	*582*	*174*	***329***	***214***	*761*	*275*	***702***	***285***
Tuskfish	*321*	*115*	***294***	***154***	***600***	***283***	*1,154*	*393*
Blue Threadfin	***242***	***116***	*310*	*118*	***867***	***363***	*1,139*	*419*
King Threadfin	*525*	*195*	*861*	*298*	***1,054***	***525***	***214***	***134***
Marlin	-	-	***85***	***83***	-	-	***22***	***15***
Mullet	*8,009*	*2,784*	*2,327*	*850*	***2,475***	***1,526***	***2,093***	***1,244***
Sooty Grunter	***100***	***74***	***87***	***58***	***169***	***164***	-	-
Oxeye Herring	***396***	***390***	-	-	***371***	***286***	-	-
Northern Saratoga	***49***	***48***	-	-	-	-	-	-
Scalefish, other	***3,084***	***1,432***	***8,643***	***7,942***	***8,261***	***4,354***	***1,384***	***570***
Small baitfish	***7,143***	***3,621***	***10,706***	***4,298***	***4,501***	***2,087***	***4,932***	***2,247***
Sharks and rays	***148***	***102***	***69***	***50***	***144***	***90***	***411***	***189***
Cephalopods					***363***	***358***	***1,238***	***785***
Mud Crabs	***8,191***	***3,321***	7,322	1,852	18,409	4,203	15,099	3,200
Orange Mud Crab	***285***	***162***	***324***	***206***	*1,326*	*523*	***386***	***194***
Freshwater prawns	***809***	***765***	***909***	***554***	***2,007***	***973***	***255***	***174***
Prawns	***10,591***	***9,572***	***1,891***	***1,686***	***331***	***236***		
Bivalves	***563***	***531***	***563***	***531***	***1,129***	***1,080***		

Note: SE is standard error; values in bold indicate relative standard error > 40%; values in italics indicate fewer than 30 households recorded catches of the species

Appendix 9. Numbers and proportions of households (fishers, non-fishers and total) reporting boat ownership as at September 2018 by residential stratum, that is, households containing one or more non-Aboriginal Territory residents

Residential stratum	Fishers (2017-18)	Total households	Boat ownership			
			Number	SE	% ownership	SE
Darwin						
	Fishers	15,467	8,036	456	52.0	2.9
	Non-fishers	26,362	2,390	283	9.1	1.1
	Total	41,829	10,426	507	24.9	1.2
Other coastal						
	Fishers	2,455	1,671	121	68.1	4.9
	Non-fishers	3,432	328	67	9.6	2.0
	Total	5,887	1,998	130	33.9	2.2
Hinterland						
	Fishers	571	144	68	25.2	11.9
	Non-fishers	8,119	528	140	6.5	1.7
	Total	8,690	672	154	7.7	1.8
Total NT						
	Fishers	18,493	9,851	477	53.3	2.6
	Non-fishers	37,913	3,246	323	8.6	0.9
	Total	**56,406**	**13,096**	**545**	**23.2**	**1.0**

Note: SE is standard error