

**An integrated system to survey  
boat-based recreational fishing in  
Western Australia 2011/12**

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## Executive Summary

The Department of Fisheries developed an integrated system involving several survey methods to provide a more robust approach for obtaining annual estimates of recreational catch by boat-based fishers at both state-wide and bioregional levels. These surveys, which used the recently implemented Recreational Fishing from Boat Licence (RFBL) as the basis for sampling, were the most comprehensive ever conducted in Western Australia. They not only provided estimates of catch and effort but provided the information for the validation of these estimates by enabling comparisons across the various methods.

The integrated survey includes three complementary components: (i) off-site phone surveys (encompassing an initial Screening Survey, a 12-month Phone-Diary Survey, followed by post-enumeration Wash-Up/Attitudinal, Non Intending Fisher and Benchmark Surveys); (ii) on-site boat-ramp surveys (including a state-wide Biological Survey and a Perth metropolitan Validation Survey); and (iii) a remote Camera Survey. The 12-month period from 1 March 2011 to 29 February 2012 incorporated the Phone-Diary, boat-ramp and Camera Surveys.

The geographic range of fishing effort observed in the Phone-Diary Survey included the majority of the WA coastline, with the exception of remote and/or generally inaccessible marine waters such as between Broome and Port Hedland and between Esperance and Eucla.

The temporal coverage of fishing effort observed in the Phone-Diary Survey indicated the majority of the state-wide boat-based fishing effort (measured in boat days) during 2011-12 took place during summer (32%) and autumn (35%) with lower levels taking place in winter (19%) and spring (14%). There were, however, marked differences in this pattern between bioregions with autumn/winter the most active seasons in terms of fishing effort in the North Coast (77%) and Gascoyne Coast (80%). In the lower half of the State, summer/autumn were the most active seasons for fishing effort in the West Coast (75%) and South Coast (66%).

At a state-wide level, the majority of boat-based recreational fishing effort in WA (measured in boat days) occurred in nearshore habitat (51%), followed by inshore demersal (25%) and estuary (16%). The remainder of fishing effort was offshore demersal (5%) and pelagic (2%). As shore-based fishing was not covered by the survey's scope, inland effort (freshwater) was minimal. The majority of boat-based fishing effort (boat days) during 2011-12 was from line fishing (68%), followed by pots (26%), diving (4%) and nets (2%), but there were differences among bioregions.

Boat-based recreational fishers caught a diverse range of species/taxa during the 12-month survey, including scalefish (195 species/taxa), elasmobranchs (15), crustaceans (nine) and molluscs (six). A total of over 3.7 million individual specimens with a high variety of taxa were caught. A similar proportion of catch was either retained (approx. 1.9 million) or released (approx. 1.8 million). Approximately 60% of the recreational catch comprised finfish (2.35 million) compared with the total number of invertebrates captured of 1.36 million. A higher proportion of the recreational catch of finfish was released (52%) compared with invertebrates (40%).

School Whiting was the most commonly caught finfish species state-wide with 322,000 kept or released state-wide by number, followed by Australian Herring (250,000), King George whiting (169,000), snapper (150,000), silver trevally (122,000), black bream (119,000), grass emperor (82,000), spangled emperor (66,000), western king wrasse (50,000), stripey snapper (48,000), tailor (45,000) and West Australian dhufish (44,000). High release rates were observed for many of these species, including snapper (81%), western king wrasse (81%), stripey snapper (78%),

black bream (73%), grass emperor (66%), spangled emperor (62%), West Australian dhufish (60%) and tailor (51%). Release rates were lower for silver trevally (47%), King George whiting (36%), school whiting (20%) and Australian herring (15%).

Blue swimmer crab was the most commonly caught invertebrate species (870,816 kept or released state-wide by number), followed by prawns (135,713), western rock lobster (194,708) and squid (116,865). High release rates were observed for blue swimmer crab (51%) and western rock lobster (37%) compared with squid (5%) and prawn (0%).

The recreational catch data presented in this report will now be examined against previous recreational surveys to determine if there have been any material changes in recreational catch levels. This approach will particularly focus on the indicator species used to monitor each of the bioregional level suites, which could give an indicator of how effectively the current management arrangements are operating. Given that different survey designs have been used in the past, this needs to be done in a more considered manner than drawing simple comparisons to ensure that aspects such as survey method, sampling period and other differences are appropriately accounted for. The results of these additional assessments will be published separately.

In addition to providing estimates of annual state-wide and bioregion recreational catch, one of the integrated survey's critical objectives was to develop an improved understanding of issues that may be affecting these estimates. This will also be undertaken in a separate companion study to proactively examine the data for possible biases and behavioural adjustments of fishers, and investigating how to adapt the survey design and/or analysis to accommodate them. It is anticipated that the lessons learnt in this inaugural state-wide integrated survey would provide improvements for future surveys, which would better deal with stakeholder concerns and expectations.

Based on the outcomes of this first integrated survey and the additional analyses, some components of future survey methodology may be modified to further improve the accuracy and precision of catch estimates, as well as ensuring it is cost effective. The Department also recognises that the survey needs to be flexible enough to accommodate changes in recreational fishing patterns. The Department has therefore developed a collaborative research agreement with Edith Cowan University to investigate some of these issues and potential biases. Additionally, the Department will be working collaboratively with Recfishwest to identify whether additional types of information might also be collected that could contribute to a better understanding of the behaviours of recreational fishers in each of the different regions of the State. This could further improve future catch and effort estimates.



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## **1.0 Introduction**

### **1.1 Importance of recreational fishing in WA**

Recreational fishing is a popular activity in Western Australia, with significant benefits to the economy. The estimated number of recreational fishers in WA has increased from 315,000 in 1989/90 (Lindner and McLeod 1991) to 691,000 in 2011/12 (Department of Fisheries 2012a). The estimated participation rate of WA residents is generally above the national average, with an estimated 26.6% of the population (aged 15 years or older) fishing in 1989/90 and 28.5% (aged 5 years or older) fishing in 2000/01 (Lindner and McLeod 1991, Henry and Lyle 2003). The annual survey of participation rate for recreational fishing in WA has been estimated as 32% in 2011/2012 and remained constant for the last three years (Department of Fisheries 2012a). The expenditure attributable to recreational fishing in WA has been estimated at \$55–130 million in 1989/90 and \$338 million in 2000/01, with an average fisher expenditure of \$415 and \$706, respectively (Lindner and McLeod 1991, Henry and Lyle 2003).

Recreational fishing often has important catch-related motives, such as fishing to obtain a feed of fresh seafood. However, there are also significant social benefits from recreational fishing. In 2000/01, the majority of recreational fishers in WA (68%) cited non-catch related motives (e.g. to relax and unwind, to be outdoors, for solitude, or to be with family and friends) as their primary motive for fishing (Henry and Lyle 2003). While most recreational fishers only catch a relatively small number of individuals, collectively this can add up to a relatively large number. In 2000/01, the estimated total recreational harvest in WA included over 10.4 million finfish (by number), 2.3 million crabs, 0.9 million prawns, 0.4 million lobster, and 0.2 million cephalopods (Henry and Lyle 2003).

### **1.2 Need for recreational fishing information**

An understanding of the level of recreational fishing catch and effort is used to inform a number of fisheries management processes. These include stock assessments, resource allocation between commercial and recreational sectors, resource management (development, implementation and review), and industry development. Effective management of exploited fish stocks requires that suitable estimates of the catch taken by all sectors are available. In WA, the harvest of many nearshore and estuarine species is dominated by the recreational sector, with lower but important harvest levels occurring further offshore (Department of Fisheries 2012b). Therefore a high priority has been placed on the collection of data over the past decade for the key recreational fishing sectors in Western Australia (Wise and Fletcher 2013).

The challenges in obtaining suitable recreational data in Western Australia include the large coastline (20,781 km) and rapid regional development, which is changing the distribution and intensity of the total catch and effort by recreational fishers. In 2011/12, approximately one third of the Western Australian population participated in recreational fishing, with the majority of effort (58%) in the West Coast Bioregion, centred around the capital city (Perth) and several of the State's large regional centres (Bunbury, Busselton and Geraldton). Recreational fishing effort was lower in the South Coast (26%), Gascoyne Coast (11%) and North Coast Bioregions (5%) (Department of Fisheries 2012b).

Estimating the total catch taken by recreational fishers can be logistically difficult and is often relatively costly. These difficulties are especially apparent where there is no licence sampling

frame (i.e. list of licence holders) to easily identify participants. Until recently, in Western Australia recreational fishers only needed a licence to fish for rock lobster, abalone and marron and to participate in freshwater angling and netting. The Recreational Fishing from Boat Licence (RFBL) was introduced in March 2010. There is no licence required for shore-based recreational fishing in WA. Importantly, in 2000/01, 57% of fishing effort and 54% of the recreational harvest was attributable to shore-based fishers (Henry and Lyle 2003).

Recreational fishing licence fees raised \$6.61 million in 2011/12 (Department of Fisheries 2012b). Funds generated by these licences are invested in a number of initiatives of direct benefit to recreational fishers including contributing funding to recreational fishing surveys. These surveys are providing the necessary harvest estimates and socio-economic information for the development of a broad spatial approach to research and management. They also assist in the implementation of Integrated Fisheries Management (IFM), which is designed to ensure sustainable fish resources are best shared between competing fishing sectors (Department of Fisheries 2010; Fletcher and Curnow 2002). To date, explicit resource allocations have been developed for: Western Rock Lobster (5% recreational, 95% commercial); metropolitan Roes' Abalone (40t recreational, 36t commercial); and the West Coast Demersal Scalefish Fishery (36% recreational, 64% commercial).

Long-term monitoring of recreational fishing information will provide greater understanding of the temporal variability and trends in catch and effort and is essential for assessment of stocks, resource allocation and management setting within the broad context of Ecologically Sustainable Development (Department of Fisheries 2012b) and Ecosystem Based Fisheries Management (Fletcher *et al.* 2011, Fletcher and Santoro 2012).

### **1.3 Recreational fishing surveys in Australia**

The spatial resolution of monitoring recreational fishing needs to be matched to the spatial scale at which fisheries are managed. Off-site methods are most appropriate for recreational fisheries that cover large geographical areas, with numerous access points to the fishery and many recreational fishing participants (Pollock *et al.* 1994). The sampling frame used to randomly select recreational fishers for an off-site survey can range from a general population list (e.g. White Pages telephone directories) or specific lists (e.g. list of anglers).

An important consideration for recreational fishing survey design is determining the most appropriate method of contacting anglers (Malvestuto 1996). White Pages sampling requires excess sampling of non-fishing households to locate fishing households, whereas angler lists have a higher probability of contacting fishers. Additionally, the Electronic White Pages directory is no longer available, and fishing households with unlisted (silent or mobile) numbers or without a telephone are out-of-scope for the survey. Similarly, the effectiveness of licence databases is determined by exemptions, data availability and non-compliance (Ryan *et al.* 2009, Hartill *et al.* 2012).

The National Recreational and Indigenous Fishing Survey (NRFS) provided state-wide estimates of boat and shore based recreational fishing across Australia from 1 May 2000 to 30 April 2001 (Henry and Lyle 2003). This survey used telephone interviews of fishers who were randomly selected from White Pages telephone directories. This methodology has been employed in state-wide repeat surveys in: South Australia from 1 November 2007 and 31 October 2008 (Jones 2009), Tasmania from 1 December 2007 and 30 November 2008 (Lyle *et al.* 2009), Northern Territory from 1 April 2009 to 31 March 2010 (West *et al.* 2012), and Queensland from 1 October 2010 to 30 September 2011 (Taylor *et al.* 2012).

Alternative sampling frames for off-site surveys are licence databases, where they exist. This approach has been routinely used in sample surveys to estimate the total recreational catch for many specialised, low participation licensed fisheries (e.g. abalone, rock lobster and scallops) in Australia (e.g. Melville-Smith and Anderton 2000, Currie *et al.* 2006, de Lestang *et al.* 2012, Lyle and Tracey 2010, Tracey and Lyle 2008).

The telephone-diary survey approach using a licence database as a sampling frame was identified as the preferred method to provide cost-effective, annual estimates of total catch for key recreational fisheries in Victoria, where data collected in the NRFS indicated that a large majority of the recreational catch of key species (such as snapper) was taken by boat-based anglers that held a Recreational Fishing Licence (Ryan *et al.* 2009). This methodology was evaluated in a survey to assess the recreational catch from the western Victoria snapper stock, with particular emphasis on catches from Port Phillip Bay and Western Port, from 1 July 2006 to 30 June 2007. Although the Victorian licence has several exemption categories, bias from exempt fishers was investigated with a concurrent Boat Ramp Survey. The magnitude of snapper harvest by exempt anglers was estimated to be about 13% of that taken by licensed fishers, similar to the standard error of the harvest estimate for licensed fishers.

The advantages of sampling from a licence database were: reduced costs for the initial screening survey, high response rates (reducing non-response bias), and the ability to use an optimal survey design where avid fishers were oversampled (Ryan *et al.* 2009). This oversampling of avid anglers effectively increased the number of fishing events in the sample and improved precision. Harvest estimates for snapper in Port Phillip Bay and Western Port from the 2006/07 survey were consistently more precise than those obtained state-wide in the NRFS.

## **1.4 Recreational fishing surveys in WA**

Apart from the WA component of the National Recreational and Indigenous Fishing Survey (Henry and Lyle 2003), all large scale surveys of recreational boat-based fishing in WA have been undertaken using Boat Ramp Surveys at a bioregion level. These include 12-month surveys in the West Coast Bioregion in 1996–97 and 2005–06 (Sumner and Williamson 1999, Sumner *et al.* 2008); Gascoyne Coast in 1998–99 (Sumner *et al.* 2002); North Coast (Pilbara region) in 1999-00 (Williamson *et al.* 2006); and South Coast in 2002-03 (Smallwood and Sumner 2007). The introduction of the Recreational Fishing from a Boat Licence (RFBL) in March 2010 provided a suitable sampling frame for a comprehensive state-wide survey (both spatially and temporally) to estimate boat-based recreational catch for all of Western Australia.

To ensure the most appropriate survey and sampling design based on this licence sampling frame was developed, a workshop was held in 2010 to coincide with the introduction of the RFBL with invited technical survey experts and managers from most jurisdictions in Australia and New Zealand. The workshop concluded that an integrated system that obtained data from several survey methods, utilising the RFBL as the basis for sampling recreational fishers, would provide the most robust approach for obtaining annual estimates of recreational catch by boat-based fishers at both state-wide and bioregion levels (Wise and Fletcher 2013).

## **1.5 State-wide integrated survey of boat-based recreational fishing in WA (2011-12)**

The integrated survey includes three complementary components: (i) off-site Phone Surveys using the RFBL as a sampling frame, with an initial Screening Survey to recruit respondents for a 12 month longitudinal Phone-Diary Survey, followed by post-enumeration surveys to detect differences among licence holders (Wash-Up/Attitudinal, Non Intending Fisher and Benchmark Surveys); (ii) on-site Boat Ramp Surveys (including a state-wide Biological Survey and a Perth metropolitan Validation Survey) to provide biological information and validate information collected in the Phone-Diary Survey; and (iii) a remote Camera Survey using video cameras mounted at key boat ramps to monitor 24/7 launches and retrievals.

The integrated approach using the RFBL: tests the applicability of licence sampling frames to estimate recreational activity for generalised, high participation fisheries; provides estimates at spatial scales appropriate for management; and has several survey components to consider bias. The integrated survey was designed in the second half of 2010, with data collection commencing in December 2010 to pilot test the survey design and questionnaires, and to train interviewers. The main period of data collection occurred for a 12 month period between 1 March 2011 and 29 February 2012, with follow-up post-enumeration surveys conducted in March through to June 2012. Validation and analyses of data generated by these surveys occurred from July to November 2012 with catch estimates generated by this survey presented in this report.

This design enables state-wide and bioregion estimates of annual boat-based recreational catches with coverage of all fishing times, locations and boat-based recreational fishing methods (including line, pot, net and diving); for all motorised vessels used in boat-based recreational fishing. This report presents the findings of the first of a series of state-wide surveys of boat-based fishing within Western Australia.

## **1.6 Survey Objectives**

The objective of this survey was to generate annual estimates of the total recreational catch and effort (both retained and released) by boat-based recreational fishers at state-wide and bioregion levels. These estimates will complement data obtained routinely from the commercial sector. Furthermore, the implementation of regular, reliable and cost-effective surveys will provide data that will allow more realistic and rigorous assessments of recreational fisheries.

## **1.7 Report structure**

This report is one of three documents that will be generated based on the results of the surveys. This report will focus on producing the state-wide and bioregional catch estimates by numbers (and in some species by weight) of each of the main species captured by boat-based recreational fishing. A second report will examine if there have been any material changes in recreational catch levels compared to previous surveys that may have potential management implications. A third report will investigate in more detail the statistical and sampling elements of this survey and whether further improvements can be made to increase the robustness of the estimates.

This report has been structured to enable comparisons, notably in the presentation of results, with state-wide recreational fishing survey reports from the Northern Territory (West *et al.* 2012), Queensland (Taylor *et al.* 2012), South Australia (Jones 2009) and Tasmania (Lyle *et al.*

2009). The reports from the National Recreational Fishing Survey (Henry and Lyle 2003) and the recent state-wide surveys are respectfully noted as having laid the foundation for these types of surveys in Australia.

Each of the chapters in this report cover specific details or outputs of the surveys, including:

Chapter 2 (Survey Design and Analysis) provides information of the survey design and scope for the Phone, Boat Ramp and Camera Surveys. Methods used for the expansion, weighting and analysis of survey data are discussed, along with measures of uncertainty associated with survey estimates.

Chapter 3 (Participation) presents estimates of the total number of Recreational Fishing from a Boat Licence (RFBL) holders that fished in WA between 1 March 2010 to 28 February 2011 (Screening Survey) and 1 March 2011 to 29 February 2012 (Benchmark Survey). Participation estimates have been summarised by age, gender, bioregion fished and avidity.

Chapter 4 (Fishing Effort) presents estimates of the total number of separate days of boat-based fishing from the 12 month Phone-Diary Survey. Fishing effort has been summarised state-wide and for each bioregion by habitat, fishing method, season and month.

Chapter 5 (State-wide Recreational Catch) presents information on targeted fishing, recreational catch (total, kept and released numbers) attributable to boat-based fishing from the 12 month Phone-Diary Survey with estimates of the annual catch (total, kept and released numbers) and release rates for all species.

Chapter 6 (Estimates of Catch for Key Species) summarises the total recreational catch by bioregion, habitat, fishing method and season for key species.

Chapter 7 (Bioregion Fisheries) provides an overview of the species composition of the recreational catch in each bioregion with estimates of the annual catch (total, kept and released numbers) and proportion released/discarded in each bioregion.

Chapter 8 (Harvest Weights) provides an overview of the estimated annual catch (kept numbers), average weight and estimated harvest weight for the top 10 scalefish species/species groupings and the top 10 demersal scalefish species/species groupings in each bioregion.

The similarities in report structure among states originates from similarities in state-wide telephone/diary survey design and analysis methods used in other states, which have benefited from the *RecSurvey* package (Lyle *et al.* 2010). This package was designed for state-wide surveys using a White Pages sampling frame with expansion to Australian Bureau of Statistics estimated population profiles. Western Australia is the only state in Australia to use a licence sampling frame for their state-wide survey, and refinement of the *RecSurvey* package for these types of surveys is in development. Data collected from the WA integrated state-wide survey are extensive, and while this report summarises initial key findings, further analyses and refinement of analysis methods are anticipated over the next 2–3 years.

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## **2.0 Survey Design and Analysis**

### **2.1 Survey Scope**

The integrated survey includes three complementary components: (i) off-site Phone Surveys (encompassing an initial Screening Survey, 12 month Phone-Diary Survey, followed by post-enumeration Wash-Up/Attitudinal, Non Intending Fisher and Benchmark Surveys); (ii) on-site Boat Ramp Surveys (including a state-wide Biological Survey and a Perth metropolitan Validation Survey); and (iii) a remote Camera Survey. Planning for the integrated State-Wide Recreational Fishing from a Boat Survey required consideration of inherent differences between off-site (e.g. telephone) and on-site (e.g. face-to-face) sampling to ensure consistency (where possible) in the information collected from each survey. Output specifications for the Phone, Boat and Remote Camera Surveys are listed in Table 1 to identify what was considered in-scope for each survey.

#### **2.1.1 Who was Included in the Survey?**

Persons in scope included recreational fishers that held a Recreational Fishing from Boat Licence (RFBL), which is required to undertake any general fishing activity from a motorised vessel anywhere in WA. In the Phone Surveys, this was defined as fishers that held a RFBL in the 12 month period prior to the survey component, with the additional criterion for the Phone-Diary Survey of an intention to fish from a boat in marine water in the coming 12 months. Commercial fishers were considered in scope, if they held an RFBL.

A minimum age criterion of 5 years was applied to all surveys. In the Phone Surveys, parents were a proxy for children aged 5–13 years and parent permission was required for children aged 14–17 years. No further proxies were allowed, with the exception of nominated individuals within a household where there was language difficulty or illness. No substitution of respondents occurred during the Phone Surveys.

#### **2.1.2 What Fishing Activities were covered?**

Activities in scope were all boat-based recreational fishing methods, including line fishing, and other fishing methods, such as diving, netting, potting and spear fishing, as undertaken from a licensed powered vessel as per WA recreational fishing rules. Illegal (non-compliant) recreational fishing activity was not included in the survey. Charter boat fishing was not included in the Boat Ramp Surveys as this information is collected in charter logbooks. However, fishing from charter boats was included in the Phone-Diary Survey, but excluded from the analysis. The proportion of RFBL holders that fished from the shore was assessed in the Screening and Benchmark Surveys, but shore-based fishing activity was not included in the Phone-Diary Survey.

#### **2.1.3 What Species were covered?**

Species in scope included any aquatic (animal) species caught by boat-based fishing. This includes both finfish (e.g. scalefish, sharks and rays) and invertebrates (e.g. abalone, cephalopods, crabs, lobsters and prawns). The majority of catches are reported on an individual species, but there are some instances where species have been reported in taxonomic groups (e.g. School Whiting includes Southern School Whiting, Western School Whiting and Yellowfin Whiting, King Snapper includes *Pristipomoides* spp.). Where species or taxa groups are represented by few records, catches are reported in broad taxonomic categories (e.g. ‘Other scalefish’). Species

taxonomy follows the Codes for Australian Aquatic Biota (Rees *et al.* 2012, [www.marine.csiro.au/caab/](http://www.marine.csiro.au/caab/)). Consistent with the management of many of the multi-species fisheries in WA and EBFM, the results were in some instances also reported at the species suite level (Department of Fisheries 2011d).

#### **2.1.4 Survey Area**

The geographic scope was fishing activity in Western Australia only. Consistent with the Department's bioregional approach to management, the spatial strata for boat-based fishing activity used the four marine bioregions off Western Australia (Figure 1). The Phone Surveys provided state-wide coverage, while the Biological and Camera Surveys provided state-wide coverage, as accessible from the boat ramps in the survey design. The Validation Survey applied to metropolitan Perth only. Based on the Department's EBFM policy, each of the bioregions were also divided into broad ecological depth based habitats (Fletcher and Santoro 2012, Department of Fisheries 2011d): pelagic (across all depths), offshore (demersal greater than 250 m), inshore (demersal 20–250 m), near shore (to 20 m deep), estuarine (saltwater and 'brackish' to river mouth), and freshwater (river, stream, dams) (Figure 2).

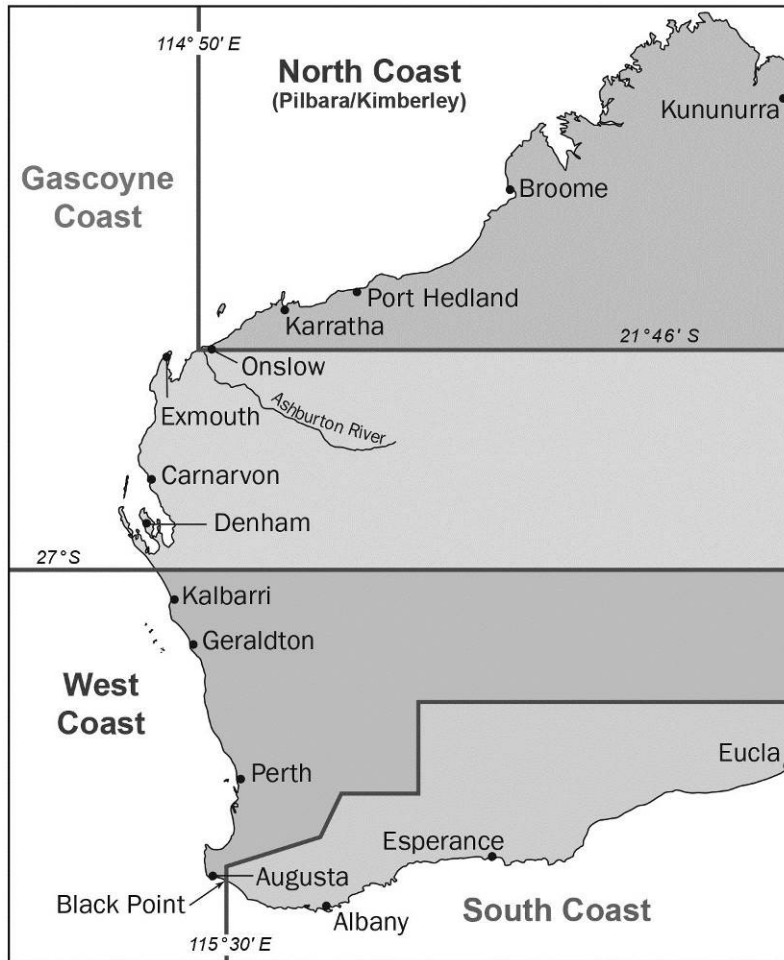
#### **2.1.5 Survey Duration**

The 12 month period from 1 March 2011 to 29 February 2012 applied to the Phone-Diary, Boat Ramp and Camera Surveys. The Phone Surveys included an initial Screening Survey conducted in the 2 months leading up to the Phone-Diary Survey, and Post-Enumeration Surveys conducted during three months following the Phone-Diary Survey.

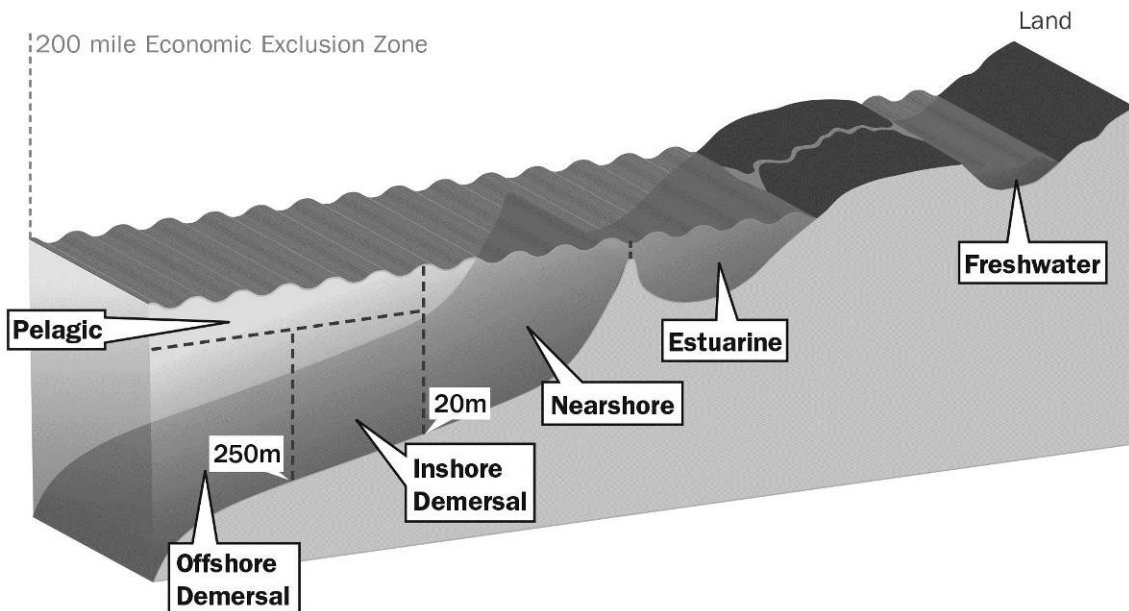
**Table 1.** Output Specifications for each survey component.

Specification	Item	Phone Surveys			Boat Ramp Surveys		Camera Survey
		Screening	Phone-Diary	Benchmark	Validation	Biological	
Persons in scope	Residency status	All, including WA residents, interstate and overseas fishers			All		n/a
	Age	<5 years excluded				All	n/a
	Sampling frame	RFBL holders Mar 2010 to Feb 2011	RFBL holders Mar 2010 to Feb 2011, with 'intention to fish' in WA	RFBL holders Mar 2011 to Feb 2012	Spatio-temporal frame		
Activities	Sectors	Recreational fishing only (traditional/indigenous fishing excluded)					
	Platform	Boat- and shore-based	Boat-based fishing only	Boat- and shore-based	Boat-based fishing only		
	Boat type	All, including private, hire and charter			Private and hire fishing (charter excluded)		All
	Methods	All methods including line fishing, diving, netting, potting and spearing					
Species	Species	All aquatic (animal) species					n/a
	Catch	Retained and released					n/a
Geographic scope	Residency status	WA residents, interstate and overseas fishers			n/a		
	Fishing activity	Bioregion, and marine vs freshwater	10x10 nautical mile grids state-wide (all WA waters)	Bioregion, and marine vs freshwater	10x10 nautical mile grids in West Coast Metro Zone (as per boat ramps)	10x10 nautical mile grids state-wide (as per boat ramps)	
	Access points for boat fishing	n/a	All, including boat ramps (public and private), moorings and marinas	n/a	6 key public boat ramps within the West Coast Metro Zone	Selected key public boat ramps state-wide	
Temporal scope	Annual coverage	12 months prior to Screening (recall basis)	12 months after Screening (longitudinal survey)	12 months matching the diary period (recall basis)	12 months matching the diary period (progressive sampling)		
	Day hours	All			Certain daylight hours	All	
	Survey dates	Dec 2010 to Feb 2011	1 Mar 2011 to 29 Feb 2012	Apr to Jun 2012	1 Mar 2011 to 29 Feb 2012		





**Figure 1.** Map of WA coastline showing major bioregions.



**Figure 2.** Major habitat groups for Western Australian fisheries (Department of Fisheries 2011d).

### **2.1.6 Survey Data Elements**

Another key difference between off-site and on-site sampling is whether fishing activity is recorded on an event or trip basis. For the Phone-Diary Survey, fishing information was collected on an ‘event’ basis, where separate events were recorded for changes in location, habitat, target species and/or fishing method. For example, line fishing and diving during a single boat trip would be recorded as separate fishing events. Fishing activity in the Boat Ramp Surveys was recorded on a ‘trip’ or day basis. Where possible, data elements were standardised between surveys, in terms of question wording and responses (Table 2). Reference tables for data elements (such as boat ramp, species and fishing method) were also standardised among survey components.

## **2.2 Survey Components**

### **2.2.1 Phone Surveys**

#### **Survey Overview**

The Phone Surveys were the main component of the integrated survey. This off-site survey was based on the telephone/diary methodology, which has been developed and proven to provide cost-effective data over large spatial scales (i.e. state-wide and bioregion). Detailed descriptions of the design philosophy and methodology are provided in Lyle *et al.* (2002) and Henry and Lyle (2003). Key features of this methodology include: (i) tested survey instruments (e.g. Diary Card) to minimise recall bias; and (ii) frequent telephone contact by trained interviewers to collect data at consistent standards, reduce potential bias, explain difficult concepts, counter resistance and ensure confidentiality. The combination of the Diary Card and structured interviews is designed to minimise respondent burden, increase response rates and ensure data quality.

Unlike previous surveys of this kind in Australia, interviews were conducted by Computer-Assisted Telephone Interview (CATI). This allows a cost effective and flexible means of recording questionnaire data as it is entered directly into survey databases during interviews. It also provides an effective system for ensuring data quality as work stations are networked with a supervisor. Electronic survey data is contained within secure computer networks with appropriate management systems.

The primary objective of the Phone Surveys were to estimate recreational fishing effort (hours and days fished) and catch (numbers by species, both harvested and released) for a full 12 month period for boat-based recreational fishing at state-wide and bioregion levels. It was anticipated that highest precision would be achieved for key species at annual and state-wide levels, however, estimates with lower precision may be available at finer scale temporal (monthly) and spatial (zone within bioregions) levels.

The Phone Surveys involved a multi-phase survey design (Figure 3), which included: an initial Screening Survey to recruit fishers to the Phone-Diary Survey; a longitudinal Phone-Diary Survey to provide detailed catch and effort information over a 12-month period; and Post-Enumeration Surveys (i.e. Wash Up/Attitudinal, Non-Intending Fisher and Benchmark Surveys). These separate Post-Enumeration Surveys were conducted concurrently at the end of the 12 month Phone-Diary Survey to determine and adjust for exceptions outside the distribution of behaviours covered by the Phone-Diary Survey, particularly new licence holders and non-respondents, and to enquire about opinions of RFBL holders for various fishing-related matters.

## **Screening Survey**

The Screening Survey (Figure 3) aims to collect profiling information (i.e. avidity, previous and intended fishing activity) for a random sample of people that purchased a Recreational Fishing from a Boat Licence (RFBL) and identify RFBL holders that intended to fish from a boat in WA during 2011/12 and were eligible for the Phone-Diary Survey. The Screening Survey was conducted by telephone interview during December 2010 to February 2011. The sampling frame for the Screening Survey was obtained from a database of fishers who purchased a RFBL between March 2010 and February 2011 (Figure 4).

## **Phone-Diary Survey**

The Phone-Diary Survey (Figure 3) was conducted from 1 March 2011 to 29 February 2012. The aim of the Phone-Diary Survey was to quantify recreational fishing effort (hours and days fished) and catch (numbers by species, both harvested and released) for a full 12 month period. Other information was also obtained in terms of target species, fishing method and fishing location. The Phone-Diary Survey was confined to recreational boat fishing in WA, using all fishing methods (such as line fishing, diving, nets, traps and spears). Fishing activity was classified in terms of bioregions, habitats and fishing location, defined by unique location name, latitude and longitude co-ordinates, or 10 by 10 nautical mile grid blocks (Department of Fisheries 2011a). This report will summarise data at state-wide and bioregion levels.

Participants received a Diary Kit containing a Welcome Letter, species identification guides (with clear colour images of common species), Fishing Location Guide and Diary Card. The Diary Card was in a standard format used for these types of surveys and is designed to be 'memory jogger' rather than a traditional fishing logbook. Participants were encouraged to use the Diary Card to record key fishing data and were contacted regularly by survey interviewers, who were responsible for collecting this information. Participants also received a brief diary explanation interview with the survey interviewer after receiving the Diary Kit.

Species identification guides included a Northern Fish Identification Guide (Department of Fisheries 2011b) and Southern Fish Identification Guide (Department of Fisheries 2011c). These guides were developed to help diary participants identify common species, and enhance consistent and accurate species identification. Interviewers were trained in species identification by Research Scientists from the Department of Fisheries, and instructed on detailed taxonomic reference (Allen 2009, Hutchins and Swainston 1999, Jones and Morgan 2002).

Data were collected during a telephone interview each month, even if there was no fishing to report, or more frequently for participants with more frequent fishing activity. It should be noted that during the Phone-Diary Survey, some participants did not actually fish, despite intending to during the Screening Survey. These fishers 'dropped-out' of the fishery, but this was in the range of expected behaviours for the survey.

## **Wash-Up/Attitudinal Surveys**

The Wash-Up/Attitudinal Surveys were conducted during March to May 2012 during the final telephone contact with each diarist to confirm completion of the survey, assess opinions and attitudes for a range of fisheries-related issues, and collect boat-profiling information. Other questions were included to assess diarists' perceptions as to whether they fished "more, less or about the same" amount of time in the 12 month diary period, compared with the prior 12 months. Different Wash-Up/Attitudinal Surveys were used for participants that fished, or did not fish, during the Phone-Diary Survey (Figure 3).

### **Non Intending Fisher Survey**

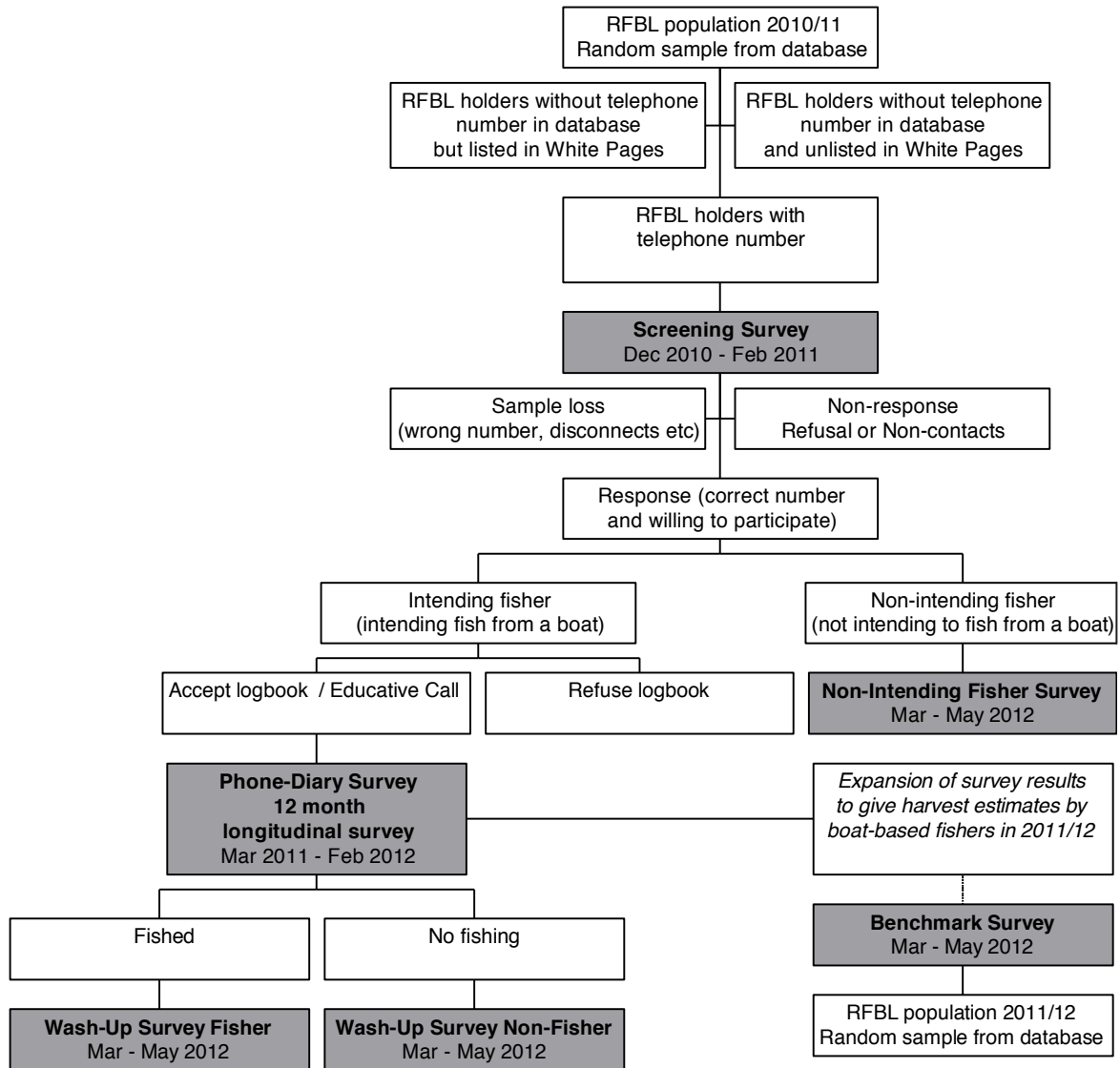
The Non-Intending Fisher Survey (Figure 3) was conducted during March to May 2012 to record the incidence of fishing by RFBL holders sampled in the Screening Survey that were not intending to fish in the next 12 months. These respondents were not eligible for the Phone-Diary Survey, but it is important to identify and account for ‘unexpected fishing’ that may have occurred during the period. This ‘call-back’ survey determines the impact of unexpected ‘drop-ins’ to the fishery.

### **Benchmark Survey**

The Benchmark Survey (Figure 3) was conducted during March to May 2012 to identify the impact of additional ‘drop-ins’ to the fishery, such as RFBL holders who purchased a new licence in 2011-12. This survey was essentially a repeat of the Screening Survey, with aims to collect profiling information (i.e. avidity, previous and intended fishing activity) for a random sample of people that purchased a Recreational Fishing from Boat Licence (RFBL) during the same time period as the Phone-Diary Survey. Therefore, the sampling frame for the Benchmark Survey was obtained from a database of fishers who purchased a RFBL between March 2011 and February 2012 (Figure 5), but excluding RFBL holders that had been selected for the Screening Survey. Most importantly, the Benchmark Survey provided the necessary information for licence holders from the current RFBL population for calibration and expansion of results from the Phone-Diary Survey.

### **Survey Documentation**

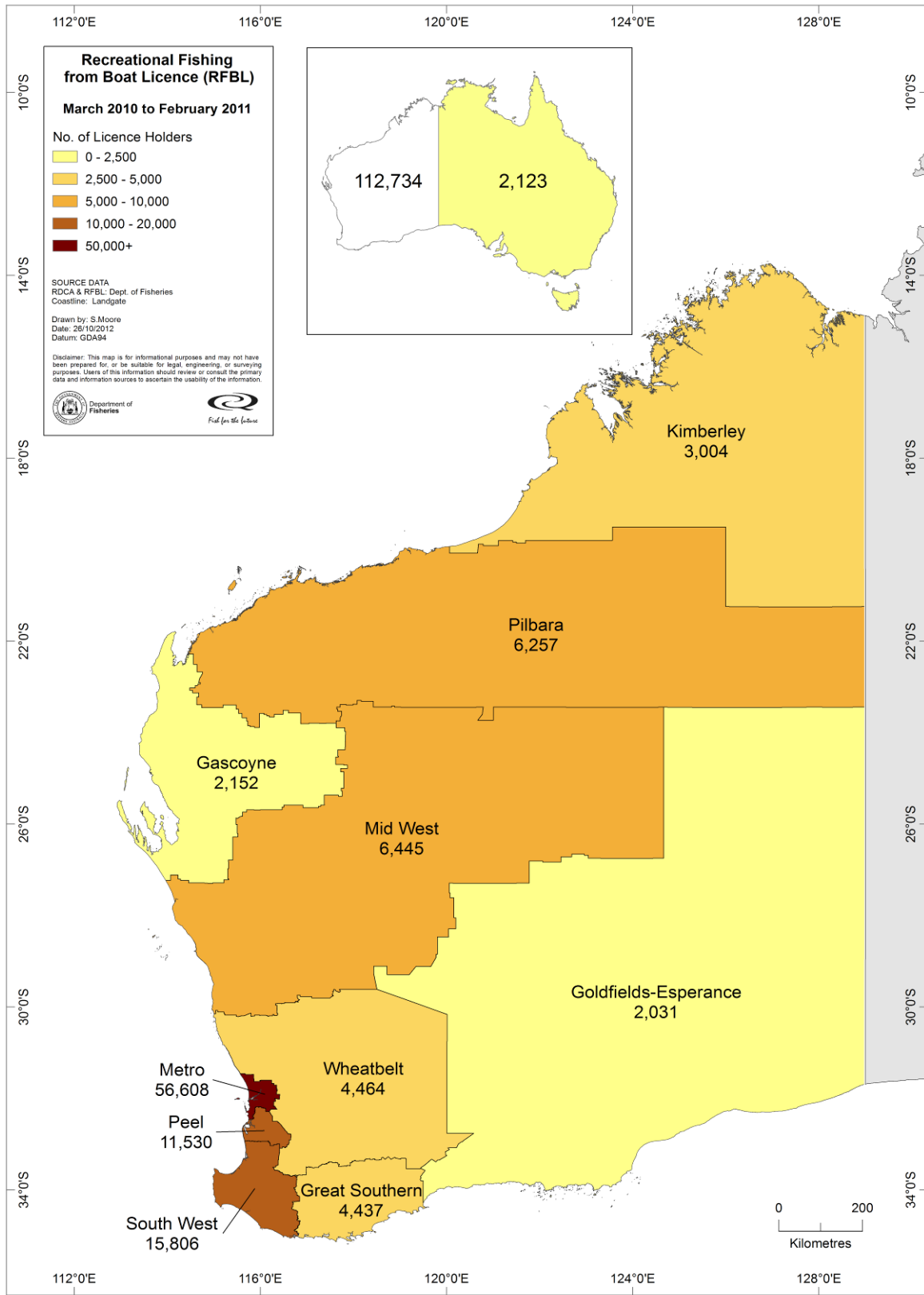
The Phone Survey methodology utilises outputs from the NRFS. Development of the NRFS resulted in a set of survey materials, including questionnaires and interviewer manuals, to facilitate the collection/recording of survey data (Survey Development Working Group 2000). These were produced following an extensive design and testing program. Highly structured questionnaires were developed, where question wording, instructions to interviewers and pre-coded answer categories were included in accordance with a range of standardised interviewing conventions. An equivalent approach was employed for all Phone Survey components in the present study, including thorough training and monitoring of interviewers, and development of a comprehensive interviewer manual.



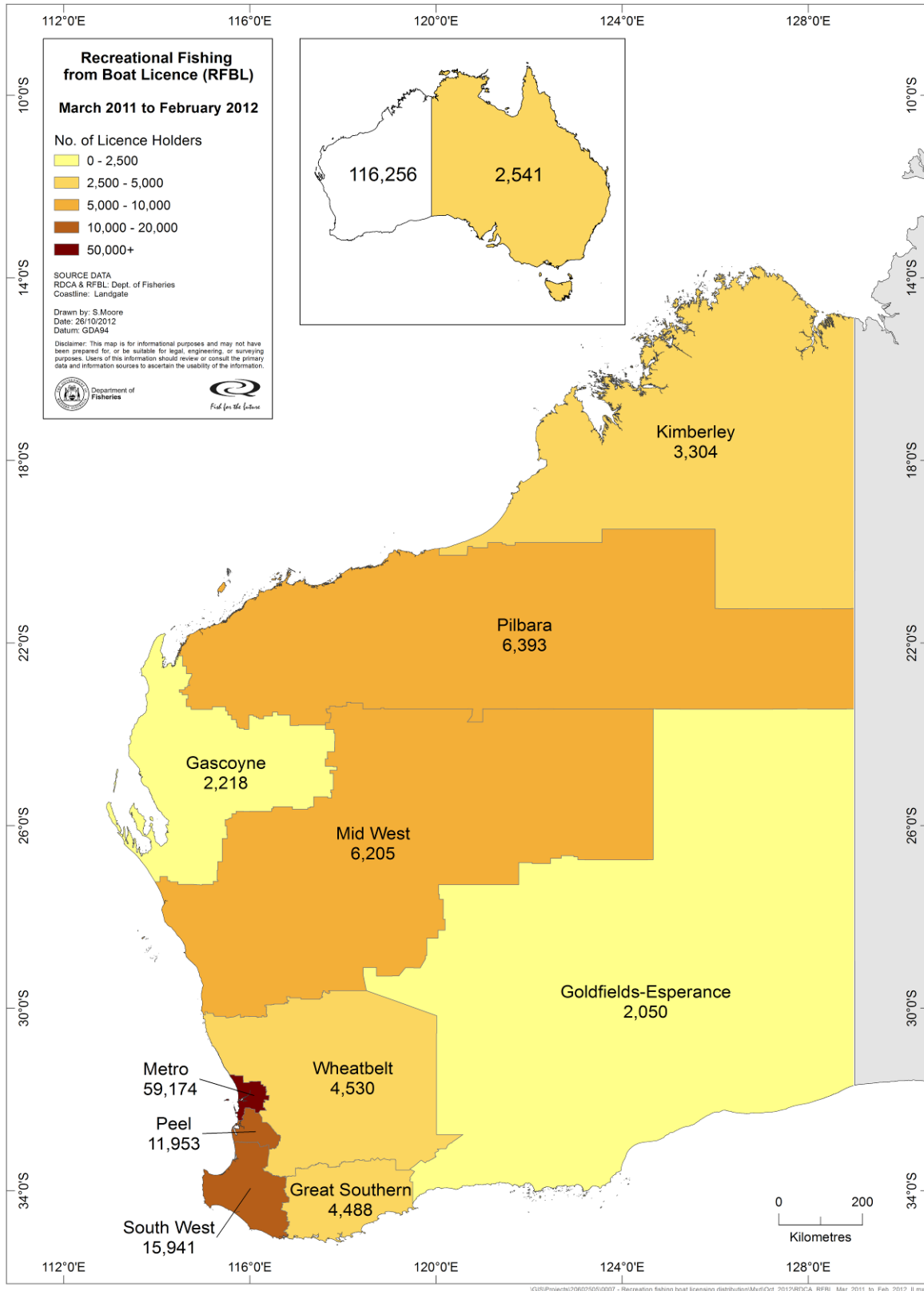
**Figure 3.** Survey Components for state-wide Phone Surveys of boat-based recreational fishing in WA 2011-12.

**Table 2.** Data elements for each survey component.

Specification	Data	Phone Surveys			Boat Ramp Surveys		Camera Survey
		Screening	Phone-Diary	Benchmark	Validation	Biological	
<b>Persons in Scope</b>							
Residential status	Postcode	Yes			No		n/a
	Strata	Yes			No		n/a
Demographic profiling	Age	Yes			No (except < 5 yrs excluded)		n/a
	Sex	Yes			No		n/a
Number in Fishing Party	Fishers 5+ yrs	n/a	Yes	n/a	Yes		n/a
	RFBL holders	n/a	Yes	n/a	No	Yes	n/a
<b>Recreational Fishing Activities in Scope</b>							
Platform	Boat vs shore	Yes	Boat only	Yes	n/a		
Boat type	Private, hire, or charter	No	Yes	No	Yes (charter excluded)		Yes
Methods	Method code	No	Yes	No	Yes	No	n/a
	No. Pots/Nets	n/a	Yes	n/a	Yes	No	n/a
<b>Species in Scope</b>							
Species	Species	Yes					n/a
Target	1st/2nd target	No	Yes	No			n/a
Catch	Harvest (H)	No	Yes	No	Yes		n/a
	Release (R)	No	Yes	No	Yes		n/a
	Total (C)	Yes or No (by recall)	Yes (from H + R)	Yes or No (by recall)	Yes		n/a
	Reasons for release	n/a	Yes	n/a	No		n/a
<b>Geographic Scope</b>							
Fishing location	Location	n/a	Yes	n/a	Yes		n/a
	WA Bioregion	Yes			West Coast	Yes	
	Habitat	Fresh vs salt-water only	Yes	Fresh vs salt-water only	Yes	No	
Boat access type	Boat access	No	Yes	No	Yes (always public ramp)		
	Boat ramp	No	Yes	No	Yes		
<b>Broad assessment of fishing</b> (previous and next 12 months, primarily by recall)							
Any fishing in WA?		Yes	n/a	Yes	No		n/a
Avidity (category of days fished in previous 12 months)		Yes	n/a	Yes	Yes		n/a
Avidity (number of days fished in diary period by month)			Yes (from diary)	Yes (by recall)	No		n/a
Intention to boat-fish in WA in next 12 months?		Yes	n/a	Yes	No		n/a
<b>Temporal Scope</b> (i.e. for assessment of any fishing activity)							
Dates of fishing/event	Start date	n/a	dd/mm/yy	n/a	dd/mm/yy		n/a
	End date	n/a	dd/mm/yy	n/a	dd/mm/yy		n/a
Times of fishing/event	Start time	n/a	hh:mm	n/a	No	No	n/a
	Finish time	n/a	hh:mm	n/a	No	No	n/a
	Breaks	n/a	hh:mm	n/a	No	No	n/a
Times of boat activity	Launch	n/a	hh:mm	n/a	hh:mm (daylight hours only)		Yes
	Retrieval	n/a	hh:mm	n/a	hh:mm (daylight hours only)		Yes



**Figure 4.** Number of RFBL holders within Regional Commission Boundaries from March 2010 to February 2011.



**Figure 5.** Number of RFBL holders within Regional Commission Boundaries from March 2011 to February 2012.



## **Response Profiles**

A summary of the response profiles relating to the Screening, Phone-Diary and Benchmark Surveys is given in Table 3. The majority (49%) of sample loss in the Screening and Benchmark Surveys was from disconnected telephone numbers (3.1% of the gross sample). Sample loss also occurred where the respondent was not known at the number (0.9% of the gross sample), the respondent was known but no new contact details were available (0.6%), or the respondent was away for the survey period (0.8%). Less common sources of sample loss were fax/modem numbers (0.2%), language difficulties (0.2%), or respondent incapacitated or deceased (0.3%).

The initial Screening Survey conducted prior to the Phone-Diary Survey was based on a sample of 4635 RFBL holders, of which 96.1% were fully responding (i.e. completed all required interview questions) (Table 3). The 191 non-responding RFBL holders were either non-contacts (3.1% of the net sample) or refusals (0.8% of the net sample). Similarly, 94.0% RFBL holders fully responded from a sample of 4824 for the Benchmark Survey at the end of the Phone-Diary Survey. The 272 non-responding RFBL holders were non-contacts (3.7% of the net sample) or refusals (2.3% of the net sample).

The majority of non-response in the Screening and Benchmark Surveys was from non-contacts, despite at least 20 effective calls to each respondent, over a range of day times and days of the week, during the survey period. The higher refusal rate for the Benchmark Survey may be attributable to the release of Marine Park media on the weekend the Benchmark Survey commenced. Despite this, refusal rates were low for both surveys, and could be attributable to the use of experienced interviewers and the fact that relevance of the subject matter strongly correlates with response propensity (i.e. an 'interest' in fishing).

There were 3221 RFBL holders identified as eligible for Phone-Diary Survey (i.e. having an intention to fish from a boat in WA during March 2011 to February 2012). This represented 77% of the fully responding group from the Screening Survey. Of the eligible RFBL holders, 3116 (96.7%) agreed to participate in the Phone-Diary Survey. Subsequently, 2,977 participants completed the Phone-Diary Survey, representing 95.5% completion rate among uptake, or 92.4% among eligible (Table 3). The 139 participants that failed to complete the Phone-Diary Survey were mainly from lost contacts (through relocation or disconnected numbers) with some refusals.

Response rates were relatively consistent across all sampling strata. The response rates achieved in all components of this study were very high, which provides confidence in overall data quality and minimises the impact of non-response bias.

### **2.2.2 Boat Ramp Surveys**

Boat Ramp Surveys were undertaken to carry out face to face interviews with approximately 5,000–10,000 boat-based recreational fishers. The Boat Ramp Surveys included: a state-wide Biological Survey; and a metropolitan Validation Survey.

#### **Biological Survey**

The objective of the Biological Survey was to provide the necessary biological information to allow conversion of estimates of catch (by numbers) from the Phone-Diary Survey to be converted to catch (by weight). This allows for direct comparison of recreational harvest estimates to commercial fishery information, which is routinely recorded as weights.

The target population included all boat-based recreational fishers as accessed with a spatial-temporal sampling frame. The sample design was a probability-based sample of key boat ramps throughout

Western Australia. The primary sampling unit was sample day. The secondary sampling unit was fishing party, which can include both RFBL holders and non-licensed fishers (unlicensed fishers can fish if at least one person on board has an RFBL, provided the total catch of the fishing party is within the bag limit for the RFBL holder, and the boat limit when two or more RFBL holders are on board). Fishers younger than 5 were identified during the interview and excluded from sample selection.

**Table 3.** Sample size and response profile for Screening, Phone-Diary and Benchmark Surveys by stratum.

<b>SCREENING SURVEY</b>	<b>Total RFBL Holders</b>	<b>Initial sample</b>	<b>Sample loss</b>	<b>Net sample</b>	<b>Non-response</b>	<b>Full response</b>	<b>Response rate</b>
Kimberley	3,004	197	22	175	9	166	94.86%
Pilbara	6,257	308	21	287	15	272	94.77%
Gascoyne	2,152	161	17	144	8	136	94.44%
Mid West	6,445	291	10	281	13	268	95.37%
Wheat Belt	4,464	209	16	193	3	190	98.45%
Metro	56,608	1,896	107	1,789	70	1,719	96.09%
Peel	11,530	402	22	380	14	366	96.32%
South West	15,806	530	38	492	16	476	96.75%
Great Sth'n	4,437	225	9	216	7	209	96.76%
Gold fields	2,031	211	9	202	4	198	98.02%
Interstate	2,123	205	18	187	9	178	95.19%
Total	114,857	4,635	289	4,346	168	4,178	96.13%

<b>PHONE-DIARY SURVEY</b>	<b>Full response at screening</b>	<b>Eligible for the Diary Survey</b>	<b>Diary Uptake</b>	<b>Diary Survey Completed</b>	<b>Uptake rate among eligible (%)</b>	<b>Completion rate among uptake (%)</b>	<b>Completion rate among eligible (%)</b>
Kimberley	166	143	139	132	97.20%	94.96%	92.31%
Pilbara	272	218	212	202	97.25%	95.28%	92.66%
Gascoyne	136	102	98	93	96.08%	94.90%	91.18%
Mid West	268	215	209	198	97.21%	94.74%	92.09%
Wheatbelt	190	144	141	133	97.92%	94.33%	92.36%
Metro	1,719	1,339	1,290	1,241	96.34%	96.20%	92.68%
Peel	366	274	264	252	96.35%	95.45%	91.97%
South West	476	397	387	366	97.48%	94.57%	92.19%
Great Sth'n	209	169	165	157	97.63%	95.15%	92.90%
Goldfields	198	146	141	134	96.58%	95.04%	91.78%
Interstate	178	74	70	69	94.59%	98.57%	93.24%
TOTAL	4,178	3,221	3,116	2,977	96.74%	95.54%	92.42%

<b>BENCHMARK SURVEY</b>	<b>Total RFBL Holders</b>	<b>Initial sample</b>	<b>Sample loss</b>	<b>Net sample</b>	<b>Non-response</b>	<b>Full response</b>	<b>Response rate</b>
Kimberley	3,304	250	18	232	19	213	91.81%
Pilbara	6,393	299	28	271	19	252	92.99%
Gascoyne	2,218	250	25	225	12	213	94.67%
Mid West	6,205	282	16	266	16	250	93.98%
Wheatbelt	4,530	250	7	243	10	233	95.88%
Metro	59,174	1,839	107	1,732	103	1,629	94.05%
Peel	11,953	391	32	359	15	344	95.82%
South West	15,941	513	33	480	34	446	92.92%
Great Sth'n	4,488	250	19	231	11	220	95.24%
Goldfields	2,050	250	6	244	13	231	94.67%
Interstate	2,541	250	17	233	20	213	91.42%
TOTAL	118,797	4,824	308	4,516	272	4,244	93.98%

Spatial stratification for the Biological Survey included marine bioregion and regions (or zones) within bioregions. There were 65 ramps sampled state-wide in the Biological Survey, including: 14 ramps in the North Coast (6 in the Kimberley region and 8 ramps in the Pilbara region); 11 ramps in the Gascoyne Coast (6 ramps in the Shark Bay region and 5 ramps in the Ningaloo region); 26 ramps in the West Coast (7 ramps in the North Zone, 11 in the Metro Zone, 8 ramps in the South Zone); and 14 ramps in the South Coast (8 ramps in the Albany region and 6 ramps in the Esperance region).

Temporal stratification for the biological survey included; day type (weekend/weekday); time of day (am/pm shifts); and month. Sample days were also confined to daylight hours only.

Summaries of the state-wide and bioregion estimates of average weight of key species from Boat Ramp Surveys in 2011–12, including; the number of weight measurements recorded, average weight (measured in grams) and standard error are given in Appendix 1.

### **Validation Survey**

The objective of the Validation Survey was to provide a comparison of recreational harvest and effort estimates with those obtained in the Phone-Diary Survey. The catch and effort data from these on-site surveys at boat ramps will be used to validate estimates from the Phone-Diary Survey.

The target population included all boat-based recreational fishers as accessed with a spatial-temporal sampling frame. The sample design was a bus-route survey using a probability-based sample of key boat ramps within the Metro Zone in the West Coast. The primary sampling unit was sample day. The secondary sampling unit was fishing party, both RFBL holders and other (non-licensed) fishers. Fishers younger than 5 were identified during the interview and excluded from sample selection. RFBL status was not identified in the Validation Survey.

The survey was undertaken as a bus-route survey, with three northern and three southern ramps forming separate bus routes, to avoid excessive travel time in driving between north and south metropolitan areas. Two interviewers were assigned to each sample day, with one interviewer for each bus route.

Spatial stratification for the validation survey included 2 bus routes. The boat ramps selected for the Validation Survey were: Mindarie, Ocean Reef and Hillarys in the northern bus-route; and Leeuwin, Woodman Point and Point Peron in the southern bus-route. These ramps were identified as having the greatest activity in the Perth metropolitan region.

Temporal stratification for the biological survey included; day type (weekend/weekday); time of day (am/pm); and month. Sample days were also confined to daylight hours only. Sample days were divided into morning and afternoon survey shifts, with the break point between the morning and afternoon shifts being the approximate midpoint between sunrise and sunset. Sunrise and sunset varied throughout the year and the minimum duration of a morning/afternoon shift was 315 mins in June 2011 (Table 4). The daily survey period ranged from the earliest sunrise within the month (rounded down to the nearest ten minutes within the hour) to the latest sunset within the month (rounded up to the nearest ten minutes within the hour). It was split into two shifts, with the break point between the shifts set as the midpoint between the start and end times. Earliest sunrise ranged from 5:03 December 2011 to 7:08 June 2011, and latest sunset ranged from 7:27 January 2011 to 5:23 June 2011 (Table 4).

Boat ramps were visited in a random order according to random selection from a list of possible ramp orders (Table 4). Morning or afternoon shifts were determined by ramp order, actual travel

times provided by Google, with comfort breaks of an additional 30 minutes between ramps (extended to 40 minutes for Leeuwin and Point Peron). Schedules were prepared for morning and afternoon shifts for the two bus routes. Shift start and end times were determined from the table of monthly sunrises and sunsets (Table 4).

Documentation for the Boat Ramp Surveys included: interviewer guidelines, forms and questionnaires, and training for interviewers in survey instruments and species identification.

**Table 4.** Key elements in the sample design for the Validation Survey.

Year	Month	Earliest sunrise	Latest sunset	Daily survey period			Shift Duration (minutes)
				Start	End	Midpoint	
2011	3	6:06 AM	6:52 PM	6:00 AM	7:00 PM	12:30 PM	390
2011	4	6:28 AM	6:13 PM	6:20 AM	6:20 PM	12:20 PM	360
2011	5	6:48 AM	5:39 PM	6:40 AM	5:40 PM	12:10 PM	330
2011	6	7:08 AM	5:23 PM	7:00 AM	5:30 PM	12:15 PM	315
2011	7	7:07 AM	5:40 PM	7:00 AM	5:40 PM	12:20 PM	320
2011	8	6:36 AM	5:59 PM	6:30 AM	6:00 PM	12:15 PM	345
2011	9	5:57 AM	6:18 PM	5:50 AM	6:20 PM	12:05 PM	375
2011	10	5:21 AM	6:40 PM	5:20 AM	6:40 PM	12:00 PM	400
2011	11	5:04 AM	7:07 PM	5:00 AM	7:10 PM	12:05 PM	425
2011	12	5:03 AM	7:26 PM	5:00 AM	7:30 PM	12:15 PM	435
2012	1	5:14 AM	7:27 PM	5:10 AM	7:30 PM	12:20 PM	430
2012	2	5:41 AM	7:19 PM	5:40 AM	7:20 PM	12:30 PM	410
2012	3	6:06 AM	6:51 PM	6:00 AM	7:00 PM	12:30 PM	390

Year and month	Actual Days		Survey Days		Total number of shifts for each bus route
	Weekday	Weekend or Public Holiday	Weekday	Weekend or Public Holiday	
1103	22	9	6	5	22
1104	18	12	5	6	22
1105	22	9	6	5	22
1106	21	9	6	5	22
1107	21	10	6	5	22
1108	23	8	6	4	20
1109	22	8	6	4	20
1110	20	11	5	6	22
1111	22	8	6	4	20
1112	20	11	5	6	22
1201	20	11	5	6	22
1202	21	8	6	4	20

Bus route 1			Actual travel (mins)		Travel + breaks		Total time
First ramp	Second ramp	Third ramp	1st to 2nd	2nd to 3rd	1st to 2nd	2nd to 3d	
Mindarie	Ocean Reef	Hillarys	18	14	48	44	92
Mindarie	Hillarys	Ocean Reef	28	14	58	44	102
Ocean Reef	Mindarie	Hillarys	18	28	48	58	106
Ocean Reef	Hillarys	Mindarie	14	28	44	58	102
Hillarys	Mindarie	Ocean Reef	28	18	58	48	106
Hillarys	Ocean Reef	Mindarie	14	18	44	48	92

Bus route 2			Actual travel (mins)		Travel + breaks		Total time
First ramp	Second ramp	Third ramp	1st to 2nd	2nd to 3rd	1st to 2nd	2nd to 3d	
Leeuwin	Woodman	Point Peron	23	29	53	59	112
Leeuwin	Point Peron	Woodman	48	29	88	59	147
Woodman	Leeuwin	Point Peron	23	48	53	88	141
Woodman	Point Peron	Leeuwin	29	48	59	88	147
Point Peron	Leeuwin	Woodman	48	23	88	53	141
Point Peron	Woodman	Leeuwin	29	23	59	53	112

### 2.2.3 Remote Camera Survey

Remote Camera Surveys aim to monitor recreational boating activity via video cameras mounted at key boat ramps. The objective of this survey component was to provide validation of estimates of effort from the Phone-Diary Survey over 24-hour periods. Information was gathered on the number of launches and retrievals by boat type at 5 minute intervals, with the proportion of boating activity that involved fishing to be derived from the Boat Ramp Surveys. This information was collected at a number of key boat ramps throughout the same time period as the Phone-Diary Survey.

The exact locations of remote video cameras was determined by infrastructure at the boat ramp and the logistics of transmitting the information to the Department. The 12 boat ramps selected for the Camera Survey were: Broome (Entrance Point) and Dampier in the North Coast; Denham and Monkey Mia in the Gascoyne Coast; Mindarie, Ocean Reef, Hillarys, Leeuwin, Woodman Point and Point Peron in the West Coast; and Albany and Esperance in the South Coast.

Data for the camera at Hillarys were missing from 31 May to 21 June and 24 June to 28 June as the camera was disconnected during those periods. Similarly, data for Monkey Mia were not available for May 2011 due to camera failure. The total activity reported for Hillarys and Monkey Mia represents values for available monthly data over the survey period (i.e. 11 months) rather than estimates of total activity over the full 12 month period. Estimates provided in this report are the best that are currently available, but improved estimates may result in the

future as a result of refinement of the methods used for analyses. Summaries of the total power boat launches and retrievals during 2011–12, including: the location of the boat ramp; total annual launches and retrievals; total launches and retrievals by month; and hourly launches and retrievals by month are given in Appendix 2.

### **2.3 Phone-Diary Survey Expansion, Weighting and Analysis**

The Phone Surveys design incorporated stratified random sampling with samples divided into homogenous units to reduce sampling variance (Cochran 1977, Pollock *et al.* 1994, Lohr 2010, Särndal *et al.* 2003). The number of samples within each stratum were selected proportionally to the size of the stratum. Spatial strata were applied to respondents in the Phone Surveys according to Regional Commission Boundaries in Western Australia. A single residential stratum applied to interstate RFBL holders (<2% of all RFBL holders). Overseas RFBL holders (<0.02% of all RFBL holders) were excluded from the Phone Surveys.

Exclusions from the sampling frame occurred before sample selection where currency of address information was invalid or fishers were identified as having multiple licences. All sampling was conducted without replacement using PROC SURVEYSELECT in SAS (SAS 2004).

The Screening Survey was conducted in three waves to accommodate survey commencement and availability of the sampling frame. The first wave commenced in December 2010 with a sample of RFBL holders from March to October 2010. This group of Wave 1 respondents was recruited to a trial of the Phone-Diary Survey from January to February 2011 to test data collection processes. The second wave commenced was conducted from January to February 2011 with a sample of RFBL holders from March to December 2010. This was the major sample wave. The third wave commenced late February 2011 with ‘top-up’ sample of RFBL holders from January to February 2011. This approach allowed proportional sampling of RFBL holders from March 2010 to February 2011.

The Benchmark Survey commenced in the second week of March 2012, and the sample selected in a single wave for RFBL holders from March 2011 to February 2012. Where possible, sample selection for the Benchmark Survey excluded RFBL holders previously selected in the Screening Survey, and duplicate RFBL holders (e.g. where RFBL holders purchased ‘new’ licences with different licence numbers and/or contact details).

Data from Phone Surveys that use the White Pages as a sampling frame can be expanded to the total population using profiles from the Australian Bureau of Statistics, based on household structure, age and gender (Jones 2009, Lyle *et al.* 2009, Taylor *et al.* 2012, West *et al.* 2012). However, a different approach is required for surveys that use licence sampling frames, including the RFBL. Analysis of the RFBL database (2010-11 compared with 2011-12) indicates that approximately 25% RFBL holders do not renew their licence (i.e. ‘drop-out’), while approximately 25% RFBL take up a new licence (i.e. ‘drop-in’), each year. The Phone-Diary Survey did not progressively sample and recruit new entrants to the RFBL population during the survey period.

The Benchmark and Non-Intending Fisher Surveys were designed to assist in matching Phone-Diary participants (sampled from the 2010-11 RFBL) to the RFBL population that held a licence during the phone-diary period (2011-12). Calculation of weighting factors requires counter-parting Phone-Logbook participants (based on actual days fished) with Benchmark Survey participants (based on recalled days fished). This process accounts for behavioural differences that result from the dynamic nature of the RFBL population.

The sample weight (or expansion factor) for a given subsample was determined by the inverse of the fraction it represented in the population, according to the following equation, where  $\alpha_{hi}$  = weight for RFBL holder  $i$  in stratum  $h$ ,  $N_h$  = total number of RFBL holders in stratum  $h$ ,  $n_h$  = number of RFBL holders sampled in stratum  $h$ .

$$a_{hi} = \frac{N_h}{n_h}$$

The total catch of species in each stratum over the phone-diary period was calculated by multiplying the weighted catch for all participants in each stratum with the number of RFBL holders in each stratum for the relevant RFBL population, as determined by the Benchmark Survey. This approach accounts for: fishers that unexpectedly ‘drop-out’ from the Phone-Diary Survey (i.e. participants that intended to fish, but did not); fishers that unexpectedly ‘drop-in’ during the phone-diary period (i.e. respondents in the Screening Survey that did not intend to fish during the phone-diary period, but actually did); and additional ‘drop-in’ fishers (i.e. fishers who were not eligible for sample selection for the Screening Survey, but purchased a RFBL during the phone-diary period).

Raw data collected from diarists have been initially expanded by the number of RFBL holders in the residential stratum divided by the number of RFBL holders sampled in residential stratum. Final estimates will include adjustment of these weighting factors to account for avidity bias and non-intending fishing. Parameter estimates in this report are based on expanded data, scaled-up to represent the appropriate stratum population. Estimates were determined for participation (by number of RFBL holders), effort (boat days) and catch (numbers retained, released and totals by species). Length data from the Biological Survey are provided for estimation of catch by weight. Phone Survey data has been stored in an ACCESS database with analysis of survey estimates using the *survey* package (Lumley 2004, 2010) in the statistical computing language *R* (R Development Core Team 2008). Detailed descriptions of the *survey* and *recsurvey* packages are given in Lumley (2010) and Lyle *et al.* (2010) respectively.

## 2.4 Uncertainty

The integrated surveys provide validated catch estimates in a cost effective manner, however, they are still surveys, and as such, cannot be expected to provide the level of precision that would be available from a total census. As such it is important to determine the level of uncertainty associated with these survey estimates. Two measures of uncertainty have been used in this report:

- i. The Standard Error indicates the difference between the estimate (obtained from a sample) and the true value (of the population). The Standard Error of the estimate is calculated from the standard deviation of the sample divided by the sample size.
- ii. The Relative Standard Error indicates the uncertainty expressed as a percentage of the estimate, and allows comparisons between estimates because it accounts for differences in magnitude of the estimates. The Relative Standard Error of the estimate is calculated from the standard error of the sample divided by the estimate.

Interpretation of survey estimates requires consideration of both the magnitude of the Relative Standard Error and the number of participants that contributed to the estimate. Where required, estimates in tables have been highlighted to identify Relative Standard Error greater than 40% and sample sizes with fewer than 30. These warnings provide caution that the estimates may not be precise or representative.

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## **3.0 Participation**

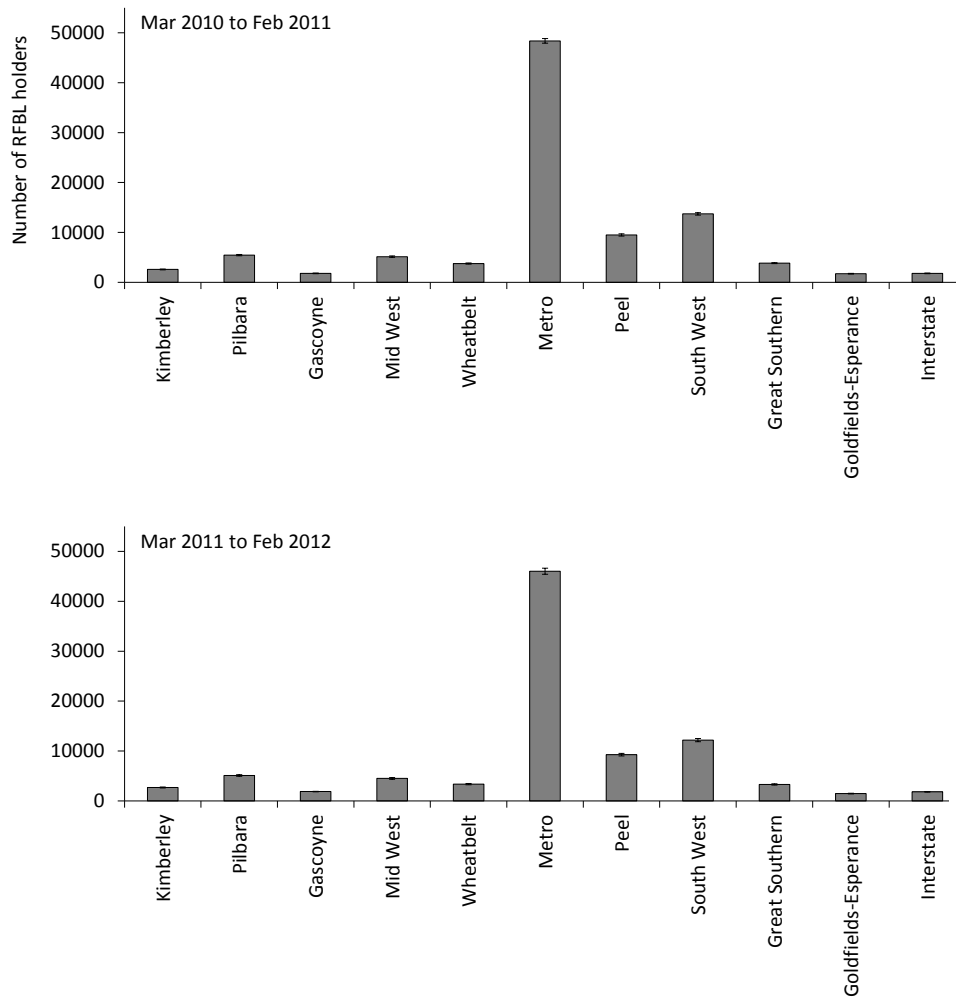
This section presents results from the Screening and Benchmark Surveys. These cross sectional, recall surveys were based on respondents that held a Recreational Fishing from a Boat Licence (RFBL) between 1 March 2010 to 28 February 2011 (Screening Survey) and 1 March 2011 to 29 February 2012 (Benchmark Survey).

### **3.1 Regional Commission Boundary**

From the population of 114,857 recreational fishers that held a RFBL in 2010-11, an estimated 97,698 (85%) RFBL holders fished at least once in WA, and an estimated 17,159 (15%) RFBL holders did not fish, in the 12 months prior to March 2011. The population of 118,797 recreational fishers that held a RFBL in 2011-12 included an estimated 91,657 (77%) RFBL holders that fished at least once in WA, and an estimated 27,140 (23%) RFBL holders did not fish, in the 12 months prior to March 2012.

Despite the decrease in RFBL holders that fished from 2010-11 to 2011-12, the proportions of RFBL holders in each Regional Commission Boundary (RCB) were similar in both years. The majority of RFBL holders that fished resided in the Perth Metropolitan Regional Commission Boundary (49.5% in 2010-11 and 50.2% in 2011-12). The next highest participation was observed by residents in the South West (14.0% in 2010-11 and 13.3% in 2011-12) and Peel (9.7% in 2010-11 and 10.1% in 2011-12) Regional Commission Boundaries (Figure 6).





**Figure 6.** Estimated number of RFBL holders aged five years and older who fished recreationally in WA in the 12 months prior to March 2011 (above; from Screening Survey) and March 2012 (below; from Benchmark Survey) by Regional Commission Boundary.

Smaller proportions of RFBL holders were observed in rural stratum: Pilbara (5.6% in 2010-11 and 5.6% in 2011-12), Mid West (5.3% in 2010-11 and 4.9% in 2011-12), Great Southern (3.9% in 2010-11 and 3.7% in 2011-12), Wheatbelt (3.8% in 2010-11 and 3.6% in 2011-12), Kimberley (2.6% in 2010-11 and 2.9% in 2011-12), Gascoyne (1.8% in 2010-11 and 2.1% in 2011-12), and Goldfields-Esperance (1.8% in 2010-11 and 2.0% in 2011-12); and Interstate (1.8% in 2010-11 and 1.6% in 2011-12) (Figure 6). However, comparisons of these estimates with general population estimates are likely to reveal the proportions of RFBL holders in each rural RCB actually represent high participation rates among the general population.

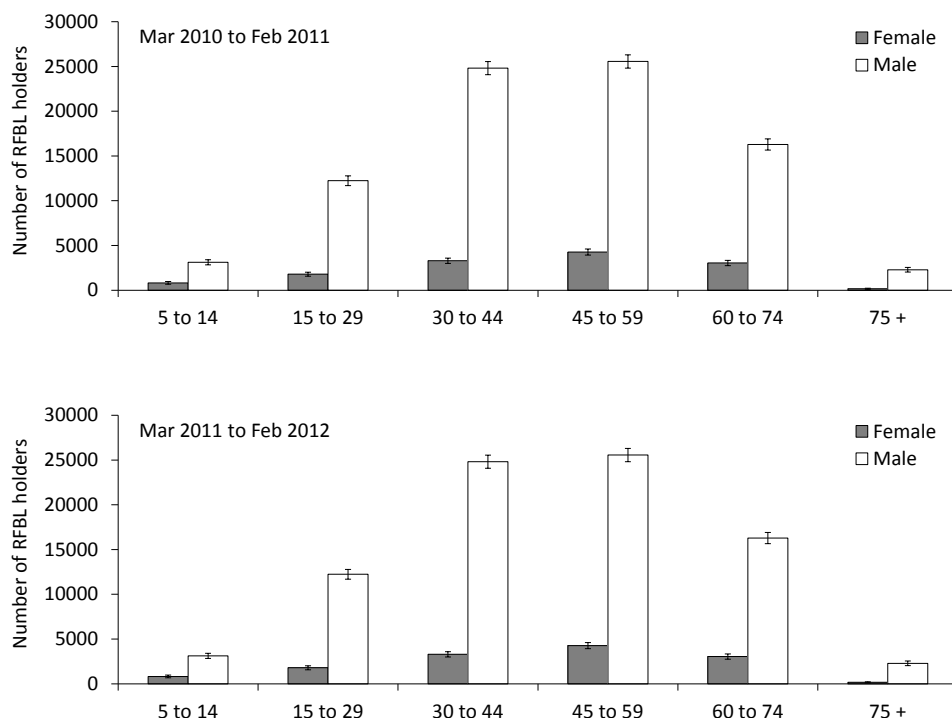
### 3.2 Gender and Age

Males accounted for the majority of RFBL holders that fished at least once in the 12 months prior to March 2011 (86.3% of all RFBL holders in 2010-11) and the 12 months prior to March 2012 (85.5%). Females accounted for 13.7% RFBL holders in 2010-11 and 14.5% in 2011-12.

In both surveys, highest numbers of RFBL holders that fished were the: 45 to 59 year age group (31% in 2010-11 and 33% in 2011-12) and the 30 to 44 year age group (29% in both 2010-11 and 2011-12). The 15 to 29 year age group accounted for 14% in 2010-11 and 2011-12. The 60

to 74 year age group accounted for 20% of all RFBL holders that fished in 2010-11 and 17% in 2011-12. The lowest numbers of RFBL holders that fished were the: 5 to 14 year age group (4% in 2010-11 and 5% in 2011-12) and 75 year or older group (3% in 2010-11 and 2% in 2011-12).

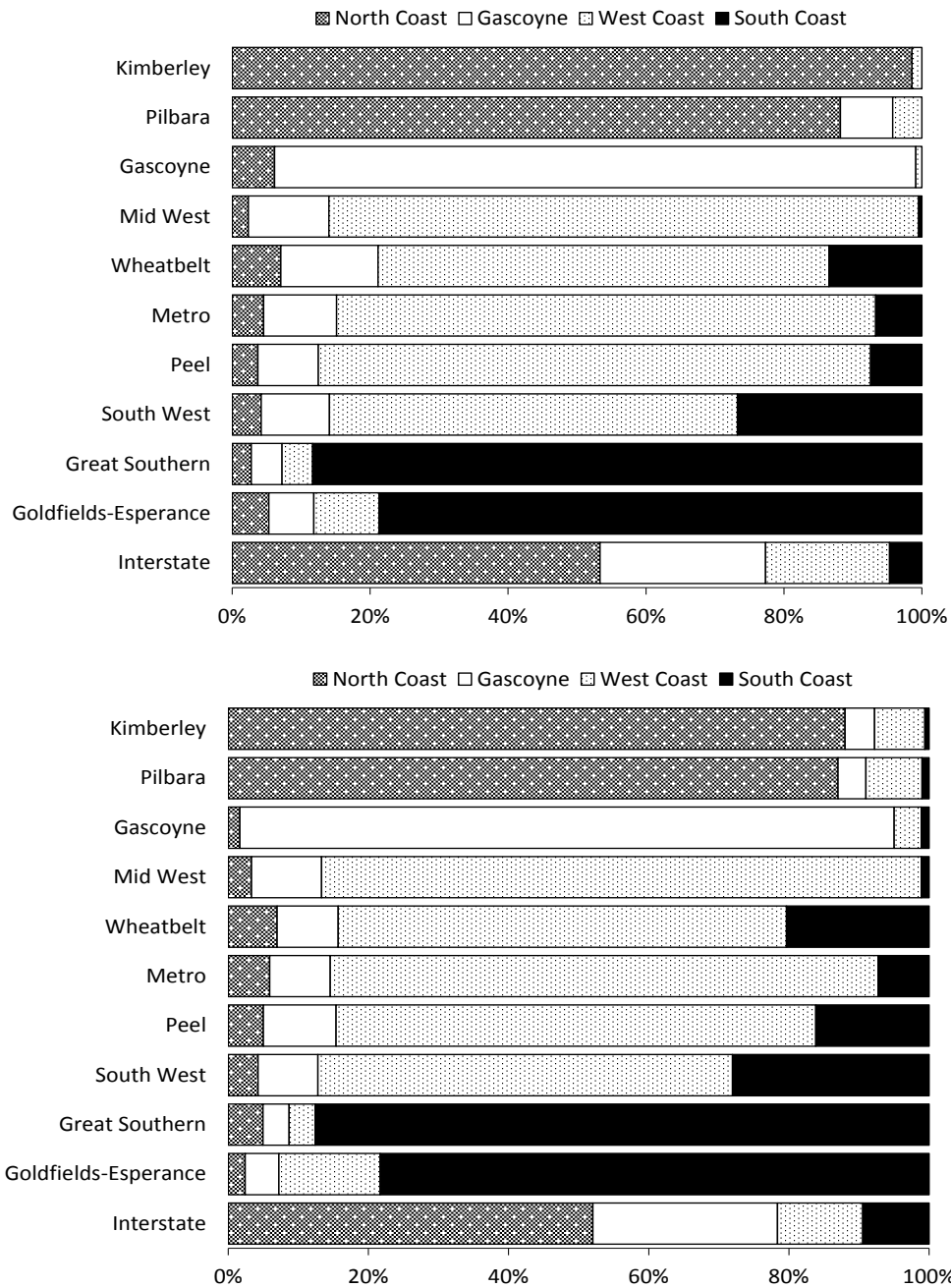
Similar trends were observed in the numbers of female and male RFBL holders that fished at least once in WA in the 12 months prior to March 2011 and March 2012 by age group (Figure 7).



**Figure 7.** Estimated number of RFBL holders aged five years and older who fished recreationally in WA in the 12 months prior to March 2011 (above; from Screening Survey) and March 2012 (below; from Benchmark Survey) by age group and gender.

### 3.3 Bioregions Fished

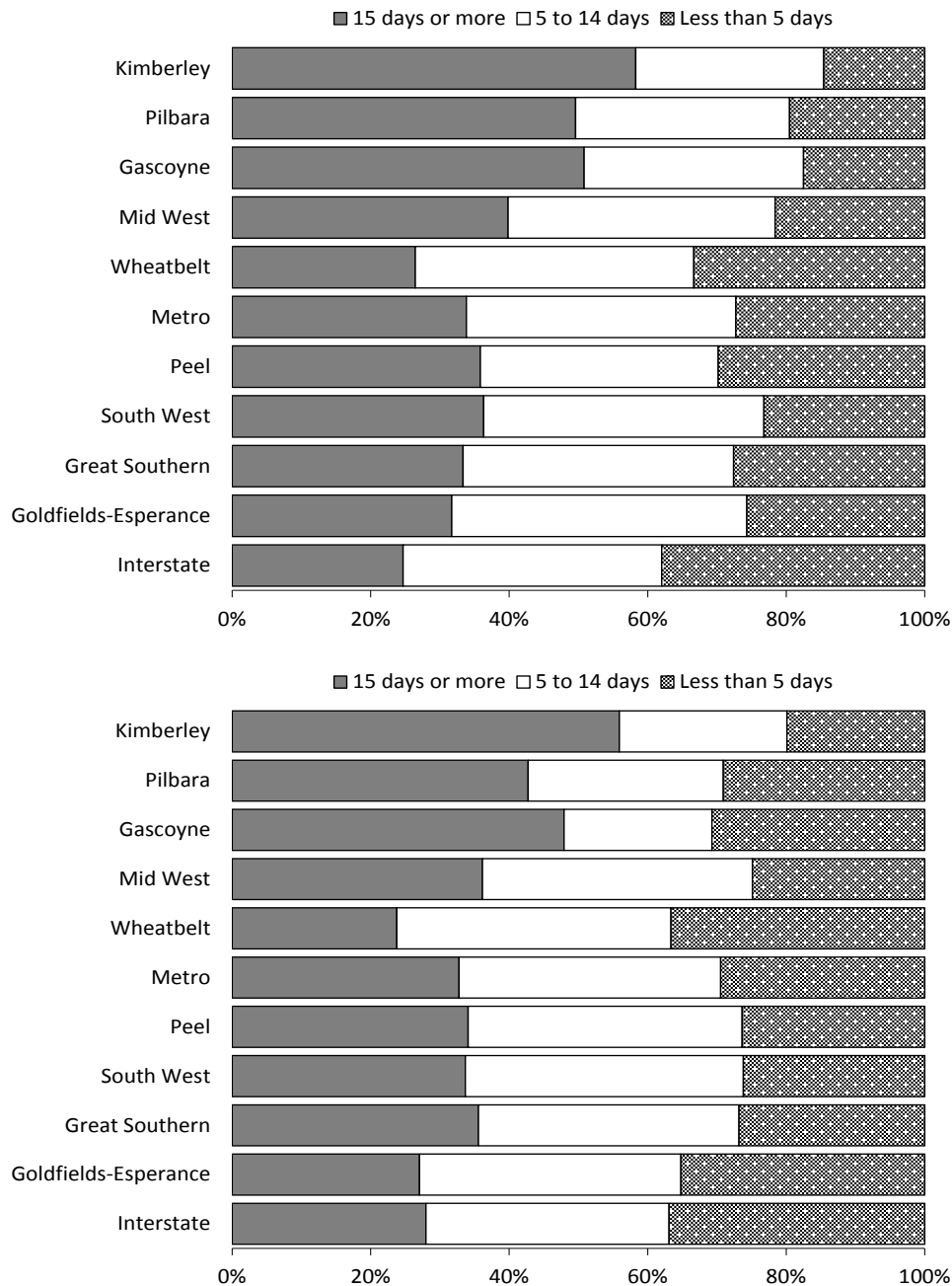
Recreational fishers that held a RFBL in 2010-11 and 2011-12 were most likely to fish in the marine bioregion closest to their home residence. Residents from the Kimberley and Pilbara were most likely to fish in the North Coast (Figure 8). Residents from the Gascoyne were most likely to fish in the Gascoyne Coast. Residents from the Mid West, Wheatbelt, Perth Metropolitan, Peel and South West were most likely to fish in the West Coast. Residents from the Great Southern and Goldfields-Esperance were most likely to fish in the South Coast. Interstate residents fished in all marine bioregions, but half of their fishing was in the North Coast.



**Figure 8.** Percentage of RFBL holders aged five years or older that fished in each bioregion in the 12 months prior to March 2011 (above; from Screening Survey) and March 2012 (below; from Benchmark Survey) by Regional Commission Boundaries.

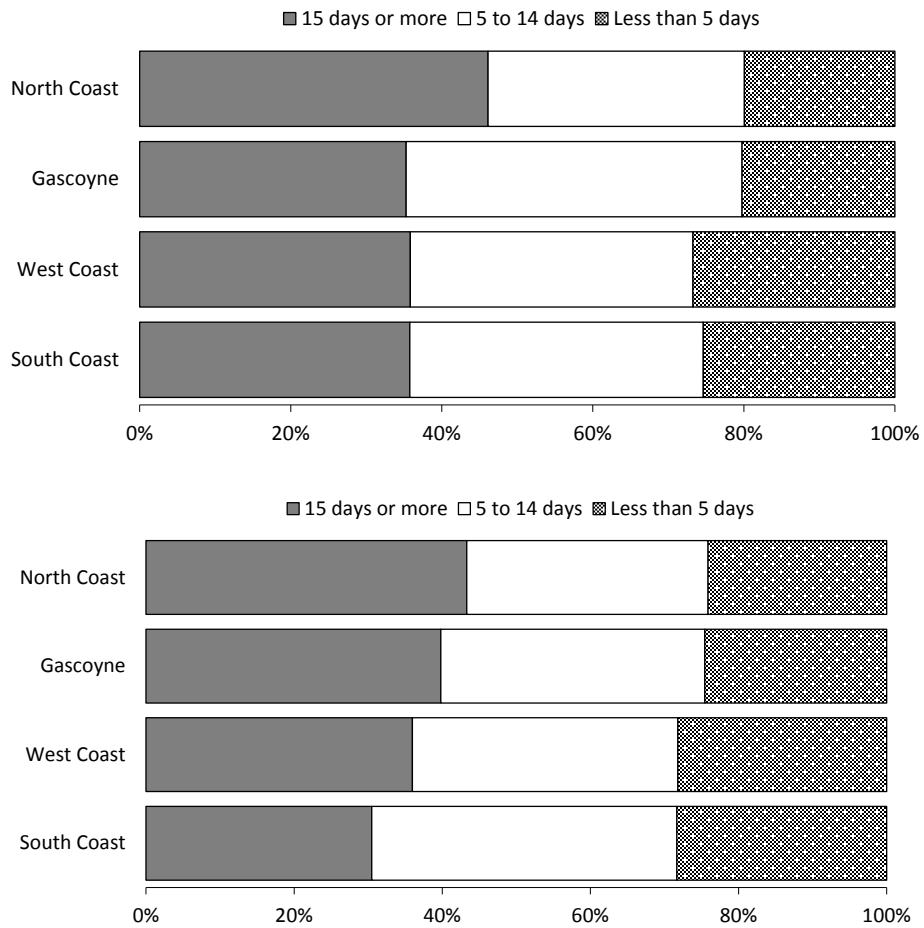
### 3.4 Avidity

Similar trends were observed in the number of days fished (by recall) in the 12 months prior to March 2011 and March 2012 by bioregion and home residence of the RFBL holder. Residents from the Kimberley, Pilbara and Gascoyne were most likely (approximately 50% or higher) to fish 15 days or more (Figure 9). Residents from the Mid West, Wheatbelt, Perth Metropolitan, Peel, South West, Great Southern and Goldfields-Esperance were most likely (approximately 35-45%) to fish 5 to 14 days. Interstate residents were most likely (approximately 37-38%) to fish less than 5 days fishing in the 12 months prior to March 2011 and March 2012.



**Figure 9.** Percentage of recalled days fished (in avidity classes) by RFBL holders aged five years or older in the 12 months prior to March 2011 (above; from Screening Survey) and March 2012 (below; from Benchmark Survey) by Regional Commission Boundaries.

Trends in the number of days fished (by recall) in the 12 months prior to March 2011 and March 2012 by recreational fishers that held a RFBL in 2010-11 and 2011-12 are shown in Figure 10. RFBL holders that fished in the North Coast were most likely to fish 15 days or more in both 2010-11 (46%) and 2011-12 (43%). RFBL holders that fished in the Gascoyne Coast were most likely to fish 5 to 14 days in 2010-11 (44%) and 15 days or more in 2011-12 (40%). RFBL holders that fished in the West Coast were most likely to fish 5 to 14 days in 2010-11 (37%), but equally likely to fish 5 to 14 days (36%) or 15 days or more (36%) in 2011-12. RFBL holders that fished in the South Coast were most likely to fish 5 to 14 days in both 2010-11 (39%) and 2011-12 (41%).



**Figure 10.** Percentage of days fished (in avidity classes) by RFBL holders aged five years or older in the 12 months prior to March 2011 (above; from Screening Survey) and March 2012 (below; from Benchmark Survey) by bioregion fished.

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## 4.0 Fishing Effort

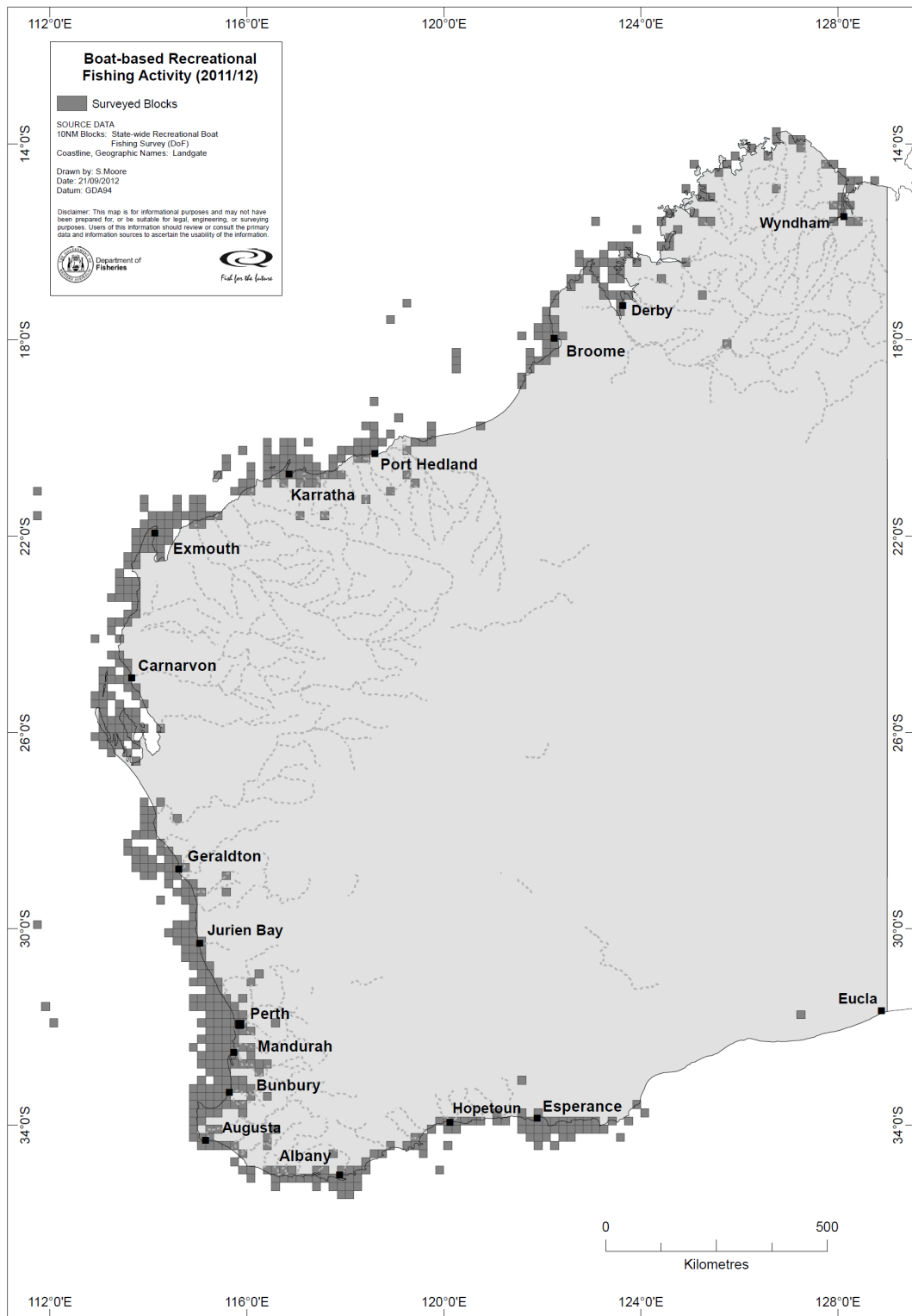
This section presents estimates of fishing effort from the Phone-Diary Survey. The 12 month longitudinal survey was based on participants that held a RFBL between 1 March 2010 and 28 February 2011, and were likely to fish from a boat in saltwater between 1 March 2011 and 29 February 2012 (Phone-Diary Survey). Fishing effort has been estimated in the number of boat days, which provides an estimate of the total number of separate days of boat-based fishing. Fishing effort has been summarised by habitat, fishing method and month, state-wide (Figure 12) and for each bioregion: North Coast (Figure 13), Gascoyne Coast (Figure 14), West Coast (Figure 15) and South Coast (Figure 16).

A summary of all locations where participants fished during the State-wide Recreational Boat Fishing Survey (2011/12) is provided in Figure 11. The geographic coverage included most of the WA coastline, with the exception of remote and/or inaccessible marine waters between Broome and Port Hedland, and between Esperance and Eucla.

Estimated measures of effort included boat days (separate days in which fishing occurred on a 'boat party' basis, regardless of the number of fishers or RFBL holders on board) and fishing events. There was an estimated 439,029 boat days during the period 1 March 2011 to 29 February 2012, with 472,232 separate fishing events (Table 5). Fishers can undertake more than one fishing event per day, with an average of 1.08 events per fisher day state-wide. Boat-based recreational fishing effort was concentrated in the West Coast Bioregion. Two thirds of the state-wide total effort (estimated in boat days and fishing events) was reported from the West Coast Bioregion.

**Table 5.** Annual fishing effort, expressed as boat days and fishing events, for boat-based recreational fishers in WA during 2011–12 (se is standard error).

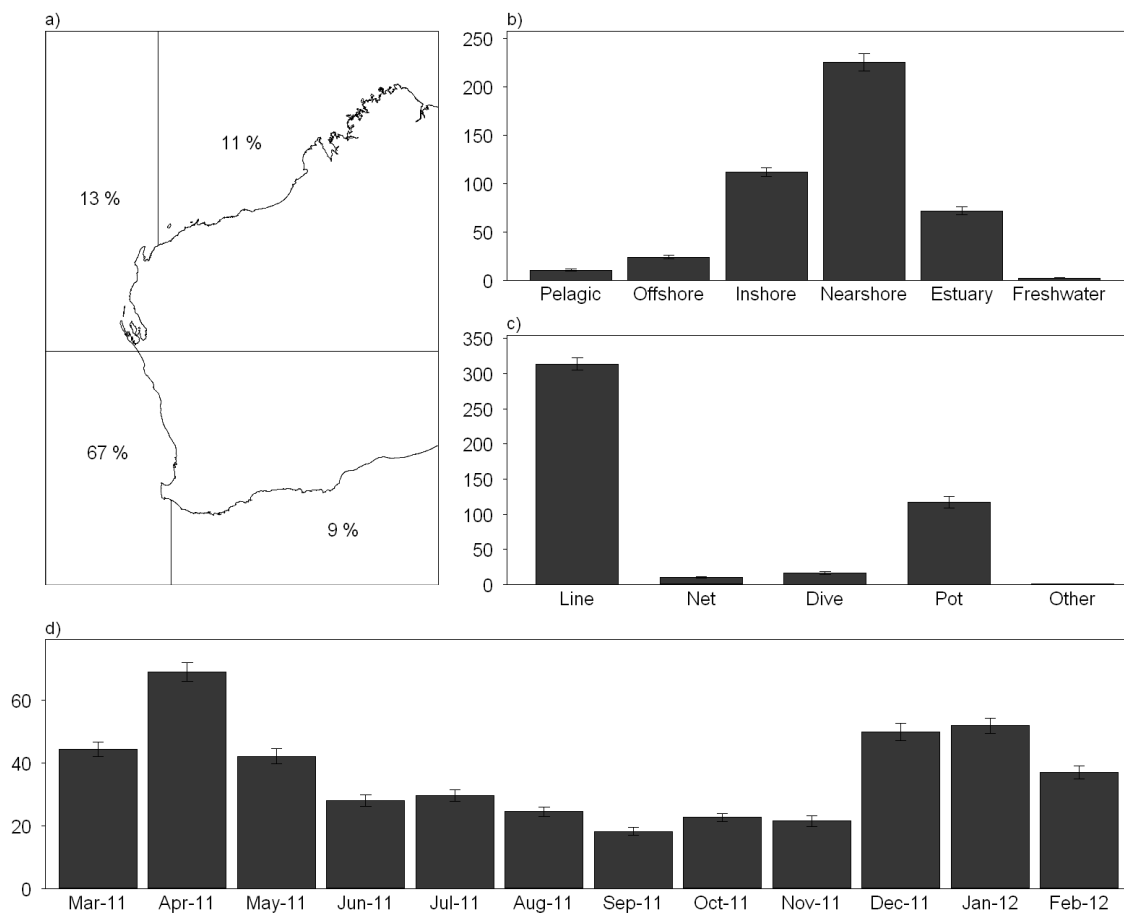
<b>Bioregion</b>	<b>Boat Days</b>	<b>se</b>	<b>Fishing Events</b>	<b>se</b>
North Coast	47,721	3,778	51,175	4,306
Gascoyne Coast	58,123	3,672	61,616	3,895
West Coast	293,112	10,688	317,543	11,972
South Coast	40,073	3,354	41,897	3,556
<b>State-wide Total</b>	<b>439,029</b>	<b>11,160</b>	<b>472,232</b>	<b>12,521</b>



**Figure 11.** Map of fishing activity by logbook participants during the state-wide Recreational Boat Fishing Survey (2011–12).

## 4.1 State-wide effort

At a state-wide level, the majority of boat-based recreational fishing effort (boat days) during 1 March 2011 to 29 February 2012 occurred in the West Coast (67%) (Figure 12). The remainder of fishing effort was relatively equal among the North Coast (11%), Gascoyne Coast (13%) and South Coast (9%). The majority of boat-based fishing effort occurred in nearshore habitat (51%), followed by inshore (25%) and estuary (16%), with lower proportions of fishing effort in offshore (5%), pelagic (2%) and freshwater (1%) habitats (Figure 12). The majority of boat-based fishing effort was attributed to line fishing (68%) and pots (26%), with lower proportions of fishing effort from nets (2%), diving (4%) and other (<1%) (Figure 12). The majority of boat-based fishing effort occurred during summer (32%) and autumn (35%) (Figure 12). Fishing effort was highest in April 2011 (16%) and lowest in September 2011 (4%) (Figure 12).

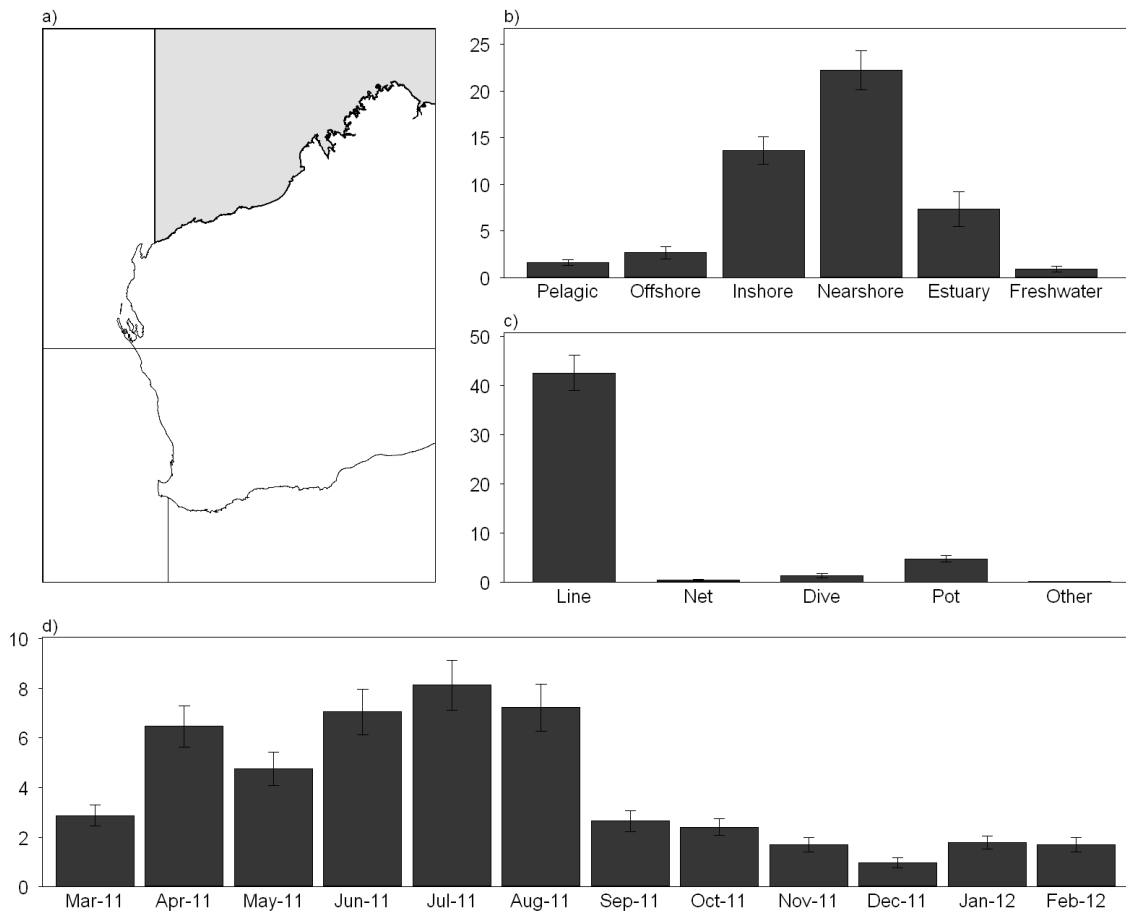


**Figure 12.** Boat-based recreational fishing effort (boat days x 1000) in WA during 2011–12; a) map of the proportion (%) of the effort by fishing bioregion; b) effort by habitat; c) effort by fishing method; and d) effort by month.



## 4.2 North Coast

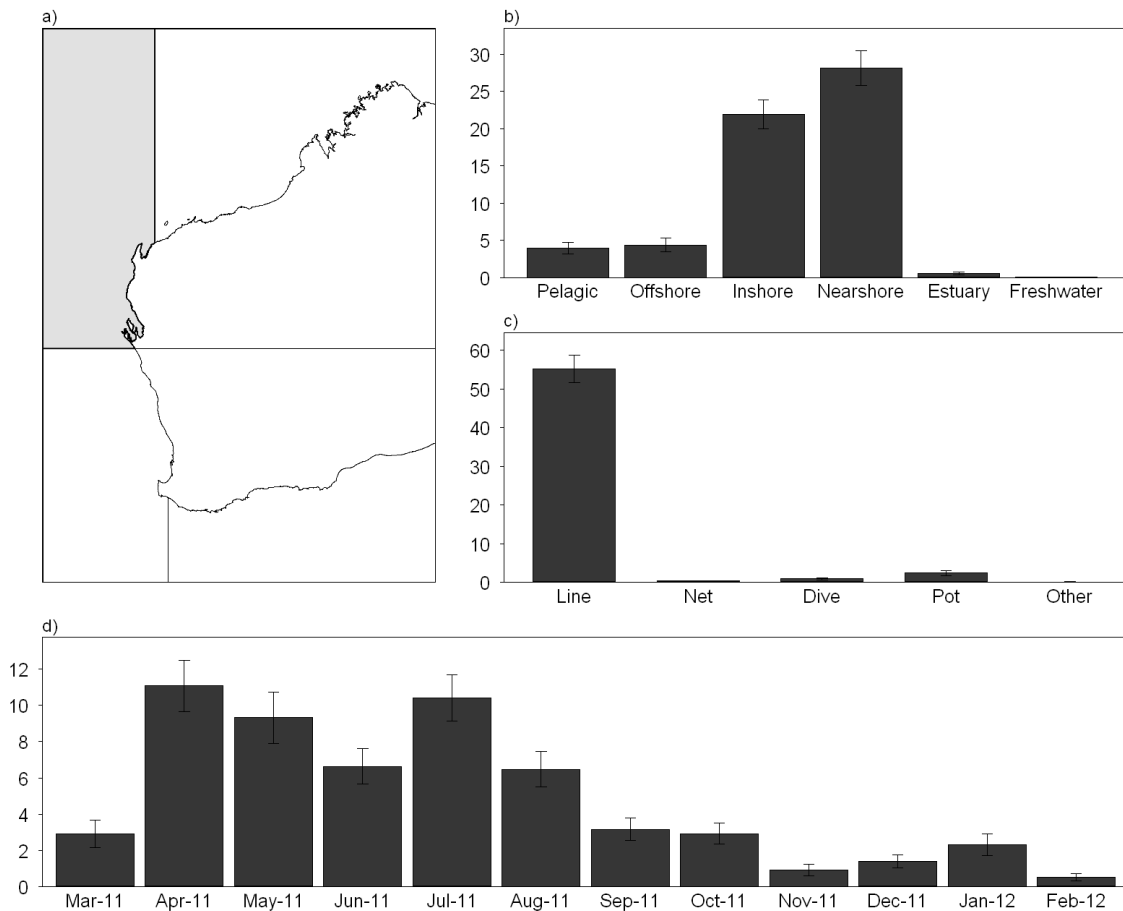
The majority of boat-based fishing effort (boat days) during 1 March 2011 to 29 February 2012 in the North Coast occurred in nearshore habitat (46%), followed by inshore (28%) and estuary (15%), with lower proportions of fishing effort in offshore (6%), pelagic (3%) and freshwater (2%) habitats (Figure 13). The majority of boat-based fishing effort was attributed to line fishing (86%), with lower proportions of fishing effort from pots (10%), diving (3%), nets (1%) and other (<1%) (Figure 13). The majority of boat-based fishing effort occurred during autumn (30%) and winter (47%). Fishing effort was highest in July 2011 (17%) and lowest in December 2011 (4%) (Figure 13).



**Figure 13.** Boat-based recreational fishing effort (boat days x 1000) in the North Coast during 2011–12; a) map of the bioregion; b) effort by habitat; c) effort by fishing method; and d) effort by month.

### 4.3 Gascoyne Coast

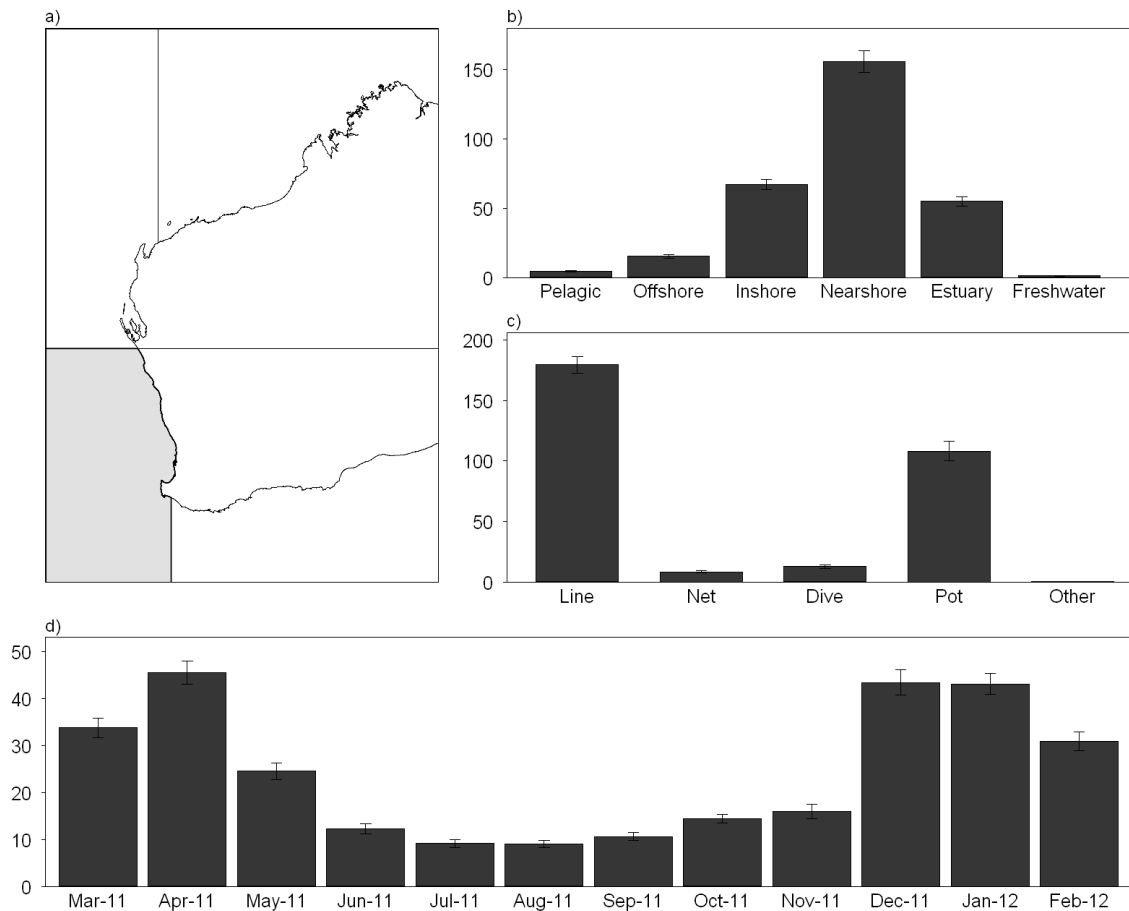
The majority of boat-based fishing effort (boat days) during 1 March 2011 to 29 February 2012 in the Gascoyne Coast occurred in nearshore (48%) and inshore (37%) habitat, with lower proportions of fishing effort in offshore (7%), pelagic (7%), estuary (1%) and freshwater (<1%) habitats (Figure 14). The majority of boat-based fishing effort was attributed to line fishing (94%), with lower proportions of fishing effort from pots (4%), diving (2%), nets (1%) and other (<1%) (Figure 14). The majority of boat-based fishing effort occurred during autumn (40%) and winter (40%). Fishing effort was highest in April 2011 (19%) and lowest in February 2012 (1%) (Figure 14).



**Figure 14.** Boat-based recreational fishing effort (boat days x 1000) in the Gascoyne Coast during 2011–12; a) map of the bioregion; b) effort by habitat; c) effort by fishing method; and d) effort by month.

## 4.4 West Coast

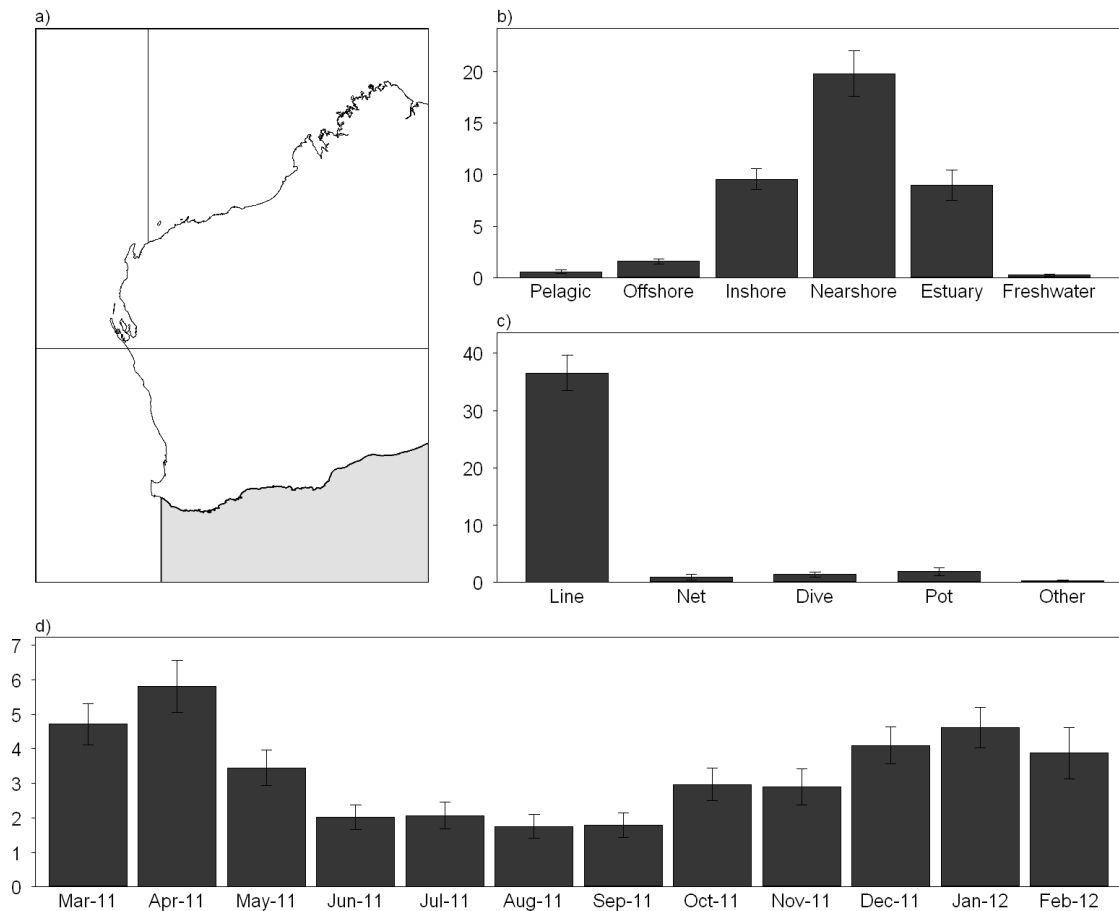
The majority of boat-based fishing effort (boat days) during 1 March 2011 to 29 February 2012 in the West Coast occurred in nearshore habitat (52%), followed by inshore (22%) and estuary (18%), with lower proportions of fishing effort in offshore (5%), pelagic (1%) and freshwater (<1%) habitats (Figure 15). The majority of boat-based fishing effort was attributed to line fishing (58%) and pots (35%), with lower proportions of fishing effort from diving (4%), nets (3%) and other (<1%) (Figure 15). The majority of boat-based fishing effort occurred during summer (40%) and autumn (35%). Fishing effort was highest in April 2011 (16%) and lowest in July and August 2011 (3% each) (Figure 15).



**Figure 15.** Boat-based recreational fishing effort (boat days x 1000) in the West Coast during 2011–12; a) map of the bioregion; b) effort by habitat; c) effort by fishing method; and d) effort by month.

## 4.5 South Coast

The majority of boat-based fishing effort (boat days) during 1 March 2011 to 29 February 2012 in the South Coast occurred in nearshore habitat (49%), followed by inshore (23%) and estuary (22%), with lower proportions of fishing effort in offshore (4%), pelagic (1%) and freshwater (<1%) habitats (Figure 16). The majority of boat-based fishing effort was attributed to line fishing (89%), with lower proportions of fishing effort from pots (5%), diving (3%), nets (2%) and other (<1%) (Figure 16). The majority of boat-based fishing effort occurred during summer (31%) and autumn (35%). Fishing effort was highest in April 2011 (15%) and lowest in August and September 2011 (4% each) (Figure 16).



**Figure 16.** Boat-based recreational fishing effort (boat days x 1000) in the South Coast during 2011–12; a) map of the bioregion; b) effort by habitat; c) effort by fishing method; and d) effort by month.

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## **5.0 State-wide Recreational Catch**

This section presents estimates of recreational catch (kept, released and total in numbers) from the Phone-Diary Survey. This 12 month longitudinal survey was based on respondents that held a RFBL between March 2010 and February 2011, and were likely to fish from a boat in saltwater between March 2011 and February 2012 (Phone-Diary Survey). Raw data collected from diarists have been expanded to population estimates based on the total number of RFBL holders divided by the number of RFBL holders sampled for each residential stratum. Final estimates will include adjustment of these weighting factors to account for avidity bias and non-intending fishing (see section on Future Research). The estimates (and errors) in the following section will be revised on this basis.

Shore-based recreational catch has not been assessed in this report. Shore-based fishers and boat-based fishers that intended to fish only in freshwater were out of scope for the Phone-Diary Survey. The catch estimates for inland, estuarine and nearshore species provided in this report, particularly those harvested with high proportions of shore based effort, will be underestimated.

### **5.1 Annual catch (total, kept and released numbers)**

A table of the estimated annual catch (total, kept and released numbers) and proportion released/discarded during 2011–12 by RFBL holders aged five years or older is given in Table 6. Boat-based recreational fishers captured a diverse range of species/taxa during the 12 month survey, including scalefish (195 species/taxa), elasmobranchs (15), crustaceans (9) and molluscs (6). A total of 3,723,492 individual species/taxa were caught. Similar proportions of catches were retained (1,954,595 of the total by number or 52%) and released or discarded (1,768,897 of the total by number or 48%). The majority of the recreational catch were finfish (2,358,840 of the total by number or 63%), compared with invertebrates (1,364,652 of the total by number or 37%). Higher proportions of the recreational catch of finfish were released (52%), compared with invertebrates (40%).

School Whiting was the most commonly caught finfish species (275,850 total kept and released by number), followed by Australian Herring (249,721), King George Whiting (169,013), Snapper (150,132), Black Bream (119,685), Grass Emperor (81,615), Silver Trevally (81,094), Spangled Emperor (65,970), Western King Wrasse (50,174), Stripey Snapper (48,015), Yellowfin Whiting (46,221), Tailor (45,007) and West Australian Dhufish (43,846). High release rates were observed for many of these species, including Snapper (81%), Western King Wrasse (81%), Stripey Snapper (78%), Black Bream (73%), Grass Emperor (66%), Spangled Emperor (62%), West Australian Dhufish (60%) and Tailor (51%). Release rates were lower for Silver Trevally (47%), King George Whiting (36%), Yellowfin Whiting (26%), School Whiting (20%) and Australian Herring (15%).

Blue Swimmer Crab was the most commonly caught invertebrate species (870,816 total kept and released by number), followed by Prawn (135,713), Western Rock Lobster (194,708) and Squid (116,865). High release rates were observed for Blue Swimmer Crab (51%) and Western Rock Lobster (37%) compared with Squid (5%) and Prawn (0%).

## 5.2 Release Rates

A summary of release rates for species released or discarded by fishers during 2011–12 by RFBL holders aged five years or older is given Table 7. Lowest release rates were observed for Hapuku (0%), Prawn (0%), Abalone (3%), Yelloweye Mullet (4%), Squid (5%), Wahoo (6%), Robust Garfish (7%), Western Blue Groper (7%), Goldband Snapper (10%), Tropical Lobster (10%), Robinson' Seabream (13%), Sand Bass (13%), Sea Mullet (14%), Australian Herring (15%), Blue Morwong (15%), Harlequin Fish (17%) and Southern Garfish (18%). Highest release rates were observed for Rainbow Runner (90%), Blue-Eye Trevalla (94%), Western Sooty Grunter (95%), Billfish (96%), Longtom (96%), Blowfish (98%), Eeltail Catfishes (98%), Western Shovelnose Ray (99%), Western Striped Grunter (100%), Sawshark (100%), Port Jackson Shark (100%) and Greynurse Shark (100%). High release rates were also observed for poisonous species Silver Toadfish (91%) and Weeping Toadfish (100%), and protected species Humphead Maori Wrasse (97%), Potato Rockcod (77%) and Queensland Grouper (95%).

**Table 6.** Estimated annual catch (total, kept and released numbers) and proportion released/discarded during 2011–12 by RFBL holders aged five years or older.  
 se is standard error; values in bold indicate relative standard error >40% (i.e. se >40% of estimate); values in italics indicate <30 diarists recorded catches of the species.

Reporting Group	Common Name	Scientific Name	Kept Number	se	Released Number	se	Total Number	se	% Rel
Gastropod	Roe's Abalone	<i>Haliotis roei</i>	<b>6,738</b>	<b>2,674</b>	<b>197</b>	<b>141</b>	6,935	2,714	3%
	Greenlip Abalone	<i>Haliotis laevigata</i>	<b>4,870</b>	<b>1,645</b>	<b>204</b>	<b>99</b>	5,073	1,714	4%
	Brownlip Abalone	<i>Haliotis rubra conicopora</i>	<b>1,341</b>	<b>742</b>	<i>0</i>	<i>0</i>	<b>1,341</b>	<b>742</b>	0%
Cephalopod	Cuttlefish	<i>Sepia</i> spp.	3,319	510	2,118	525	5,437	750	39%
	Octopus	<i>Octopus</i> spp.	1,982	672	<b>1,286</b>	<b>859</b>	<b>3,267</b>	<b>1,501</b>	39%
	Squid	Order Teuthoidea - undifferentiated	110,624	10,090	6,241	1,068	116,865	10,650	5%
Prawn	Prawn	<b>135,553</b>	<b>58,482</b>	<b>160</b>	<b>109</b>	<b>135,713</b>	<b>58,482</b>	0%	
Lobster	Western Rock Lobster	<i>Panulirus cygnus</i>	122,263	15,787	72,445	11,205	194,708	25,245	37%
	Southern Rock Lobster	<i>Jasus edwardsii</i>	1,683	607	<b>631</b>	<b>384</b>	2,313	888	27%
	Painted Rock Lobster	<i>Panulirus versicolor</i>	301	109	<b>14</b>	<b>9</b>	315	110	4%
	Ornate Rock Lobster	<i>Panulirus ornatus</i>	<b>194</b>	<b>98</b>	<b>38</b>	<b>33</b>	<b>232</b>	<b>123</b>	16%
Crab	Blue Swimmer Crab	<i>Portunus armatus</i>	424,474	26,787	446,341	32,278	870,816	56,031	51%
	Sand Crab	<i>Ovalipes</i> spp.	<b>50</b>	<b>38</b>	<b>31</b>	<b>24</b>	<b>81</b>	<b>62</b>	38%
	Mud Crab	<i>Scylla olivacea &amp; serrata</i>	11,167	1,392	10,389	2,529	21,555	3,548	48%
Sharks	Bronze Whaler	<i>Carcharhinus brachyurus</i>	743	128	2,102	312	2,846	357	74%
	Greynose Shark	<i>Carcharias taurus</i>	<i>0</i>	<i>0</i>	<b>220</b>	<b>142</b>	<b>220</b>	<b>142</b>	100%
	Gummy Sharks	<i>Mustelus antarcticus &amp; stevensi</i>	1,722	634	544	137	2,265	731	24%
	Hammerhead Sharks	Sphymidae - undifferentiated	179	57	323	78	502	101	64%
	Port Jackson Shark	<i>Heterodontus portusjacksoni</i>	<i>0</i>	<i>0</i>	2,220	434	2,220	434	100%
	Sandbar Shark	<i>Carcharhinus plumbeus</i>	86	30	504	185	590	188	85%
	Sawshark	<i>Pristiophorus</i> spp.	<i>0</i>	<i>0</i>	<b>23</b>	<b>12</b>	<b>23</b>	<b>12</b>	100%
	School Shark	<i>Galeorhinus galeus</i>	<b>5</b>	<b>4</b>	<i>0</i>	<i>0</i>	<b>5</b>	<b>4</b>	0%
	Tiger Shark	<i>Galeocerdo cuvier</i>	55	30	277	111	332	117	83%
	Whaler Sharks	Carcharhinidae - undifferentiated	445	91	3,513	533	3,958	553	89%
	Whiskery Shark	<i>Furgaleus macki</i>	184	52	<b>62</b>	<b>30</b>	246	68	25%
	Wobbegong	Orectolobidae - undifferentiated	<b>304</b>	<b>213</b>	<b>1,231</b>	<b>498</b>	<b>1,535</b>	<b>699</b>	80%
	Other Sharks		744	123	5,832	1,014	6,576	1,028	89%

Reporting Group	Common Name	Scientific Name	Kept Number	se	Released Number	se	Total Number	se	% Rel	
Rays	Western Shovelnose Ray	<i>Aptychootrema vincentiana</i>	18	17	1,454	449	1,472	449	99%	
	Other Rays and Skates		30	21	3,089	486	3,119	488	99%	
Barracouta	Barracouta	<i>Thyrustes atun</i>	1,346	947	774	447	2,119	1,384	37%	
Barramundi	Barramundi	<i>Lates calcarifer</i>	2,103	662	5,490	1,661	7,593	2,242	72%	
Bass Groper	Bass Groper	<i>Polyprion americanus</i>	25	15	32	19	57	25	56%	
Billfish	Black Marlin	<i>Makaira indica</i>	23	13	1,208	372	1,231	374	98%	
	Blue Marlin	<i>Makaira nigricans</i>	35	31	107	47	142	57	75%	
Sailfish	Sailfish	<i>Istiophorus platypterus</i>	21	11	585	172	607	174	96%	
	Striped Marlin	<i>Tetrapturus audax</i>	0	0	12	9	12	9	100%	
Bonito	Bonito	<i>Sarda spp.</i>	636	243	934	460	1,570	645	59%	
	Oriental Bonito	<i>Sarda orientalis</i>	557	167	166	82	723	221	23%	
Bream	Black Bream	<i>Acanthopagrus butcheri</i>	32,835	6,851	86,850	13,141	119,685	18,818	73%	
	Frypan Bream	<i>Argyrops spinifer</i>	211	100	188	101	399	172	47%	
	Northwest Black Bream	<i>Acanthopagrus palmaris</i>	694	203	1,435	340	2,129	472	67%	
	Snapper	<i>Pagrus auratus</i>	29,035	2,051	121,096	11,135	150,132	12,113	81%	
	Tanwhine	<i>Rhabdosargus sarba</i>	2,246	620	9,270	2,813	11,516	3,329	80%	
	Western Yellowfin Bream	<i>Acanthopagrus latus</i>	905	311	3,274	734	4,179	878	78%	
	Other Bream	Sparidae - undifferentiated	406	150	3,167	1,390	3,573	1,432	89%	
	Rosy Threadfin Bream	<i>Nemipterus furcosus</i>	36	34	63	46	99	57	63%	
	Western Butterfish	Western Butterfish	<i>Pentapodus vitta</i>	4,808	1,197	25,590	5,753	30,398	6,077	84%
		Other Butterfish	Stromateidae - undifferentiated	168	85	2,659	859	2,827	869	94%
Catfish	Eeltail Catfishes	Plotosidae - undifferentiated	26	14	1,057	308	1,083	309	98%	
	Estuary Cobbler	<i>Cnidogobius macrocephalus</i>	222	96	272	208	494	230	55%	
	Giant Sea Catfish	<i>Arius thalassinus</i>	197	124	1,574	395	1,771	415	89%	
	Silver Cobbler	<i>Neoarius midgleyi</i>	904	431	2,120	886	3,025	1,201	70%	
	Other Catfish	Order Siluriformes - undifferentiated	105	57	2,477	571	2,582	587	96%	
Chinamanfish	Chinamanfish	<i>Symphorus nematophorus</i>	823	210	1,147	298	1,969	400	58%	
Cobia	Cobia	<i>Rachycentron canadum</i>	916	168	243	67	1,159	186	21%	



Reporting Group	Common Name	Scientific Name	Kept Number	Released Number	Total Number	se	% Rel
Cod	Barramundi Cod	<i>Cromileptes altivelis</i>	71	30	325	150	170
	Blackspotted Rockcod	<i>Epinephelus malabaricus</i>	2,523	414	12,800	2,513	15,323
	Blacktip Rockcod	<i>Epinephelus fasciatus</i>	186	72	81	39	266
	Breaksea Cod	<i>Epinephelides armatus</i>	18,163	1,551	11,855	1,034	30,018
	Chinaman Rockcod	<i>Epinephelus rivulatus</i>	7,002	2,490	18,431	3,602	25,433
	Duskytail Grouper	<i>Epinephelus bleekeri</i>	0	0	18	17	18
	Eightbar Grouper	<i>Epinephelus octofasciatus</i>	115	59	106	69	221
	Frostback Rockcod	<i>Epinephelus bilobatus</i>	115	70	784	292	899
	Goldspotted Rockcod	<i>Epinephelus coioides</i>	3,310	496	10,611	1,609	13,922
	Harlequin Fish	<i>Othos dentex</i>	2,394	391	493	276	2,887
	Potato Rockcod <sup>PROTECTED</sup>	<i>Epinephelus tukula</i>	106	61	357	101	463
	Queensland Grouper <sup>PROTECTED</sup>	<i>Epinephelus lanceolatus</i>	7	7	153	102	160
	Rankin Cod	<i>Epinephelus multinotatus</i>	7,509	843	6,310	1,145	13,819
	Temperate Rockcods	Epinephelidae - undifferentiated	1,099	249	6,311	1,907	7,410
	Yellowspotted Rockcod	<i>Epinephelus areolatus</i>	868	316	1,775	418	2,643
Coral Trout	Barcheek Coral Trout	<i>Plectropomus maculatus</i>	6,756	782	6,767	928	13,524
	Common Coral Trout	<i>Plectropomus leopardus</i>	1,709	512	1,119	452	2,828
	Yellowedge Coronation Trout	<i>Variola louti</i>	569	136	284	85	853
	Common Dart	<i>Trachinotus botla</i>	220	199	417	212	638
	Bluespotted Emperor	<i>Lethrinus punctulatus</i>	2,128	476	4,445	1,192	6,573
Emperor	Grass Emperor	<i>Lethrinus laticaudis</i>	27,946	3,156	53,669	6,113	81,615
	Longnose Emperor	<i>Lethrinus olivaceus</i>	364	167	554	287	917
	Redspot Emperor	<i>Lethrinus lentjan</i>	93	78	304	133	397
	Redthroat Emperor	<i>Lethrinus miniatus</i>	9,103	1,185	18,588	2,952	27,692
	Robinsons' Seabream	<i>Gymnocranius grandoculis</i>	1,800	454	258	76	2,058
	Spangled Emperor	<i>Lethrinus nebulosus</i>	25,238	2,662	40,731	4,175	65,970
	Yellowtail Emperor	<i>Lethrinus atkinsoni</i>	388	162	263	119	652
	Other Emperor	Lethrinidae - undifferentiated	553	222	197	80	750
	Northern Sand Flathead	<i>Platycephalus endrachtensis</i>	703	199	5,327	1,485	6,029
	Southern Bluespotted Flathead	<i>Platycephalus speculator</i>	3,594	523	14,835	3,236	18,430
Flathead	Yellowtail Flathead	<i>Platycephalus westraliae</i>	1,368	246	8,557	1,927	9,925
	Other Flathead	Platycephalidae - undifferentiated	1,150	215	12,298	3,807	13,448
							3,895

Reporting Group	Common Name	Scientific Name	Kept Number	Released Number	Total Number	se	% Rel
Flounder	Smalltooth Flounder	<i>Pseudorhombus jenynsii</i>	226	411	638	158	65%
	Other Flatfish	<i>Bothidae &amp; Pleuronectidae</i> spp.	338	2,952	3,291	2,268	90%
Foxfish		<i>Bodianus frenchii</i>	1,527	607	2,135	359	28%
Garfish	Robust Garfish	<i>Hemiramphus robustus</i>	3,807	1,253	4,096	1,276	7%
	Southern Garfish	<i>Hyporhamphus melanochir</i>	18,542	4,157	22,699	4,313	18%
Goatfish	Unspecified Garfish	Hemiramphidae - undifferentiated	4,875	1,238	5,397	1,303	10%
	Bluespotted Goatfish	<i>Upeneichthys vlamingii</i>	490	147	3,497	860	86%
Grunter	Western Striped Grunter	<i>Pelates octolineatus</i>	0	15,845	15,845	4,804	100%
	Western Sooty Grunter	<i>Hephaestus jenkinsi</i>	88	48	1,954	826	95%
Grunter Bream	Grunter Bream	Haemulidae - undifferentiated	1,504	851	16,076	4,104	91%
	Gurnard		434	136	3,276	536	87%
Hapuku		<i>Polyprion oxygeneios</i>	66	45	66	45	0%
Javelin/Javelin	Barred Javelin	<i>Pomadasys kaakan</i>	244	111	339	123	28%
	Blotched Javelin	<i>Pomadasys maculatus</i>	18	11	257	200	93%
Jewfish/Mulloway	Black Jewfish	<i>Protonibea diacanthus</i>	324	93	710	218	54%
	Mulloway	<i>Argyrosomus japonicus</i>	1,077	202	4,552	1,133	76%
Leatherjacket	Horseshoe Leatherjacket	<i>Meuschenia hippocrepis</i>	770	183	4,333	996	82%
	Sixspine Leatherjacket	<i>Meuschenia freycineti</i>	533	167	3,714	950	86%
Lizardfish/Grinners	Leatherjacket	Monacanthidae - undifferentiated	1,595	307	11,236	2,366	86%
	Lizardfish/Grinners	Bathysauridae and Synodontidae - undifferentiated.	205	172	1,049	415	80%
Longtom	Longtom	Belonidae - undifferentiated	43	25	968	357	96%
	Blue Mackerel	<i>Scomber australasicus</i>	1,892	807	2,774	873	32%
Mackerel	Grey Mackerel	<i>Scomberomorus semifasciatus</i>	192	64	444	118	57%
	School Mackerel	<i>Scomberomorus queenslandicus</i>	2,890	574	6,971	1,432	59%
Shark Mackerel	Shark Mackerel	<i>Grammatocynus bicarinatus</i>	814	172	2,511	410	68%
	Spanish Mackerel	<i>Scomberomorus commerson</i>	9,866	814	18,724	1,834	47%
Spotted Mackerel	Spotted Mackerel	<i>Scomberomorus munroi</i>	691	153	1,675	409	59%
	Wahoo	<i>Acanthocybium solandri</i>	256	62	273	63	6%
Other Mackerel	Other Mackerel	Scomberidae - undifferentiated	381	137	1,676	1,203	81%
	Mahi Mahi	<i>Coryphaena</i> spp.	1,231	280	1,928	432	36%

Reporting Group	Common Name	Scientific Name	Kept Number	Released Number	Total Number	se	% Rel
Morwong	Blue Morwong	<i>Nemadactylus valenciennesi</i>	5,754	985	6,739	789	15%
	Dusky Morwong	<i>Dactylophora nigricans</i>	95	80	175	53	46%
	Other Morwong	Cheilodactylidae - undifferentiated	147	0	147	65	0%
Mullet	Bluetail Mullet	<i>Valamugil buchanani</i>	0	166	166	107	100%
	Diamondscale Mullet	<i>Liza vaigiensis</i>	72	0	72	56	0%
	Greenback Mullet	<i>Liza subviridis</i>	31	761	792	670	96%
	Sea Mullet	<i>Mugil cephalus</i>	8,482	1,434	9,915	4,456	14%
	Yelloweye Mullet	<i>Aldrichetta forsteri</i>	6,476	250	6,726	4,111	4%
	Other Mullet	Mugilidae - undifferentiated	6,219	351	6,571	2,535	5%
Parrotfish	Bluebarred Parrotfish	<i>Scarus ghobban</i> sp. complex	654	1,909	2,563	483	74%
	Other Parrotfish	Scaridae - undifferentiated	362	2,236	2,598	773	86%
Pearl Perch	Northern Pearl Perch	<i>Glaucosoma buergeri</i>	963	617	1,581	334	39%
	West Australian Dhufish	<i>Glaucosoma hebraicum</i>	17,403	26,443	43,846	3,824	60%
Pike	Great Barracuda	<i>Sphyræna barracuda</i>	84	352	436	115	81%
	Snook	<i>Sphyræna novaehollandiae</i>	4,046	2,273	6,319	1,424	36%
	Striped Barracuda	<i>Sphyræna obtusata</i>	393	778	1,171	273	66%
	Other Pike	Sphyrænaidae - undifferentiated	7,390	3,052	10,442	2,727	29%
	Queenfish	Scomberoides spp.	1,040	1,488	2,528	413	59%
Rainbow Runner	<i>Elagatis bipinnulata</i>	69	48	711	457	90%	
Redfish	Bight Redfish	<i>Centroberyx gerrardi</i>	11,016	6,215	17,231	2,117	36%
	Swallowtail	<i>Centroberyx lineatus</i>	2,955	2,929	5,884	841	50%
	Yelloweye Redfish	<i>Centroberyx australis</i>	113	90	204	91	44%
Salmon/Herring	Australian Herring	<i>Arripis georgianus</i>	212,383	37,337	249,721	21,238	15%
Sand Bass	Western Australian Salmon	<i>Arripis truttaceus</i>	3,361	2,216	5,577	1,155	40%
	Sand Bass	<i>Psammoderus waigiensis</i>	242	36	278	182	13%
	Sergeant Baker	<i>Aulopus purpurissatus</i>	2,298	6,127	8,425	1,008	73%
Snappers (King)	Goldband Snapper	<i>Pristipomoides multidens</i>	2,457	276	2,732	867	10%
	Rosy Snapper	<i>Pristipomoides filamentosus</i>	233	164	397	114	41%
	Sharptooth Snapper	<i>Pristipomoides typus</i>	346	233	579	348	40%

Reporting Group	Common Name	Scientific Name	Kept Number	Released Number	Total Number	se	% Rel
Snappers (Tropical)	Brownstripe Snapper	<i>Lutjanus vitta</i>	262	256	518	121	49%
	Crimson Snapper	<i>Lutjanus erythropterus</i>	1,494	3,498	4,992	995	70%
	Darktail Snapper	<i>Lutjanus lemniscatus</i>	129	367	496	209	74%
	Golden Snapper	<i>Lutjanus johnii</i>	1,490	2,399	3,889	960	62%
	Mangrove Jack	<i>Lutjanus argentimaculatus</i>	3,889	4,236	8,125	1,430	52%
	Maori Snapper	<i>Lutjanus rivulatus</i>	63	39	102	40	38%
	Moses' Snapper	<i>Lutjanus russellii</i>	984	1,998	2,983	573	67%
	Red Emperor	<i>Lutjanus sebae</i>	7,348	6,101	13,448	1,537	45%
	Ruby Snapper	<i>Etelis carbunculus</i>	464	128	592	453	22%
	Saddletail Snapper	<i>Lutjanus malabaricus</i>	1,422	888	2,310	596	38%
	Stripetail Snapper	<i>Lutjanus carponotatus</i>	10,442	37,573	48,015	6,332	78%
	Fusiliers	Caesionidae, Lutjanidae, Symphysanodontidae	0	101	101	89	100%
	Other Snapper	<i>Lutjanus</i> spp.	1,293	1,990	3,283	839	61%
	Sweep	Banded Sweep	<i>Scorpius georgiana</i>	923	1,107	2,030	468
Sea Sweep		<i>Scorpius aequipinnis</i>	3,203	1,314	4,518	766	29%
Sweetlips	Painted Sweetlips	<i>Diagramma labiosum</i>	2,269	4,043	6,312	1,372	64%
	Tailor	<i>Pomatomus saltatrix</i>	22,222	22,785	45,007	11,394	51%
Threadfin	Blue Threadfin	<i>Eleutheronema tetradactylum</i>	2,233	1,919	4,152	1,568	46%
	King Threadfin	<i>Polydactylus macrochir</i>	241	125	366	130	34%
Trevalla	Blue-Eye Trevalla	18	17	300	200	94%	
Trevally	Amberjack	<i>Seriola dumerili</i>	111	715	826	376	87%
	Samsonfish	<i>Seriola hippos</i>	2,119	9,949	12,069	1,819	82%
	Yellowtail Kingfish	<i>Seriola lalandi</i>	1,545	1,640	3,185	852	51%
	Giant Trevally	<i>Caranx ignobilis</i>	1,255	4,316	5,571	869	77%
	Golden Trevally	<i>Gnathanodon speciosus</i>	2,599	9,119	11,719	1,517	78%
	Silver Trevally	<i>Pseudocaranx dentex &amp; wrighti</i>	64,882	56,854	121,736	8,859	47
	Turum	<i>Carangoides fulvoguttatus</i>	370	525	896	245	59%
	Other Trevally	<i>Caranginae</i> spp.	1,342	2,898	4,240	690	68%
	Tripletail	<i>Lobotes surinamensis</i>	72	49	121	51	41%
	Trumpeter	<i>Latridopsis</i> spp.	1,981	11,168	13,148	3,057	85%

Reporting Group	Common Name	Scientific Name	Kept Number	Released Number	Total Number	se	% Rel
Tuna	Dogtooth Tuna	<i>Gymnosarda unicolor</i>	25	20	45	15	43%
	Mackerel Tuna	<i>Euthynnus affinis</i>	546	895	1,441	280	62%
	Northern Bluefin Tuna	<i>Thunnus orientalis</i>	943	1,452	2,394	827	61%
	Skipjack Tuna	<i>Katsuwonus pelamis</i>	2,750	1,321	4,071	408	32%
	Southern Bluefin Tuna	<i>Thunnus maccoyii</i>	882	340	1,222	117	28%
	Yellowfin Tuna	<i>Thunnus albacares</i>	1,525	1,266	2,791	377	45%
	Other Tuna	<i>Scombridae</i> spp. (Sardini & Thunnini)	364	144	508	52	28%
	Baldchin Groper	<i>Choerodon rubescens</i>	15,364	1,376	23,897	1,413	36%
	Blackspot Tuskfish	<i>Choerodon schoenleinii</i>	3,396	541	10,913	1,720	69%
	Blue Tuskfish	<i>Choerodon cyanodus</i>	2,029	383	9,933	1,821	80%
Tuskfish/Wrasse	Bluespotted Tuskfish	<i>Choerodon cauteroma</i>	192	87	862	284	78%
	Brownspotted Wrasse	<i>Notolabrus parilus</i>	5,665	1,563	33,103	3,556	83%
	Goldspot Pigfish	<i>Bodianus perditio</i>	112	70	124	9	10%
	Humphead Maori Wrasse	<i>Chelinus undulatus</i> PROTECTED	29	20	889	349	97%
	Purple Tuskfish	<i>Choerodon cephalotes</i>	202	84	1,507	553	87%
	Southern Maori Wrasse	<i>Ophthalmolepis lineolatus</i>	1,365	307	12,279	1,640	89%
	Western Blue Groper	<i>Achoerodus gouldii</i>	560	155	601	18	7%
	Western King Wrasse	<i>Coris auricularis</i>	9,379	2,101	50,174	4,643	81%
	Other Wrasse	Labridae - undifferentiated	1,825	346	19,349	2,271	91%
	Whiting	Goldenline Whiting	<i>Sillago analis</i>	1,551	744	1,947	218
King George Whiting		<i>Sillaginodes punctata</i>	107,689	13,513	169,013	9,107	36%
School Whiting		<i>Sillago bassensis, vittata &amp; schomburgkii</i>	256,058	21,443	322,071	6,646	20
Western Trumpeter Whiting		<i>Sillago burrus</i>	1,272	744	3,384	781	62%
Other Whiting			5,187	1,582	8,327	872	38%
Yellowtail Scad	<i>Trachurus novaezelandiae</i>	1,465	416	4,542	785	68%	
Western Blue Devil	<i>Paraplesiops sinclairi</i>	50	17	285	59	82%	
Small Baitfish	Baitfish		1,687	1,095	1,945	231	13%
	Pilchard	<i>Sardinops sagax</i>	1,134	750	1,175	41	3%
	Herring		5,146	1,499	8,529	1,777	40%

Reporting Group	Common Name	Scientific Name	Kept Number	se	Released Number	se	Total Number	se	% Rel
Finfish, Others	Archerfishes	Toxotidae - undifferentiated	34	24	12	11	46	26	26%
	Bighead Gurnard Perch	Neosebastes pandus	63	38	540	162	603	167	90%
	Blowfish	Tetraodontidae - undifferentiated	796	509	34,550	5,210	35,346	5,235	98%
	Pufferfish	Tetraodontidae - undifferentiated	0	0	473	247	473	247	100%
	Toadfish	Tetraodontidae - undifferentiated	0	0	108	74	108	74	100%
	Silver Toadfish	<i>Lagocephalus sceleratus</i>	170	107	1,738	585	1,908	599	91%
	Weeping Toadfish	<i>Torquigener pleurogramma</i>	0	0	3,571	1,922	3,571	1,922	100%
	Boarfish	Pentacerotidae - undifferentiated	45	21	0	0	45	21	0%
	Boxfish	Ostraciidae - undifferentiated	27	19	18	17	45	26	40%
	Morid Cods	Moridae - undifferentiated	2,095	325	6,314	795	8,408	967	75%
	Conger Eel	<i>Conger</i> spp.	0	0	48	26	48	26	100%
	Eel	Anguilliformes & Synbranchiformes	8	8	420	164	428	164	98%
	Dory	Zeidae - undifferentiated	36	33	0	0	36	33	0%
	Moonfish/Batfish	Lampridae - undifferentiated	6	6	132	71	138	77	96%
	Salmon	Salmonidae - undifferentiated	525	160	454	252	980	306	46%
	Silver Drummer	<i>Kyphosus</i> spp. complex	91	62	1,388	654	1,479	663	94%
	Tarpon	<i>Megalopidae</i> - undifferentiated	115	103	0	0	115	103	0%

**Table 7.** Summary of release rates for selected species during 2011–12 by RFBL holders aged five years or older.

0 to 19%	20-39%	40-59%	60-79%	80-89%	90-100%
Hapuku	Baldchin Groper	Rankin Cod	Mackerel Tuna	Amberjack	Billfish
Abalone	Barracouta	Banded Sweep	Barramundi	Barramundi Cod	Blowfish
Australian Herring	Bight Redfish	Barcheek Coral Trout	Black Bream	Bartail Flathead	Blue-Eye Trevalla
Blue Morwong	Blue Mackerel	Bass Groper	Blackspot Tuskfish	Blackspotted Rockcod	Giant Sea Catfish
Goldband Snapper	Breaksea Cod	Black Jewfish	Blue Tuskfish	Brownspotted Wrasse	Grey nurse Shark
Harlequin Fish	Cobia	Blue Swimmer Crab	Bluebarred Parrotfish	Common Dart	Grunter Bream
Prawn	Common Coral Trout	Blue Threadfin	Bluespotted Emperor	Flounder	Humphead Maori Wrasse
Robinson's Seabream	Cuttlefish	Bonito	Chinaman Rockcod	Giant Trevally	Longtom
Robust Garfish	Foxfish	Brownstripe Snapper	Crimson Snapper	Great Barracuda	Port Jackson Shark
Sand Bass	Gummy Sharks	Chinamanfish	Golden Snapper	Gurnard	Queensland Groper
Sea Mullet	King George Whiting	Dogtooth Tuna	Golden Trevally	Horseshoe Leatherjacket	Rainbow Runner
Southern Garfish	King Snapper *	Eightbar Grouper	Goldspotted Rockcod	Leatherjacket	Rays
Squid	King Threadfin	Estuary Cobbler	Grass Emperor	Lizardfish/Grinners	Sawshark
Tropical Lobster	Mahi Mahi	Grey Mackerel	Hammerhead Shark	Northern Sand Flathead	Silver Toadfish
Wahoo	Northern Pearl Perch	Javelinfin	Longnose Emperor	Pink Snapper	Weeping Toadfish
Western Blue Groper	Octopus	Mangrove Jack	Moses' Snapper	Potato Rockcod	Western Shovelnose Ray
Yelloweye Mullet	Oriental Bonito	Mud Crab	Mulloway	Red mullet	Western Sooty Grunter
	Ruby Snapper	Queenfish	Northern Bluefin Tuna	S'ihn Bluespotted Flathead	Striped Trumpeter
	Saddletail Snapper	Red Emperor	Northwest Black Bream	Samsongfish	
	Sand Crab	School Mackerel	Painted Sweetlips	Sandbar Shark	
	Sea Sweep	Silver Trevally	Redthroat Emperor	Sixspine Leatherjacket	
	Skipjack Tuna	Spangled Emperor	Sergeant Baker	Southern Maori Wrasse	
	Snook	Spanish Mackerel	Shark Mackerel	Tarwhine	
	Southern Bluefin Tuna	Swallowtail	Silver Cobbler	Tiger Shark	
	Southern Rock Lobster	Tailor	Spotted Mackerel	Western Blue Devil	
	School Whiting	Tripletail	Striped Barracuda	Western Butterfish	
	WA Salmon	West Australian Dhufish	Stripey Snapper	Western King Wrasse	
	Western Rock Lobster	Yelloweye Redfish	Trumpeter Whiting	Whaler Sharks	
	Whiskery Shark	Yellowfin Tuna	Yellowspotted Rockcod	Wobbegong	
	Y'edge Coronation Trout	Yellowtail Kingfish	Yellowtail Scad	Yellowfin Bream	
	Yellowfin Whiting				

\* *Pristipomoides* spp.

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## 6.0 Estimates of Catch for Key Species

This section presents estimates of recreational catch (kept, released and total in numbers) from the Phone-Diary Survey for the 12 month period from 1 March 2011 to 29 February 2012. Raw data collected from diarists have been expanded to population estimates based on the total number of RFBL holders divided by the number of RFBL holders sampled for each residential stratum. Final estimates will include adjustment of these weighting factors to account for avidity bias and non-intending fishing (see Chapter 9). The estimates (and errors) in the following section will be revised on this basis. Shore-based recreational catch has not been assessed in this report. Shore-based fishers and boat-based fishers that intended to fish only in freshwater were out of scope for the Phone-Diary Survey. The catch estimates for inland, estuarine and nearshore species provided in this report, particularly those harvested with high proportions of shore-based effort, will be underestimated.

Summaries are provided by bioregion, habitat, fishing method and season for priority species identified on the basis of abundance in the reported catch and importance for management. Key Species have been allocated to habitat types according to the Resource Assessment Framework (RAF) (Department of Fisheries 2011). However, the following RAF indicator species were caught in low numbers and are not included in this section: Blue-eye Trevalla (*Hyperoglyphe antarctica*); Perth Herring (*Nematalosa vlaminghi*); Pilchard (*Sardinops sagax*); Sandbar Shark (*Carcharhinus plumbeus*); Western Blue Groper (*Achoerodus gouldii*); Whiskery Shark (*Furgaleus macki*); and Whitebait (*Hyperlophus vittatus*).

Estimates of recreational catch for key species are presented by habitat types. This includes:

- 1 species/taxa for inland; Silver Cobbler (*Neoarius midgleyi*).
- 5 species/taxa for estuarine; Barramundi (*Lates calcarifer*), Black Bream (*Acanthopagrus butcheri*), Estuary Cobbler (*Cnidoglanis macrocephalus*), Yellowtail Flathead (*Platycephalus westraliae*), and Southern Bluespotted Flathead (*Platycephalus speculator*).
- 17 species/taxa for nearshore; Australian Herring (*Arripis georgianus*), Western Australian Salmon (*Arripis truttaceus*), Garfish (*Hyporhamphus melanochir* and *Hemiramphus robustus*), Sea Mullet (*Mugil cephalus*), Tailor (*Pomatomus saltatrix*), Blue Threadfin (*Eleutheronema tetradactylum*), King Threadfin (*Polydactylus macrochir*), King George Whiting (*Sillaginodes punctata*), School Whiting (*Sillago bassensis*, *vittata* and *schomburgkii*), Western Trumpeter Whiting (*Sillago burrus*), Mangrove Jack (*Lutjanus argentimaculatus*), Silver Trevally (*Pseudocaranx dentex*), Western Butterfish (*Pentapodus vitta*), Western Yellowfin Bream (*Acanthopagrus latus*), Western King Wrasse (*Coris auricularis*), Brownspotted Wrasse (*Notolabrus parilus*) and Yellowtail Scad (*Trachurus novaezelandiae*).
- 17 species/taxa for inshore; Baldchin Groper (*Choerodon rubescens*), Bight Redfish (*Centroberyx gerrardi*), Blue Morwong (*Nemadactylus valenciennesi*), Bluespotted Emperor (*Lethrinus punctulatus*), Brownstripe Snapper (*Lutjanus vitta*), Goldband Snapper (*Pristipomoides multidens*), Snapper (*Pagrus auratus*), Rankin Cod (*Epinephelus multinotatus*), Red Emperor (*Lutjanus sebae*), Spangled Emperor (*Lethrinus nebulosus*), West Australian Dhufish (*Glaucosoma hebraicum*), Barcheek Coral Trout (*Plectropomus maculatus*), Common Coral Trout (*Plectropomus leopardus*), Breaksea Cod (*Epinephelides armatus*), Grass Emperor (*Lethrinus laticaudis*), Redthroat Emperor (*Lethrinus miniatus*) and Stripey Snapper (*Lutjanus carponotatus*).

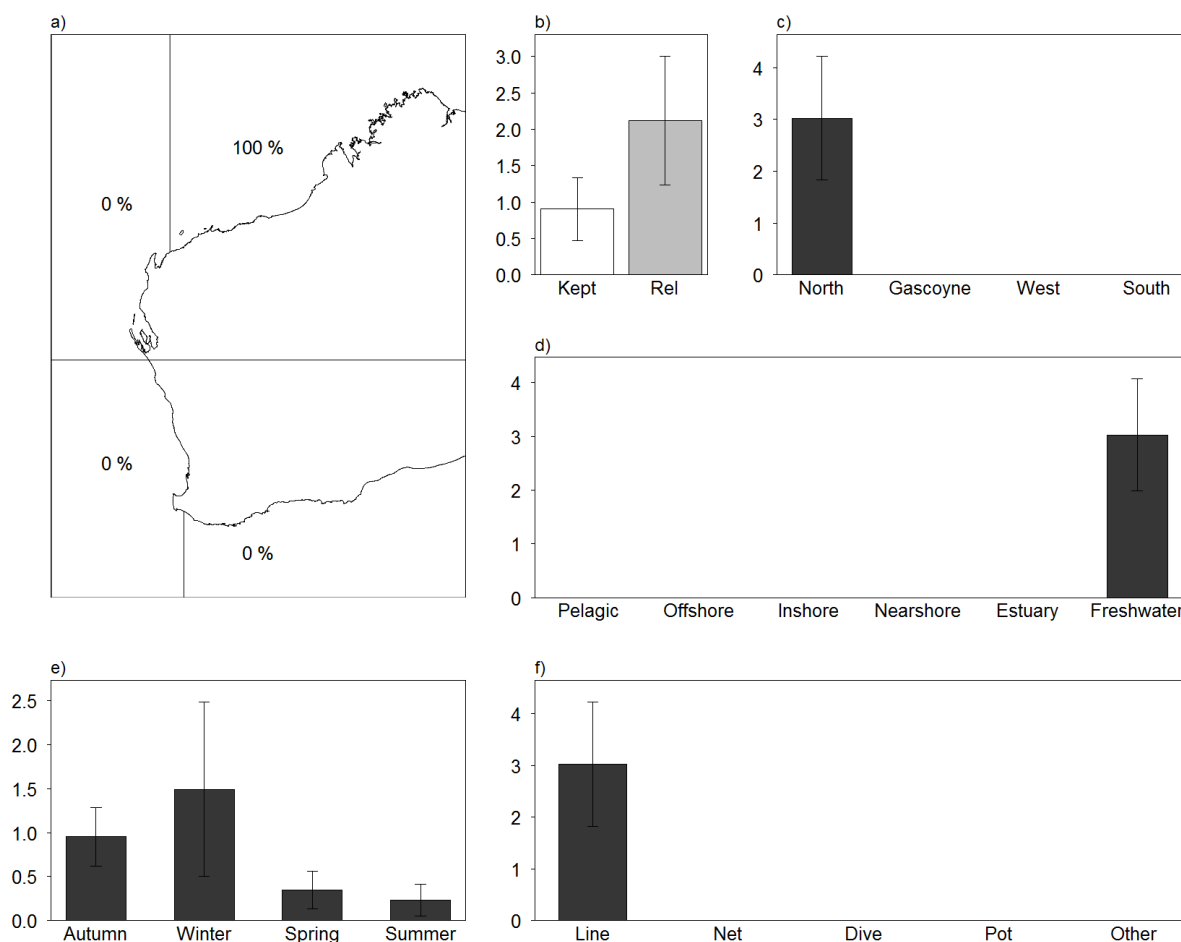


- 3 species/taxa for offshore; Eightbar Grouper (*Epinephelus octofasciatus*), Hapuku (*Polyprion oxygeneios*) and Ruby Snapper (*Etelis carbunculus*)
- 6 species/taxa for pelagic; Spanish Mackerel (*Scomberomorus commerson*), Samsonfish (*Seriola hippos*), Grey Mackerel (*Scomberomorus semifasciatus*), Blue Mackerel (*Scomber australasicus*), Billfish and Southern Bluefin Tuna (*Thunnus maccoyii*).
- 4 species/taxa for sharks; Whaler Sharks (Family Carcharhinidae), Gummy Sharks (*Mustelus antarcticus* and *M. stevensi*), Port Jackson Shark (*Heterodontus portusjacksoni*) and Wobbegong (Family Orectolobidae).
- 3 species/taxa for crustaceans; Western Rock Lobster (*Panulirus cygnus*), Mud Crab (*Scylla olivacea* and *S. serrata*) and Blue Swimmer Crab (*Portunus armatus*).
- 1 species/taxa for molluscs; Abalone (*Haliotis* spp.).
- 3 species/taxa for cephalopods; Cuttlefish (Order Sepiidae), Squid (Order Teuthoidea) and Octopus (Order Octopodidae).

## 6.1 Inland

### 6.1.1 Silver Cobbler (*Neoarius midgleyi*)

Silver Cobbler is an indicator species in the Northern Inland Bioregion. Recreational catches of Silver Cobbler by RFBL holders aged five years or older occurred in the North Coast bioregion (Figure 17 a and c). The majority of the boat-based recreational catch of Silver Cobbler was released or discarded (70%) (Figure 17b). Silver Cobbler were harvested in freshwater habitat (Figure 17d) throughout the year, with higher catches observed in winter (49%), spring (12%) and autumn (31%) (Figure 17e). All catches were taken by line-fishing (100%) (Figure 17f). Catch estimates for this species will be underestimated as shore-based fishers and boat-based fishers that fished only in freshwater were out of scope.

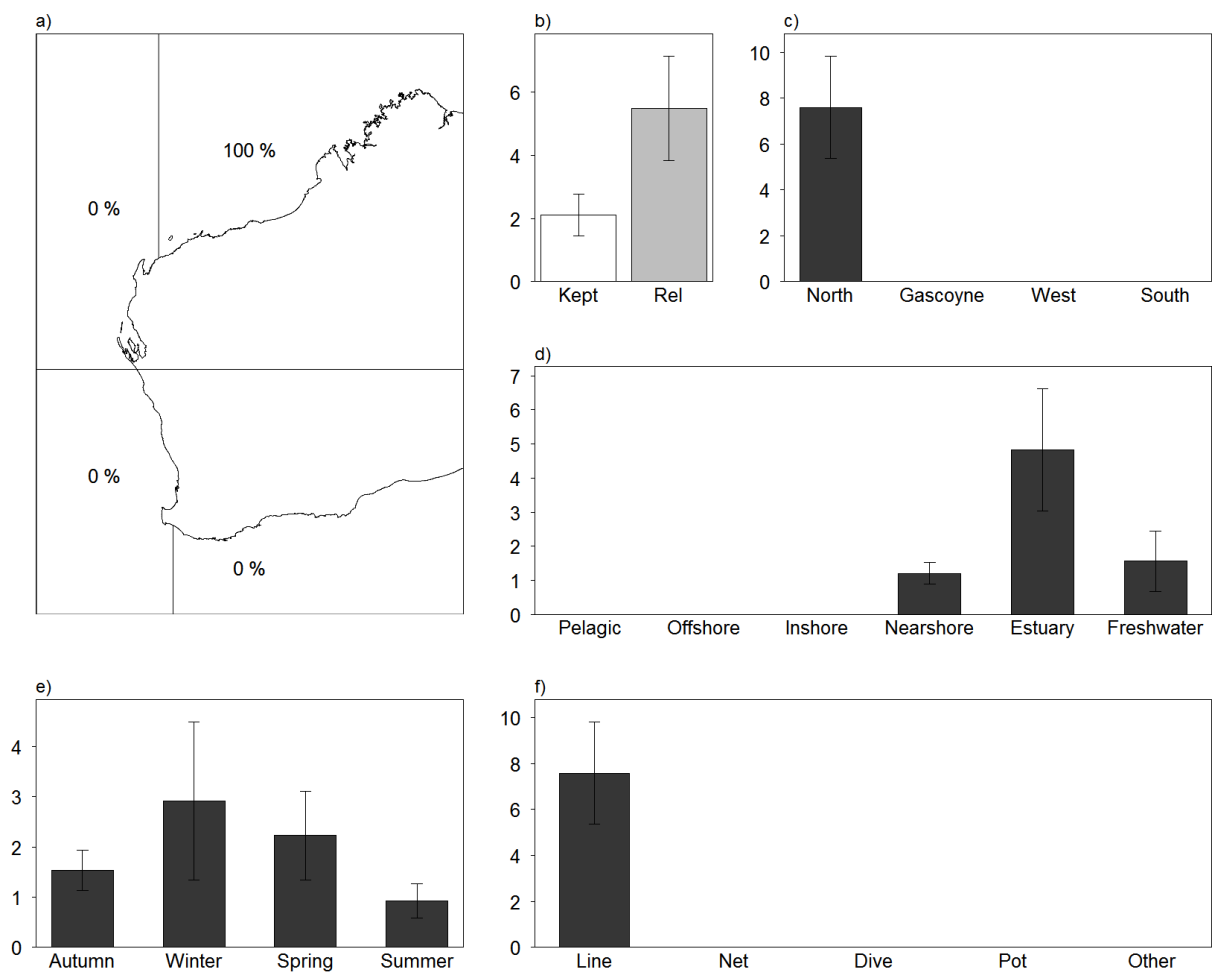


**Figure 17.** Boat-based recreational catch (numbers x 1000) of Silver Cobbler in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

## 6.2 Estuarine

### 6.2.1 Barramundi (*Lates calcarifer*)

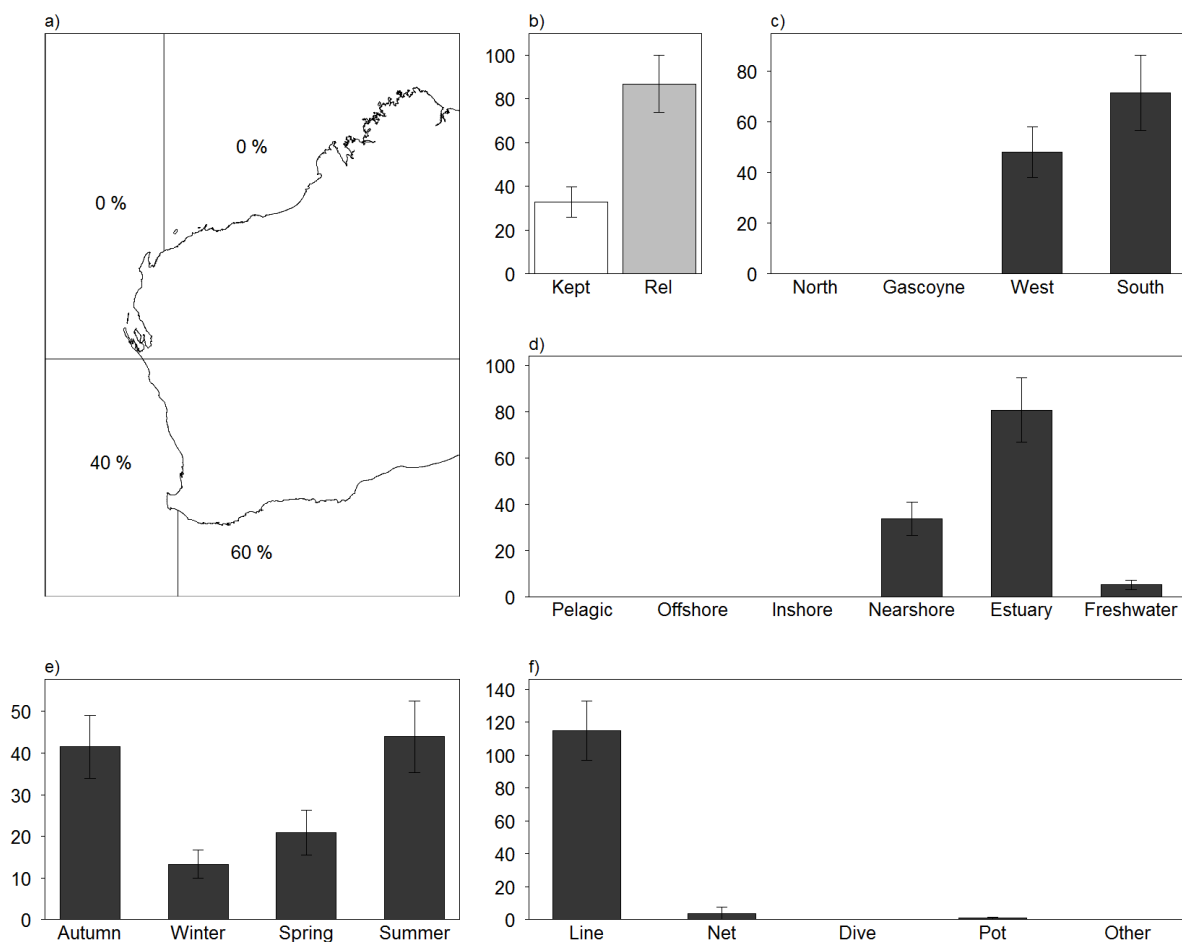
Barramundi is an indicator species in the North Coast. Recreational catches of Barramundi by RFBL holders aged five years or older occurred in the North Coast bioregion (Figure 18 a and c). The majority of the boat-based recreational catch of Barramundi was released or discarded (72%) (Figure 18b). The majority of the catch was taken in estuary habitat (64%), but also freshwater (21%) and nearshore (16%) (Figure 18d). Barramundi were harvested throughout the year, with higher catches observed in winter (38%), spring (29%) and autumn (20%) (Figure 18e). All catches were taken by line-fishing (100%) (Figure 18f). Catch estimates for this species will be underestimated as shore-based fishers and boat-based fishers that fished only in freshwater were out of scope of the survey.



**Figure 18.** Boat-based recreational catch (numbers x 1000) of Barramundi in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.2.2 Black Bream (*Acanthopagrus butcheri*)

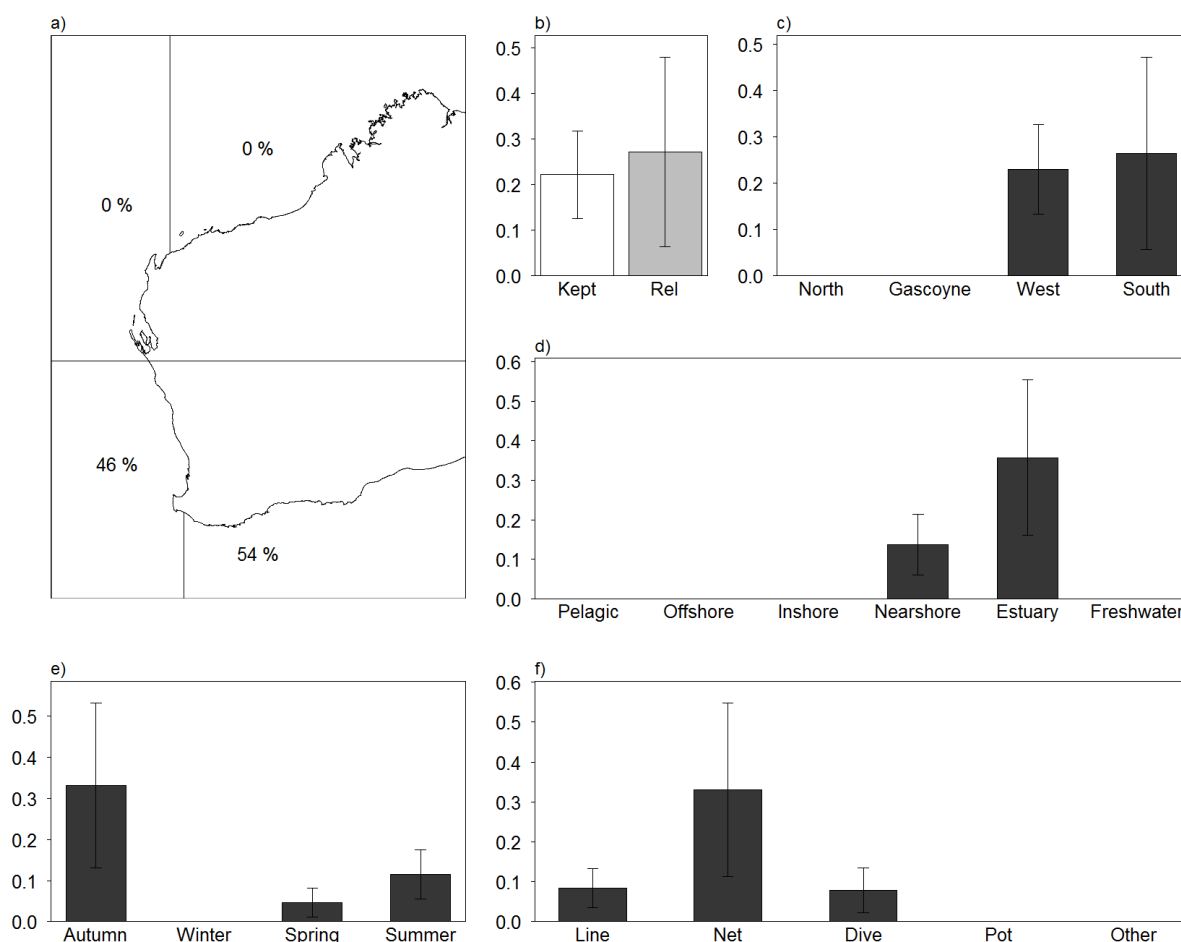
Black Bream is an indicator species in the West Coast and South Coast bioregions. The majority of the recreational catches of Black Bream by RFBL holders aged five years or older occurred in the South Coast (60%), followed by the West Coast (40%) (Figure 19 a and c). The majority of the boat-based recreational catch of Black Bream was released or discarded (73%) (Figure 19b). Catches were taken predominantly from estuary habitat (67%), but also freshwater (4%) and nearshore (28%) (Figure 19d). Black Bream were harvested throughout the year, with higher catches observed in summer (37%) and autumn (35%) compared with winter (11%) and spring (17%) (Figure 19e). The majority of the catch was taken by line-fishing (96%), with some fishing from nets (3%) and pots (1%) (Figure 19f). Catch estimates for this species will be underestimated as shore-based fishers and boat-based fishers that fished only in freshwater were out of scope of the survey.



**Figure 19.** Boat-based recreational catch (numbers x 1000) of Black Bream in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.2.3 Estuary Cobbler (*Cnidoglanis macrocephalus*)

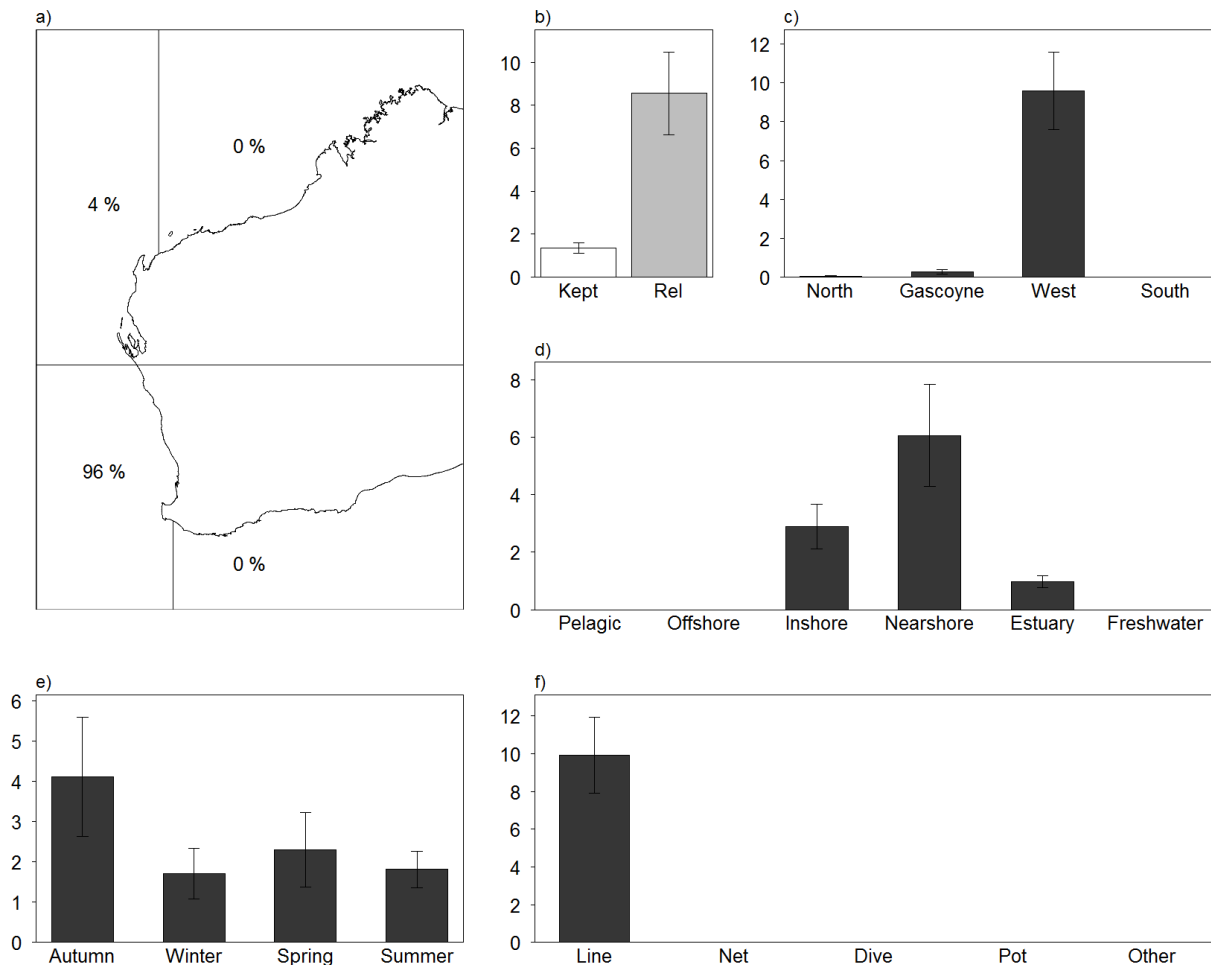
Estuary Cobbler is an indicator species in the West Coast and South Coast bioregions. The majority of the recreational catches of Estuary Cobbler by RFBL holders aged five years or older occurred in the South Coast (54%), followed by the West Coast (46%) (Figure 20 a and c). Just over half of the boat-based recreational catch of Estuary Cobbler was released or discarded (55%) (Figure 20b). Catches were taken predominantly from estuary habitat (72%), but also from nearshore habitat (28%) (Figure 20d). Estuary Cobbler were harvested from spring to autumn, with highest catches in autumn (68%) compared with spring (9%) and summer (23%) (Figure 20e). The majority of the catch was taken by nets (67%), with some fishing from lines (17%) and dive (16%) (Figure 20f). Catch estimates for this species will be underestimated as shore-based fishers and boat-based fishers that fished only in freshwater were out of scope of the survey.



**Figure 20.** Boat-based recreational catch (numbers x 1000) of Estuary Cobbler in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.2.4 Yellowtail Flathead (*Platycephalus westraliae*)

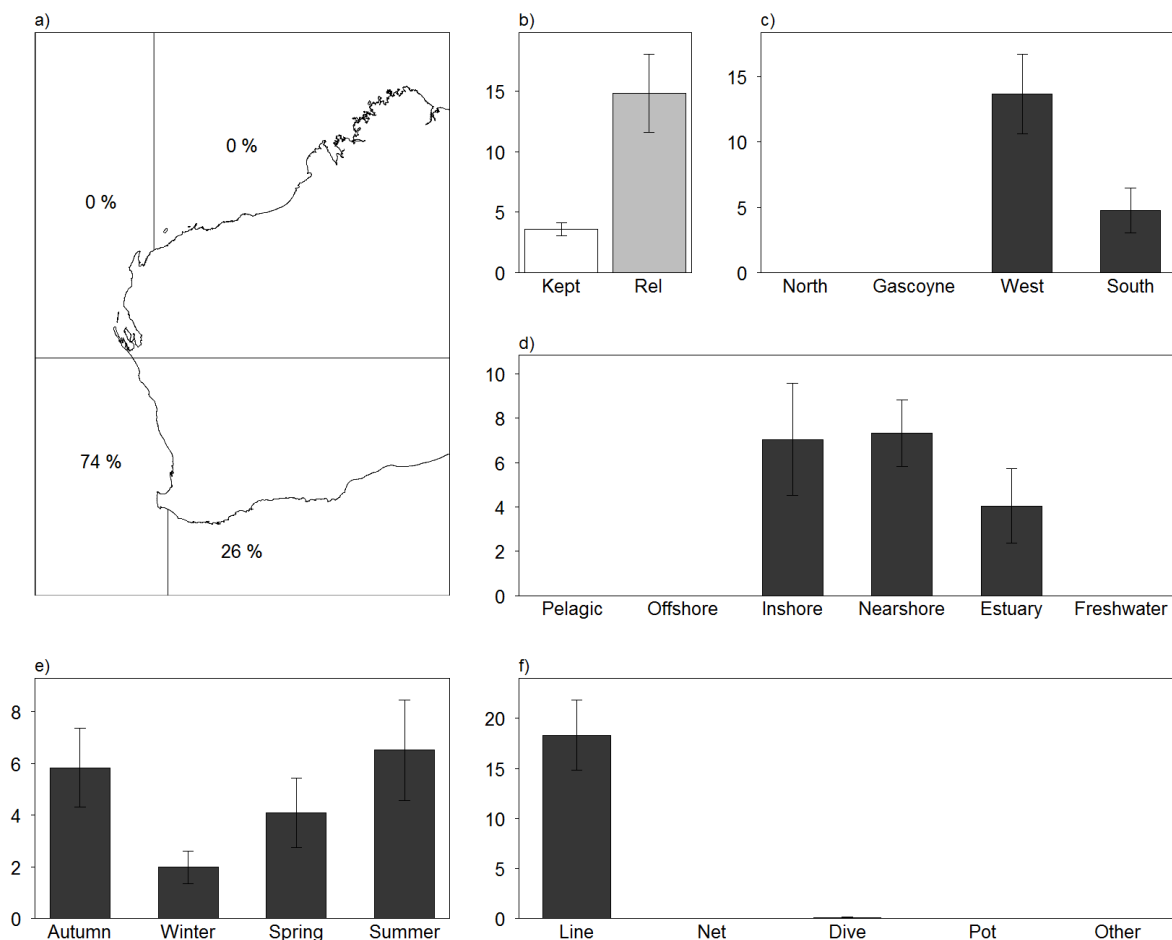
The majority of the recreational catches of Yellowtail Flathead by RFBL holders aged five years or older occurred in the West Coast (96%), with some catches in the Gascoyne Coast (4%) (Figure 21a and c). The majority of the boat-based recreational catch of Yellowtail Flathead was released or discarded (86%) (Figure 21b). Catches were taken predominantly from nearshore habitat (61%), but also inshore (29%) and estuary (10%) (Figure 21d). Yellowtail Flathead were harvested throughout the year, with higher catches observed in autumn (41%) compared with winter (17%), spring (24%) and summer (18%) (Figure 21e). Catches were taken by line-fishing (100%) (Figure 21f).



**Figure 21.** Boat-based recreational catch (numbers x 1000) of Yellowtail Flathead in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.2.5 Southern Bluespotted Flathead (*Platycephalus speculator*)

The majority of the recreational catches of Southern Bluespotted Flathead by RFBL holders aged five years or older occurred in the West Coast (74%), followed by the South Coast (26%) (Figure 22 a and c). The majority of the boat-based recreational catch of Southern Bluespotted Flathead was released or discarded (80%) (Figure 22b). Catches were taken predominantly from nearshore habitat (40%), but also inshore (38%) and estuary (22%) (Figure 22d). Southern Bluespotted Flathead were harvested throughout the year, with higher catches observed in summer (35%) and autumn (32%) compared with winter (11%) and spring (22%) (Figure 22e). The majority of the catch was taken by line-fishing (99%), with some fishing from diving (1%) (Figure 22f).

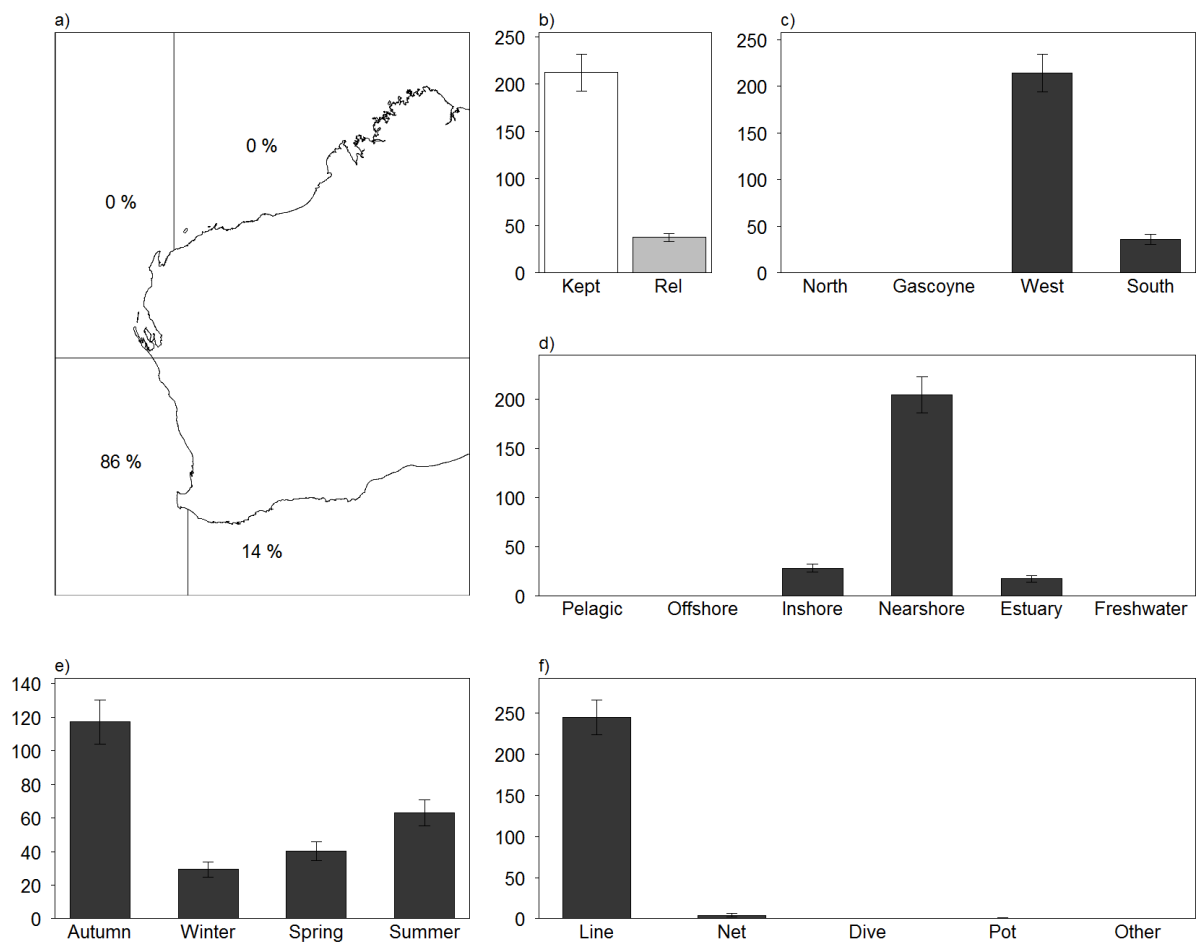


**Figure 22.** Boat-based recreational catch (numbers x 1000) of Southern Bluespotted Flathead in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

## 6.3 Nearshore

### 6.3.1 Australian Herring (*Arripis georgianus*)

Australian Herring is an indicator species in the West Coast and South Coast bioregions. The majority of the recreational catches of Australian Herring by RFBL holders aged five years or older occurred in the West Coast (86%), followed by the South Coast (14%) (Figure 23a and c). The majority of the boat-based recreational catch of Australian Herring was retained (85%) (Figure 23b). Catches were taken predominantly from nearshore habitat (82%), but also inshore (11%) and estuary (7%) (Figure 23d). Australian Herring were harvested throughout the year, with higher catches observed in summer (25%) and autumn (47%) compared with winter (12%) and spring (16%) (Figure 23e). The majority of the catch was taken by line-fishing (98%), with some fishing from nets (2%) (Figure 23f).

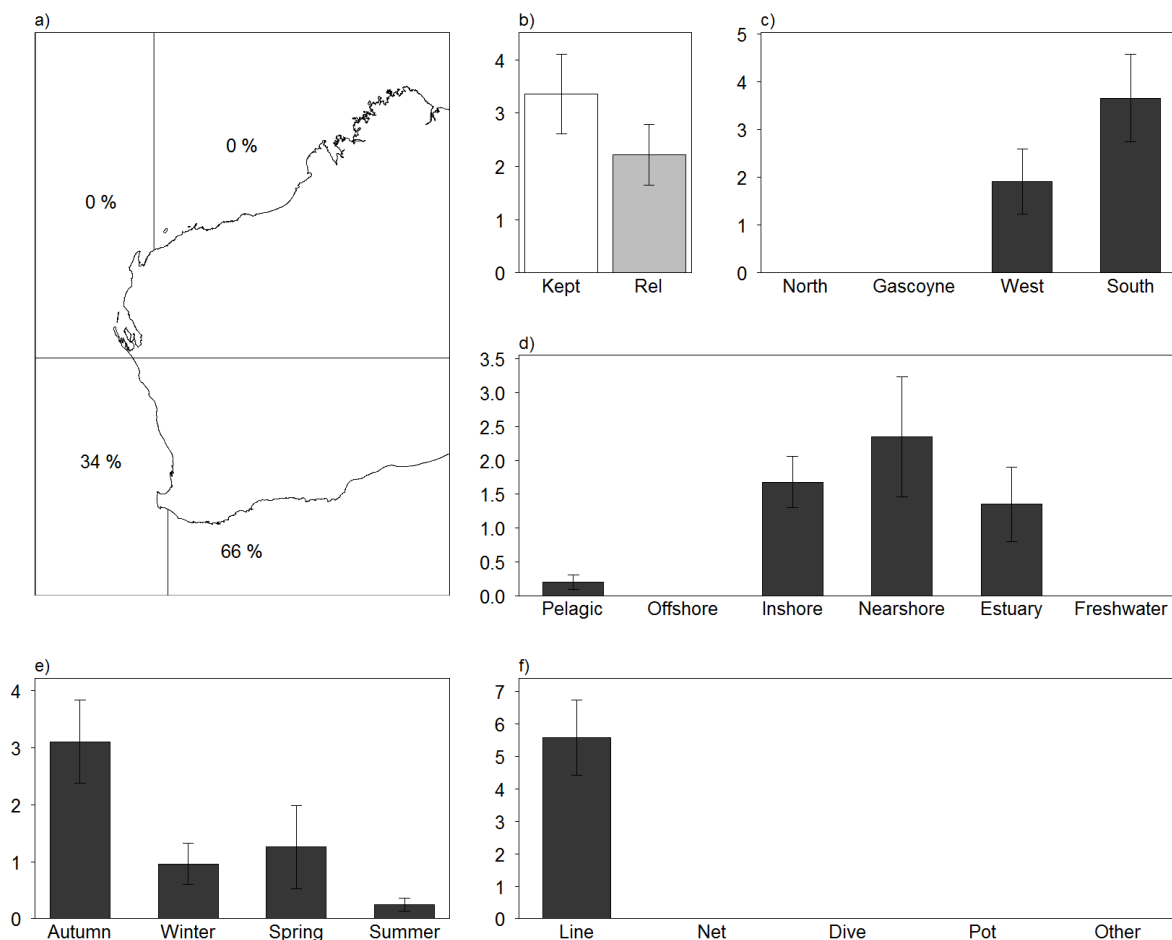


**Figure 23.** Boat-based recreational catch (numbers x 1000) of Australian Herring in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.



### 6.3.2 Western Australian Salmon (*Arripis truttaceus*)

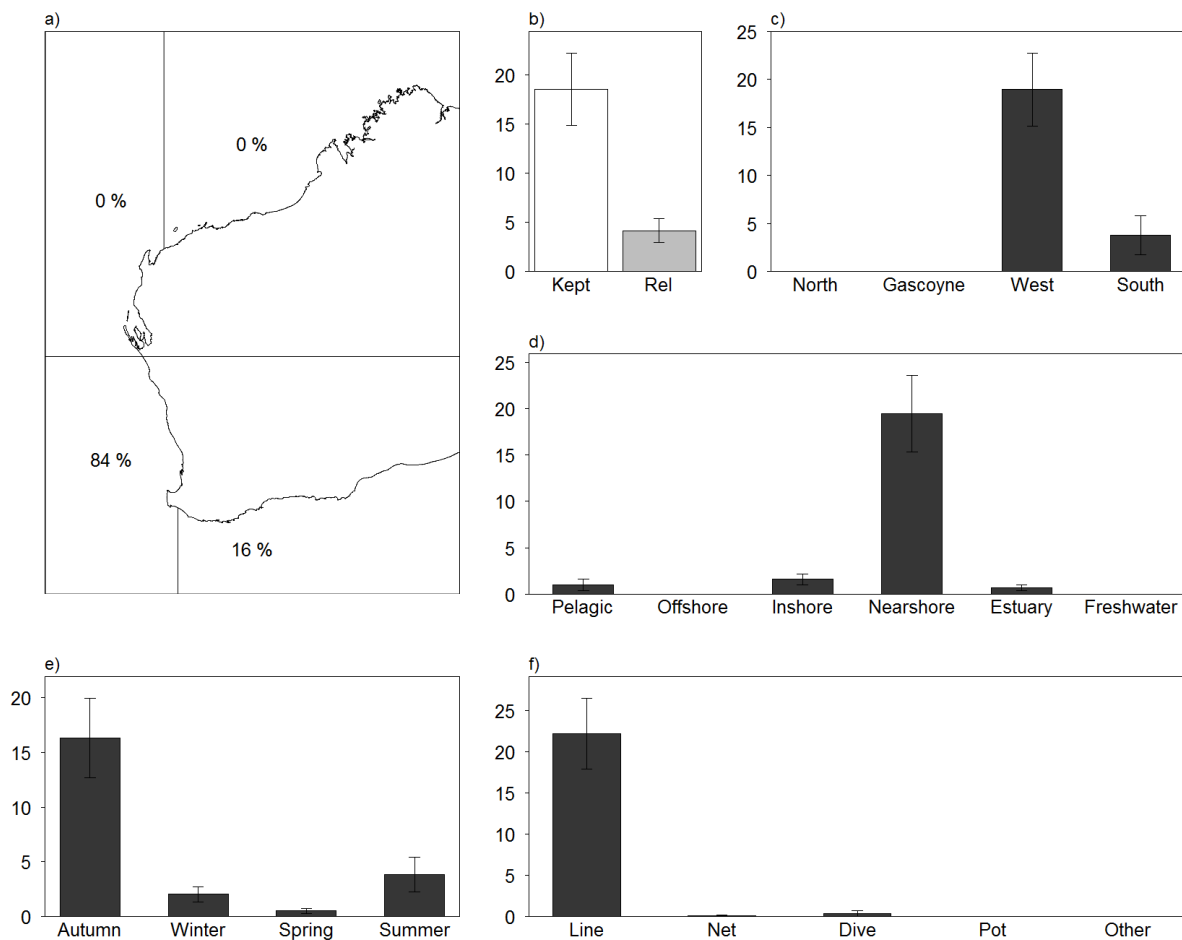
Western Australian Salmon is an indicator species in the South Coast. The majority of the recreational catches of Western Australian Salmon by RFBL holders aged five years or older occurred in the South Coast (66%), followed by the West Coast (34%) (Figure 24a and c). The majority of the boat-based recreational catch of Western Australian Salmon was retained (60%) (Figure 24b). Catches were taken predominantly from nearshore habitat (42%), but also inshore (30%), estuary (24%) and pelagic (4%) (Figure 24d). Western Australian Salmon were harvested throughout the year, with higher catches observed in autumn (56%) compared with winter (17%), spring (23%) and summer (4%) (Figure 24e). All catches were taken by line-fishing (Figure 24f).



**Figure 24.** Boat-based recreational catch (numbers x 1000) of Western Australian Salmon in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.3.3 Garfish (*Hyporhamphus melanochir* and *Hemiramphus robustus*)

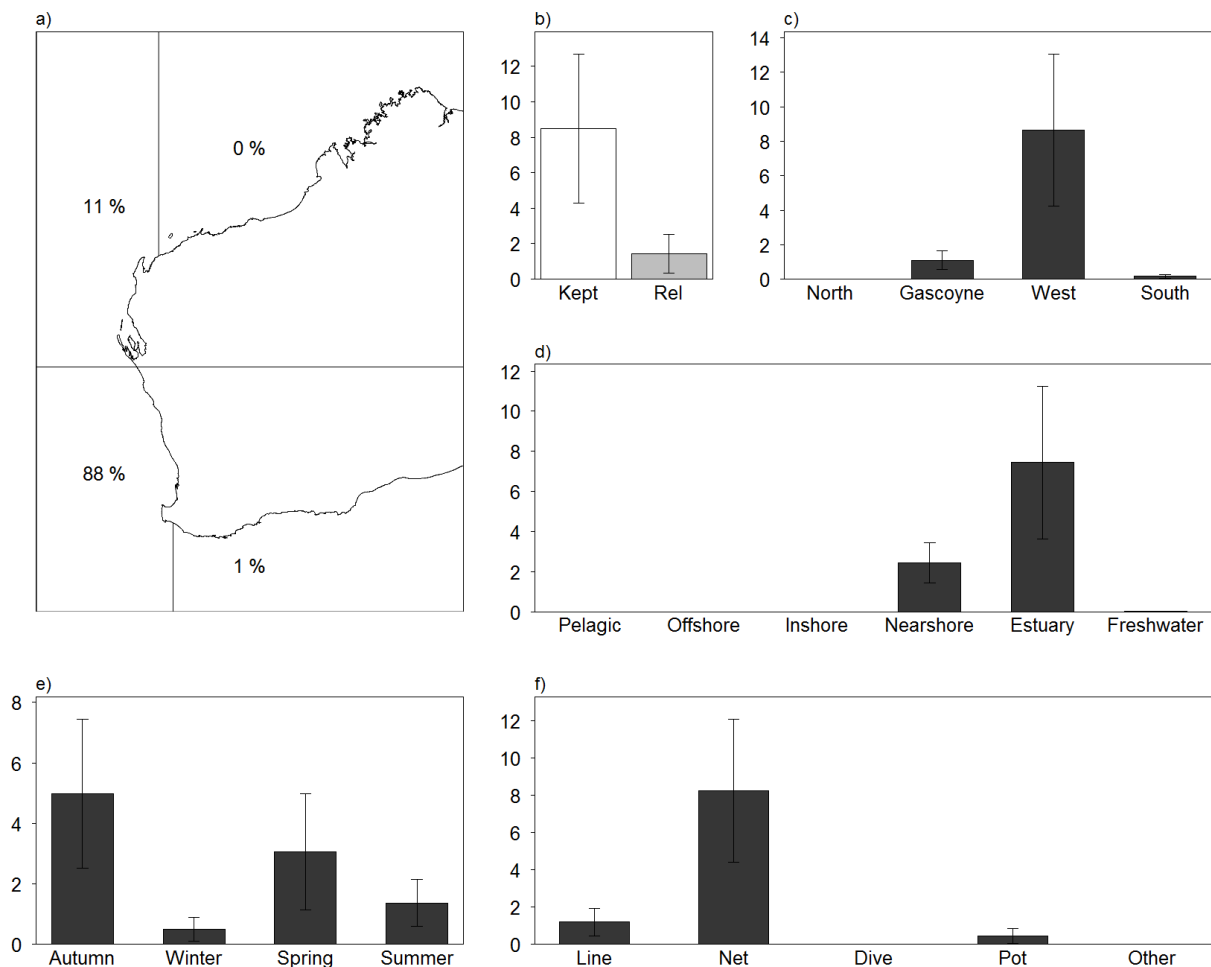
Garfish species are Southern Garfish (*Hyporhamphus melanochir*) and Robust Garfish (*Hemiramphus robustus*). Garfish is an indicator species in the West Coast. The majority of the recreational catches of Garfish by RFBL holders aged five years or older occurred in the West Coast (84%), followed by the South Coast (16%) (Figure 25 a and c). The majority of the boat-based recreational catch of Garfish was retained (82%) (Figure 25b). Catches were taken predominantly from nearshore habitat (86%), but also inshore (7%), estuary (3%) and pelagic (4%) (Figure 25d). Garfish were harvested throughout the year, with higher catches observed in autumn (72%) compared with winter (9%), spring (2%) and summer (17%) (Figure 25e). The majority of the catch was taken by line-fishing (98%), with some fishing from diving (1%) and nets (1%) (Figure 25f).



**Figure 25.** Boat-based recreational catch (numbers x 1000) of Garfish in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.3.4 Sea Mullet (*Mugil cephalus*)

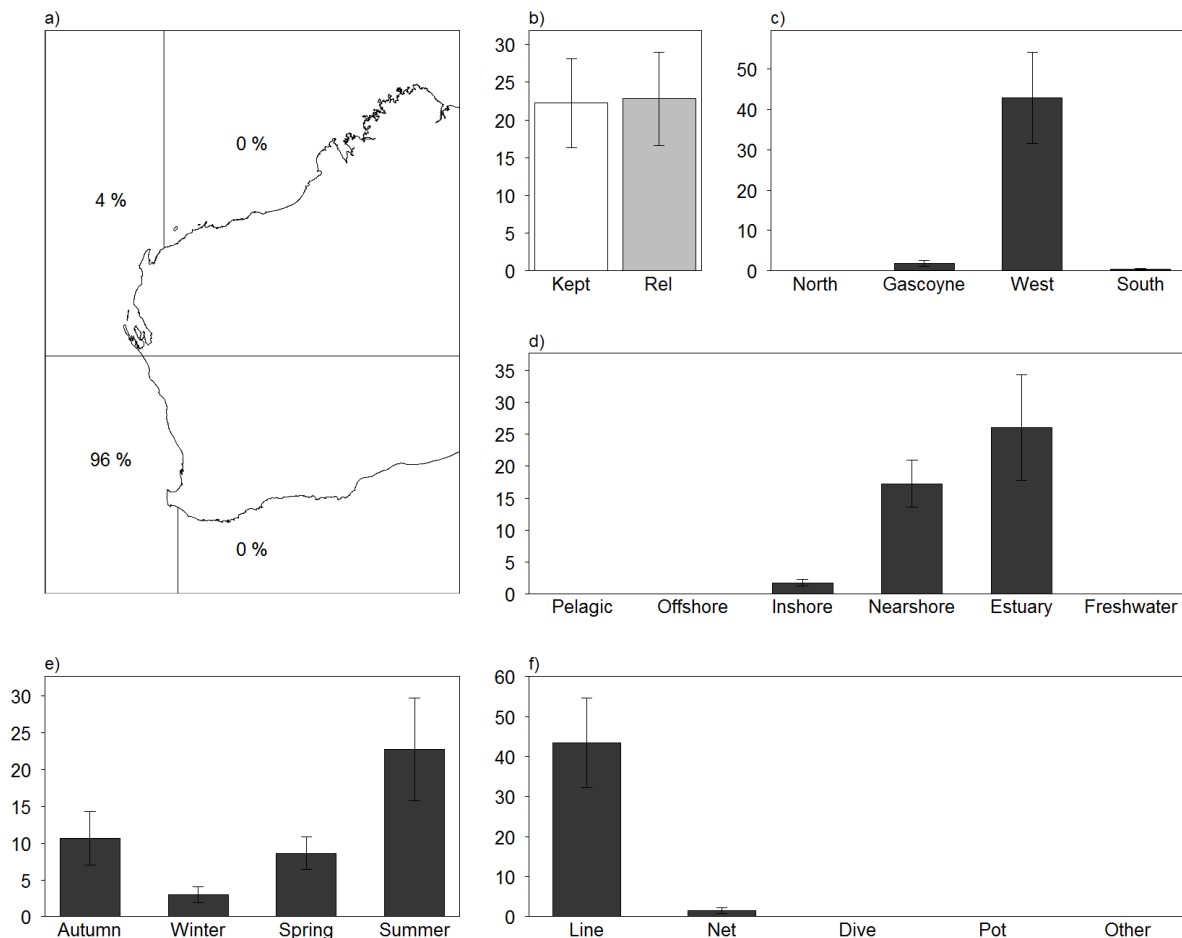
Sea Mullet is an indicator species in the South Coast. The majority of the recreational catches of Sea Mullet by RFBL holders aged five years or older occurred in the West Coast (88%), with some catches in the Gascoyne Coast (11%) and South Coast (1%) (Figure 26 a and c). The majority of the boat-based recreational catch of Sea Mullet was retained (86%) (Figure 26b). Catches were taken predominantly from estuary habitat (75%), but also nearshore (25%) (Figure 26d). Sea Mullet were harvested throughout the year, with higher catches observed in autumn (50%) compared with winter (5%), spring (31%) and summer (14%) (Figure 26e). Catches were taken by nets (83%), with some fishing from lines (12%) and pots (5%) (Figure 26f).



**Figure 26.** Boat-based recreational catch (numbers x 1000) of Sea Mullet in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.3.5 Tailor (*Pomatomus saltatrix*)

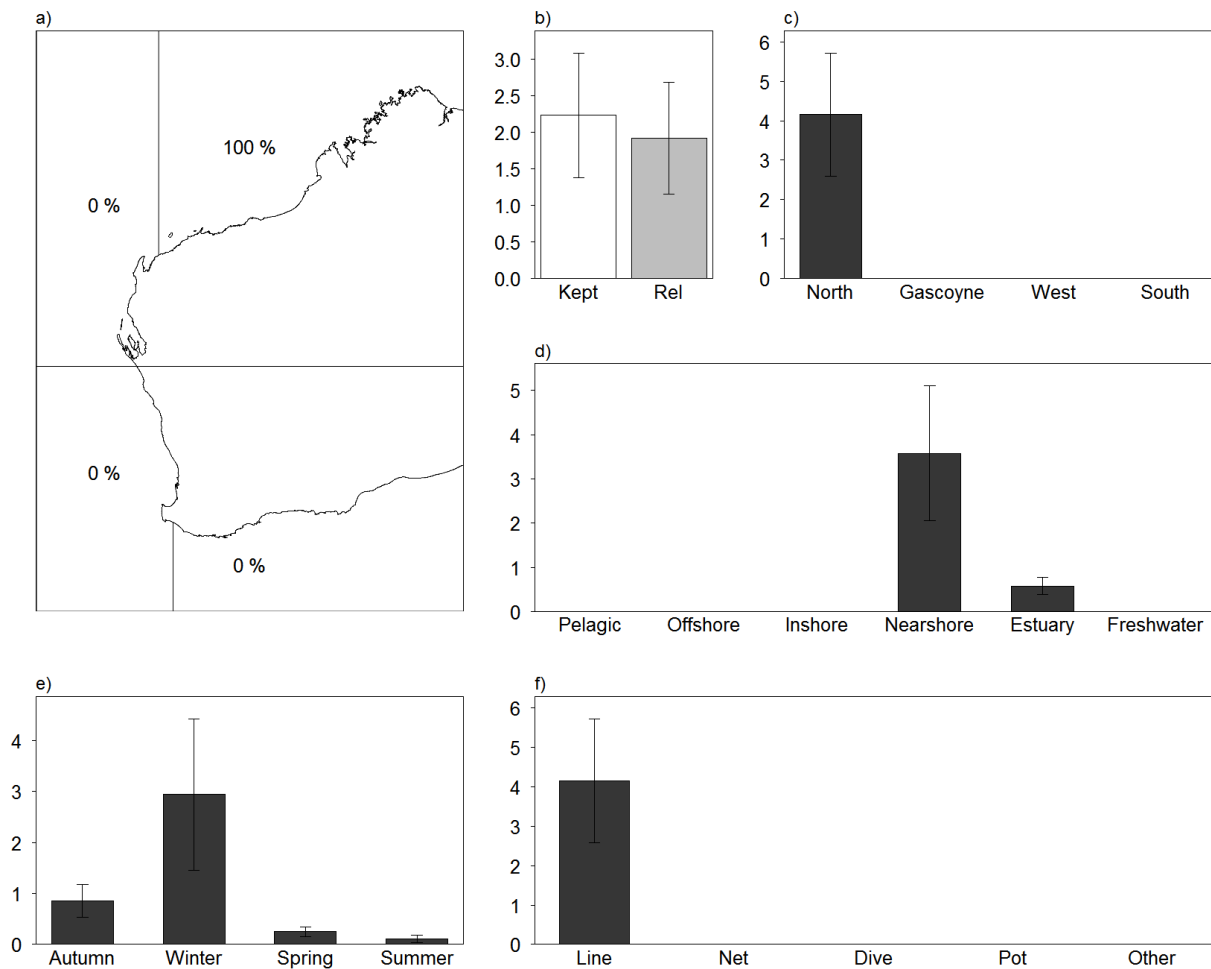
Tailor is an indicator species in the Gascoyne Coast and West Coast bioregions. The majority of the recreational catches of Tailor by RFBL holders aged five years or older occurred in the West Coast (96%), with some catches in the Gascoyne Coast (4%) (Figure 27 a and c). Equal proportions of the boat-based recreational catch of Tailor were retained (49%) and released (51%) (Figure 27b). Catches were taken predominantly from estuary habitat (58%), but also nearshore (38%) and inshore (4%) (Figure 27d). Tailor were harvested throughout the year, with higher catches observed in summer (51%) and autumn (24%) compared with winter (7%) and spring (19%) (Figure 27e). Catches were taken by line fishing (97%), with some fishing from nets (3%) (Figure 27f).



**Figure 27.** Boat-based recreational catch (numbers x 1000) of Tailor in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.3.6 Blue Threadfin (*Eleutheronema tetradactylum*)

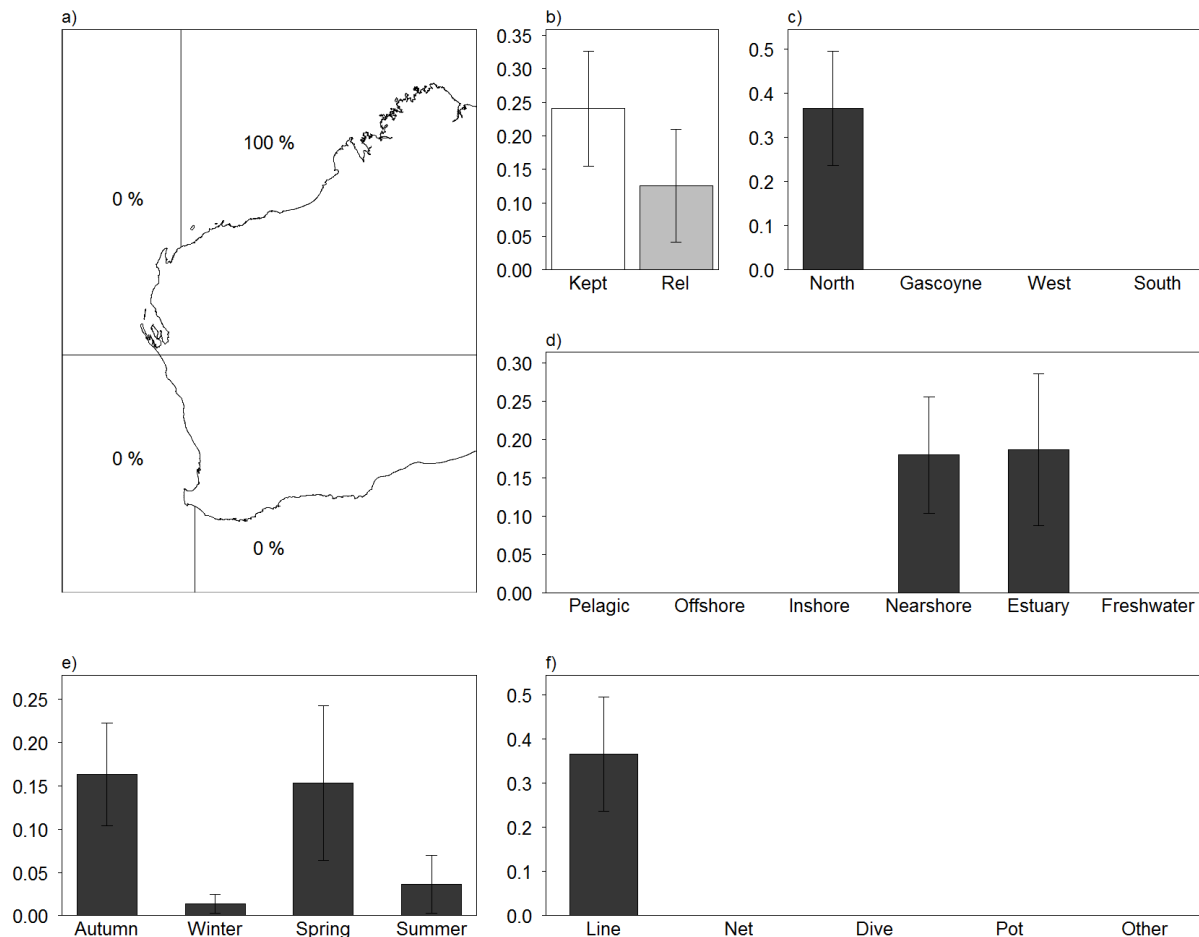
Blue Threadfin is an indicator species in the North Coast. All recreational catches of Blue Threadfin by RFBL holders aged five years or older occurred in the North Coast (Figure 28 a and c). Similar proportions of the boat-based recreational catch of Blue Threadfin were retained (54%) and released (46%) (Figure 28b). Catches were taken predominantly from nearshore habitat (86%), but also estuary (14%) (Figure 28d). Blue Threadfin were harvested throughout the year, with higher catches observed in winter (71%) compared with spring (6%), summer (3%) and autumn (20%) (Figure 28e). All catches were taken by line fishing (100%) (Figure 28f).



**Figure 28.** Boat-based recreational catch (numbers x 1000) of Blue Threadfin in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.3.7 King Threadfin (*Polydactylus macrochir*)

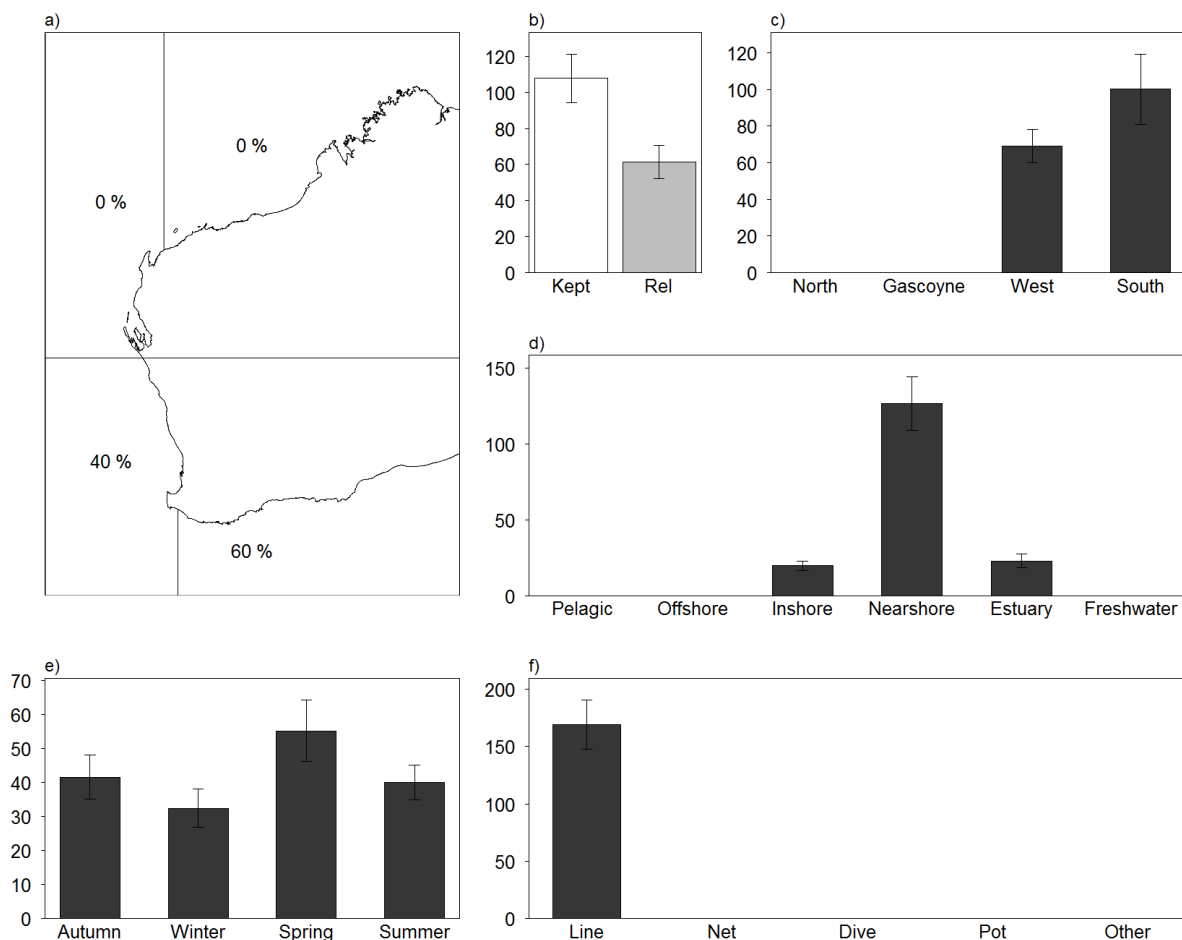
King Threadfin is an indicator species in the North Coast. All recreational catches of King Threadfin by RFBL holders aged five years or older occurred in the North Coast (Figure 29 a and c). The majority of the boat-based recreational catch of King Threadfin was retained (66%) (Figure 29b). Catches were taken from estuary (51%) and nearshore (49%) habitats (Figure 29d). King Threadfin were harvested throughout the year, with higher catches observed in autumn (45%) and spring (42%) compared with winter (4%) and summer (9%) (Figure 29e). All catches were taken by line fishing (Figure 29f).



**Figure 29.** Boat-based recreational catch (numbers x 1000) of King Threadfin in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.3.8 King George Whiting (*Sillaginodes punctata*)

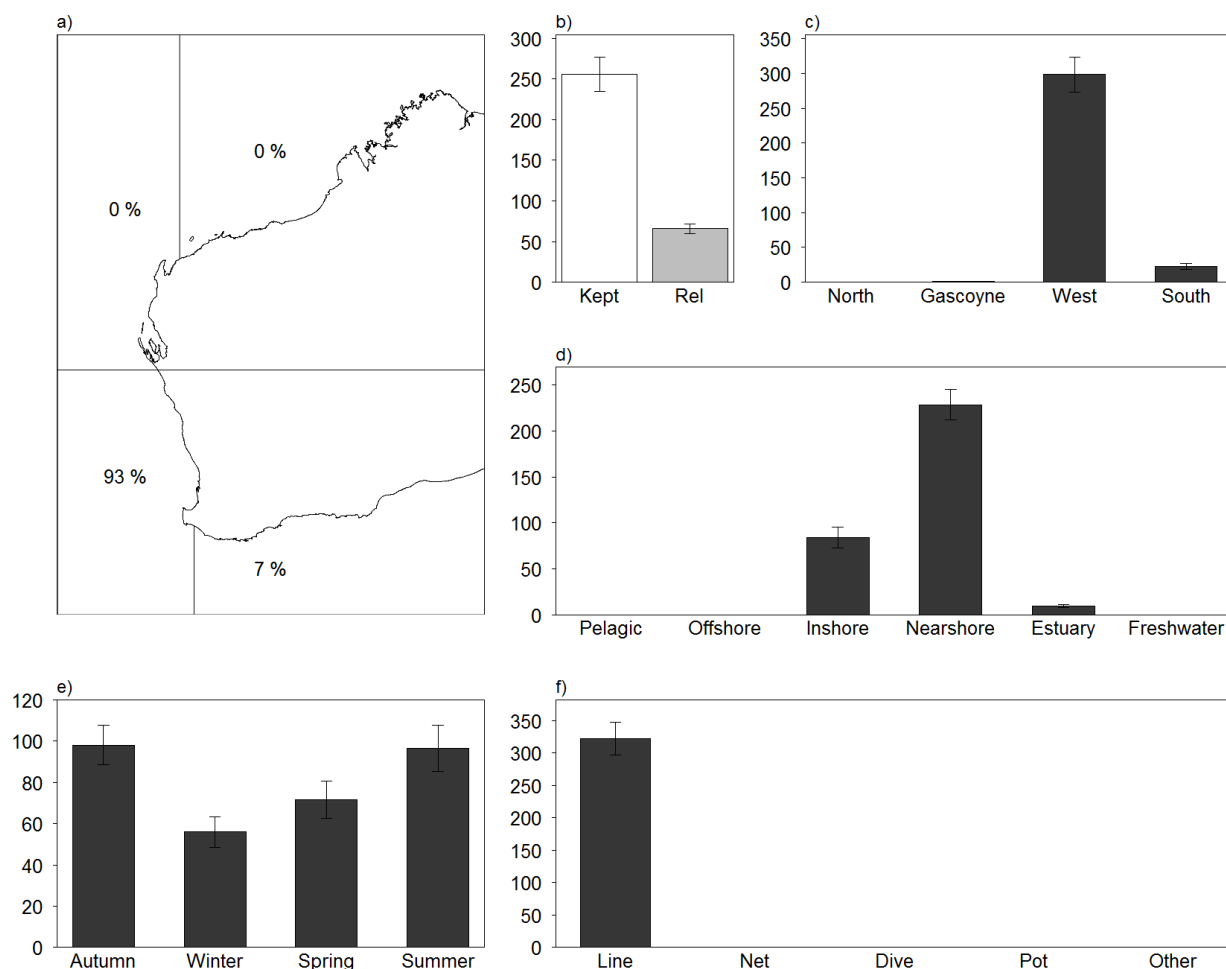
Whiting species, including King George Whiting, are indicator species in the Gascoyne Coast, South Coast and West Coast bioregions. The majority of the recreational catches of King George Whiting by RFBL holders aged five years or older occurred in the South Coast (60%), with some catches in the West Coast (40%) (Figure 30 a and c). The majority of the boat-based recreational catch of King George Whiting was retained (64%) (Figure 30b). Catches were taken predominantly from nearshore habitat (75%), but also inshore (12%) and estuary (13%) (Figure 30d). King George Whiting were harvested throughout the year, with higher catches observed in spring (33%) compared with summer (24%), autumn (25%) and winter (19%) (Figure 30e). All catches were taken by line fishing (Figure 30f).



**Figure 30.** Boat-based recreational catch (numbers x 1000) of King George Whiting in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.3.9 School Whiting (*Sillago bassensis*, *vittata* and *schomburgkii*)

Whiting species, including School and Yellowfin Whiting, are indicator species in the Gascoyne Coast, South Coast and West Coast bioregions. School Whiting includes Southern School Whiting (*Sillago bassensis*), Western School Whiting (*S. vittata*) and Yellowfin Whiting (*S. schomburgkii*). The majority of the recreational catches of School Whiting by RFBL holders aged five years or older occurred in the West Coast (93%), with some catches in the South Coast (7%) (Figure 31 a and c). The majority of the boat-based recreational catch of School Whiting was retained (80%) (Figure 31b). Catches were taken predominantly from nearshore habitat (71%), but also inshore (26%) and estuary (3%) (Figure 31d). School Whiting were harvested throughout the year, with higher catches observed in summer (30%) and autumn 30%) compared with winter (18%) and spring (22%) (Figure 31e). All catches were taken by line fishing (Figure 31f).

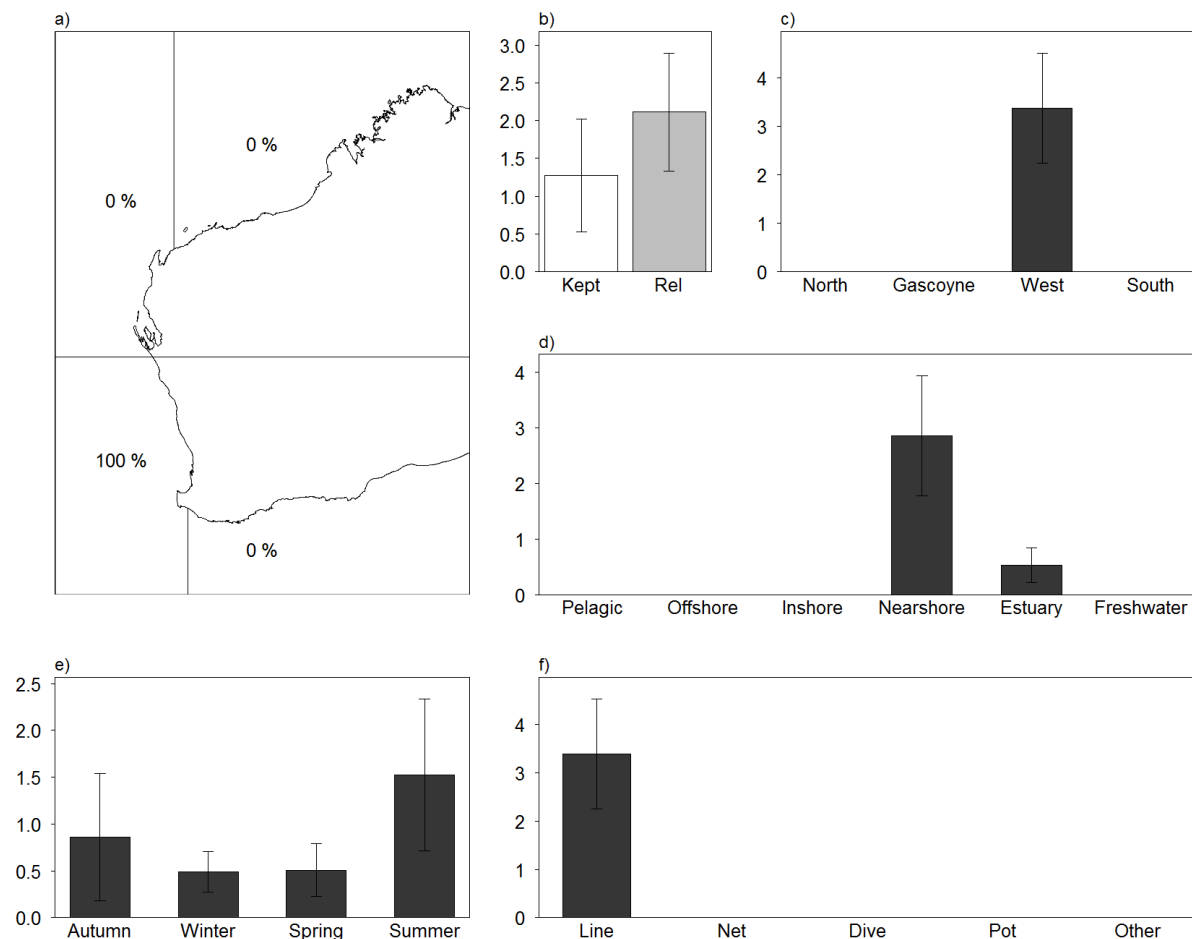


**Figure 31.** Boat-based recreational catch (numbers x 1000) of School Whiting in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch Yellowfin Whiting (*Sillago schomburgkii*)



### 6.3.10 Western Trumpeter Whiting (*Sillago burrus*)

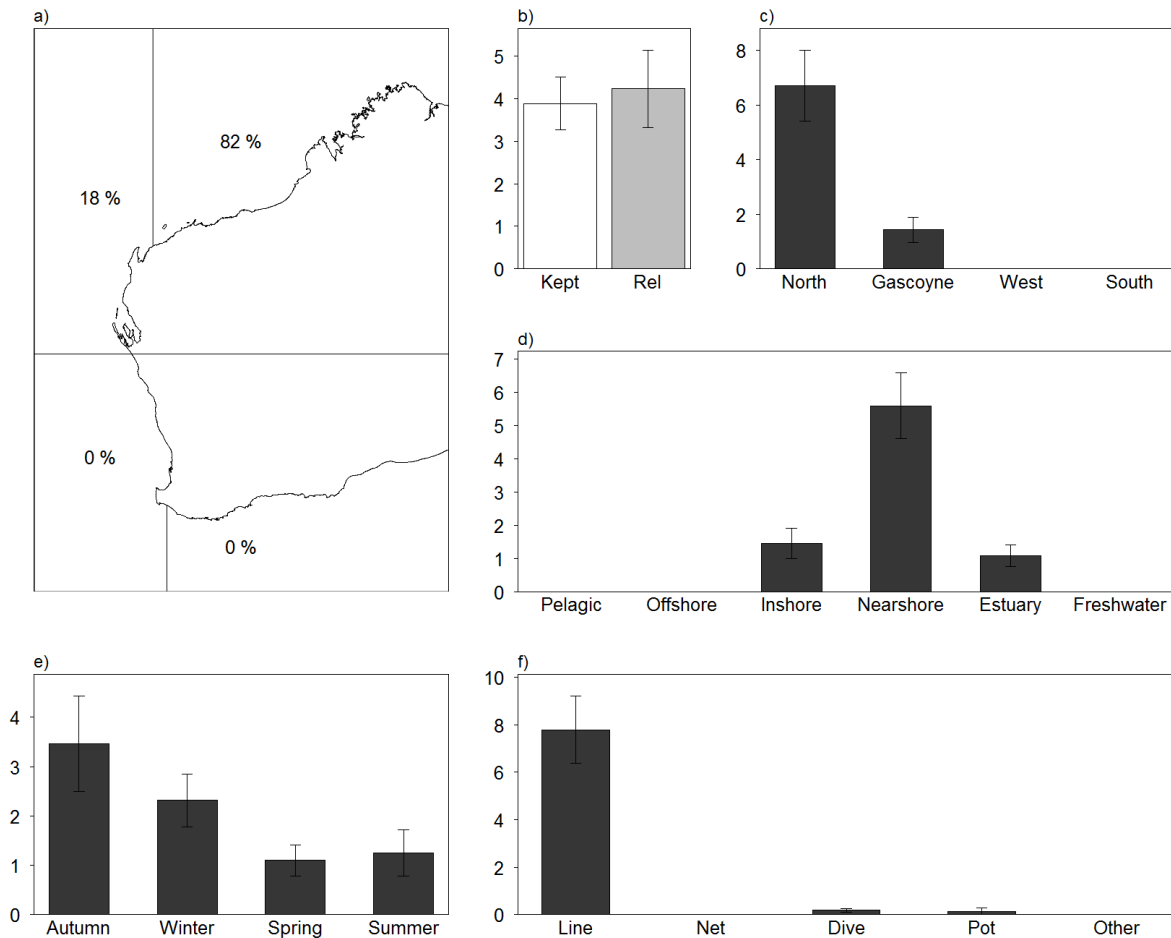
All recreational catches of Western Trumpeter Whiting by RFBL holders aged five years or older occurred in the West Coast bioregion (Figure 32 a and c). The majority of the boat-based recreational catch of Western Trumpeter Whiting was released (62%) (Figure 32b). Catches were taken predominantly from nearshore habitat (84%) (Figure 32d). Western Trumpeter Whiting were harvested throughout the year, with higher catches observed in summer (45%) compared with autumn (25%), winter (15%) and spring (15%) (Figure 32e). All catches were taken by line fishing (Figure 32f).



**Figure 32.** Boat-based recreational catch (numbers x 1000) of Western Trumpeter Whiting in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.3.11 Mangrove Jack (*Lutjanus argentimaculatus*)

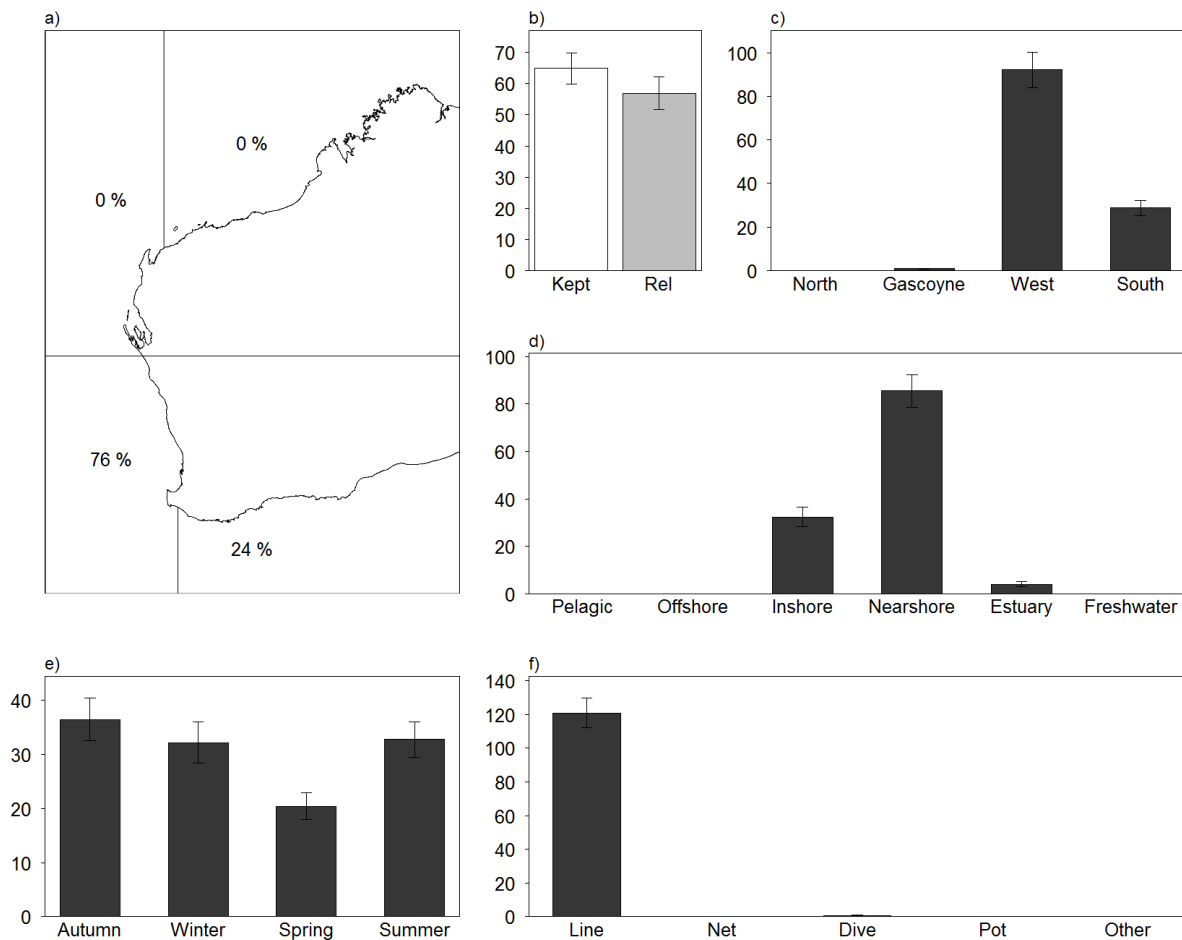
The majority of the recreational catches of Mangrove Jack by RFBL holders aged five years or older occurred in the North Coast (82%), with some catches in the Gascoyne Coast (18%) (Figure 33 a and c). Similar proportions of the boat-based recreational catch of Mangrove Jack were retained (48%) and released (52%) (Figure 33b). Catches were taken predominantly from nearshore habitat (69%), but also inshore (18%) and estuary (13%) (Figure 33d). Mangrove Jack were harvested throughout the year, with higher catches observed in autumn (43%) compared with winter (28%), spring (14%) and summer (15%) (Figure 33e). Catches were taken by line fishing (96%), with some fishing from diving (2%) and pots (2%) (Figure 33f).



**Figure 33.** Boat-based recreational catch (numbers x 1000) of Mangrove Jack in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.3.12 Silver Trevally (*Pseudocaranx dentex* and *wrighti*)

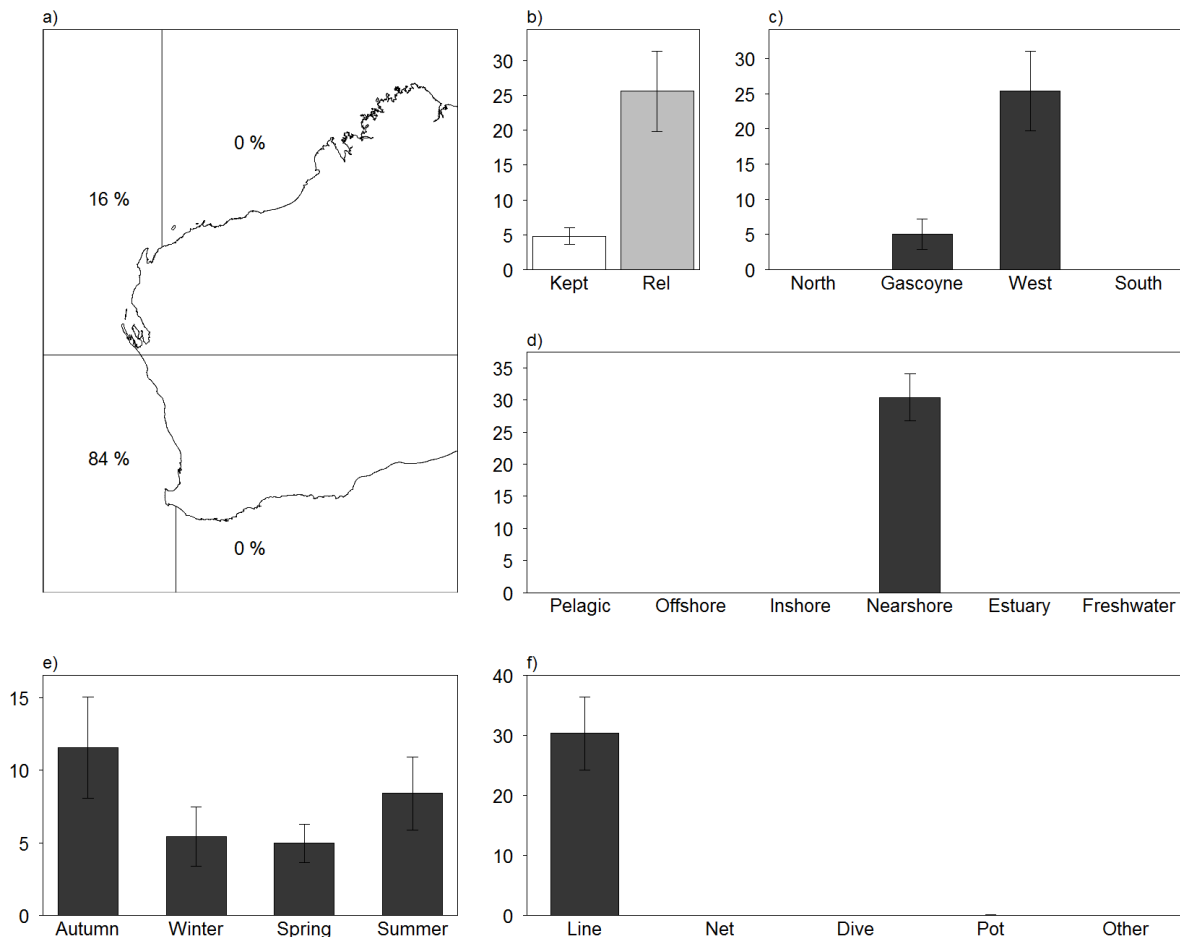
The majority of the recreational catches of Silver Trevally by RFBL holders aged five years or older occurred in the West Coast (76%), with some catches in the South Coast (24%) (Figure 34 a and c). Similar proportions of the boat-based recreational catch of Silver Trevally were retained (53%) and released (47%) (Figure 34b). Catches were taken predominantly from nearshore habitat (70%), but also inshore (27%) and estuary (3%) (Figure 34d). Silver Trevally were harvested throughout the year, with higher catches observed in autumn (30%) compared with winter (26%), spring (17%) and summer (27%) (Figure 34e). Catches were taken by line fishing (99%), with some fishing from diving (1%) (Figure 34f).



**Figure 34.** Boat-based recreational catch (numbers x 1000) of Silver Trevally in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.3.13 Western Butterfish (*Pentapodus vitta*)

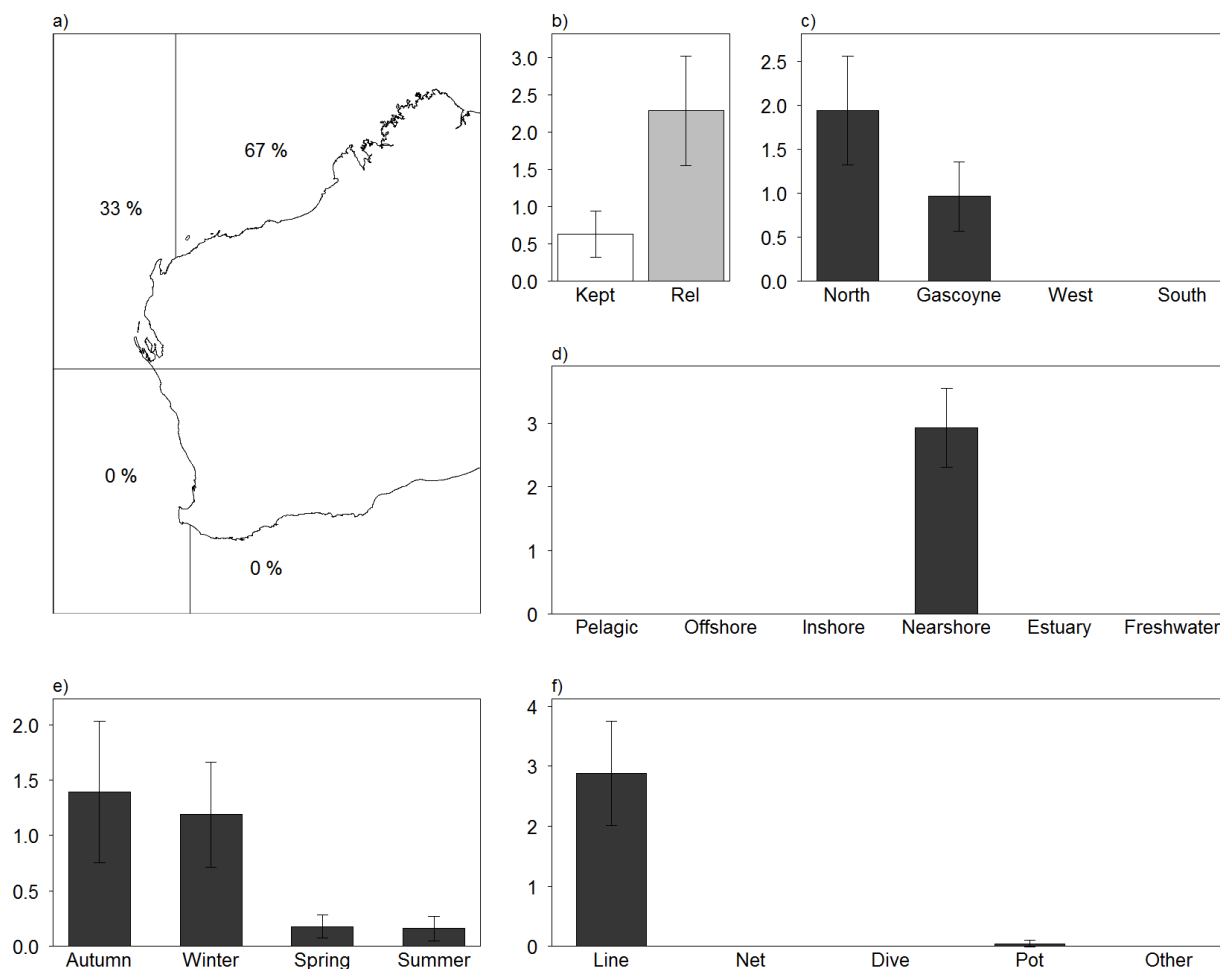
The majority of the recreational catches of Western Butterfish by RFBL holders aged five years or older occurred in the West Coast (84%), with some catches in the Gascoyne Coast (16%) (Figure 35 a and c). The majority of the boat-based recreational catch of Western Butterfish was released (84%) (Figure 35b). All catches were taken from nearshore habitat (Figure 35d). Western Butterfish were harvested throughout the year, with higher catches in autumn (38%) compared with winter (18%), spring (16%) and summer (28%) (Figure 35e). All catches were taken by line fishing (Figure 35f).



**Figure 35.** Boat-based recreational catch (numbers x 1000) of Western Butterfish in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.3.14 Western Yellowfin Bream (*Acanthopagrus latus*)

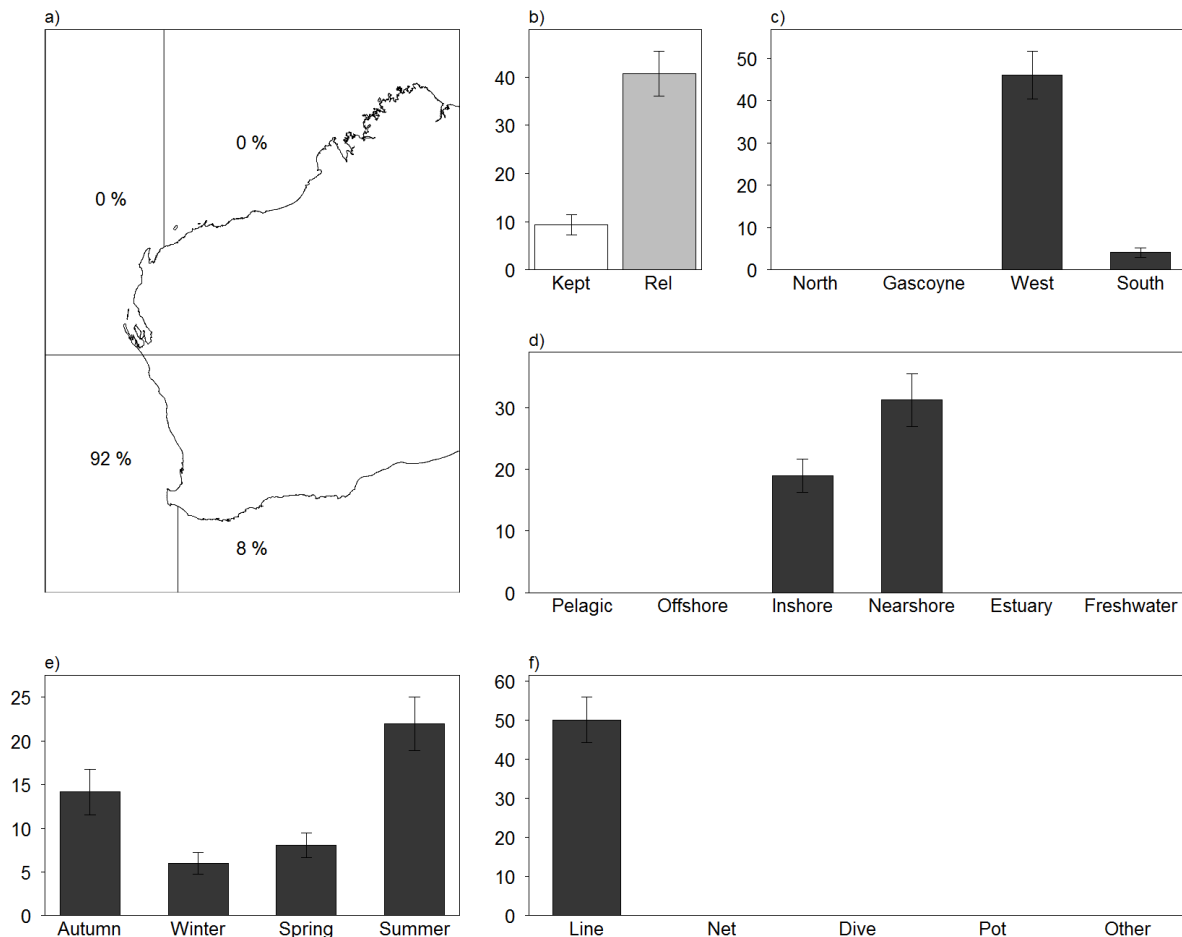
The majority of the recreational catches of Western Yellowfin Bream by RFBL holders aged five years or older occurred in the North Coast (67%), with some catches in the Gascoyne Coast (33%) (Figure 36 a and c). The majority of the boat-based recreational catch of Western Yellowfin Bream was released (78%) (Figure 36b). All catches were taken from nearshore habitat (Figure 36d). Western Yellowfin Bream were harvested throughout the year, with higher catches observed in autumn (48%) and winter (40%), compared with spring (6%) and summer (6%) (Figure 36e). Catches were taken by line fishing (98%), with some fishing from pots (2%) (Figure 36f).



**Figure 36.** Boat-based recreational catch (numbers x 1000) of Western Yellowfin Bream in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.3.15 Western King Wrasse (*Coris auricularis*)

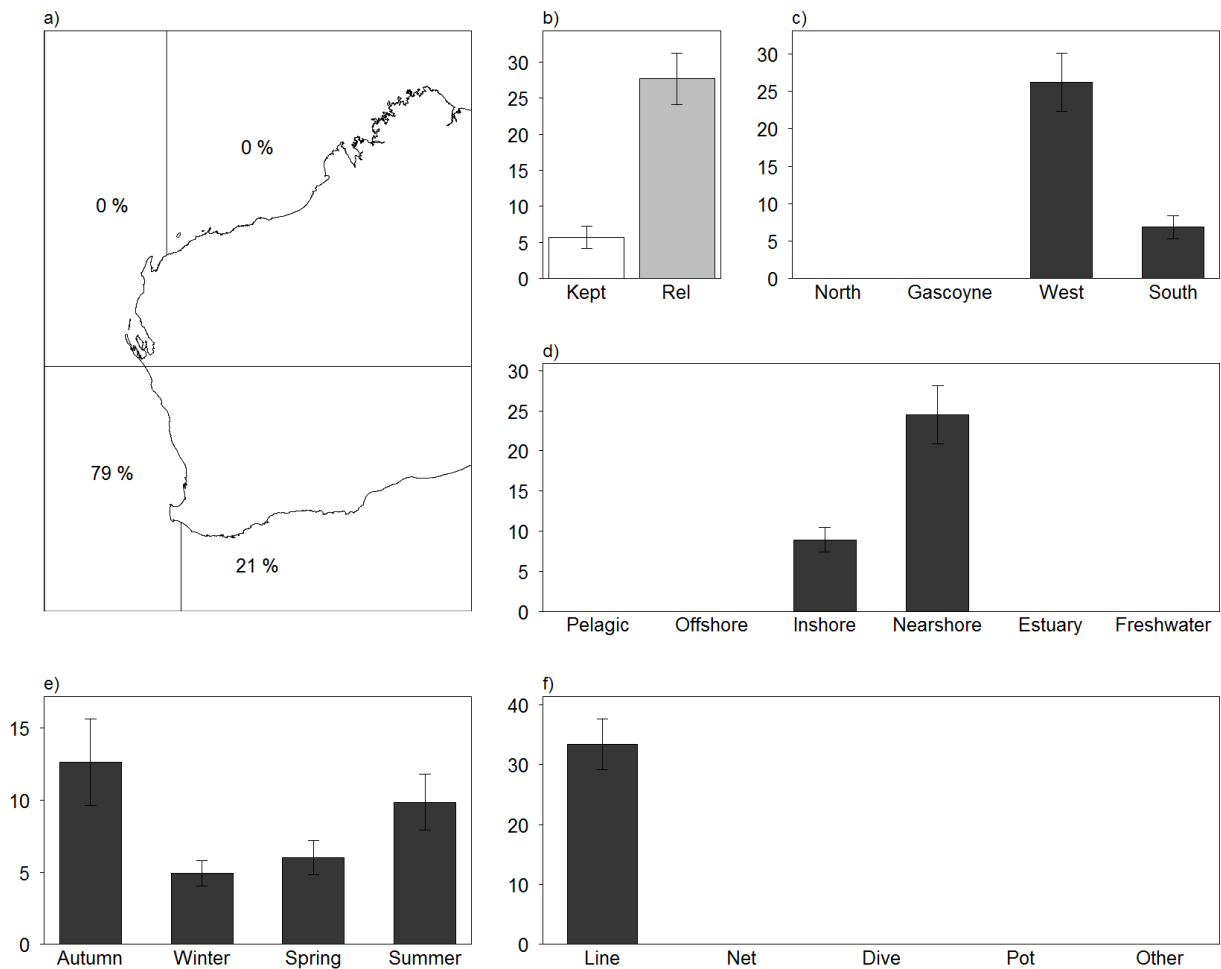
The majority of the recreational catches of Western King Wrasse by RFBL holders aged five years or older occurred in the West Coast (92%), with some catches in the South Coast (8%) (Figure 37 a and c). The majority of the boat-based recreational catch of Western King Wrasse was released (81%) (Figure 37b). Catches were taken predominantly from nearshore habitat (62%), but also inshore (38%) (Figure 37d). Western King Wrasse were harvested throughout the year, with higher catches observed in summer (44%) compared with autumn (28%), winter (12%) and spring (16%) (Figure 37e). All catches were taken by line fishing (Figure 37f).



**Figure 37.** Boat-based recreational catch (numbers x 1000) of Western King Wrasse in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.3.16 Brownspeotted Wrasse (*Notolabrus parilus*)

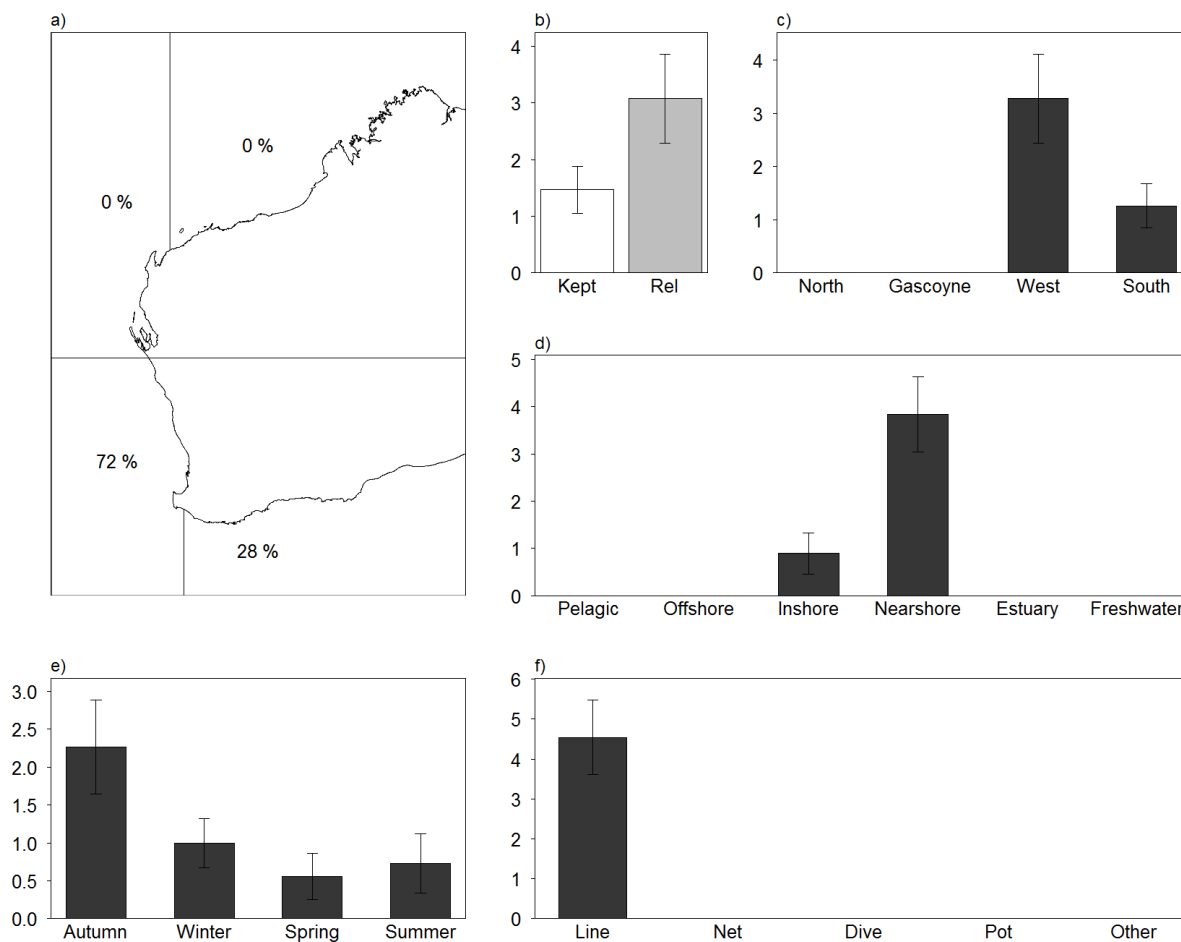
The majority of the recreational catches of Brownspeotted Wrasse by RFBL holders aged five years or older occurred in the West Coast (79%), with some catches in the South Coast (21%) (Figure 38 a and c). The majority of the boat-based recreational catch of Brownspeotted Wrasse was released (83%) (Figure 38b). Catches were taken predominantly from nearshore habitat (73%), but also inshore (27%) (Figure 38d). Brownspeotted Wrasse were harvested throughout the year, with higher catches observed in summer (30%) and autumn (38%) compared with winter (15%) and spring (17%) (Figure 38e). All catches were taken by line fishing (Figure 38f).



**Figure 38.** Boat-based recreational catch (numbers x 1000) of Brownspeotted Wrasse in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.3.17 Yellowtail Scad (*Trachurus novaezelandiae*)

Yellowtail Scad is an indicator species in the South Coast. The majority of the recreational catches of Yellowtail Scad by RFBL holders aged five years or older occurred in the West Coast (72%), with some catches in the South Coast (28%) (Figure 39 a and c). The majority of the boat-based recreational catch of Yellowtail Scad was released (68%) (Figure 39b). Catches were taken predominantly from nearshore habitat (81%), but also inshore (19%) (Figure 39d). Yellowtail Scad were harvested throughout the year, with higher catches observed in autumn (50%) compared with winter (22%), spring (12%) and summer (16%) (Figure 39e). All catches were taken by line fishing (Figure 39f).



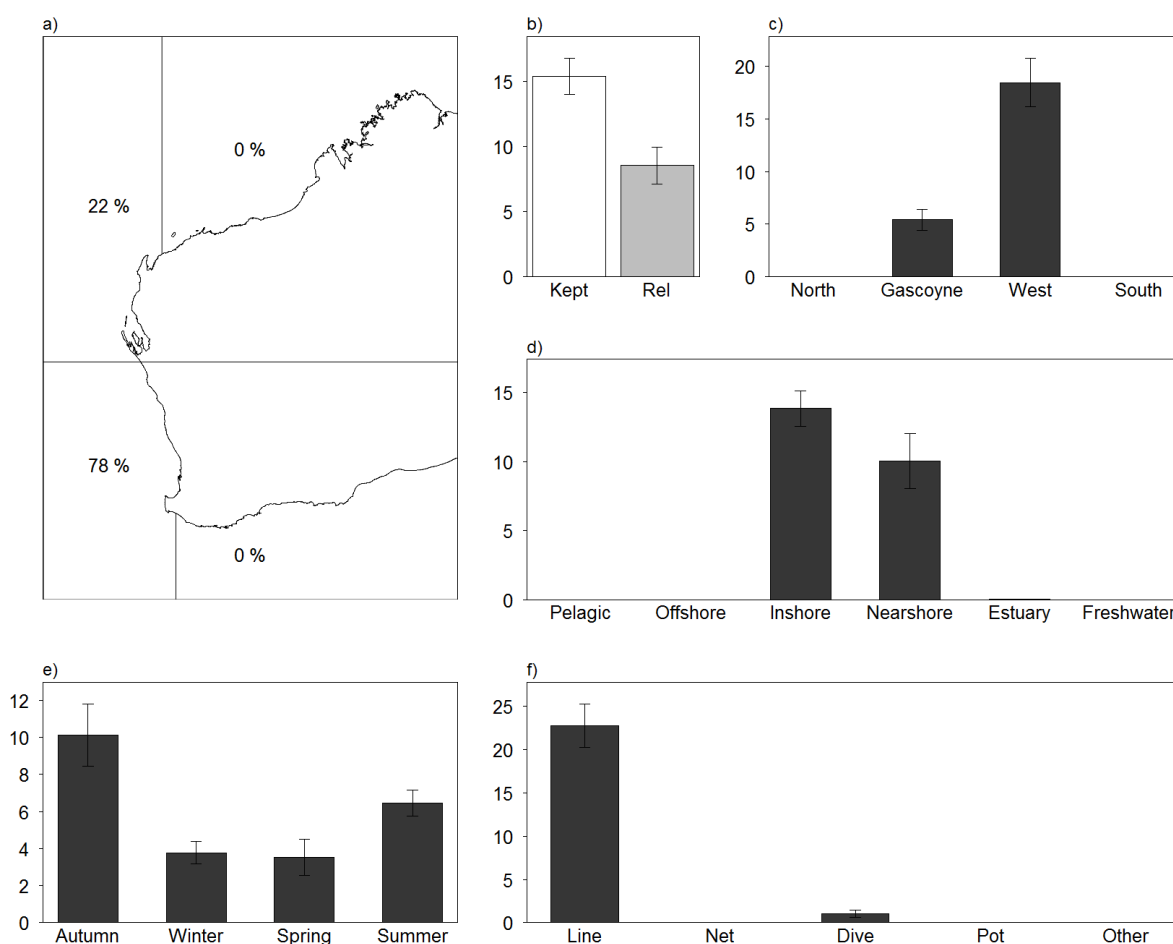
**Figure 39.** Boat-based recreational catch (numbers x 1000) of Yellowtail Scad in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.



## 6.4 Inshore

### 6.4.1 Baldchin Groper (*Choerodon rubescens*)

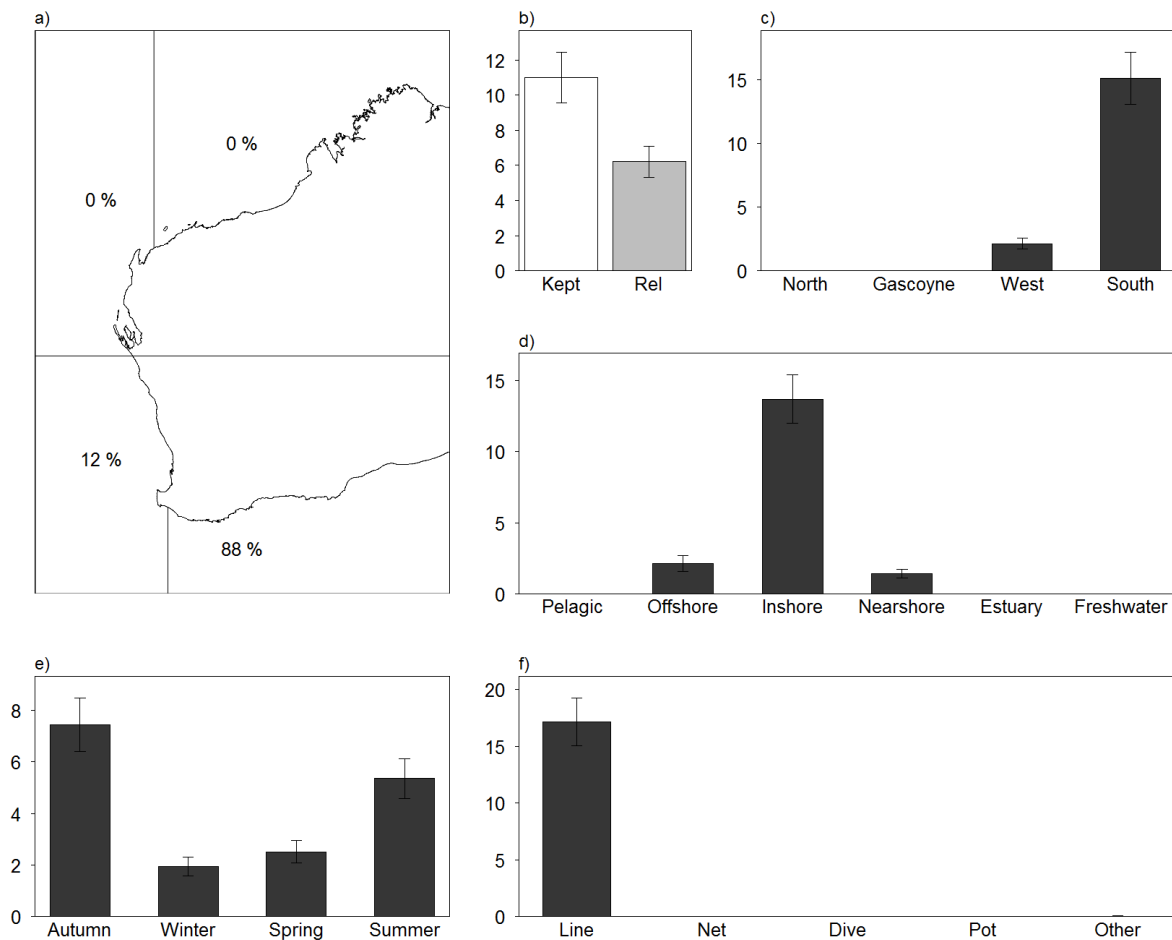
Baldchin Groper is an indicator species in the West Coast. The majority of the recreational catches of Baldchin Groper by RFBL holders aged five years or older occurred in the West Coast (78%), with some catches in the Gascoyne Coast (22%) (Figure 40 a and c). The majority of the boat-based recreational catch of Baldchin Groper was retained (64%) (Figure 40b). Catches were taken predominantly from inshore habitat (58%), but also nearshore (42%) (Figure 40d). Baldchin Groper were harvested throughout the year, with higher catches observed in autumn (42%) compared with winter (16%), spring (15%) and summer (27%) (Figure 40e). Catches were taken by line fishing (96%), with some fishing from diving (4%) (Figure 40f).



**Figure 40.** Boat-based recreational catch (numbers x 1000) of Baldchin Groper in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.4.2 Bight Redfish (*Centroberyx gerrardi*)

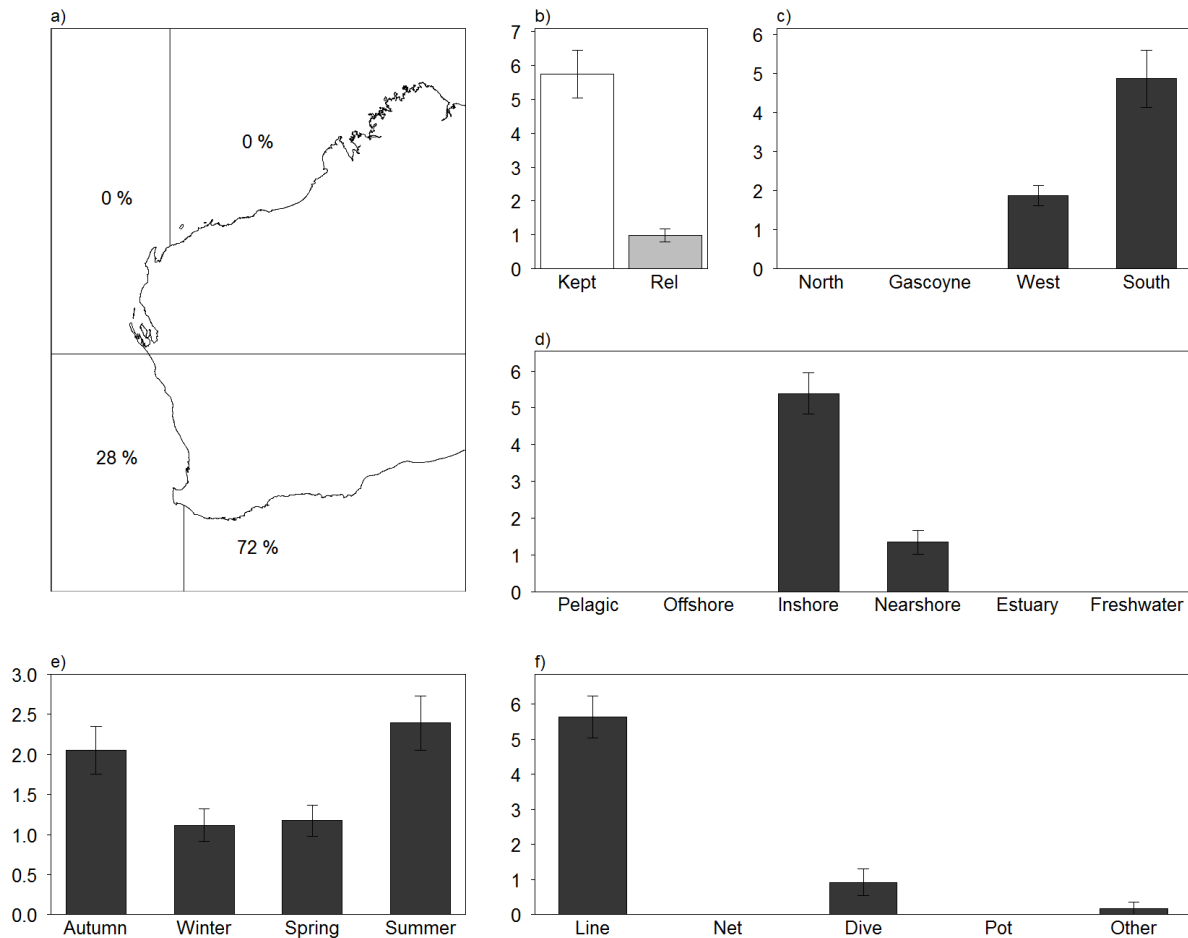
Bight Redfish is an indicator species in the South Coast. The majority of the recreational catches of Bight Redfish by RFBL holders aged five years or older occurred in the South Coast (88%), with some catches in the West Coast (12%) (Figure 41 a and c). The majority of the boat-based recreational catch of Bight Redfish was retained (64%) (Figure 41b). Catches were taken predominantly from inshore habitat (80%), but also nearshore (8%) and offshore (12%) (Figure 41d). Bight Redfish were harvested throughout the year, with higher catches observed in autumn (43%) compared with winter (11%), spring (15%) and summer (31%) (Figure 41e). All catches were taken by line fishing (Figure 41f).



**Figure 41.** Boat-based recreational catch (numbers x 1000) of Bight Redfish in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.4.3 Blue Morwong (*Nemadactylus valenciennesi*)

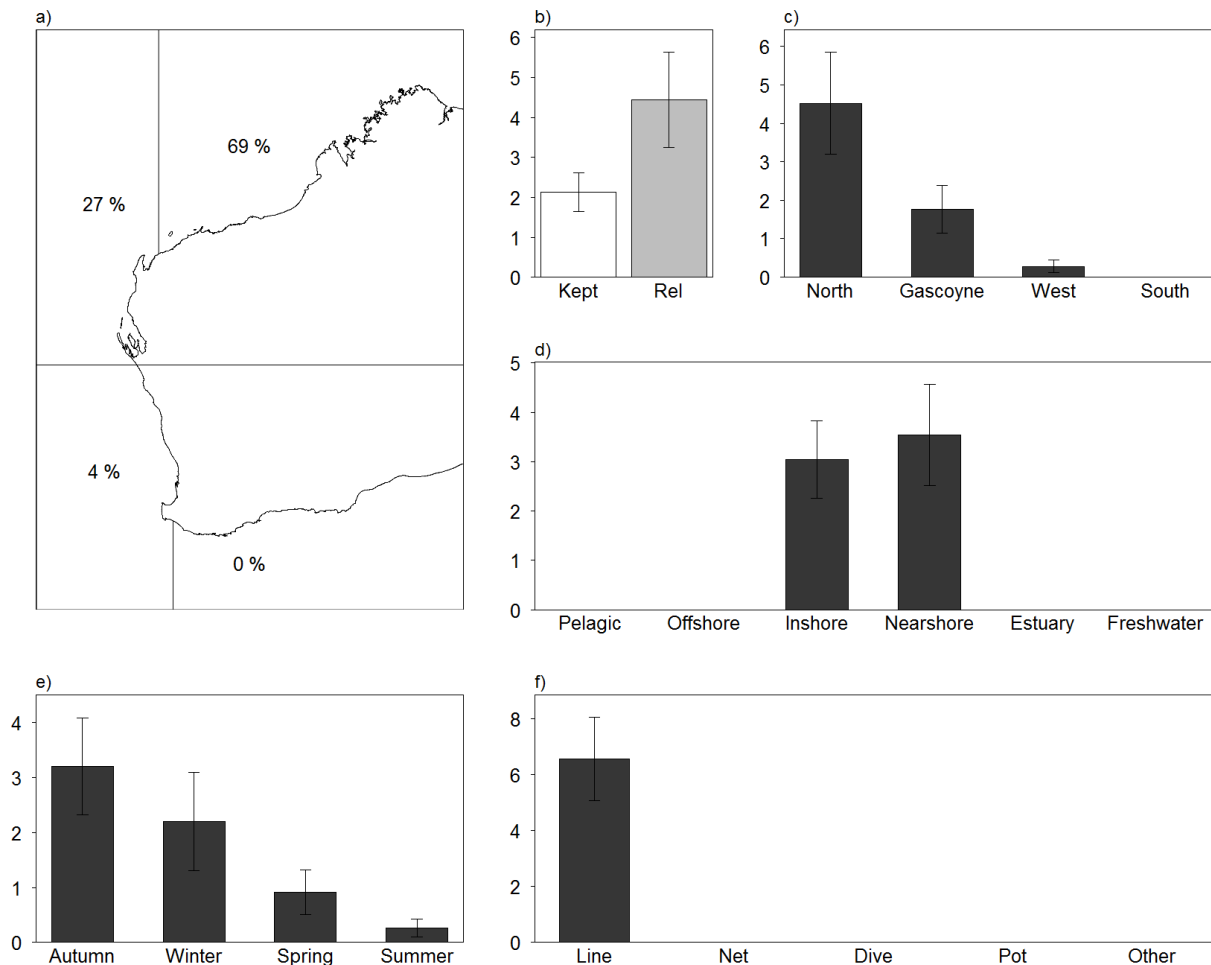
Blue Morwong is an indicator species in the South Coast. The majority of the recreational catches of Blue Morwong by RFBL holders aged five years or older occurred in the South Coast (72%), with some catches in the West Coast (28%) (Figure 42 a and c). The majority of the boat-based recreational catch of Blue Morwong was retained (85%) (Figure 42b). Catches were taken predominantly from inshore habitat (80%), but also nearshore (20%) (Figure 42d). Blue Morwong were harvested throughout the year, with higher catches observed in summer (35%) and autumn (30%) compared with winter (17%) and spring (18%) (Figure 42e). Catches were taken by line fishing (84%), with some fishing from diving (14%) and other (2%) (Figure 42f).



**Figure 42.** Boat-based recreational catch (numbers x 1000) of Blue Morwong in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

#### 6.4.4 Bluespotted Emperor (*Lethrinus punctulatus*)

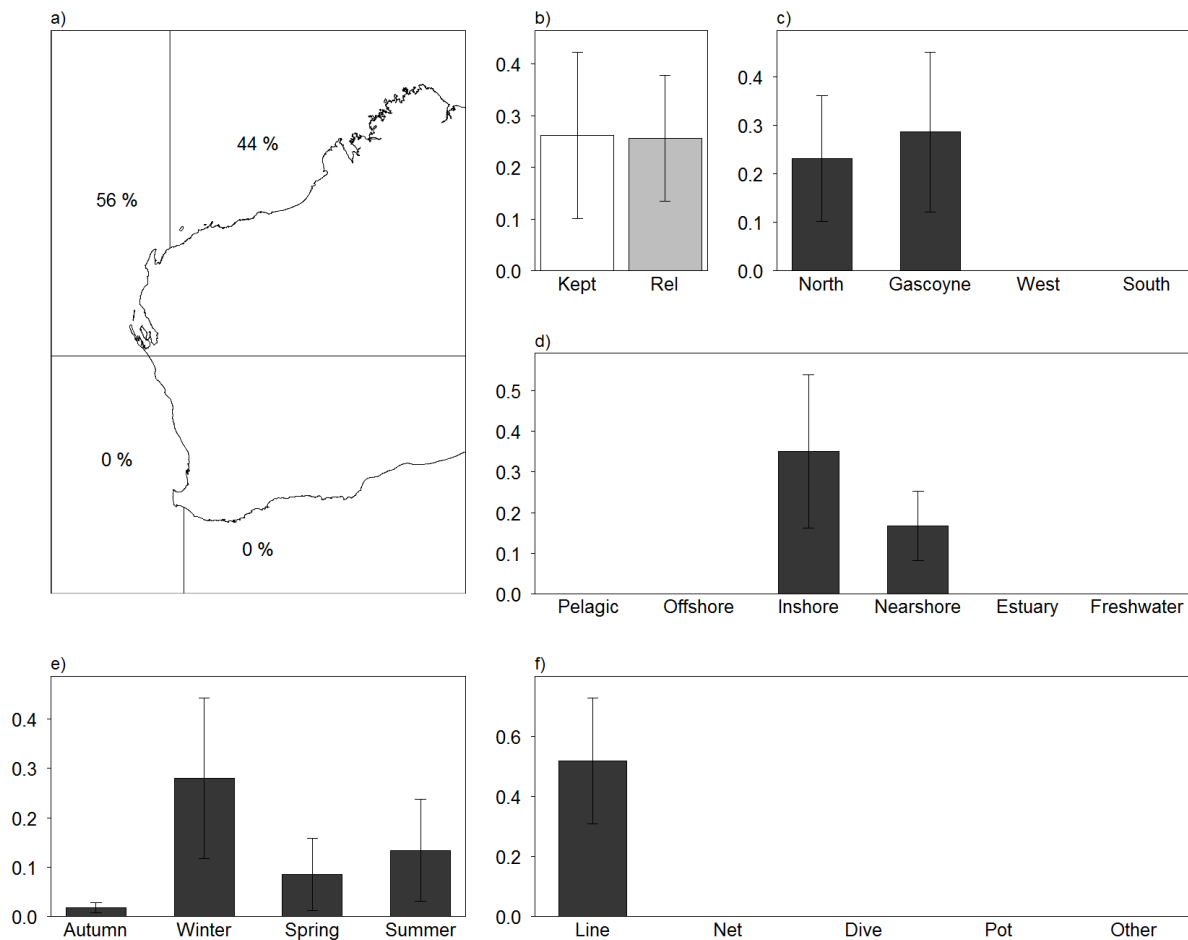
Bluespotted Emperor is an indicator species in the North Coast. The majority of the recreational catches of Bluespotted Emperor by RFBL holders aged five years or older occurred in the North Coast (69%), with some catches in the Gascoyne Coast (27%) and West Coast (4%) (Figure 43 a and c). The majority of the boat-based recreational catch of Bluespotted Emperor was released (68%) (Figure 43b). Catches were taken from nearshore (54%) and inshore (46%) habitats (Figure 43d). Bluespotted Emperor were harvested throughout the year, with higher catches observed in autumn (49%) compared with winter (33%), spring (14%) and summer (4%) (Figure 43e). All catches were taken by line fishing (Figure 43f).



**Figure 43.** Boat-based recreational catch (numbers x 1000) of Bluespotted Emperor in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.4.5 Brownstripe Snapper (*Lutjanus vitta*)

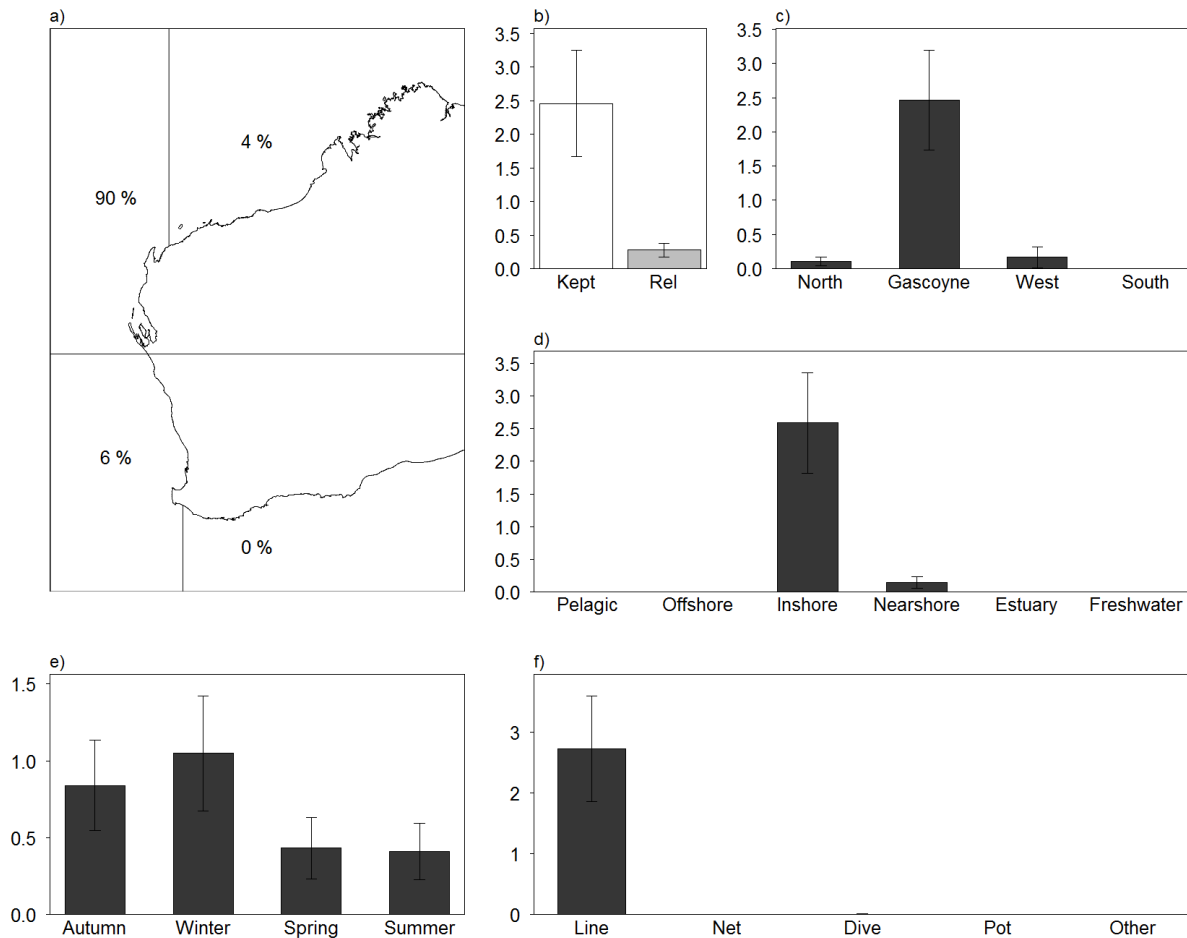
Brownstripe Snapper is an indicator species in the North Coast. Recreational catches of Brownstripe Snapper by RFBL holders aged five years or older occurred in the North Coast (44%) and Gascoyne Coast (56%) (Figure 44 a and c). Similar proportions of the boat-based recreational catch of Brownstripe Snapper were retained (51%) and released (49%) (Figure 44b). Catches were taken predominantly from inshore habitat (68%), but also nearshore (32%) (Figure 44d). Brownstripe Snapper were harvested throughout the year, with higher catches observed in winter (54%) compared with spring (16%), summer (26%) and autumn (4%) (Figure 44e). All catches were taken by line fishing (Figure 44f).



**Figure 44.** Boat-based recreational catch (numbers x 1000) of Brownstripe Snapper in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.4.6 Goldband Snapper (*Pristipomoides multidens*)

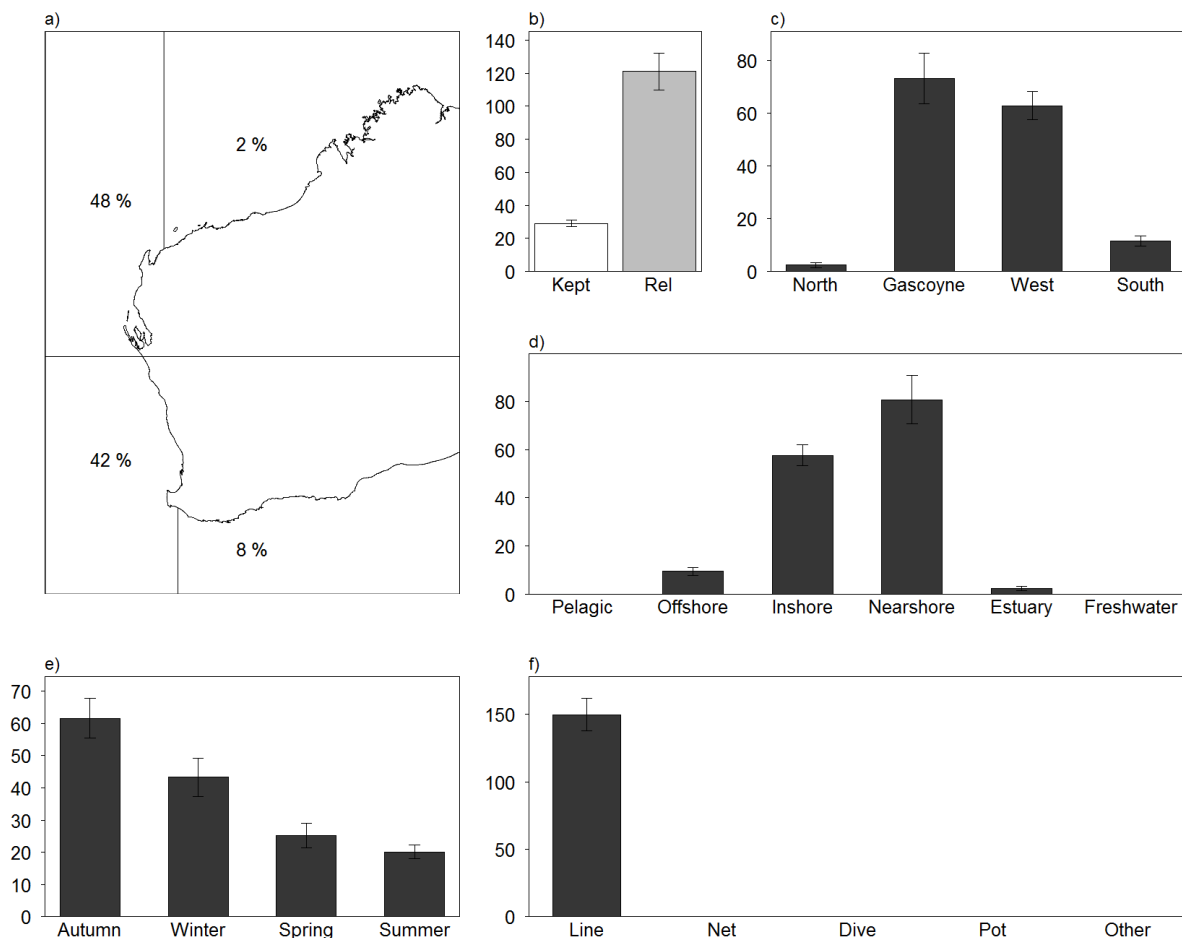
Goldband Snapper is an indicator species in the North Coast and Gascoyne Coast. The majority of the recreational catches of Goldband Snapper by RFBL holders aged five years or older occurred in the Gascoyne Coast (90%), with some catches in the North Coast (4%) and West Coast (6%) (Figure 45 a and c). The majority of the boat-based recreational catch of Goldband Snapper was retained (90%) (Figure 45b). Catches were taken predominantly from inshore habitat (95%), but also nearshore (5%) (Figure 45d). Goldband Snapper were harvested throughout the year, with higher catches observed in autumn (31%) and winter (38%), compared with spring (16%) and summer (15%) (Figure 45e). All catches were taken by line fishing (Figure 45f).



**Figure 45.** Boat-based recreational catch (numbers x 1000) of Goldband Snapper in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.4.7 Snapper (*Pagrus auratus*)

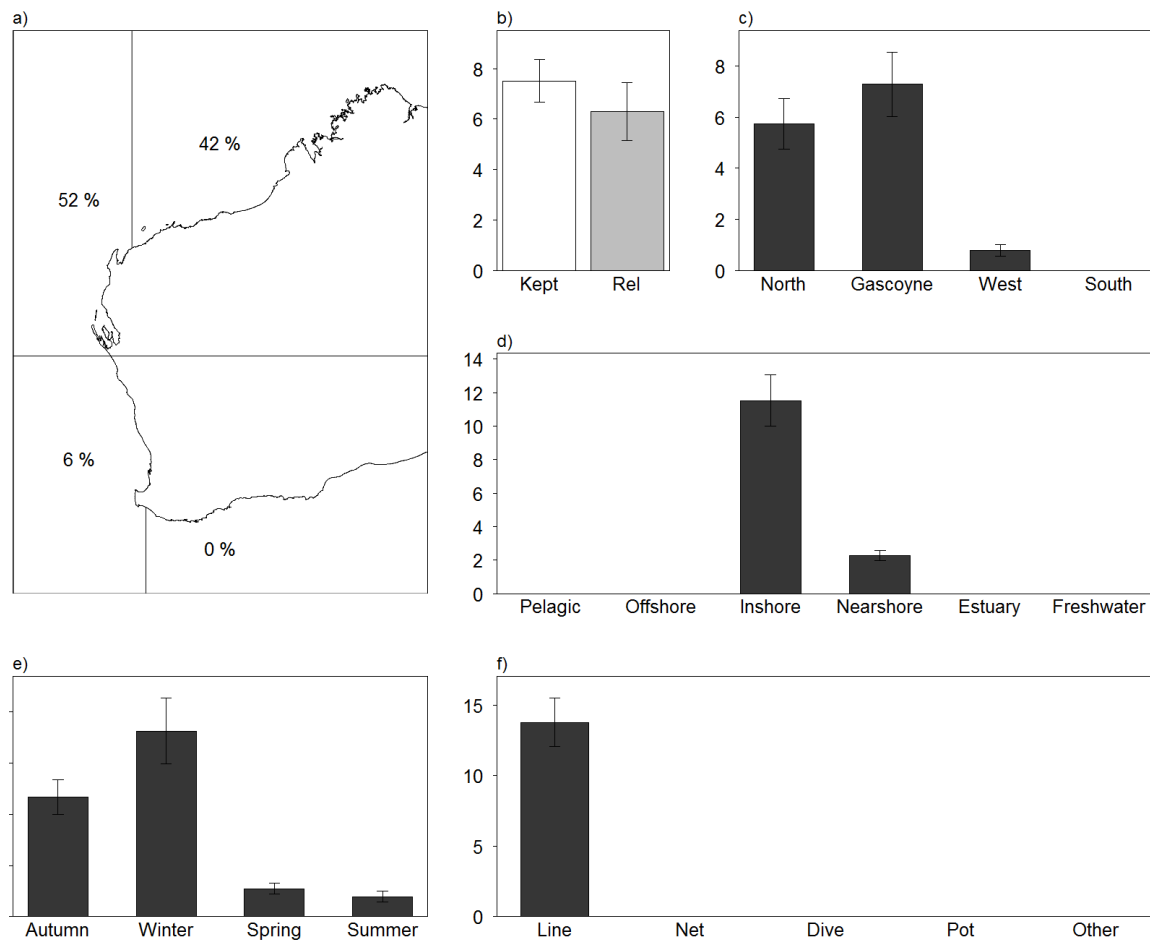
Snapper is an inshore indicator species in the Gascoyne Coast, West Coast and South Coast. It is also a nearshore indicator species in the Gascoyne Coast. The majority of the recreational catches of Snapper by RFBL holders aged five years or older occurred in the Gascoyne Coast (48%) and West Coast (42%) bioregions, with some catches in the North Coast (2%) and South Coast (8%) (Figure 46 a and c). The majority of the boat-based recreational catch of Snapper was released (81%) (Figure 46b). Catches were taken predominantly from nearshore habitat (54%), but also inshore (38%), offshore (6%) and estuary (2%) (Figure 46d). Snapper were harvested throughout the year, with higher catches observed in autumn (41%) compared with winter (29%), spring (17%) and summer (13%) (Figure 46e). All catches were taken by line fishing (Figure 46f).



**Figure 46.** Boat-based recreational catch (numbers x 1000) of Snapper in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.4.8 Rankin Cod (*Epinephelus multinotatus*)

Rankin Cod is an indicator species in the North Coast. The majority of the recreational catches of Rankin Cod by RFBL holders aged five years or older occurred in the North Coast (42%) and Gascoyne Coast (52%), with some catches in the West Coast (6%) (Figure 47 a and c). Similar proportions of the boat-based recreational catch of Rankin Cod were retained (54%) and released (46%) (Figure 47b). Catches were taken predominantly from inshore habitat (84%), but also nearshore (17%) (Figure 47d). Rankin Cod were harvested throughout the year, with higher catches observed in autumn (34%) and winter (52%), compared with spring (8%) and summer (6%) (Figure 47e). All catches were taken by line fishing (Figure 47f).

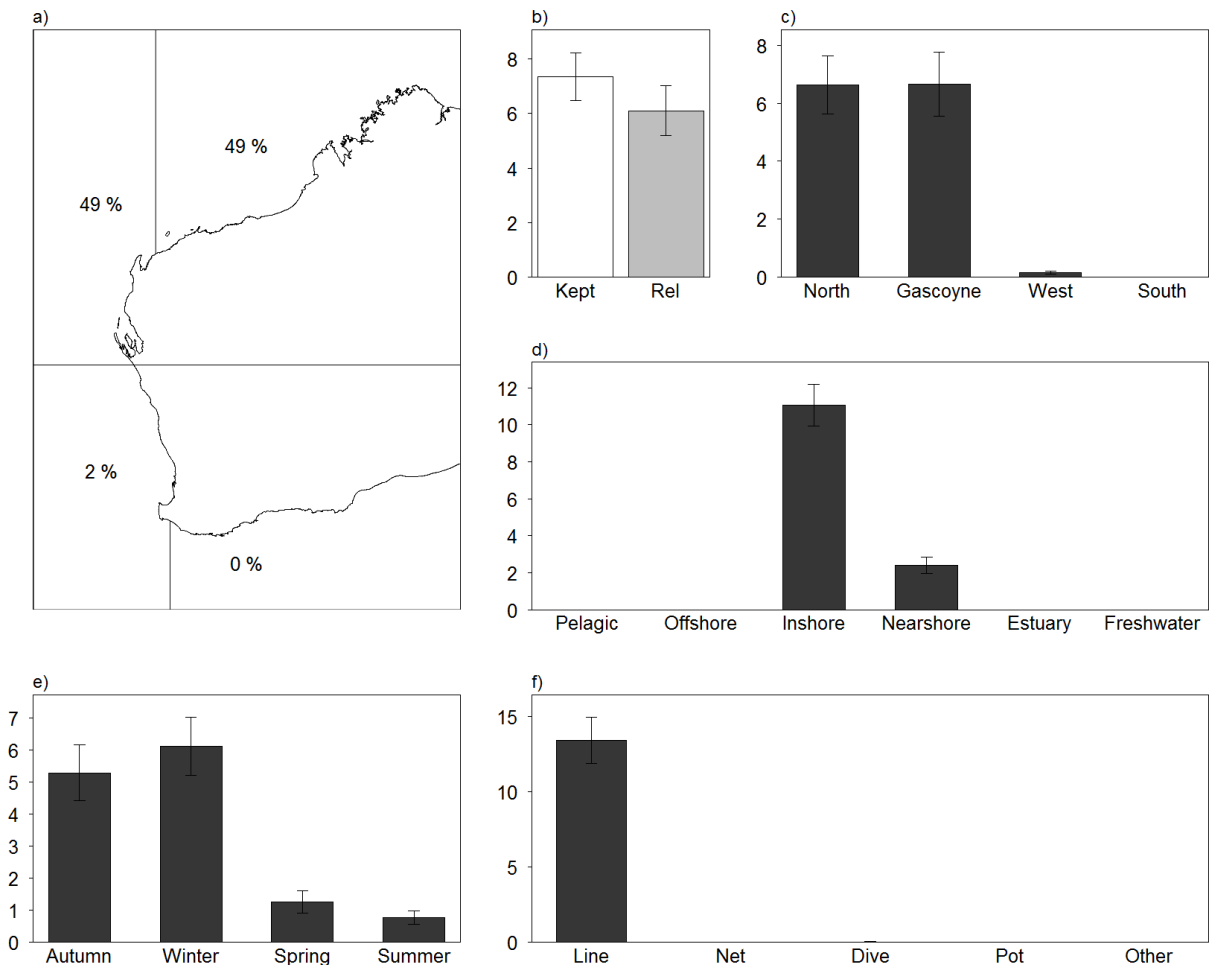


**Figure 47.** Boat-based recreational catch (numbers x 1000) of Rankin Cod in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.



### 6.4.9 Red Emperor (*Lutjanus sebae*)

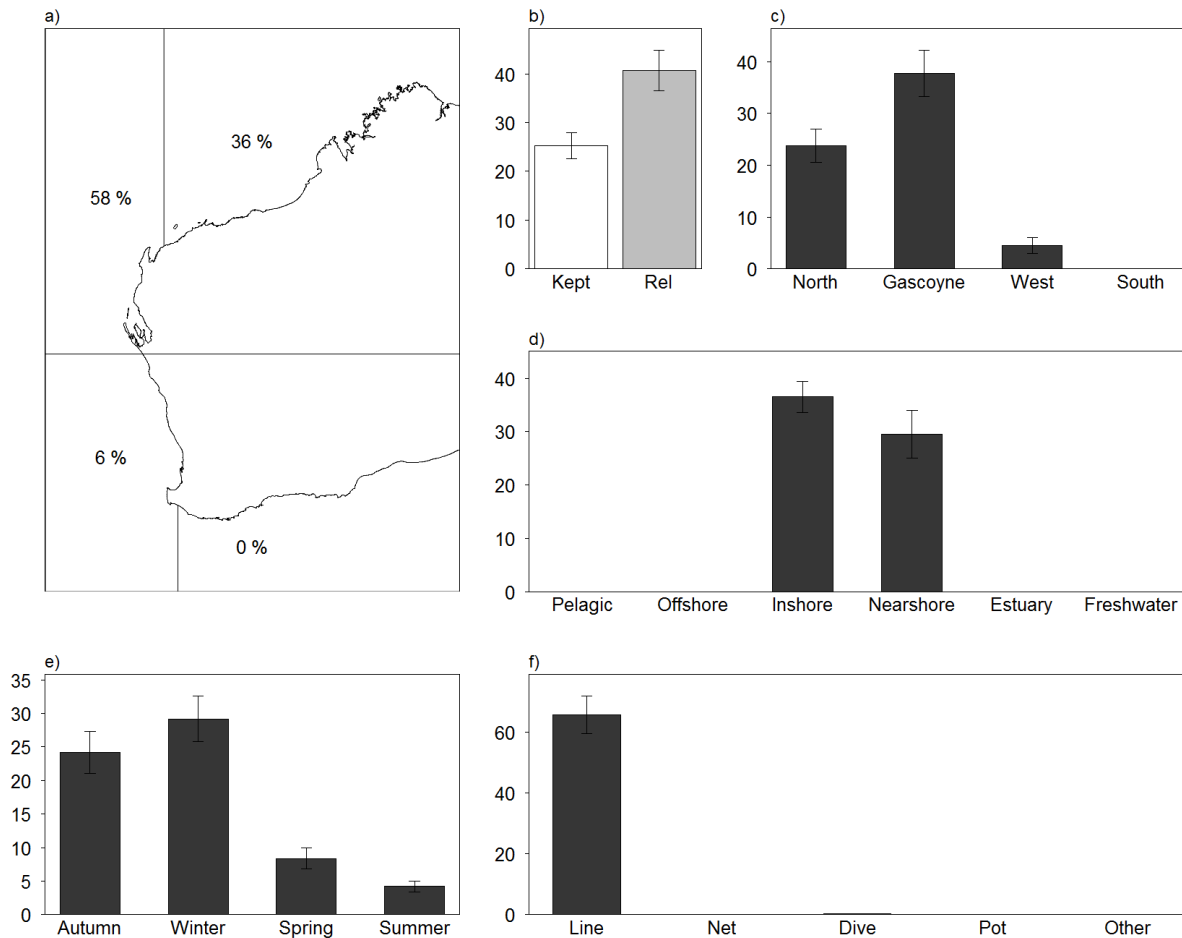
Red Emperor is an indicator species in the North Coast. The majority of the recreational catches of Red Emperor by RFBL holders aged five years or older occurred in the North Coast (49%) and Gascoyne Coast (49%), with some catches in the West Coast (2%) (Figure 48 a and c). Similar proportions of the boat-based recreational catch of Rankin Cod were retained (55%) and released (45%) (Figure 48b). Catches were taken predominantly from inshore habitat (82%), but also nearshore (18%) (Figure 48d). Red Emperor were harvested throughout the year, with higher catches observed in autumn (40%) and winter (45%), compared with spring (9%) and summer (6%) (Figure 48e). All catches were taken by line fishing (Figure 48f).



**Figure 48.** Boat-based recreational catch (numbers x 1000) of Red Emperor in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.4.10 Spangled Emperor (*Lethrinus nebulosus*)

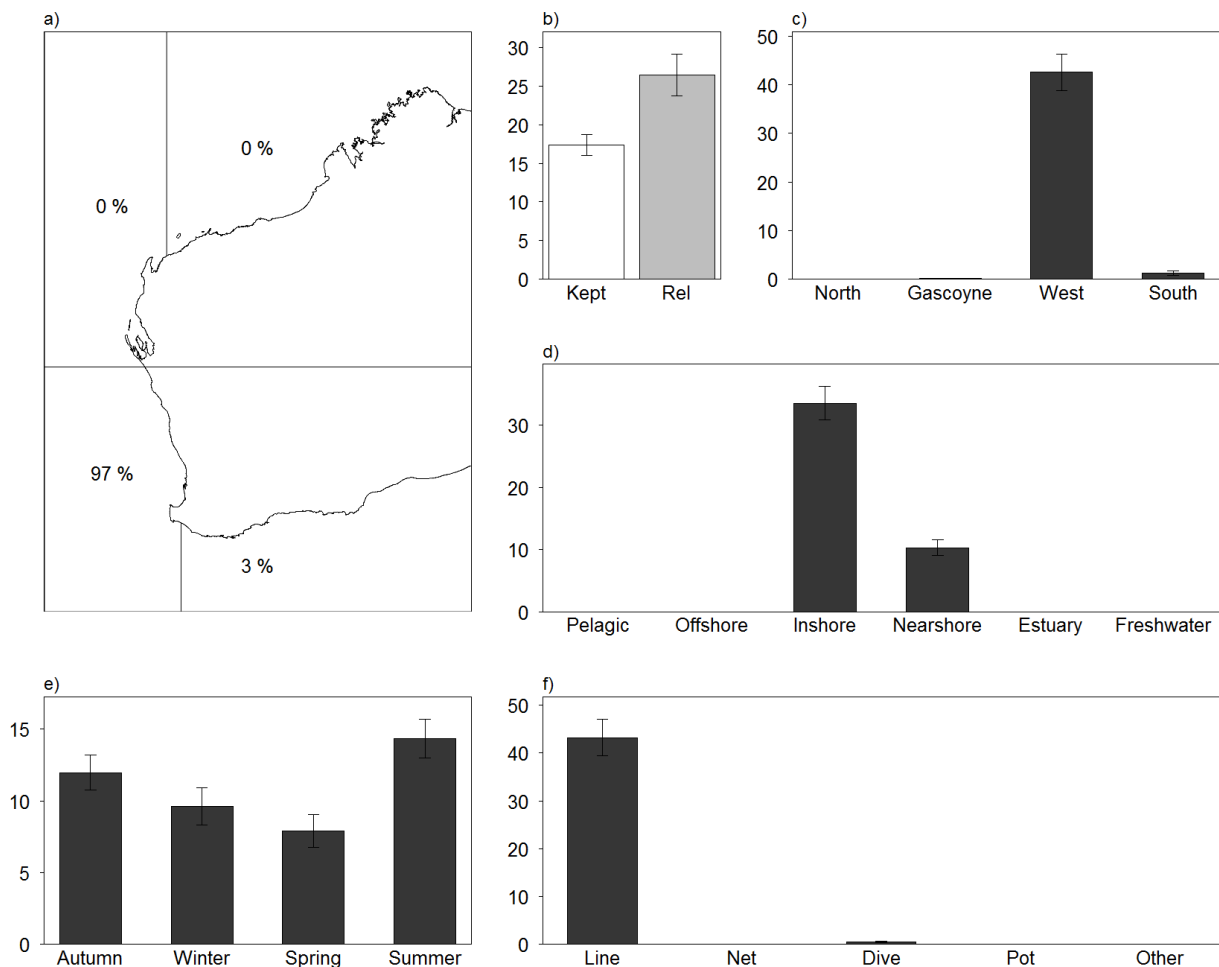
Spangled Emperor is an indicator species in the Gascoyne Coast. The majority of the recreational catches of Spangled Emperor by RFBL holders aged five years or older occurred in the North Coast (36%) and Gascoyne Coast (58%), with some catches in the West Coast (6%) (Figure 49 a and c). The majority of the boat-based recreational catch of Spangled Emperor was released (62%) (Figure 49b). Catches were taken predominantly from inshore habitat (55%), but also nearshore (45%) (Figure 49d). Spangled Emperor were harvested throughout the year, with higher catches observed in autumn (37%) and winter (44%), compared with spring (13%) and summer (6%) (Figure 49e). All catches were taken by line fishing (Figure 49f).



**Figure 49.** Boat-based recreational catch (numbers x 1000) of Spangled Emperor in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.4.11 West Australian Dhufish (*Glaucosoma hebraicum*)

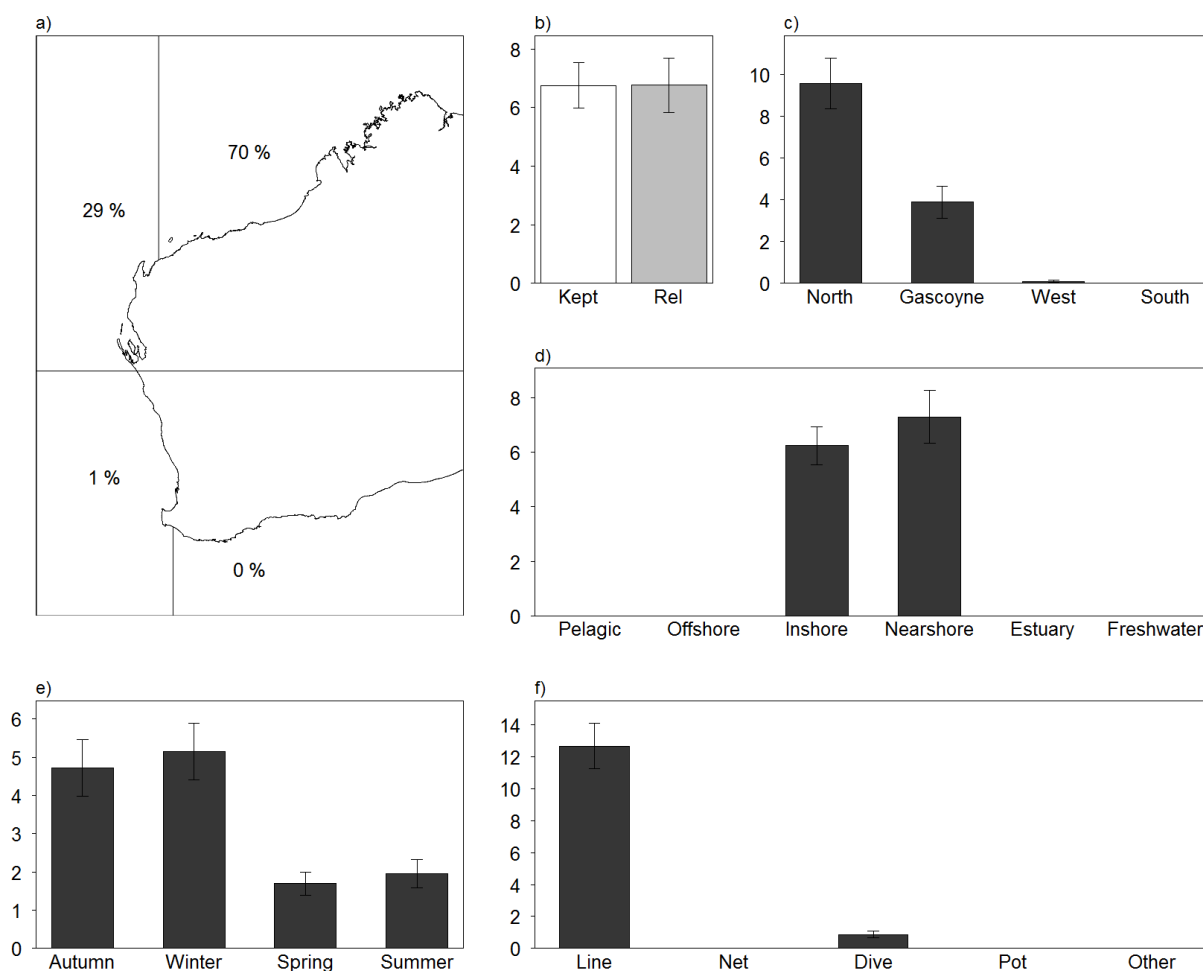
West Australian Dhufish is an indicator species in the West Coast. The majority of the recreational catches of West Australian Dhufish by RFBL holders aged five years or older occurred in the West Coast (97%), with some catches in the South Coast (3%) (Figure 50 a and c). The majority of the boat-based recreational catch of West Australian Dhufish was released (60%) (Figure 50b). Catches were taken predominantly from inshore habitat (76%), but also nearshore (24%) (Figure 50d). West Australian Dhufish were harvested throughout the year, with higher catches observed in summer (33%) compared with autumn (27%), winter (22%) and spring (18%) (Figure 50e). Catches were taken by line fishing (99%), with some fishing from diving (1%) (Figure 50f).



**Figure 50.** Boat-based recreational catch (numbers x 1000) of West Australian Dhufish in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.4.12 Barcheek Coral Trout (*Plectropomus maculatus*)

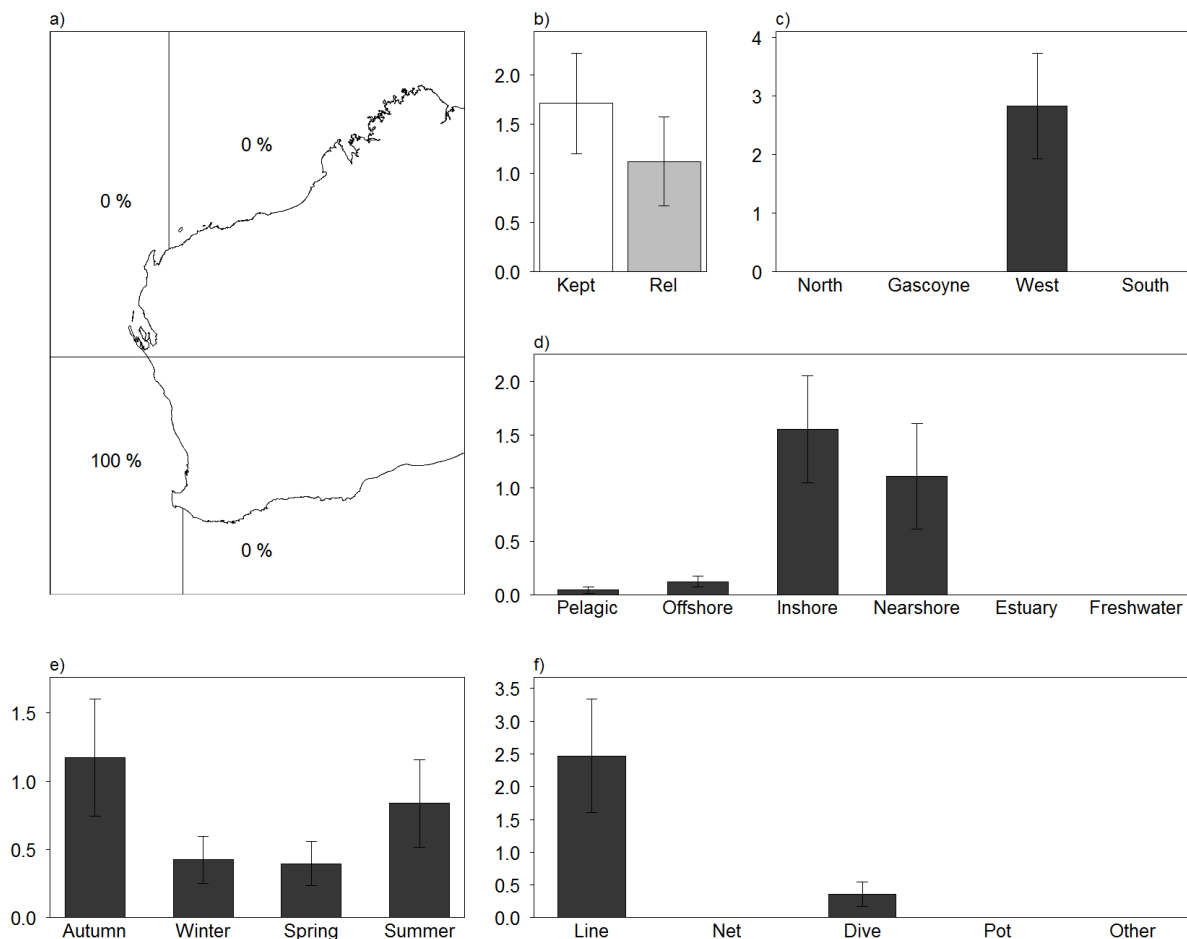
The majority of the recreational catches of Barcheek Coral Trout by RFBL holders aged five years or older occurred in the North Coast (70%), with some catches in the Gascoyne Coast (29%) and West Coast (1%) (Figure 51 a and c). Similar proportions of the boat-based recreational catch of Barcheek Coral Trout was retained (50%) and released (50%) (Figure 51b). Catches were taken predominantly from inshore (46%) and nearshore (54%) habitats (Figure 51d). Barcheek Coral Trout were harvested throughout the year, with higher catches observed in autumn (35%) and winter (38%), compared with spring (13%) and summer (14%) (Figure 51e). Catches were taken by line fishing (93%), with some fishing from diving (7%) (Figure 51f).



**Figure 51.** Boat-based recreational catch (numbers x 1000) of Barcheek Coral Trout in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.4.13 Common Coral Trout (*Plectropomus leopardus*)

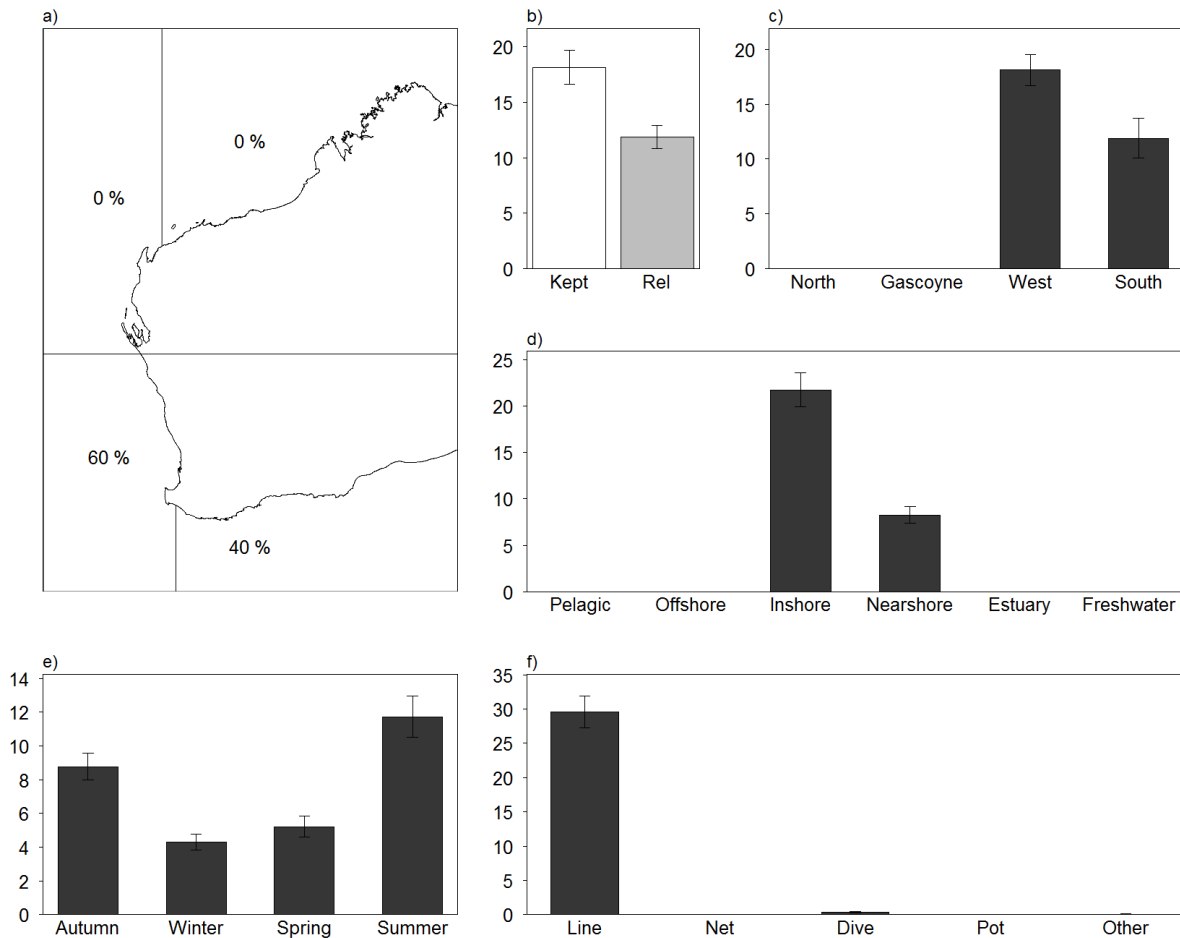
All the recreational catches of Common Coral Trout by RFBL holders aged five years or older occurred in the West Coast (Figure 52 a and c). The majority of the boat-based recreational catch of Common Coral Trout was retained (60%) (Figure 52b). Catches were taken predominantly from inshore habitat (55%), but also nearshore (39%), offshore (4%) and pelagic (2%) (Figure 52d). Common Coral Trout were harvested throughout the year, with higher catches observed in autumn (41%) compared with winter (15%), spring (14%) and summer (30%) (Figure 52e). Catches were taken by line fishing (87%), with some fishing from diving (13%) (Figure 52f).



**Figure 52.** Boat-based recreational catch (numbers x 1000) of Common Coral Trout in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

#### 6.4.14 Breaksea Cod (*Epinephelides armatus*)

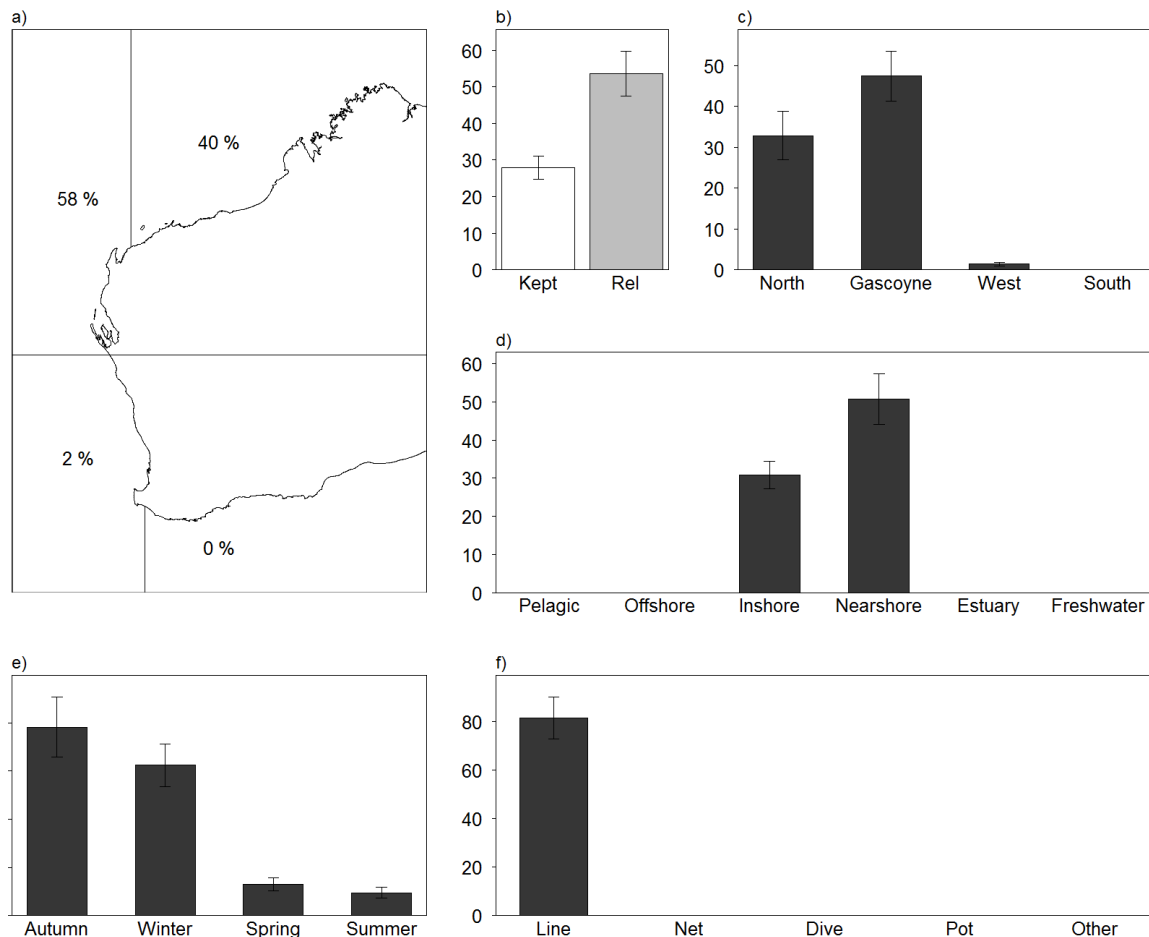
The majority of the recreational catches of Breaksea Cod by RFBL holders aged five years or older occurred in the West Coast (60%), with some catches in the South Coast (40%) (Figure 53 a and c). The majority of the boat-based recreational catch of Breaksea Cod was retained (61%) (Figure 53b). Catches were taken predominantly from inshore habitat (72%), but also nearshore (28%) (Figure 53d). Breaksea Cod were harvested throughout the year, with higher catches observed in summer (40%) and autumn (29%), compared with winter (14%) and spring (17%) (Figure 53e). Catches were taken predominantly by line fishing (99%), with some fishing from diving (1%) (Figure 53f).



**Figure 53.** Boat-based recreational catch (numbers x 1000) of Breaksea Cod in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.4.15 Grass Emperor (*Lethrinus laticaudis*)

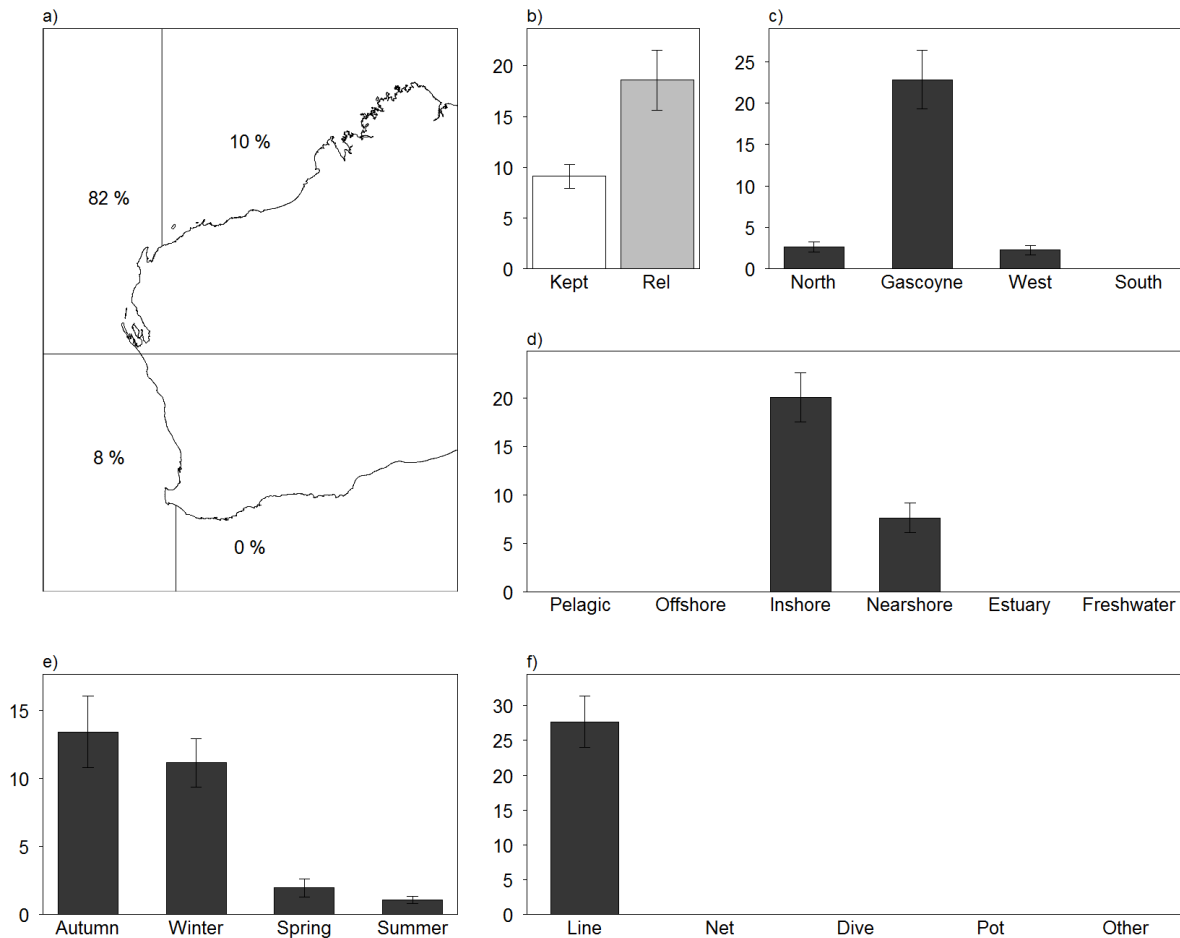
The majority of the recreational catches of Grass Emperor by RFBL holders aged five years or older occurred in the North Coast (40%) and Gascoyne Coast (58%), with some catches in the West Coast (2%) (Figure 54 a and c). The majority of the boat-based recreational catch of Grass Emperor was released (66%) (Figure 54b). Catches were taken predominantly from nearshore habitat (62%), but also inshore (38%) (Figure 54d). Grass Emperor were harvested throughout the year, with higher catches observed in autumn (48%) compared with winter (38%), spring (8%) and summer (6%) (Figure 54e). All catches were taken by line fishing (Figure 54f).



**Figure 54.** Boat-based recreational catch (numbers x 1000) of Grass Emperor in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.4.16 Redthroat Emperor (*Lethrinus miniatus*)

The majority of the recreational catches of Redthroat Emperor by RFBL holders aged five years or older occurred in the Gascoyne Coast (82%), with some catches in the North Coast (10%) and West Coast (8%) (Figure 55 a and c). The majority of the boat-based recreational catch of Redthroat Emperor was released (67%) (Figure 55b). Catches were taken predominantly from inshore habitat (72%), but also nearshore (28%) (Figure 55d). Redthroat Emperor were harvested throughout the year, with higher catches observed in autumn (49%) and winter (40%), compared with spring (7%) and summer (4%) (Figure 55e). All catches were taken by line fishing (Figure 55f).

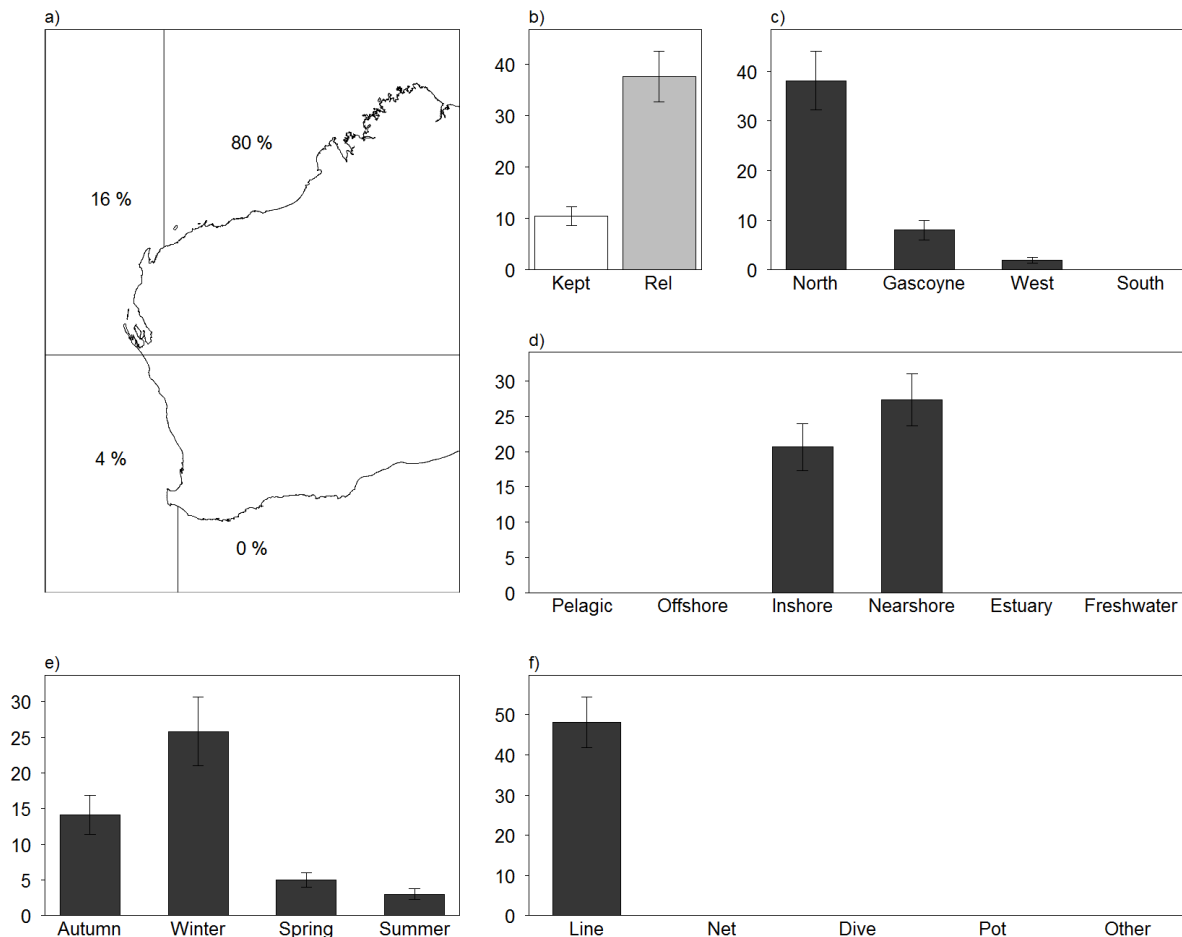


**Figure 55.** Boat-based recreational catch (numbers x 1000) of Redthroat Emperor in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.



### 6.4.17 Strikey Snapper (*Lutjanus carponotatus*)

The majority of the recreational catches of Strikey Snapper by RFBL holders aged five years or older occurred in the North Coast (80%), with some catches in the Gascoyne Coast (16%) and West Coast (4%) (Figure 56 a and c). The majority of the boat-based recreational catch of Strikey Snapper was released (78%) (Figure 56b). Catches were taken predominantly from nearshore habitat (57%), but also inshore (43%) (Figure 56d). Strikey Snapper were harvested throughout the year, with higher catches observed in winter (55%) compared with spring (10%), summer (6%) and autumn (29%) (Figure 56e). All catches were taken by line fishing (Figure 56f).

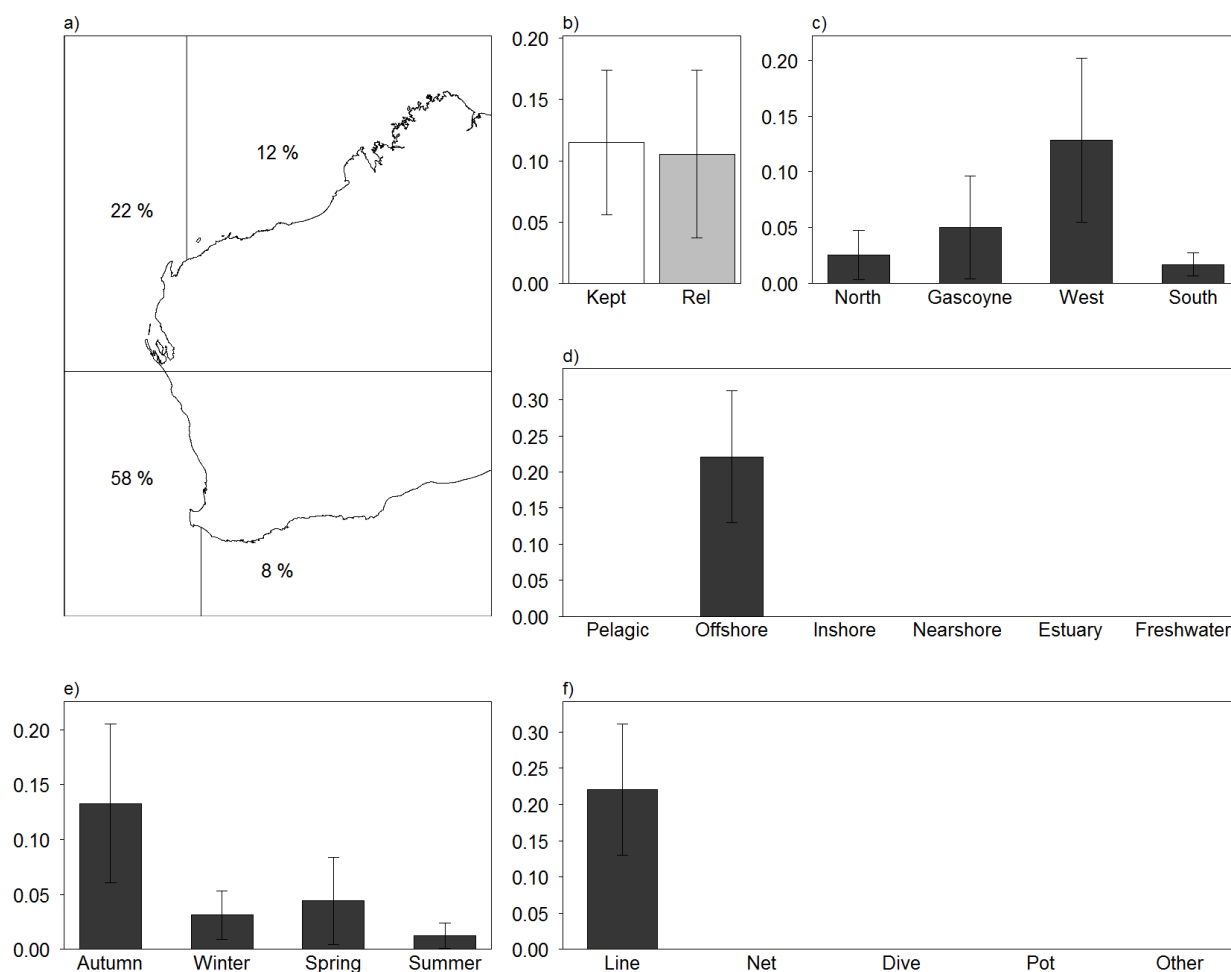


**Figure 56.** Boat-based recreational catch (numbers x 1000) of Strikey Snapper in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

## 6.5 Offshore

### 6.5.1 Eightbar Grouper (*Epinephelus octofasciatus*)

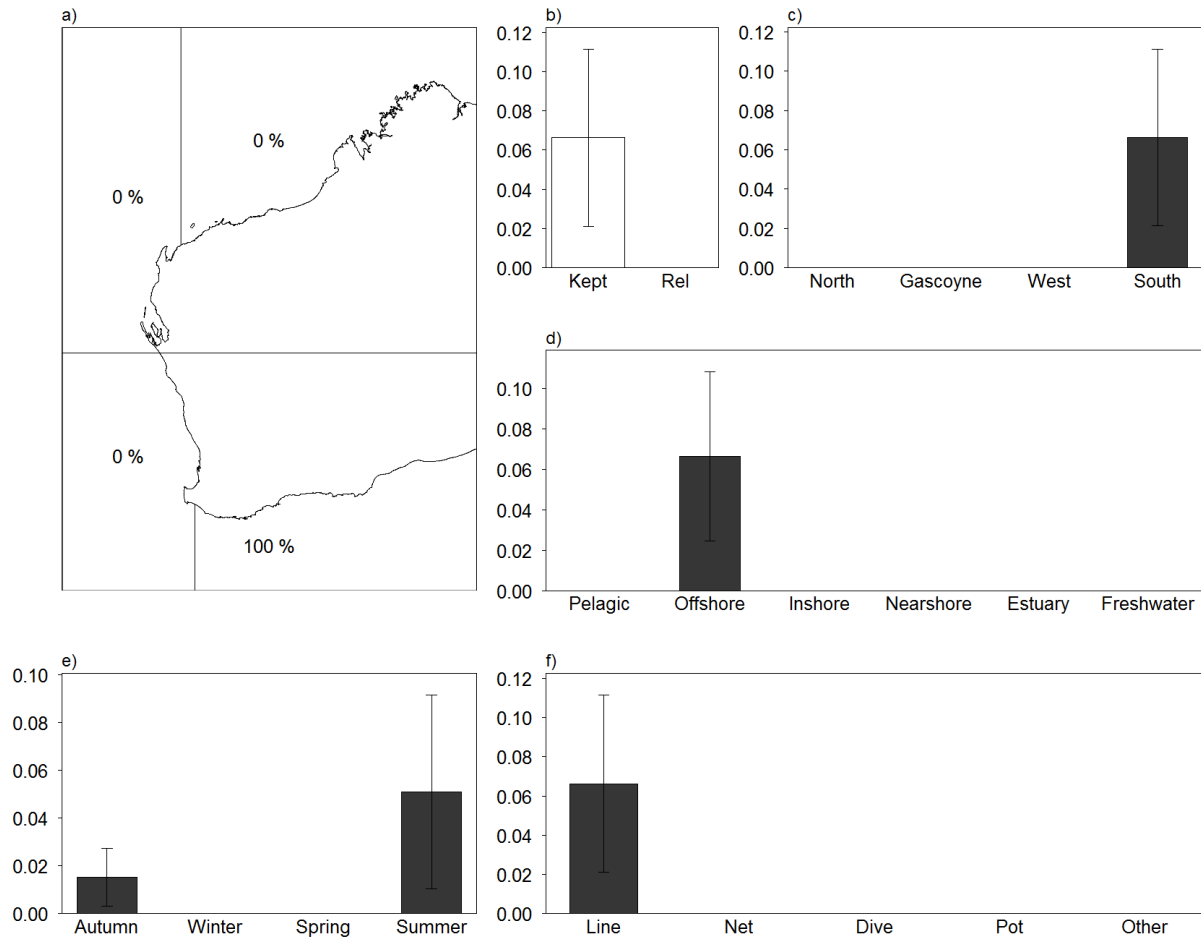
Eightbar Grouper is an indicator species in the North Coast, Gascoyne Coast, West Coast and South Coast. The majority of the recreational catches of Eightbar Grouper by RFBL holders aged five years or older occurred in the West Coast (58%), with some catches in the North Coast (12%), Gascoyne Coast (22%) and South Coast (8%) (Figure 57 a and c). Similar proportions of the boat-based recreational catch of Eightbar Grouper was retained (52%) and released (48%) (Figure 57b). All catches were taken from offshore habitat (Figure 57d). Eightbar Grouper were harvested throughout the year, with higher catches observed in autumn (60%) compared with winter (14%), spring (20%) and summer (6%) (Figure 57e). All catches were taken by line fishing (Figure 57f).



**Figure 57.** Boat-based recreational catch (numbers x 1000) of Eightbar Grouper in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.5.2 Hapuku (*Polyprion oxygeneios*)

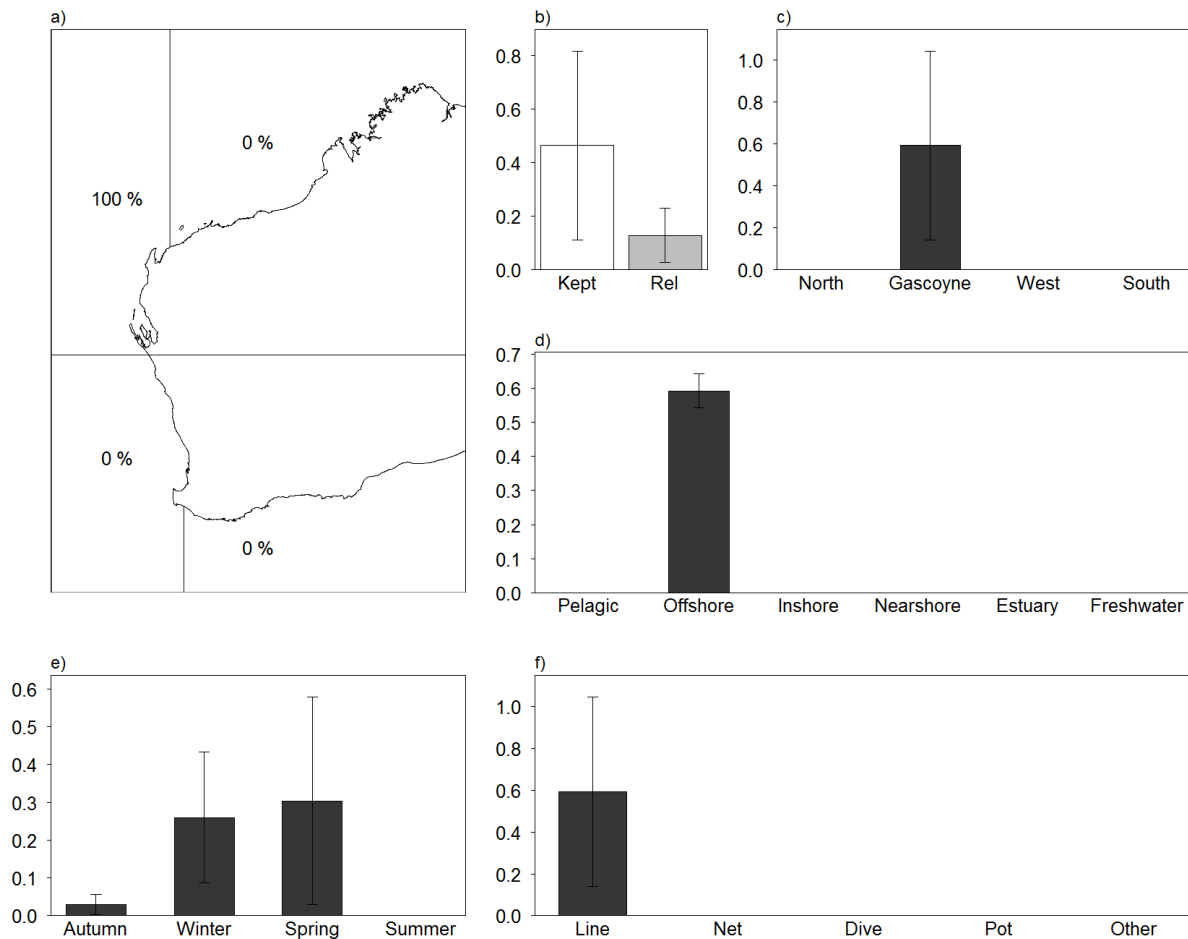
Hapuku is an indicator species in the West Coast and South Coast. All recreational catches of Hapuku by RFBL holders aged five years or older occurred in the South Coast (Figure 58 a and c). All catches were retained (Figure 58b). Catches were taken predominantly from offshore habitat (Figure 58d). Hapuku were harvested during summer and autumn, with higher catches observed in summer (50%) compared with autumn (23%) (Figure 58e). All catches were taken by line fishing (Figure 58f).



**Figure 58.** Boat-based recreational catch (numbers x 1000) of Hapuku in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.5.3 Ruby Snapper (*Etelis carbunculus*)

Ruby Snapper is an indicator species in the North Coast and Gascoyne Coast. All recreational catches of Ruby Snapper by RFBL holders aged five years or older occurred in the Gascoyne Coast (Figure 59 a and c). The majority of the boat-based recreational catch of Ruby Snapper was retained (78%) (Figure 59b). All catches were taken from offshore habitat (Figure 59d). Ruby Snapper were harvested from autumn to spring, with higher catches observed in winter (44%) and spring (51%) (Figure 59f).

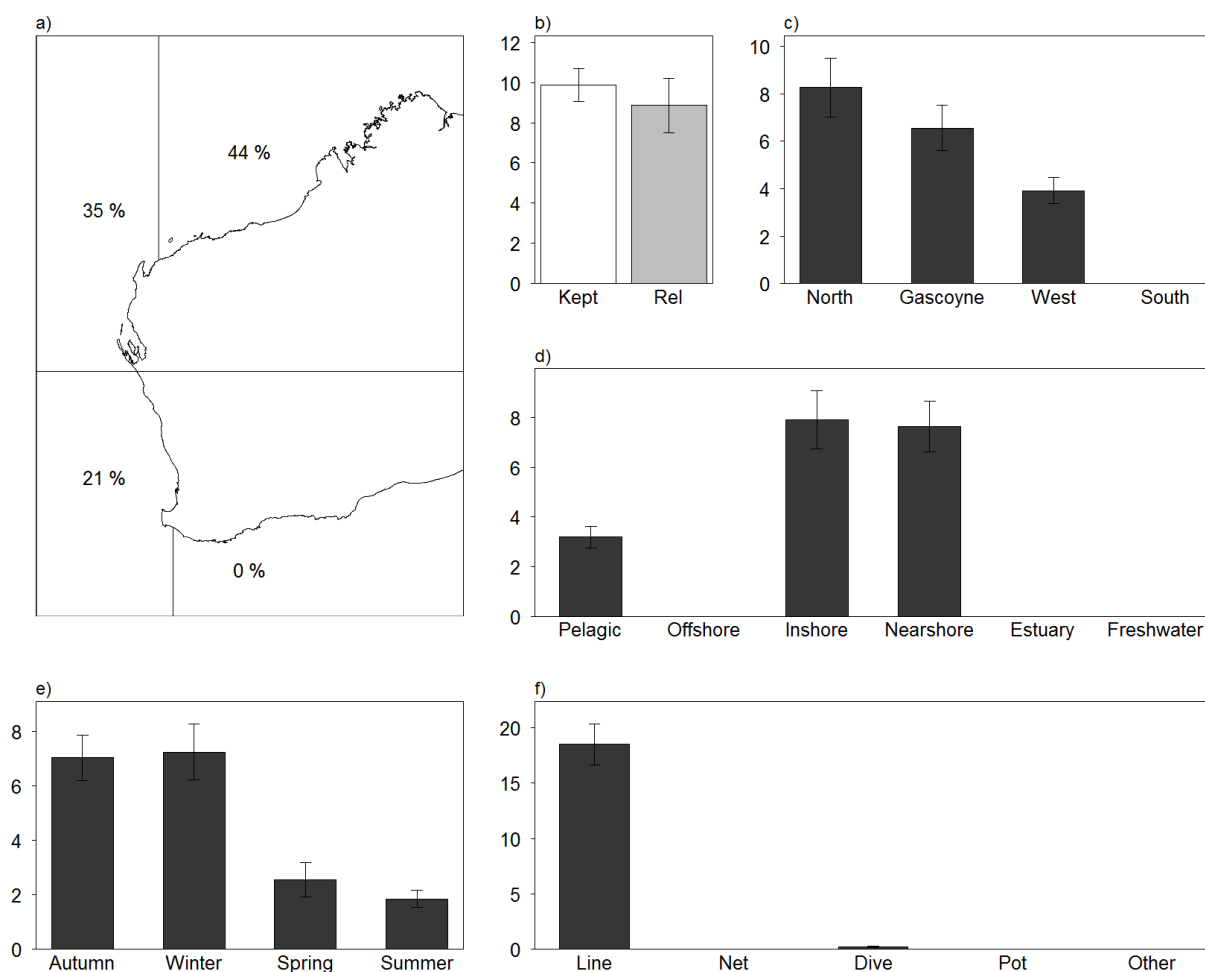


**Figure 59.** Boat-based recreational catch (numbers x 1000) of Ruby Snapper in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

## 6.6 Pelagic

### 6.6.1 Spanish Mackerel (*Scomberomorus commerson*)

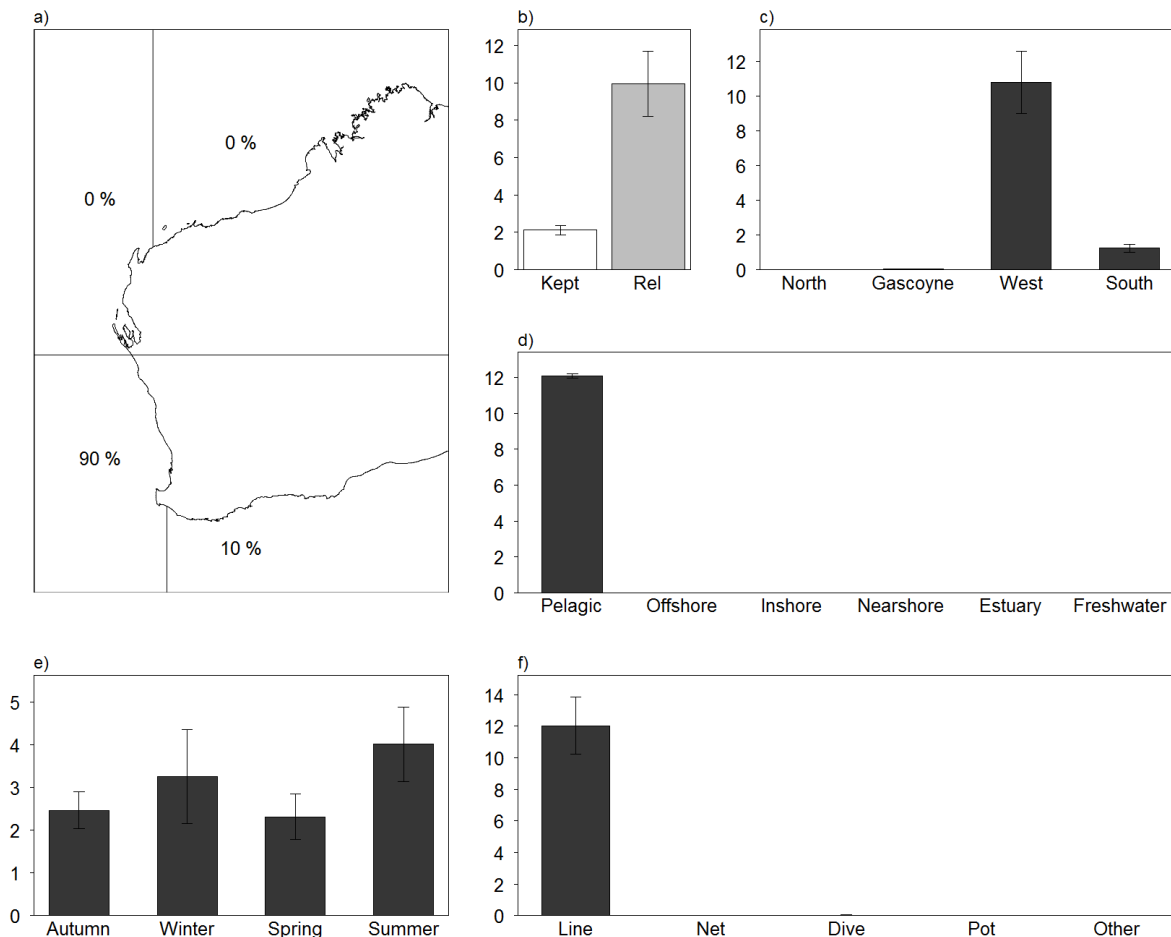
Spanish Mackerel is an indicator species in the North Coast, Gascoyne Coast and West Coast. The majority of the recreational catches of Spanish Mackerel by RFBL holders aged five years or older occurred in the North Coast (44%) and Gascoyne Coast (35%), with some catches in the South Coast (21%) (Figure 60 a and c). Similar proportions of the boat-based recreational catch of Spanish Mackerel were retained (53%) and released (47%) (Figure 60b). Catches were taken from inshore (42%) and nearshore (41%) habitats, but also pelagic (17%) (Figure 60d). Spanish Mackerel were harvested throughout the year, with higher catches observed in autumn (38%) and winter (39%), compared with spring (14%) and summer (9%) (Figure 60e). Catches were taken by line fishing (99%), with some fishing from diving (1%) (Figure 60f).



**Figure 60.** Boat-based recreational catch (numbers x 1000) of Spanish Mackerel in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.6.2 Samsonfish (*Seriola hippos*)

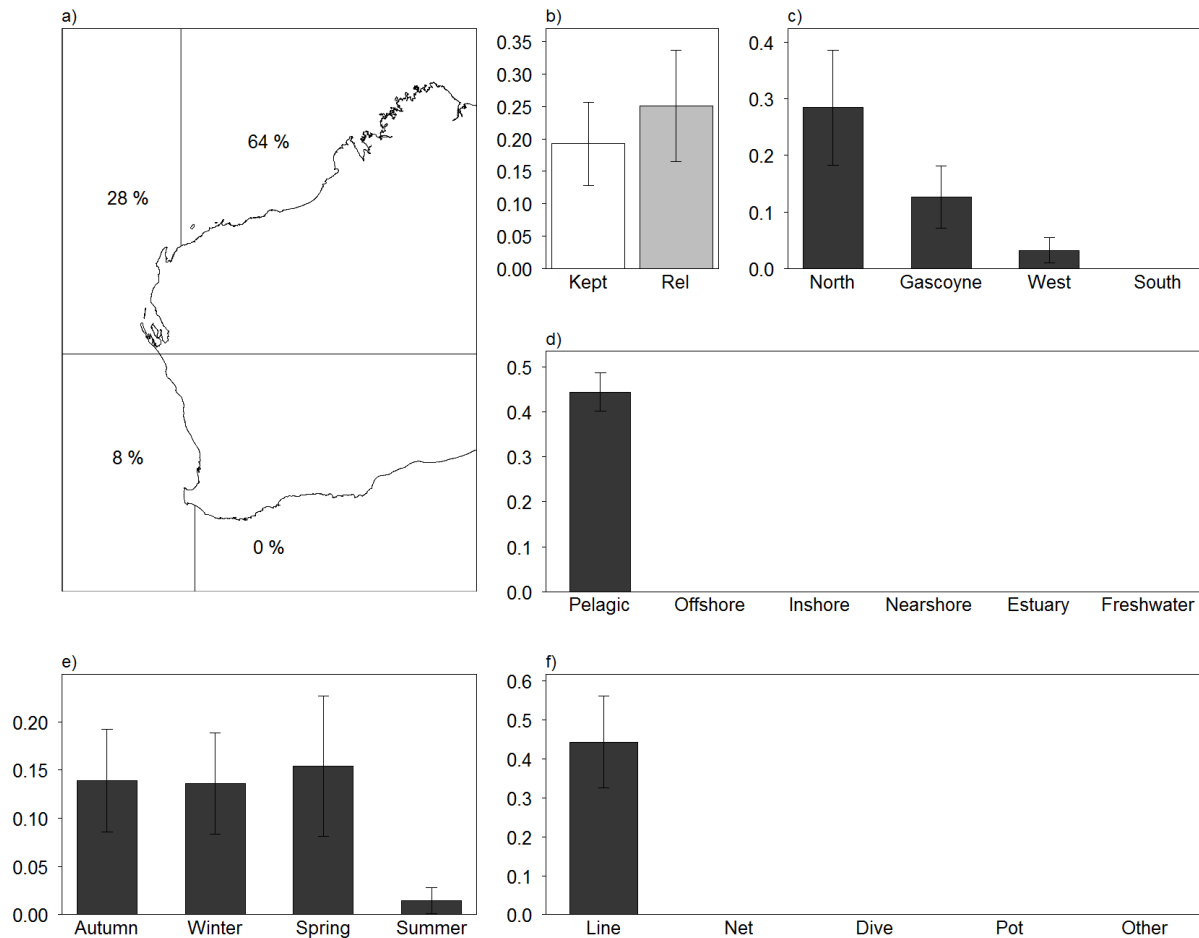
Samsonfish is an indicator species in the West Coast and South Coast. The majority of the recreational catches of Samsonfish by RFBL holders aged five years or older occurred in the West Coast (90%), with some catches in the South Coast (10%) (Figure 61 a and c). The majority of the boat-based recreational catch of Samsonfish was released (82%) (Figure 61b). All catches were taken from pelagic habitat (Figure 61d). Samsonfish were harvested throughout the year, with higher catches observed in summer (34%) compared with autumn (20%), winter (27%) and spring (19%) (Figure 61e). All catches were taken by line fishing (Figure 61f).



**Figure 61.** Boat-based recreational catch (numbers x 1000) of Samsonfish in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.6.3 Grey Mackerel (*Scomberomorus semifasciatus*)

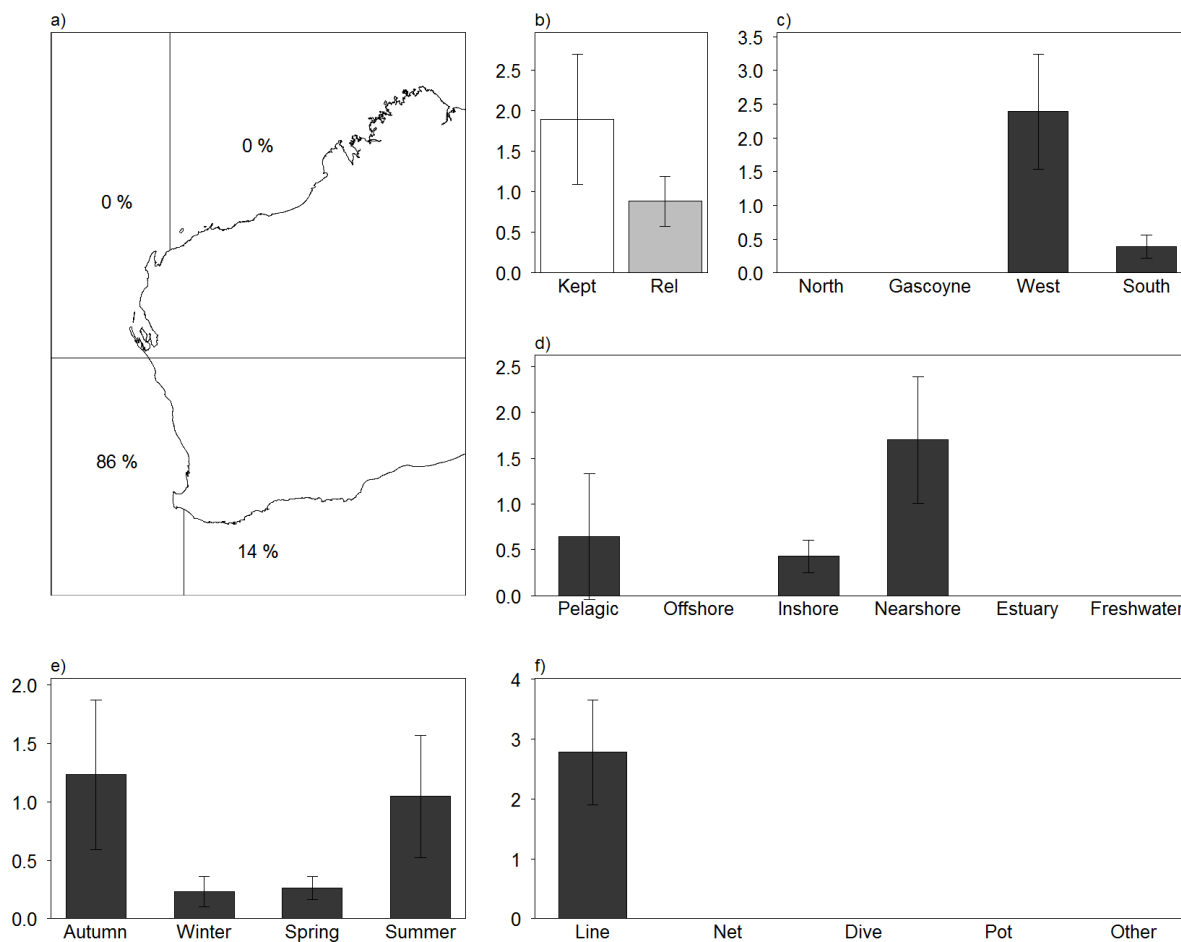
Grey Mackerel is an indicator species in the North Coast and Gascoyne Coast. The majority of the recreational catches of Grey Mackerel by RFLB holders aged five years or older occurred in the North Coast (64%), with some catches in the Gascoyne Coast (28%) and West Coast (8%) (Figure 62 a and c). The majority of the boat-based recreational catch of Grey Mackerel was released (57%) (Figure 62b). All catches were taken from pelagic habitat (Figure 62d). Grey Mackerel were harvested throughout the year, with higher catches observed in spring (35%) compared with summer (3%), autumn (31%) and winter (31%) (Figure 62e). All catches were taken by line fishing (Figure 62f).



**Figure 62.** Boat-based recreational catch (numbers x 1000) of Grey Mackerel in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.6.4 Blue Mackerel (*Scomber australasicus*)

Blue Mackerel is an indicator species in the South Coast. The majority of the recreational catches of Blue Mackerel by RFBL holders aged five years or older occurred in the West Coast (86%), with some catches in the South Coast (14%) (Figure 63 a and c). The majority of the boat-based recreational catch of Blue Mackerel was retained (68%) (Figure 63b). Catches were taken predominantly from nearshore habitat (61%), but also pelagic (23%) and inshore (16%) (Figure 63d). Blue Mackerel were harvested throughout the year, with higher catches observed in summer (38%) and autumn (43%) compared with winter (8%), spring (9%) (Figure 63e). All catches were taken by line fishing (Figure 63f).

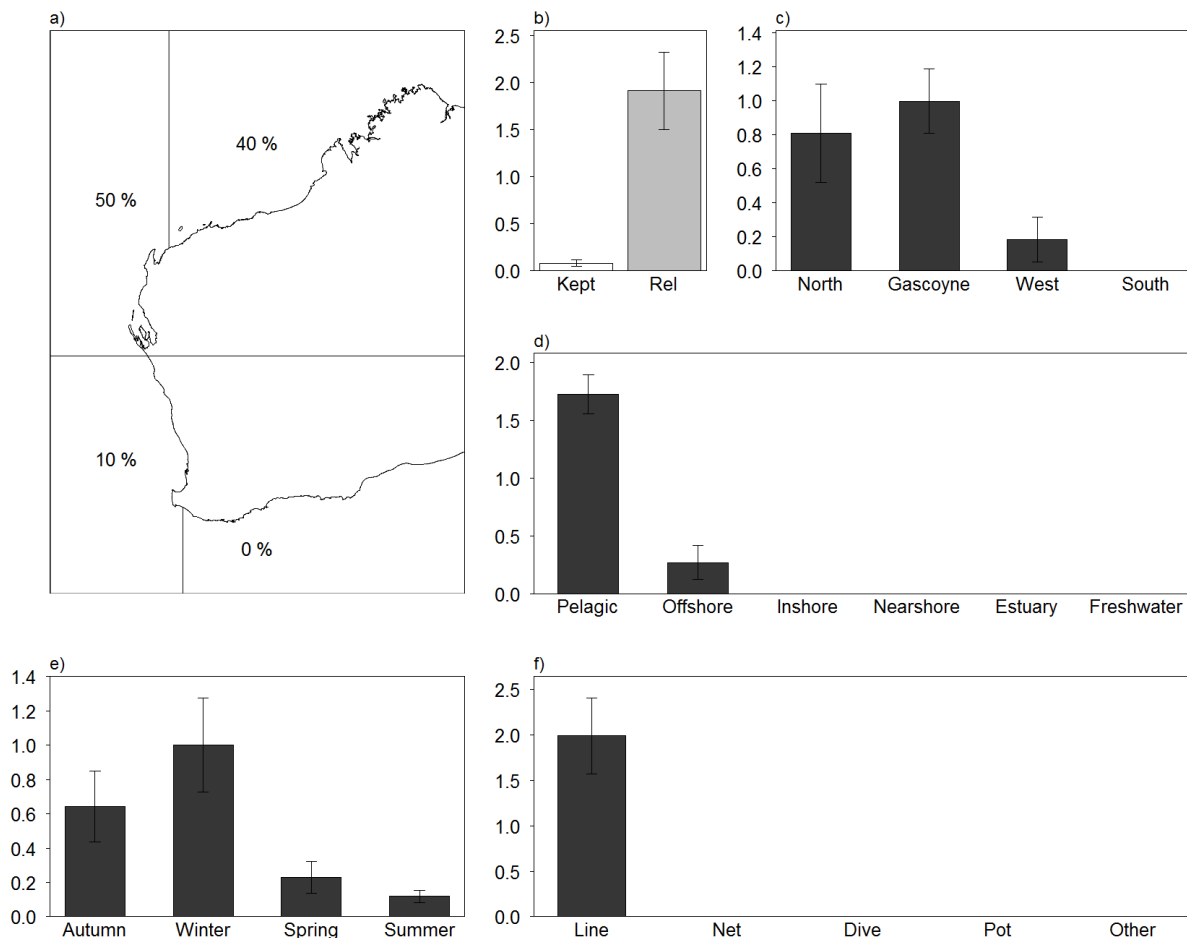


**Figure 63.** Boat-based recreational catch (numbers x 1000) of Blue Mackerel in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.



### 6.6.5 Billfish

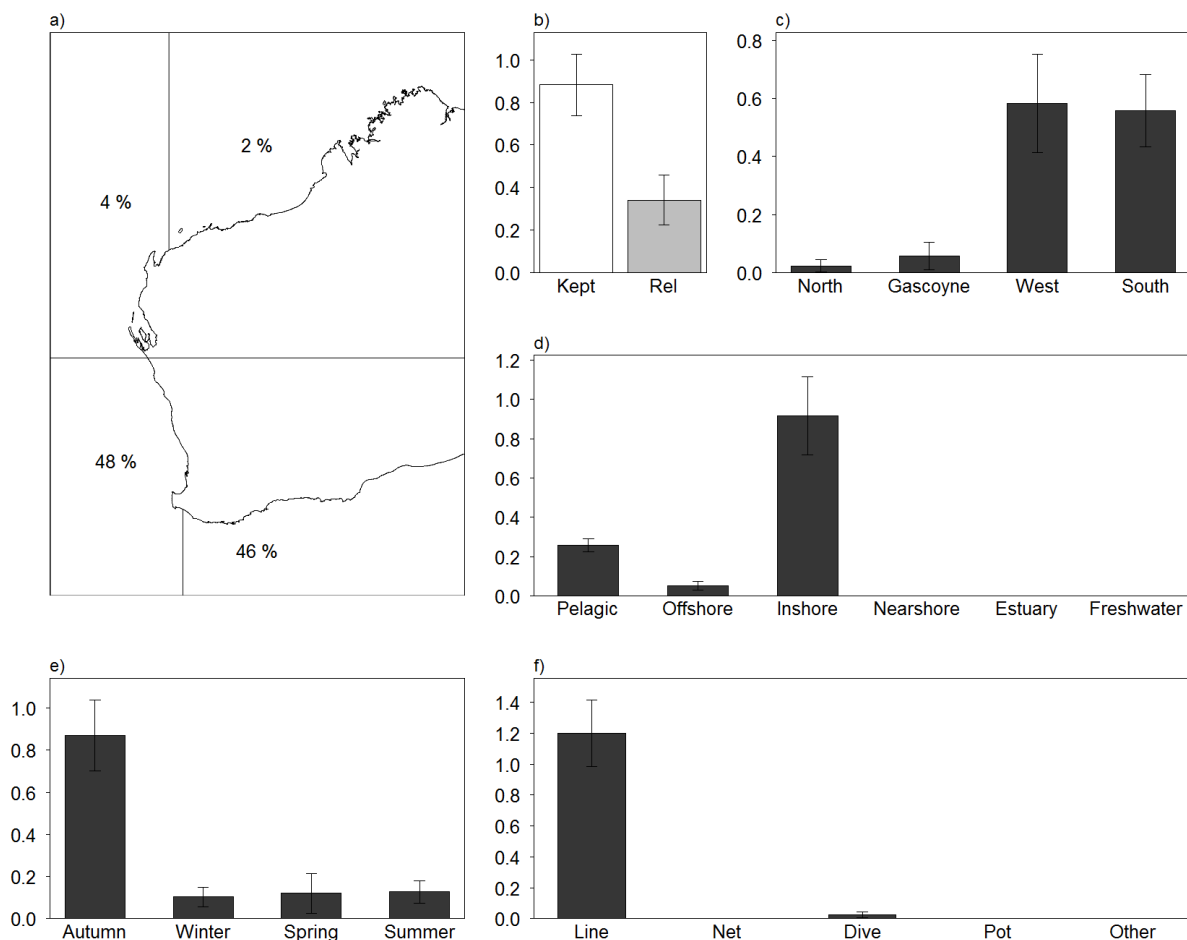
Billfish include Black Marlin (*Makaira indica*), Blue Marlin (*M. nigricans*), Striped Marlin (*Tetrapturus audax*) and Sailfish (*Istiophorus platypterus*). The majority of the recreational catches of Billfish by RFBL holders aged five years or older occurred in the West Coast (40%) and Gascoyne Coast (50%), with some catches in the West Coast (10%) (Figure 64 a and c). The majority of the boat-based recreational catch of Billfish was released (96%) (Figure 64b). Catches were taken predominantly from pelagic habitat (86%), but also offshore (14%) (Figure 64d). Billfish were harvested throughout the year, with higher catches observed in winter (50%) compared with spring (12%), summer (6%) and autumn (32%) (Figure 64e). All catches were taken by line fishing (Figure 64f).



**Figure 64.** Boat-based recreational catch (numbers x 1000) of Billfish in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.6.6 Southern Bluefin Tuna (*Thunnus maccoyii*)

The majority of the recreational catches of Southern Bluefin Tuna by RFBL holders aged five years or older occurred in the West Coast (48%) and South Coast (46%), with some catches in the North Coast (2%) and Gascoyne Coast (4%) (Figure 65 a and c). The majority of the boat-based recreational catch of Southern Bluefin Tuna was retained (72%) (Figure 65b). Catches were taken predominantly from inshore habitat (75%), but also pelagic (21%) and offshore (4%) (Figure 65d). Southern Bluefin Tuna were harvested throughout the year, with higher catches observed in autumn (72%) compared with winter (8%), spring (10%) and summer (10%) (Figure 65e). Catches were taken by line fishing (98%), with some fishing from diving (2%) (Figure 65f).

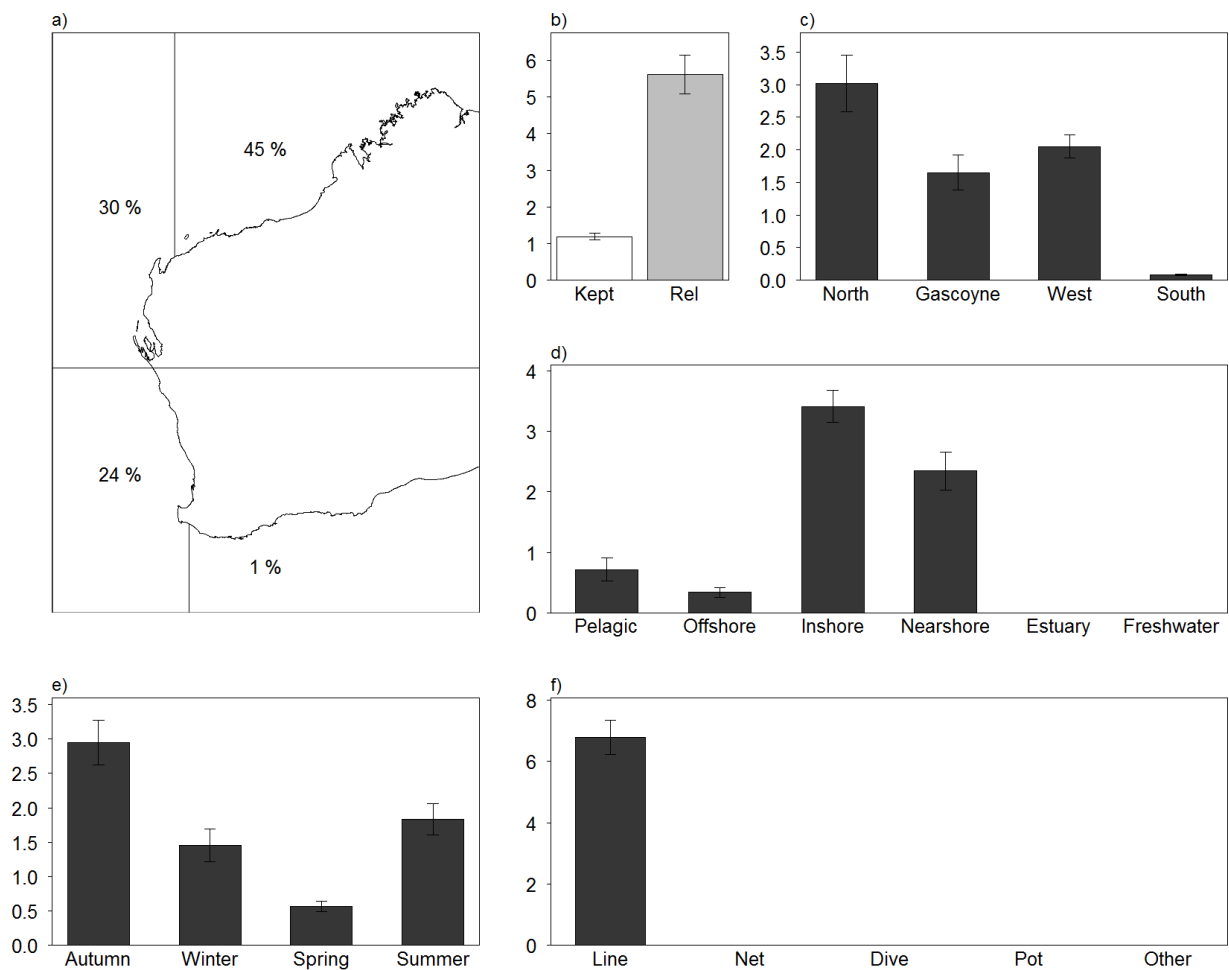


**Figure 65.** Boat-based recreational catch (numbers x 1000) of Southern Bluefin Tuna in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

## 6.7 Sharks

### 6.7.1 Whaler Sharks (Family Carcharhinidae)

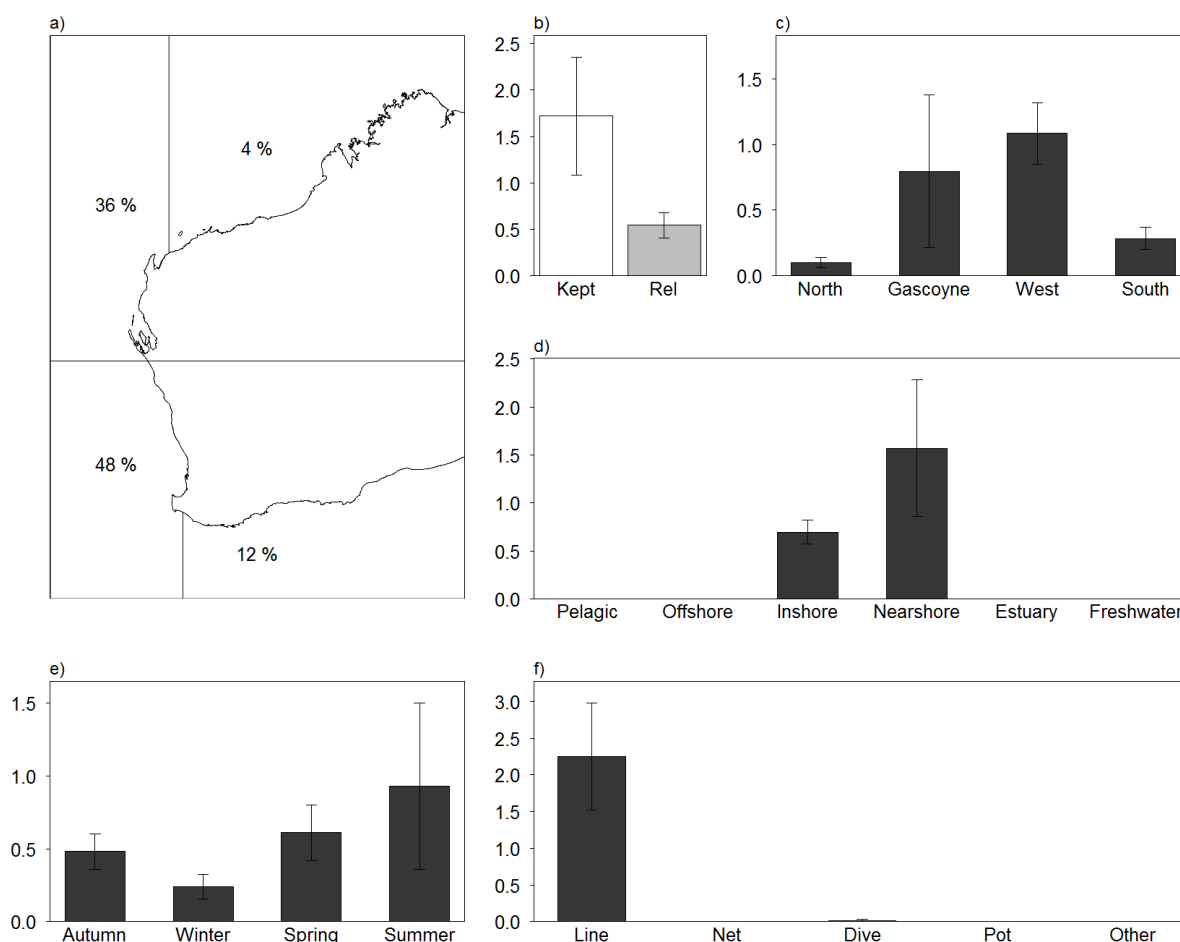
Whaler Sharks are a state-wide indicator species. For this survey Whaler Sharks (Family Carcharhinidae) have been aggregated, including the Bronze Whaler (*Carcharhinus brachyurus*). The majority of the recreational catches of Whaler Sharks by RFBL holders aged five years or older occurred in the North Coast (45%), with some catches in the Gascoyne Coast (30%), West Coast (24%) and South Coast (1%) (Figure 66 a and c). The majority of the boat-based recreational catch of Whaler Sharks was released (82%) (Figure 66b). Catches were taken from inshore (50%) and nearshore (34%) habitats, but also pelagic (11%) and offshore (5%) (Figure 66d). Whaler Sharks were harvested throughout the year, with higher catches observed in autumn (44%) compared with winter (21%), spring (8%) and summer (27%) (Figure 66e). All catches were taken by line fishing (Figure 66f).



**Figure 66.** Boat-based recreational catch (numbers x 1000) of Whaler Sharks in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.7.2 Gummy Sharks (*Mustelus antarcticus* and *stevensi*)

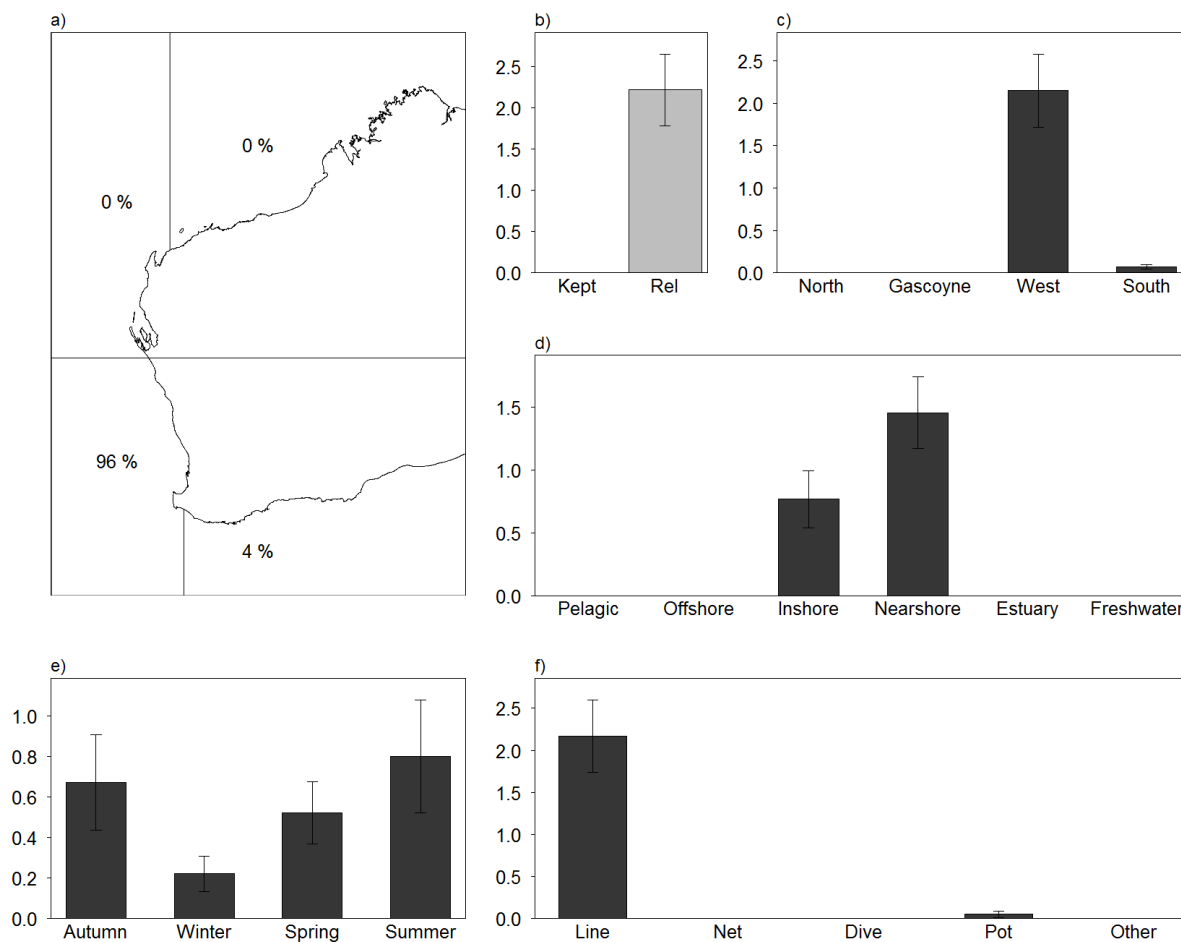
Gummy Sharks includes Gummy Shark (*Mustelus antarcticus*), which occurs in southern waters to Geraldton, and Western Spotted Gummy Shark (*M. stevensi*), which occurs from Shark Bay to the Kimberley. These species are found in depths of 100 to 300 m (Last and Stevens 2009). The majority of the recreational catches of Gummy Sharks by RFBL holders aged five years or older occurred in the Gascoyne Coast (36%) and West Coast (48%), with some catches in the North Coast (4%) and South Coast (12%) (Figure 67 a and c). The majority of the boat-based recreational catch of Gummy Sharks was retained (76%) (Figure 67b). Catches were taken predominantly from nearshore habitat (69%), but also inshore (31%) (Figure 67d). Gummy Sharks were harvested throughout the year, with higher catches observed in summer (41%) compared with autumn (21%), winter (11%) and spring (27%) (Figure 67e). Catches were taken by line fishing (99%), with some fishing from diving (1%) (Figure 67f).



**Figure 67.** Boat-based recreational catch (numbers x 1000) of Gummy Sharks in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.7.3 Port Jackson Shark (*Heterodontus portusjacksoni*)

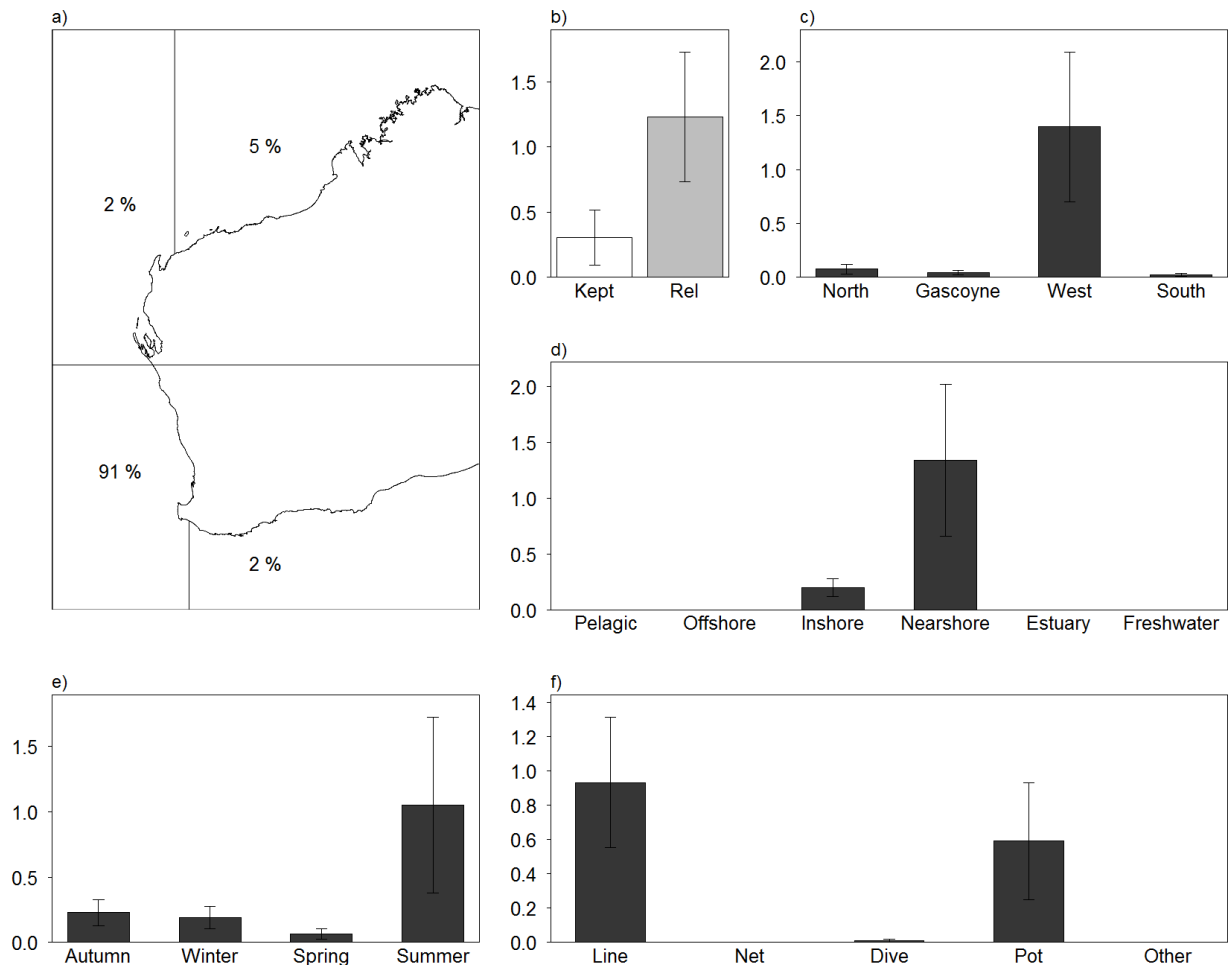
The majority of the recreational catches of Port Jackson Shark by RFBL holders aged five years or older occurred in the West Coast (96%), with some catches in the South Coast (4%) (Figure 68 a and c). All the boat-based recreational catch of Port Jackson Shark was released (Figure 68b). Catches were taken predominantly from nearshore habitat (65%), but also inshore (35%) (Figure 68d). Port Jackson Shark were harvested throughout the year, with higher catches observed in summer (36%) and autumn (30%) compared with winter (10%) and spring (24%) (Figure 68e). Catches were taken by line fishing (98%), with some fishing from pots (2%) (Figure 68f).



**Figure 68.** Boat-based recreational catch (numbers x 1000) of Port Jackson Shark in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.7.4 Wobbegong (Family Orectolobidae)

The majority of the recreational catches of Wobbegong by RFBL holders aged five years or older occurred in the West Coast (91%), with some catches in the North Coast (5%), Gascoyne Coast (2%) and South Coast (2%) (Figure 69 a and c). The majority of the boat-based recreational catch of Wobbegong was released (80%) (Figure 69b). Catches were taken predominantly from nearshore habitat (87%), but also inshore (13%) (Figure 69d). Wobbegong were harvested throughout the year, with higher catches observed in summer (68%) compared with autumn (15%), winter (13%) and spring (4%) (Figure 69e). Catches were taken by line fishing (61%), with some fishing from pots (39%) and diving (<1%) (Figure 69f).

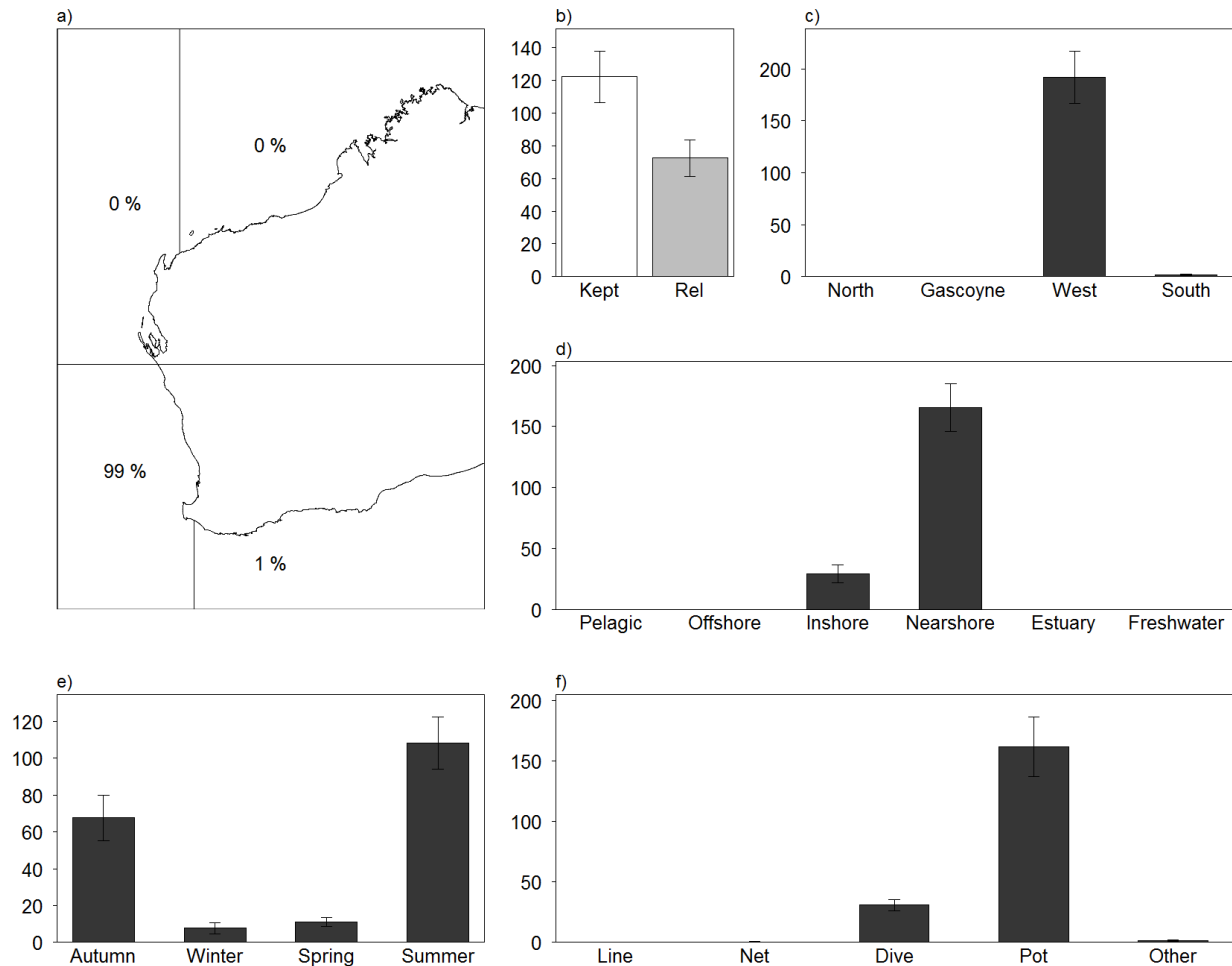


**Figure 69.** Boat-based recreational catch (numbers x 1000) of Wobbegong in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

## 6.8 Crustaceans

### 6.8.1 Western Rock Lobster (*Panulirus cygnus*)

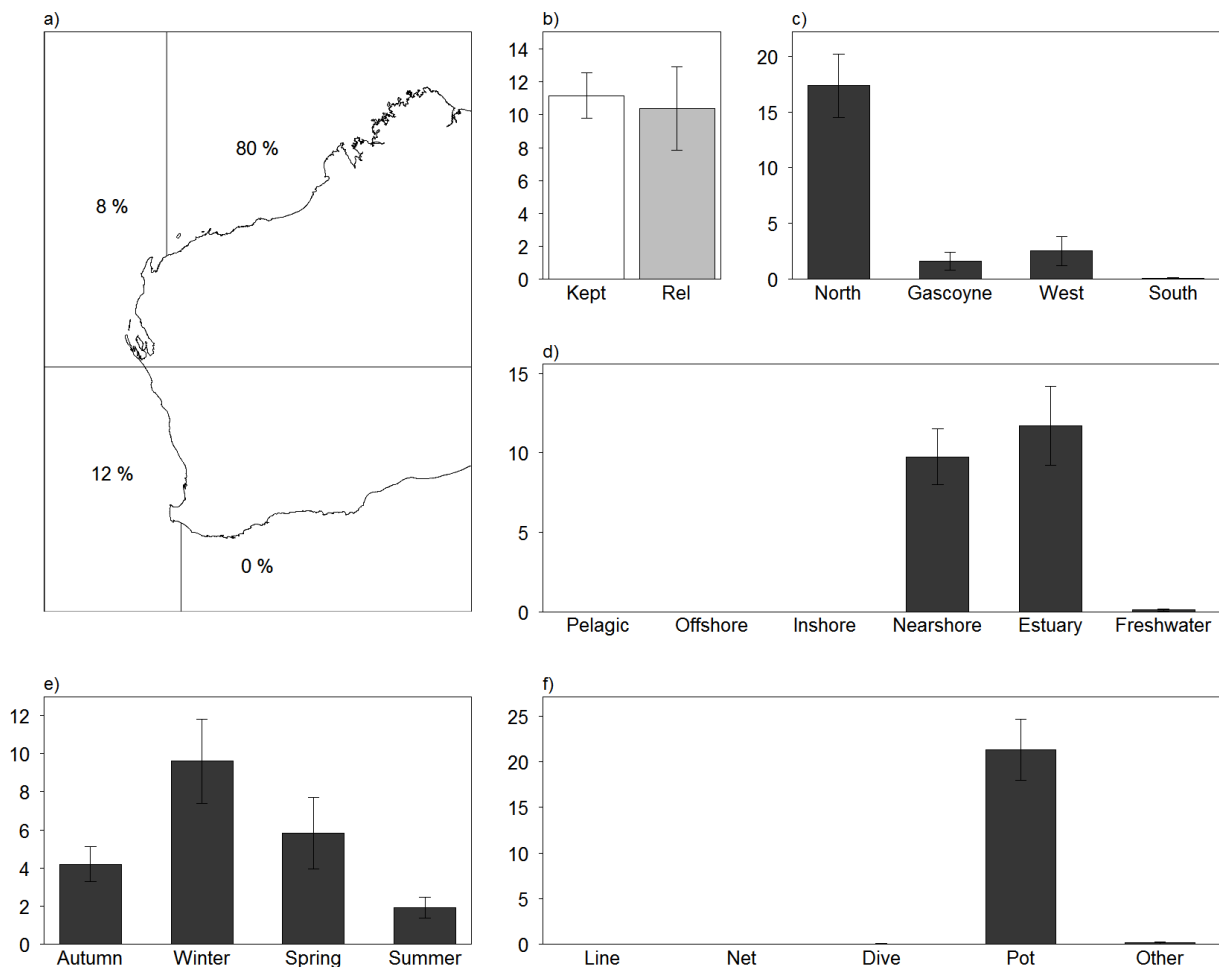
The recreational catch from this survey does not account for catches from fishers that only have the Rock Lobster licence. Approximately 40 % of Rock Lobster licence holders do not have a RFBL, therefore these results underestimate the total recreational catch of Western Rock Lobster. The majority of the recreational catches of Western Rock Lobster by RFBL holders aged five years or older occurred in the West Coast (99%), with some catches in the South Coast (1%) (Figure 70 a and c). The majority of the boat-based recreational catch of Western Rock Lobster was retained (63%) (Figure 70b). Catches were taken predominantly from nearshore habitat (85%), but also inshore (15%) (Figure 70d). Western Rock Lobster were harvested throughout the year, with higher catches observed in summer (56%) compared with autumn (34%), winter (4%) and spring (6%) (Figure 70e). Catches were taken by pots (83%), with some fishing from diving (16%) and other (1%) (Figure 70f).



**Figure 70.** Boat-based recreational catch (numbers x 1000) of Western Rock Lobster in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.8.2 Mud Crab (*Scylla olivacea* and *serrata*)

Mud Crabs include Brown Mud Crab (*Scylla olivacea*) and Green Mud Crab (*S. serrata*). The majority of the recreational catches of Mud Crab by RFBL holders aged five years or older occurred in the North Coast (80%), with some catches in the Gascoyne Coast (8%) and West Coast (12%) (Figure 71 a and c). Similar proportions of the boat-based recreational catch of Mud Crab was retained (52%) and released (48%) (Figure 71b). Catches were taken predominantly from estuary habitat (54%), but also nearshore (45%) and freshwater (1%) (Figure 71d). Mud Crab were harvested throughout the year, with higher catches observed in winter (45%) compared with spring (26%), summer (9%) and autumn (20%) (Figure 71e). The majority of the catch was taken by pots (99%) (Figure 71f).

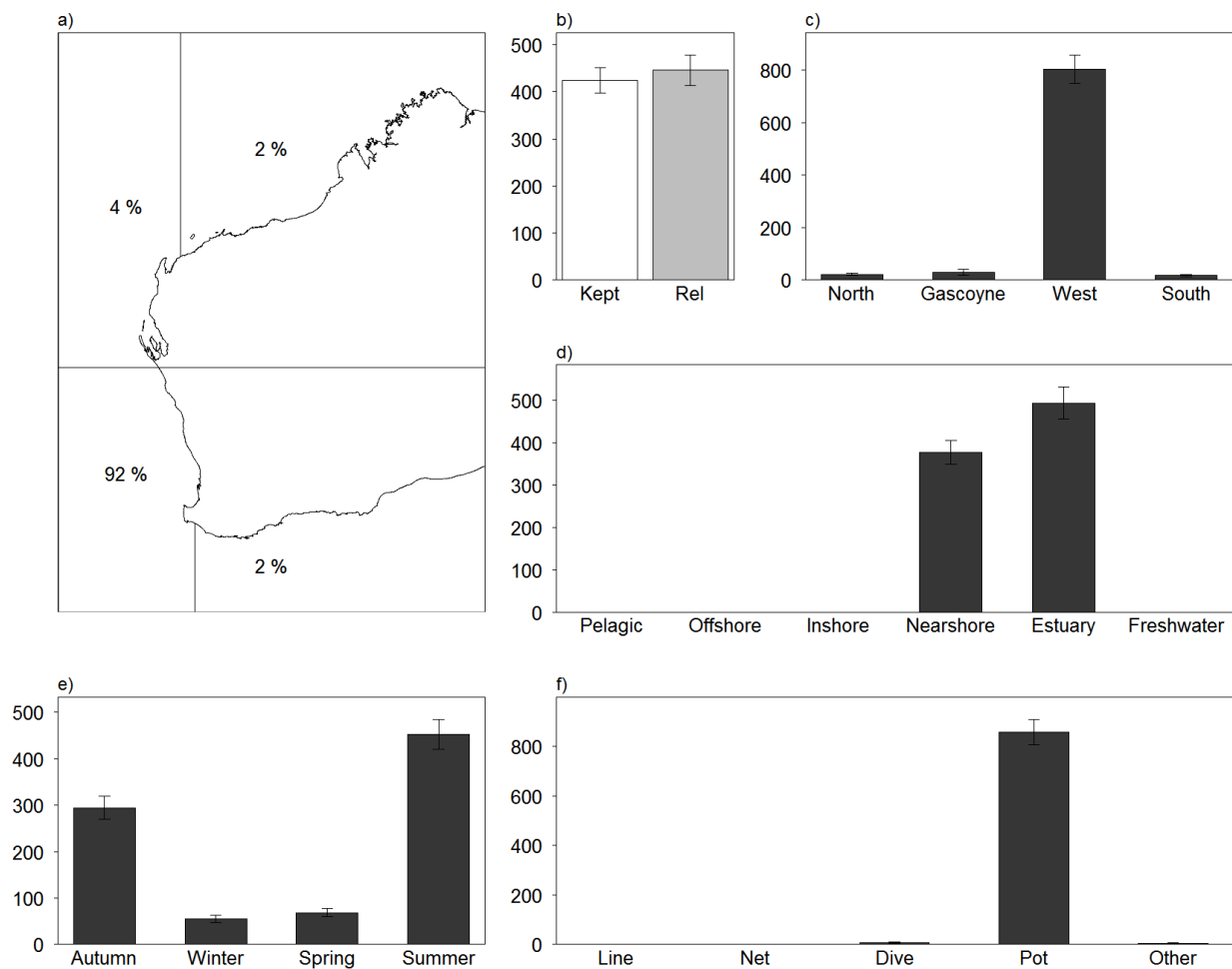


**Figure 71.** Boat-based recreational catch (numbers x 1000) of Mud Crab in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.



### 6.8.3 Blue Swimmer Crab (*Portunus armatus*)

Blue Swimmer Crab, previously known as *Portunus pelagicus*, but now classified as *Portunus armatus*, is harvested state-wide. The majority of the recreational catches of Blue Swimmer Crab by RFBL holders aged five years or older occurred in the West Coast (92%), with some catches in the North Coast (2%), Gascoyne Coast (4%) and South Coast (2%) (Figure 72 a and c). Equal proportions Blue Swimmer Crab were retained (49%) and released (49%) (Figure 72b). Catches were taken predominantly from estuary habitat (57%), but also nearshore (43%) (Figure 72d). Blue Swimmer Crab were harvested throughout the year, with higher catches observed in summer (52%) and autumn (34%) compared with winter (6%) and spring (8%) (Figure 72e). The majority of the catch was taken by pots (including drop nets) (99%), diving (1%) and other (<1%) (Figure 72f).

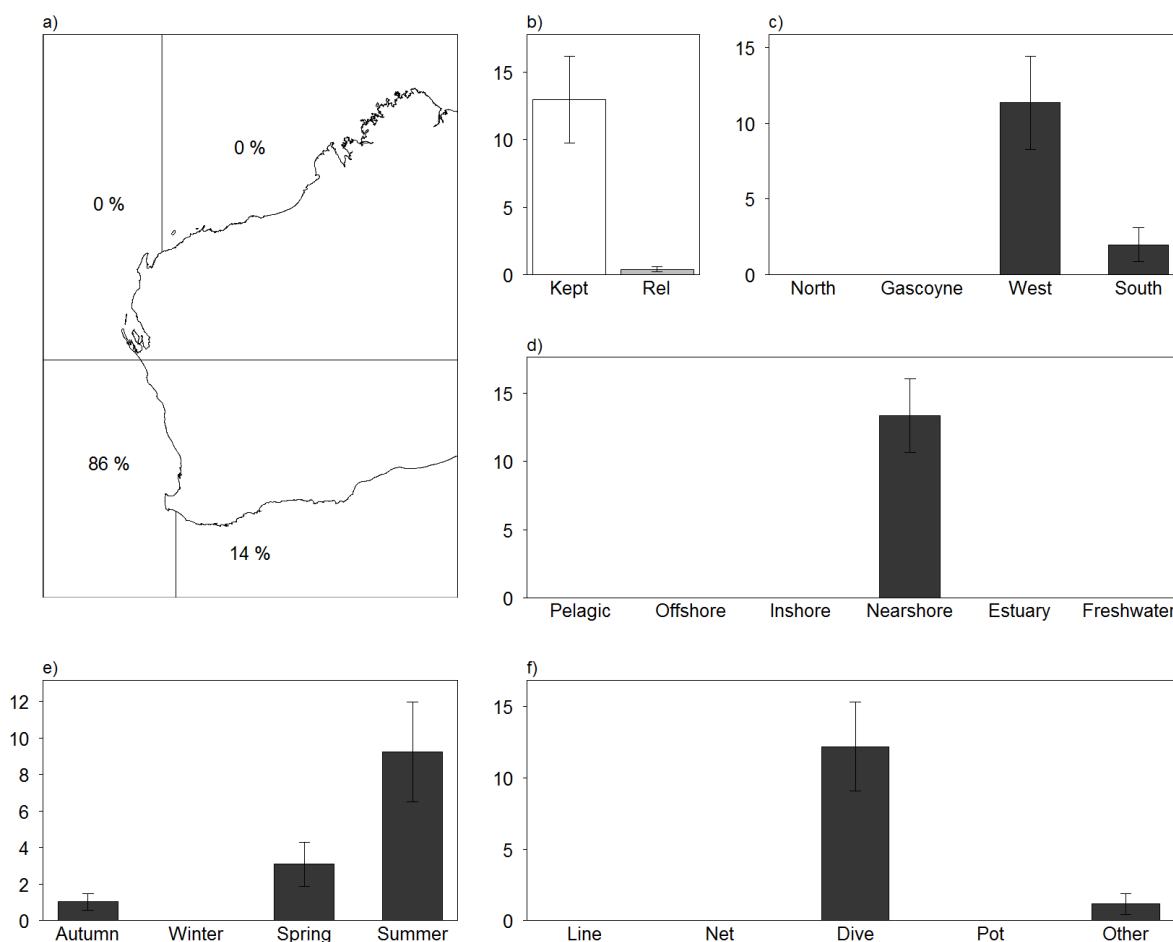


**Figure 72.** Boat-based recreational catch (numbers x 1000) of Blue Swimmer Crab in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

## 6.9 Molluscs

### 6.9.1 Abalone (*Haliotis* spp.)

Abalone includes Roe's Abalone (*Haliotis roei*), Greenlip Abalone (*H. laevigata*) and Brownlip Abalone (*H. rubra conicopora*). The majority of the recreational catches of Abalone by RFBL holders aged five years or older occurred in the West Coast (86%), with some catches in the South Coast (14%) (Figure 73 a and c). The majority of the boat-based recreational catch of Abalone was retained (97%) (Figure 73b). All catches were taken from nearshore habitat (Figure 73d). Abalone were harvested from spring to autumn, with higher catches observed in summer (69%) compared with spring (23%) and autumn (8%) (Figure 73e). Catches were taken by diving (91%), with some fishing from other methods (9%) (Figure 73f).

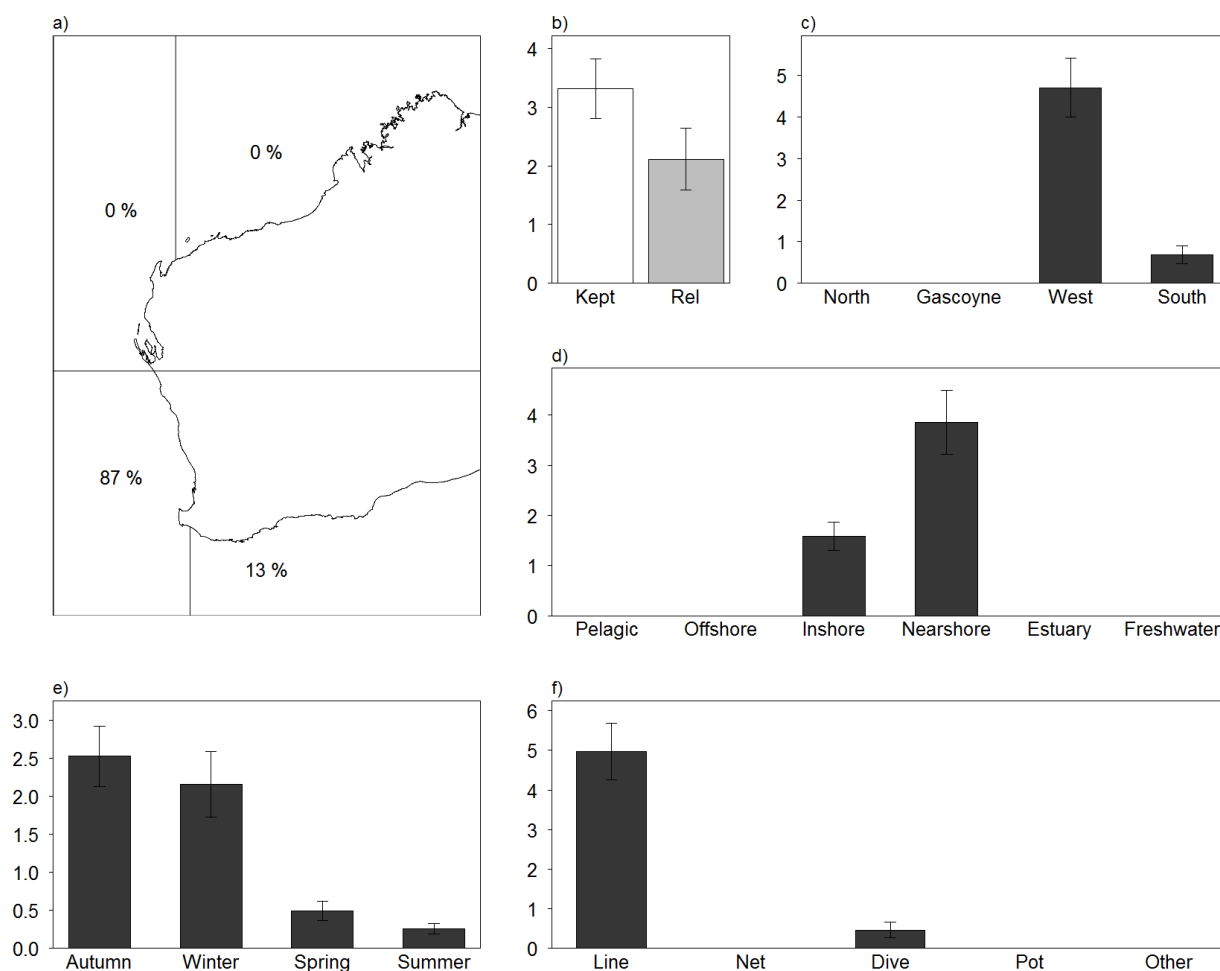


**Figure 73.** Boat-based recreational catch (numbers x 1000) of Abalone in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

## 6.10 Cephalopods

### 6.10.1 Cuttlefish (Order Sepiidae)

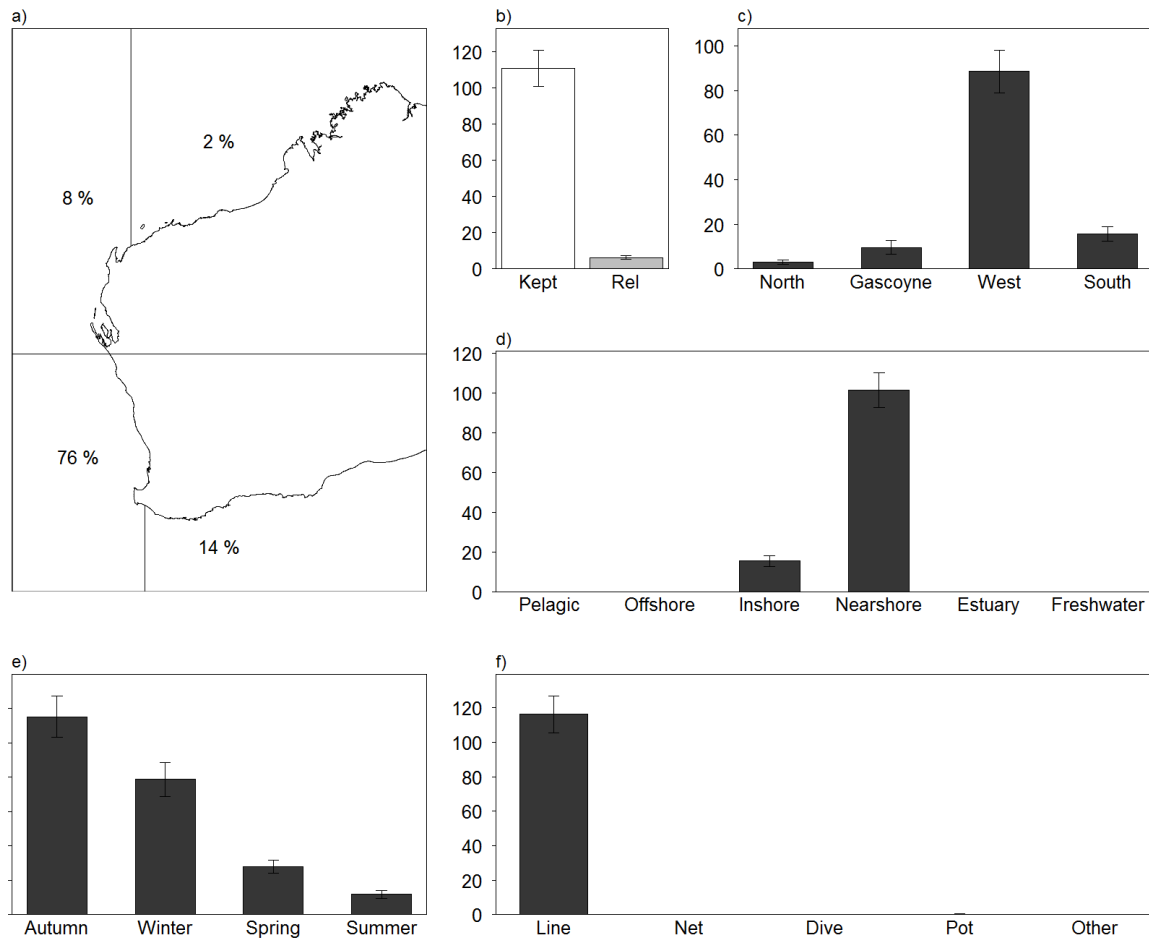
The majority of the recreational catches of Cuttlefish by RFBL holders aged five years or older occurred in the West Coast (87%), with some catches in the South Coast (13%) (Figure 74 a and c). The majority of the boat-based recreational catch of Cuttlefish was retained (61%) (Figure 74b). Catches were taken predominantly from nearshore habitat (71%), but also inshore (29%) (Figure 74d). Cuttlefish were harvested throughout the year, with higher catches observed in autumn (46%) and winter (40%) compared with spring (9%) and summer (5%) (Figure 74e). Catches were taken by line fishing (91%), with some fishing from diving (9%) (Figure 74f).



**Figure 74.** Boat-based recreational catch (numbers x 1000) of Cuttlefish in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.10.2 Squid (Order Teuthoidea)

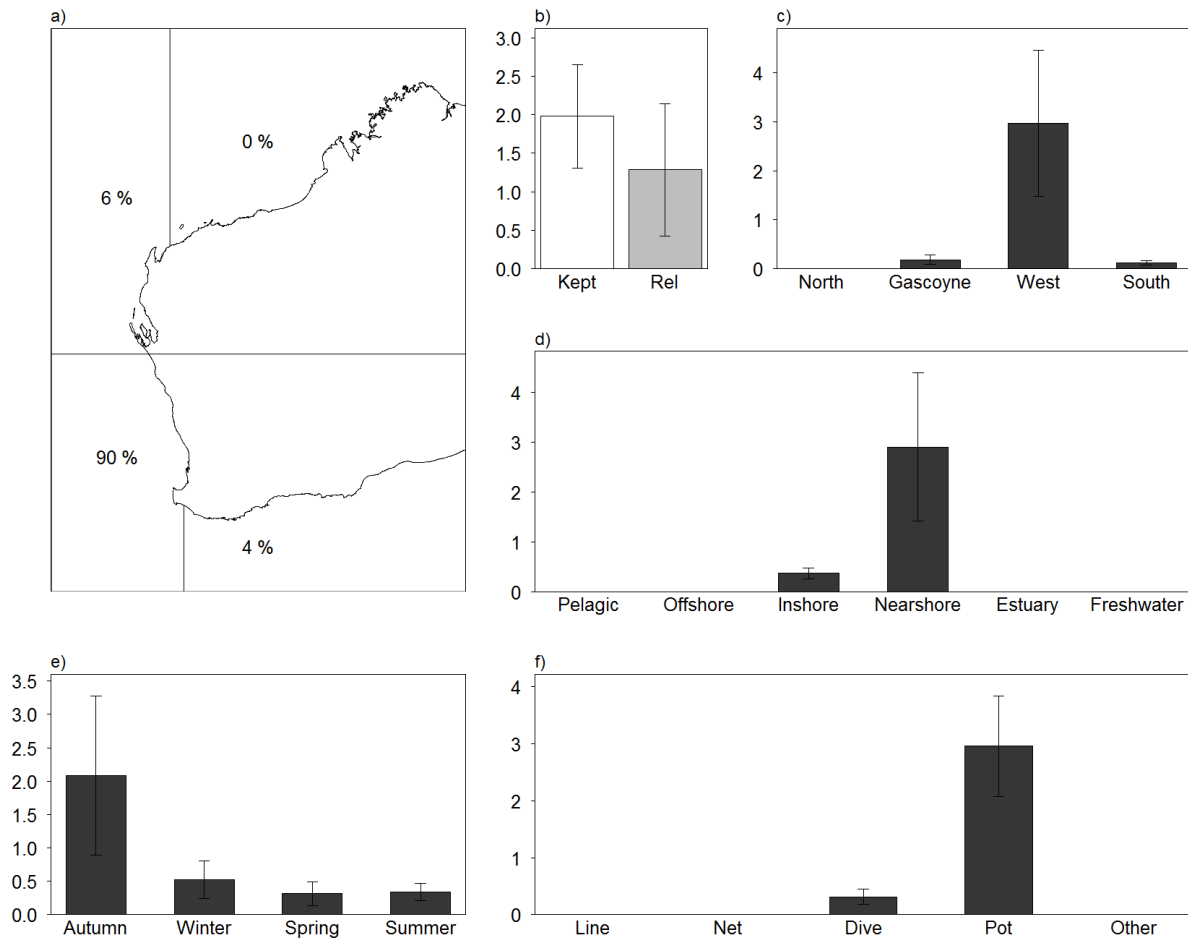
The majority of the recreational catches of Squid by RFBL holders aged five years or older occurred in the West Coast (76%), with some catches in the North Coast (2%), Gascoyne Coast (8%) and South Coast (14%) (Figure 75 a and c). The majority of the boat-based recreational catch of Squid was retained (95%) (Figure 75b). Catches were taken predominantly from nearshore habitat (87%), but also inshore (13%) (Figure 75d). Squid were harvested throughout the year, with higher catches observed in autumn (49%) compared with winter (34%), spring (12%) and summer (5%) (Figure 75e). Catches were taken by line fishing (99%), with some fishing from pots (1%) (Figure 75f).



**Figure 75.** Boat-based recreational catch (numbers x 1000) of Squid in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

### 6.10.3 Octopus (Order Octopodidae)

The majority of the recreational catches of Octopus by RFBL holders aged five years or older occurred in the West Coast (90%), with some catches in the Gascoyne Coast (6%) and South Coast (4%) (Figure 76 a and c). The majority of the boat-based recreational catch of Octopus was retained (61%) (Figure 76b). Catches were taken predominantly from nearshore habitat (89%), but also inshore (11%) (Figure 76d). Octopus were harvested throughout the year, with higher catches observed in autumn (64%) compared with winter (16%), spring (10%) and summer (10%) (Figure 76e). Catches were taken by pots (90%), with some catches taken from diving (10%) (Figure 76f).



**Figure 76.** Boat-based recreational catch (numbers x 1000) of Octopus in WA during 2011–12: a) map of the proportion (%) of the catch by fishing bioregion; b) kept and released; c) catch by bioregion; d) catch by habitat; e) catch by season; and f) catch by fishing method.

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## **7.0 Bioregion Fisheries**

This section provides an overview of the species composition of the recreational catch in each bioregion. The estimated annual catch (total, kept and released numbers) and proportion released/discarded during 2011–12 by RFBL holders aged five years or older are presented for each bioregion: North Coast (Table 8), Gascoyne Coast (Table 9), West Coast (Table 10) and South Coast (Table 11).

### **7.1 North Coast**

A total of 8 invertebrate species/taxa were taken in the North Coast. The most common were: Blue Swimmer Crab (51%) and Mud Crab (42%). These 2 species/taxa accounted for 93% of the total catch (by numbers).

A total of 153 finfish species were taken in the North Coast. The most common were: Stripey Snapper (14%), Grass Emperor (12%), Spangled Emperor (9%), Barcheek Coral Trout (4%), and Barramundi, Blackspot Tuskfish, Blackspotted Rockcod, Blue Tuskfish, Golden Trevally and Spanish Mackerel (3% each). These 10 species accounted for 57% of the total catch (by numbers).

### **7.2 Gascoyne Coast**

A total of 10 invertebrate species were taken in the Gascoyne Coast. The most common were: Blue Swimmer Crab (68%) and Squid (23%). These 2 species accounted for 91% of the total catch (by numbers).

A total of 156 finfish species were taken in the Gascoyne Coast. The most common were: Snapper (22%), Grass Emperor (14%), Spangled Emperor (11%), Redthroat Emperor (7%), Chinaman Rockcod (6%), and Baldchin Groper, Goldspotted Rockcod, Rankin Cod, Red Emperor, Spanish Mackerel and Stripey Snapper (2% each). These 11 species accounted for 72% of the total catch (by numbers).

### **7.3 West Coast**

A total of 13 invertebrate species were taken in the West Coast. The most common were: Blue Swimmer Crab (65%), Western Rock Lobster (15%), Prawns (11%) and Squid (7%). These 4 species accounted for 98% of the total catch (by numbers).

A total of 174 finfish species were taken in the West Coast. The most common were: School Whiting (19%), Australian Herring (16%), Silver Trevally (5%), King George Whiting (5%), Snapper (5%), Black Bream (4%) and Tailor, West Australian Dhufish, Western King Wrasse and Yellowfin Whiting (3% each). These 10 species accounted for 66% of the total catch (by numbers).

### **7.4 South Coast**

A total of 12 invertebrate species were taken in the South Coast. The most common were: Blue Swimmer Crab (45%), Squid (42%), Abalone (6%), and Western Rock Lobster (4%). These 5 species accounted for 97% of the total catch (by numbers).

A total of 112 finfish species were taken in the South Coast. The most common were: King George Whiting (26%), Black Bream (18%), Australian Herring (9%), School Whiting (5%), Silver Trevally (5%), Bight Redfish (4%), Breaksea Cod (3%), Sand Trevally (3%), Snapper (3%), Brownspeckled Wrasse (2%) and Tarwhine (2%). These 11 species accounted for 80% of the total catch (by numbers).

**Table 8.** Estimated annual catch (total, kept and released numbers) and proportion released/discarded in the North Coast bioregion during 2011–12 by RFBL holders aged five years or older.

se is standard error; values in bold indicate relative standard error >40% (i.e. se >40% of estimate); values in italics indicate <30 diarists recorded catches of the species.

Reporting Group	Common Name	Scientific Name	Kept Number	se	Released Number	se	Total Number	se	% Rel
Cephalopod	Squid	Order Teuthoidea - undifferentiated	2,790	941	174	112	2,964	1,013	6%
Prawn	Prawn	Penaeoidea & Caridea - undifferentiated	310	193	0	0	310	193	0%
Lobster	Western Rock Lobster	<i>Panulirus cygnus</i>	25	22	13	11	38	25	33%
	Painted Rock Lobster	<i>Panulirus versicolor</i>	203	90	8	7	212	90	4%
	Ornate Rock Lobster	<i>Panulirus ornatus</i>	137	88	38	33	175	115	22%
Crab	Blue Swimmer Crab	<i>Portunus armatus</i>	14,945	3,908	6,719	1,610	21,664	5,156	31%
	Mud Crab	<i>Scylla olivacea &amp; serrata</i>	9,387	1,207	7,965	1,959	17,352	2,843	46%
Sharks	Bronze Whaler	<i>Carcharhinus brachyurus</i>	116	48	876	227	992	249	88%
	Greynose Shark	<i>Carcharias taurus</i>	0	0	16	10	16	10	100%
	Gummy Sharks	<i>Mustelus antarcticus &amp; stevensi</i>	12	11	88	40	100	41	88%
	Hammerhead Sharks	Sphyrnidae - undifferentiated	0	0	64	28	64	28	100%
	Sandbar Shark	<i>Carcharhinus plumbeus</i>	39	22	449	182	488	184	92%
	Sawshark	<i>Pristiophorus</i> spp.	0	0	23	12	23	12	100%
	Tiger Shark	<i>Galeocerdo cuvier</i>	0	0	35	18	35	18	100%
	Whaler Sharks	Carcharhinidae - undifferentiated	116	47	1,912	421	2,028	436	94%
	Wobbegong	Orectolobidae - undifferentiated	0	0	74	44	74	44	100%
	Other Sharks		125	44	2,003	346	2,128	350	94%
Rays	Other Rays and Skates		0	0	97	45	97	45	100%
Barracouta	Barracouta	<i>Thyrsites atun</i>	25	22	114	48	139	53	82%
Barramundi	Barramundi	<i>Lates calcarifer</i>	2,077	660	5,452	1,657	7,529	2,238	72%
Billfish	Black Marlin	<i>Makaira indica</i>	0	0	612	282	612	282	100%
	Sailfish	<i>Istiophorus platypterus</i>	8	7	191	63	198	64	96%
Bonito	Bonito	<i>Sarda</i> spp.	36	34	31	27	67	44	46%

Reporting Group	Common Name	Scientific Name	Kept Number	se	Released Number	se	Total Number	se	% Rel	
Bream	Frypan Bream	<i>Argyrops spinifer</i>	73	68	110	71	183	138	60%	
	Northwest Black Bream	<i>Acanthopagrus palmaris</i>	590	196	850	259	1,440	404	59%	
	Snapper	<i>Pagrus auratus</i>	519	197	1,855	897	2,374	1,031	78%	
	Tarwhine	<i>Rhabdosargus sarba</i>	25	22	928	450	953	451	97%	
	Western Yellowfin Bream	<i>Acanthopagrus latus</i>	305	134	1,636	536	1,940	618	84%	
	Other Bream	Sparidae - undifferentiated	84	59	146	72	230	127	63%	
	Rosy Threadfin Bream	<i>Nemipterus furcosus</i>	0	0	63	46	63	46	100%	
Catfish	Eeltail Catfishes	Plotosidae - undifferentiated	14	9	962	299	976	299	99%	
	Giant Sea Catfish	<i>Arius thalassinus</i>	124	103	1,312	326	1,437	341	91%	
	Silver Cobbler	<i>Neoarius midgleyi</i>	904	430	2,120	884	3,025	1,198	70%	
	Other Catfish	Order Siluriformes - undifferentiated	86	54	2,454	569	2,540	584	97%	
	Chinamanfish	<i>Symphorus nematophorus</i>	394	108	375	129	770	184	49%	
	Cobia	<i>Rachycentron canadum</i>	434	139	88	33	521	146	17%	
	Cod	Barramundi Cod	<i>Cromileptes altivelis</i>	71	29	322	149	393	170	82%
Blackspotted Rockcod		<i>Epinephelus malabaricus</i>	1,332	303	7,508	2,132	8,840	2,358	85%	
Blacktip Rockcod		<i>Epinephelus fasciatus</i>	21	12	33	18	54	27	61%	
Chinaman Rockcod		<i>Epinephelus rivulatus</i>	465	194	1,196	466	1,660	521	72%	
Duskytail Grouper		<i>Epinephelus bleekeri</i>	0	0	18	17	18	17	100%	
Eightbar Grouper		<i>Epinephelus octofasciatus</i>	0	0	25	22	25	22	100%	
Frostback Rockcod		<i>Epinephelus bilobatus</i>	12	8	72	47	84	47	85%	
Goldspotted Rockcod		<i>Epinephelus coioides</i>	1,489	334	5,010	864	6,499	1,041	77%	
Potato Rockcod		<i>Epinephelus tukula</i>	27	26	246	85	274	94	90%	
Queensland Grouper		<i>Epinephelus lanceolatus</i>	0	0	153	101	153	101	100%	
Rankin Cod		<i>Epinephelus multinotatus</i>	2,393	360	3,345	730	5,738	993	58%	
Temperate Rockcods		Epinephelidae - undifferentiated	643	184	3,701	1,596	4,343	1,648	85%	
Yellowspotted Rockcod		<i>Epinephelus areolatus</i>	38	25	168	73	206	81	82%	
Coral Trout		<i>Plectropomus maculatus</i>	4,702	658	4,861	747	9,563	1,225	51%	
Yellowedge Coronation Trout		<i>Variola louti</i>	135	80	37	24	173	95	22%	
Dart		Common Dart	<i>Trachinotus botla</i>	214	198	223	126	438	307	51%



Reporting Group	Common Name	Scientific Name	Kept Number	Released Number	Total Number	se	% Rel
Emperor	Bluespotted Emperor	<i>Lethrinus punctulatus</i>	1,496	3,026	4,523	1,040	67%
	Grass Emperor	<i>Lethrinus laticaudis</i>	12,018	20,808	32,827	3,991	63%
	Longnose Emperor	<i>Lethrinus olivaceus</i>	136	85	197	125	59%
	Redspot Emperor	<i>Lethrinus lentjan</i>	93	78	106	82	53%
	Redthroat Emperor	<i>Lethrinus miniatus</i>	475	124	2,162	595	82%
	Robinsons' Seabream	<i>Gymnocranius grandoculis</i>	38	27	31	27	45%
	Spangled Emperor	<i>Lethrinus nebulosus</i>	7,107	926	16,634	2,551	70%
	Yellowtail Emperor	<i>Lethrinus atkinsoni</i>	13	11	0	0	0%
	Other Emperor	Lethrinidae - undifferentiated	152	75	103	60	41%
	Flathead	Northern Sand Flathead	<i>Platycephalus endrachtensis</i>	58	77	134	34
Yellowtail Flathead		<i>Platycephalus westraliae</i>	33	20	13	11	28%
Other Flathead		Platycephalidae - undifferentiated	90	69	18	17	17%
Garfish	Robust Garfish	<i>Hemiramphus robustus</i>	437	292	0	0	0%
	Unspecified Garfish	Hemiramphidae - undifferentiated	808	478	118	64	13%
Grunder	Western Striped Grunder	<i>Pelates octolineatus</i>	0	0	447	412	100%
	Western Sooty Grunder	<i>Hephaestus jenkinsi</i>	88	48	247	117	74%
Grunder Bream	Grunder Bream	Haemulidae - undifferentiated	0	0	62	41	100%
Javelinfish	Barred Javelin	<i>Pomadasyys kaakan</i>	140	50	82	47	37%
	Blotched Javelin	<i>Pomadasyys maculatus</i>	8	7	47	34	86%
Jewfish/Mulloway	Black Jewfish	<i>Protonibea diacanthus</i>	324	93	386	168	54%
Leatherjacket	Horseshoe Leatherjacket	<i>Meuschenia hippocrepis</i>	0	0	51	44	100%
	Sixspine Leatherjacket	<i>Meuschenia freycineti</i>	0	0	121	114	100%
	Leatherjacket	Monacanthidae - undifferentiated	13	11	43	23	77%
Lizardfish/Grinners	Lizardfish/Grinners	Bathysauridae and Synodontidae - undifferentiated.	0	0	600	357	100%
Longtom	Longtom	Belonidae - undifferentiated	0	0	127	76	100%

Reporting Group	Common Name	Scientific Name	Kept Number	Released Number	se	Total Number	se	% Rel	
Mackerel	Grey Mackerel	<i>Scomberomorus semifasciatus</i>	93	191	51	284	76	102	67%
	School Mackerel	<i>Scomberomorus queenslandicus</i>	1,231	1,289	335	2,520	318	561	51%
	Shark Mackerel	<i>Grammatorcynus bicarinatus</i>	250	398	77	648	143	196	61%
	Spanish Mackerel	<i>Scomberomorus commerson</i>	3,794	4,466	530	8,259	953	1,244	54%
	Spotted Mackerel	<i>Scomberomorus munroi</i>	350	278	117	628	108	193	44%
	Wahoo	<i>Acanthocybium solandri</i>	43	13	26	56	11	28	23%
	Other Mackerel	Scombridae - undifferentiated	117	120	53	238	60	80	51%
	Mahi Mahi	<i>Coryphaena</i> spp.	25	87	22	112	67	71	77%
	Morwong	<i>Dactylophora nigricans</i>	6	40	6	46	21	22	87%
	Mullet	Bluetail Mullet	<i>Valamugil buchanani</i>	0	166	0	166	107	107
Diamondscale Mullet		<i>Liza vaigiensis</i>	62	0	55	62	0	55	0%
Greenback Mullet		<i>Liza subviridis</i>	31	761	27	792	666	666	96%
Yelloweye Mullet		<i>Aldrichetta forsteri</i>	536	103	360	639	91	403	16%
Other Mullet		Mugilidae - undifferentiated	1,728	186	657	1,914	164	756	10%
Bluebarred Parrotfish		<i>Scarus ghobban</i> sp. complex	31	135	23	166	74	77	81%
Other Parrotfish		Scaridae - undifferentiated	8	31	7	38	26	27	80%
Northern Pearl Perch		<i>Glaucosoma buergeri</i>	188	457	65	645	202	237	71%
Great Barracuda		<i>Sphyræna barracuda</i>	48	241	32	289	86	94	83%
Snook		<i>Sphyræna novæhollandiæ</i>	36	36	34	73	34	68	50%
Striped Barracuda	<i>Sphyræna obtusata</i>	97	213	43	310	76	111	69%	
	Sphyrænidae - undifferentiated	0	182	0	182	171	171	100%	
Queenfish	<i>Scomberoides</i> spp.	455	982	115	1,438	302	345	68%	
Rainbow Runner	<i>Elagatis bipinnulata</i>	51	630	44	681	438	454	93%	
Sergeant Baker	<i>Aulopus purpurissatus</i>	0	140	0	140	104	104	100%	
Snappers (King)	Goldband Snapper	<i>Pristipomoides multidentis</i>	52	51	46	103	43	63	50%
	Rosy Snapper	<i>Pristipomoides filamentosus</i>	0	103	0	103	59	59	100%
	Sharptooth Snapper	<i>Pristipomoides typus</i>	0	25	0	25	22	22	100%

Reporting Group	Common Name	Scientific Name	Kept Number	Released Number	se	Total Number	se	% Rel	
Snappers (Tropical)	Brownstripe Snapper	<i>Lutjanus vitta</i>	35	196	28	231	115	85%	
	Crimson Snapper	<i>Lutjanus erythropterus</i>	1,052	1,957	288	3,009	616	65%	
	Darktail Snapper	<i>Lutjanus lemniscatus</i>	38	317	24	355	160	89%	
	Golden Snapper	<i>Lutjanus johnii</i>	1,116	2,307	270	3,424	714	67%	
	Mangrove Jack	<i>Lutjanus argentimaculatus</i>	3,297	3,405	569	6,702	848	51%	
	Maori Snapper	<i>Lutjanus rivulatus</i>	63	39	27	102	25	40	38%
	Moses' Snapper	<i>Lutjanus russellii</i>	557	1,363	164	1,920	440	481	71%
	Red Emperor	<i>Lutjanus sebae</i>	2,698	3,932	395	6,630	748	999	59%
	Saddletail Snapper	<i>Lutjanus malabaricus</i>	1,199	745	437	1,943	243	538	38%
	Stripey Snapper	<i>Lutjanus carponotatus</i>	8,497	29,652	1,735	38,149	4,561	5,946	78%
	Fusiliers	Caesionidae, Lutjanidae, Symphysanodontidae	0	101	0	101	89	89	100%
	Other Snapper	<i>Lutjanus</i> spp.	328	813	126	1,141	418	495	71%
	Banded Sweep	<i>Scorpius georgiana</i>	20	0	17	20	0	17	0%
	Sea Sweep	<i>Scorpius aequipinnis</i>	0	48	0	48	45	45	100%
Sweetlips	<i>Diagramma labiosum</i>	667	988	171	1,655	294	414	60%	
Threadfin	<i>Eleutheronema tetradactylum</i>	2,233	1,919	849	4,152	759	1,564	46%	
King Threadfin	<i>Polydactylus macrochir</i>	241	125	86	366	84	129	34%	
Trevally	<i>Seriola dumerili</i>	0	74	0	74	48	48	100%	
Yellowtail Kingfish	<i>Seriola lalandi</i>	127	52	119	179	37	125	29%	
Giant Trevally	<i>Caranx ignobilis</i>	729	2,198	253	2,928	467	588	75%	
Golden Trevally	<i>Gnathanodon speciosus</i>	1,606	5,505	305	7,111	989	1,100	77%	
Turum	<i>Carangoides fulvoguttatus</i>	66	59	38	125	37	53	47%	
Other Trevally	<i>Caranginae</i> spp.	975	2,346	266	3,321	465	620	71%	
Tripletail	<i>Lobotes surinamensis</i>	72	8	33	79	7	38	10%	
Dogtooth Tuna	<i>Gymnosarda unicolor</i>	25	17	22	42	15	27	40%	
Mackerel Tuna	<i>Euthynnus affinis</i>	220	343	82	563	113	143	61%	
Northern Bluefin Tuna	<i>Thunnus orientalis</i>	208	283	73	491	109	148	58%	
Skipjack Tuna	<i>Katsuwonus pelamis</i>	107	18	99	125	16	100	14%	
Southern Bluefin Tuna	<i>Thunnus maccoyii</i>	0	24	0	24	22	22	100%	
Yellowfin Tuna	<i>Thunnus albacares</i>	39	75	22	114	50	54	66%	
Other Tuna	<i>Scombridae</i> spp. (Sardini & Thunnini)	0	63	0	63	32	32	100%	

Reporting Group	Common Name	Scientific Name	Kept Number	Released Number	Total Number	se	se	% Rel	
Tuskfish/ Wrasse	Blackspot Tuskfish	<i>Choerodon schoenleinii</i>	2,310	5,222	7,532	475	1,558	69%	
	Blue Tuskfish	<i>Choerodon cyanodus</i>	1,157	6,640	7,797	270	1,782	85%	
	Bluespotted Tuskfish	<i>Choerodon cauteroma</i>	93	496	589	52	271	84%	
	Goldspot Pigfish	<i>Bodianus perditio</i>	5	0	5	5	0	0%	
	Purple Tuskfish	<i>Choerodon cephalotes</i>	114	1,082	1,195	73	540	90%	
	Southern Maori Wrasse	<i>Ophthalmolepis lineolatus</i>	47	212	258	41	132	82%	
	Other Wrasse	Labridae - undifferentiated	157	600	757	55	184	79%	
	Whiting	Goldenline Whiting	<i>Sillago analis</i>	1,551	396	1,947	742	217	20%
		Other Whiting		0	140	140	0	122	100%
	Western Blue Devil	Western Blue Devil	<i>Paraplesiops sinclairi</i>	0	16	16	0	10	100%

**Table 9.** Estimated annual catch (total, kept and released numbers) and proportion released/discarded in the Gascoyne Coast bioregion during 2011–12 by RFBH holders aged five years or older.

se is standard error; values in bold indicate relative standard error >40% (i.e. se >40% of estimate); values in italics indicate <30 diarists recorded catches of the species.

Reporting Group	Common Name	Scientific Name	Kept Number	se	Released Number	se	Total Number	se	% Rel
Cephalopod	Cuttlefish	<i>Sepia</i> spp.	<b>36</b>	<b>34</b>	<i>0</i>	<i>0</i>	<b>36</b>	<b>34</b>	0%
	Octopus	<i>Octopus</i> spp.	146	89	36	34	183	95	20%
	Squid	Order Teuthoidea - undifferentiated	9,274	2,914	<b>315</b>	<b>242</b>	9,589	3,017	3%
Lobster	Western Rock Lobster	<i>Panulirus cygnus</i>	741	260	<b>307</b>	<b>148</b>	1,048	366	29%
	Southern Rock Lobster	<i>Jasus edwardsii</i>	<b>377</b>	<b>341</b>	<b>363</b>	<b>341</b>	<b>740</b>	<b>682</b>	49%
	Painted Rock Lobster	<i>Panulirus versicolor</i>	43	35	<b>5</b>	<b>4</b>	<b>48</b>	<b>36</b>	11%
	Ornate Rock Lobster	<i>Panulirus ornatus</i>	<b>57</b>	<b>43</b>	<i>0</i>	<i>0</i>	<b>57</b>	<b>43</b>	0%
Crab	Blue Swimmer Crab	<i>Portunus armatus</i>	<b>17,530</b>	<b>7,511</b>	10,963	4,292	<b>28,493</b>	<b>11,656</b>	38%
	Mud Crab	<i>Scylla olivacea &amp; serrata</i>	744	314	862	576	1606	802	54%
Sharks	Bronze Whaler	<i>Carcharhinus brachyurus</i>	<b>65</b>	<b>29</b>	509	155	574	161	89%
	Grey nurse Shark	<i>Carcharias taurus</i>	<i>0</i>	<i>0</i>	<b>164</b>	<b>137</b>	<b>164</b>	<b>137</b>	100%
	Gummy Sharks	<i>Mustelus antarcticus &amp; stevensi</i>	583	<b>490</b>	<b>214</b>	<b>109</b>	<b>797</b>	<b>581</b>	27%
	Hammerhead Sharks	Sphyrmidae - undifferentiated	25	22	<b>7</b>	<b>6</b>	<b>32</b>	<b>23</b>	21%
	Sandbar Shark	<i>Carcharhinus plumbeus</i>	14	9	55	28	<b>68</b>	<b>32</b>	80%
	Tiger Shark	<i>Galeocerdo cuvier</i>	37	25	165	105	203	<b>108</b>	82%
	Whaler Sharks	Carcharhinidae - undifferentiated	<b>80</b>	<b>32</b>	998	266	1,078	268	93%
	Wobbegong	Orectolobidae - undifferentiated	<b>18</b>	<b>13</b>	<b>26</b>	<b>18</b>	<b>44</b>	<b>22</b>	59%
	Other Sharks		210	69	1,503	339	1,714	360	88%
	Rays	Western Shovelnose Ray	<i>Aptychotrema vincentiana</i>	<i>0</i>	<i>0</i>	<b>87</b>	<b>56</b>	<b>87</b>	<b>56</b>
Other Rays and Skates			<b>18</b>	<b>17</b>	<i>0</i>	<i>0</i>	<b>18</b>	<b>17</b>	0%
Barracouta	Barracouta	<i>Thyrsites atun</i>	36	34	3	2	39	<b>34</b>	8%
Bass Groper	Bass Groper	<i>Polyprion americanus</i>	<b>13</b>	<b>10</b>	<b>14</b>	<b>9</b>	<b>27</b>	<b>14</b>	52%
Billfish	Black Marlin	<i>Makaira indica</i>	<b>11</b>	<b>6</b>	434	126	446	128	97%
	Blue Marlin	<i>Makaira nigricans</i>	<b>35</b>	<b>31</b>	<b>97</b>	<b>46</b>	<b>133</b>	<b>56</b>	73%
	Sailfish	<i>Istiophorus platypterus</i>	14	<b>9</b>	395	126	408	129	97%
	Striped Marlin	<i>Tetrapturus audax</i>	<i>0</i>	<i>0</i>	<b>12</b>	<b>9</b>	<b>12</b>	<b>9</b>	100%

Reporting Group	Common Name	Scientific Name	Kept Number	se	Released Number	se	Total Number	se	% Rel
Bonito	Bonito	<i>Sarda ssp</i>	19	8	252	206	271	206	93%
	Oriental Bonito	<i>Sarda orientalis</i>	51	46	3	3	54	46	5%
Bream	Frypan Bream	<i>Argyrops spinifer</i>	138	73	78	71	216	102	36%
	Northwest Black Bream	<i>Acanthopagrus palmaris</i>	91	50	465	204	556	225	84%
	Snapper	<i>Pagrus auratus</i>	10,867	1,433	62,456	8,932	73,323	9,566	85%
	Tarwhine	<i>Rhabdosargus sarba</i>	367	247	569	386	935	625	61%
	Western Yellowfin Bream	<i>Acanthopagrus latus</i>	58	30	904	387	962	396	94%
	Other Bream	Sparidae - undifferentiated	185	113	131	63	316	153	41%
Bream Threadfin	Rosy Threadfin Bream	<i>Nemipterus furcosus</i>	36	34	0	0	36	34	0%
Butterfish	Western Butterfish	<i>Pentapodus vitia</i>	1,724	856	3,281	1,545	5,004	2,157	66%
	Other Butterfish	Stromateidae - undifferentiated	5	4	118	77	123	77	96%
Catfish	Eeltail Catfishes	Plotosidae - undifferentiated	0	0	78	73	78	73	100%
	Giant Sea Catfish	<i>Arius thalassinus</i>	73	68	249	222	321	232	77%
Chinamanfish	Chinamanfish	<i>Symphorus nematophorus</i>	376	177	696	264	1,072	349	65%
Cobia	Cobia	<i>Rachycentron canadum</i>	416	83	156	57	572	105	27%
Cod	Barramundi Cod	<i>Cromileptes altivelis</i>	0	0	3	3	3	3	100%
	Blackspotted Rockcod	<i>Epinephelus malabaricus</i>	860	201	1,822	606	2,682	695	68%
	Blacktip Rockcod	<i>Epinephelus fasciatus</i>	36	34	47	34	84	54	57%
	Chinaman Rockcod	<i>Epinephelus rivulatus</i>	6,201	2,471	15,226	3,353	21,426	5,309	71%
	Eightbar Grouper	<i>Epinephelus octofasciatus</i>	50	46	0	0	50	46	0%
	Frostback Rockcod	<i>Epinephelus bilobatus</i>	103	70	534	236	636	297	84%
	Goldspotted Rockcod	<i>Epinephelus coioides</i>	1,562	342	3,562	953	5,125	1,195	70%
	Potato Rockcod <sup>PROTECTED</sup>	<i>Epinephelus tukula</i>	78	56	75	41	153	81	49%
	Queensland Grouper <sup>PROTECTED</sup>	<i>Epinephelus lanceolatus</i>	7	7	0	0	7	7	0%
	Rankin Cod	<i>Epinephelus multinotatus</i>	4,837	722	2,442	769	7,278	1,261	34%
	Temperate Rockcods	Epinephelidae - undifferentiated	313	149	641	460	954	591	67%
	Yellowspotted Rockcod	<i>Epinephelus areolatus</i>	482	212	543	204	1,024	295	53%
Coral Trout	Barcheek Coral Trout	<i>Plectropomus maculatus</i>	1,973	400	1,906	544	3,880	757	49%
	Yellowedge Coronation Trout	<i>Variola louti</i>	434	109	191	76	625	164	31%
Dart	Common Dart	<i>Trachinotus botla</i>	6	5	185	171	191	171	97%

Reporting Group	Common Name	Scientific Name	Kept Number	Released Number	se	Total Number	se	% Rel
Emperor	Bluespotted Emperor	<i>Lethrinus punctulatus</i>	495	1,275	567	1,770	619	72%
	Grass Emperor	<i>Lethrinus laticaudis</i>	15,538	31,857	4,468	47,394	6,117	67%
	Longnose Emperor	<i>Lethrinus olivaceus</i>	228	357	258	585	304	61%
	Redspot Emperor	<i>Lethrinus lentjan</i>	0	198	104	198	104	100%
	Redthroat Emperor	<i>Lethrinus miniatus</i>	7,527	15,287	2,860	22,815	3,562	67%
	Robinsons' Seabream	<i>Gymnocranius grandoculis</i>	1,733	177	63	1,910	482	9%
	Spangled Emperor	<i>Lethrinus nebulosus</i>	16,884	20,848	2,734	37,732	4,502	55%
	Yellowtail Emperor	<i>Lethrinus atkinsoni</i>	115	81	77	196	97	41%
	Other Emperor	Lethrinidae - undifferentiated	306	81	50	387	224	21%
	Flathead	Northern Sand Flathead	<i>Platycephalus endrachtensis</i>	182	185	74	367	104
Yellowtail Flathead		<i>Platycephalus westraliae</i>	252	34	21	286	113	12%
Other Flathead		Platycephalidae - undifferentiated	28	18	17	47	26	39%
Flounder	Other Flatfish	0	31	19	31	19	100%	
Garfish	Robust Garfish	<i>Hemiramphus robustus</i>	977	846	171	1,168	863	16%
	Unspecified Garfish	Hemiramphidae - undifferentiated	0	10	9	10	9	100%
Goatfish	Bluespotted Goatfish	107	21	13	128	72	16%	
Grunter	Western Sooty Grunter	<i>Hephaestus jenkinsi</i>	0	768	683	768	683	100%
	Grunter Bream	Haemulidae - undifferentiated	0	218	205	218	205	100%
Javelin/Jewfish/Mulloway	Barred Javelin	<i>Pomadasys kaakan</i>	104	0	0	104	99	0%
	Mulloway	<i>Argyrosomus japonicus</i>	253	492	202	745	227	66%
Leatherjacket	Horseshoe Leatherjacket	<i>Meuschenia hippocrepis</i>	0	47	31	47	31	100%
	Sixspine Leatherjacket	<i>Meuschenia freycineti</i>	9	73	68	82	69	89%
	Leatherjacket	Monacanthidae - undifferentiated	18	1,219	358	1,237	359	99%
Lizardfish/Grinners	Lizardfish/Grinners	187	117	84	304	190	39%	
Longtom	Longtom	Belonidae - undifferentiated	22	769	347	791	347	97%

Reporting Group	Common Name	Scientific Name	Kept Number	Released Number	se	Total Number	se	% Rel	
Mackerel	Grey Mackerel	<i>Scomberomorus semifasciatus</i>	67	60	31	127	38	47%	
	School Mackerel	<i>Scomberomorus queenslandicus</i>	1,433	2,456	447	3,888	930	63%	
	Shark Mackerel	<i>Grammatorcynus bicarinatus</i>	413	1,148	110	1,561	274	74%	
	Spanish Mackerel	<i>Scomberomorus commerson</i>	3,078	3,475	405	6,553	697	53%	
	Spotted Mackerel	<i>Scomberomorus munroi</i>	251	706	87	957	320	74%	
	Wahoo	<i>Acanthocybium solandri</i>	203	5	56	208	3	2%	
	Other Mackerel	Scombridae - undifferentiated	175	211	118	386	99	55%	
	Mahi Mahi	<i>Coryphaena</i> spp.	474	232	155	706	117	33%	
	Morwong	Dusky Morwong	<i>Dactylophora nigricans</i>	6	34	6	40	20	85%
		Other Morwong	Cheilodactylidae - undifferentiated	14	0	11	14	0	0%
Mullet	Diamondscale Mullet	<i>Liza vaigiensis</i>	10	0	9	10	0	0%	
	Sea Mullet	<i>Mugil cephalus</i>	999	107	453	1,107	99	10%	
	Other Mullet	Mugilidae - undifferentiated	73	0	68	73	0	0%	
Parrotfish	Bluebarred Parrotfish	<i>Scarus ghobban</i> sp. complex	65	297	35	362	209	82%	
	Other Parrotfish	Scaridae - undifferentiated	7	18	6	25	17	72%	
Pearl Perch	Northern Pearl Perch	<i>Glaucosoma buergeri</i>	776	160	213	936	55	17%	
	West Australian Dhufish	<i>Glaucosoma hebraicum</i>	58	43	28	101	29	43%	
Pike	Great Barracuda	<i>Sphyaena barracuda</i>	36	111	34	147	56	75%	
	Snook	<i>Sphyaena novaeollandiae</i>	75	426	50	501	219	85%	
	Striped Barracuda	<i>Sphyaena obtusata</i>	69	287	32	356	169	81%	
	Other Pike	Sphyaenidae - undifferentiated	89	73	61	162	42	45%	
Queenfish	Queenfish	251	425	117	675	144	63%		
Rainbow Runner	Rainbow Runner	18	0	17	18	0	0%		
Redfish	Yelloweye Redfish	<i>Centroberyx australis</i>	0	73	0	73	68	100%	
	Sergeant Baker	<i>Aulopus purpurissatus</i>	0	176	0	176	128	100%	
Snappers (King)	Goldband Snapper	<i>Pristipomoides multidentis</i>	2,238	225	661	2,463	86	9%	
	Rosy Snapper	<i>Pristipomoides filamentosus</i>	233	61	82	294	51	21%	
	Sharptooth Snapper	<i>Pristipomoides typus</i>	346	208	204	554	166	38%	



Reporting Group	Common Name	Scientific Name	Kept Number	se	Released Number	se	Total Number	se	% Rel	
Snappers (Tropical)	Brownstripe Snapper	<i>Lutjanus vitta</i>	227	159	60	37	286	165	21%	
	Crimson Snapper	<i>Lutjanus erythropterus</i>	387	185	1,429	774	1,815	940	79%	
	Darktail Snapper	<i>Lutjanus lemniscatus</i>	83	71	50	47	133	118	37%	
	Golden Snapper	<i>Lutjanus johnii</i>	252	143	45	27	297	160	15%	
	Mangrove Jack	<i>Lutjanus argentimaculatus</i>	592	162	831	320	1,423	459	58%	
	Moses' Snapper	<i>Lutjanus russellii</i>	427	129	635	208	1,062	292	60%	
	Red Emperor	<i>Lutjanus sebae</i>	4,525	762	2,129	469	6,654	1,114	32%	
	Ruby Snapper	<i>Etelis carbunculus</i>	464	351	128	100	592	451	22%	
	Saddletail Snapper	<i>Lutjanus malabaricus</i>	164	63	114	74	278	124	41%	
	Stripey Snapper	<i>Lutjanus carponotatus</i>	1,459	309	6,528	1,786	7,988	2,007	82%	
	Other Snapper	<i>Lutjanus</i> spp.	263	116	810	581	1,073	599	75%	
	Sweetlips	Painted Sweetlips	<i>Diagramma labiosum</i>	1,041	376	2,496	982	3,537	1,271	71%
	Tailor	Tailor	<i>Pomatomus saltatrix</i>	1,111	489	681	328	1,792	722	38%
Trevalla	Blue-Eye Trevalla	<i>Hyperoglyphe antarctica</i>	0	0	271	199	271	199	100%	
Trevally	Amberjack	<i>Seriola dumerili</i>	0	0	18	12	18	12	100%	
	Samsonfish	<i>Seriola hippos</i>	12	11	32	19	44	22	73%	
	Yellowtail Kingfish	<i>Seriola lalandi</i>	5	4	0	0	5	4	0%	
	Giant Trevally	<i>Caranx ignobilis</i>	452	121	2,094	618	2,546	632	82%	
	Golden Trevally	<i>Gnathanodon speciosus</i>	803	171	3,020	918	3,823	948	79%	
	Silver Trevally	<i>Pseudocaranx dentex &amp; wrighti</i>	512	243	364	121	876	283	42%	
	Turrum	<i>Carangoides fulvoguttatus</i>	304	121	429	196	733	234	59%	
	Other Trevally	<i>Caranginae</i> spp.	99	47	257	118	356	150	72%	
	Tripletail	Tripletail	<i>Lobotes surinamensis</i>	0	0	42	34	42	34	100%
	Trumpeter	Trumpeter	<i>Latridopsis</i> spp	0	0	458	231	458	231	100%
	Tuna	Dogtooth Tuna	<i>Gymnosarda unicolor</i>	0	0	3	2	3	2	100%
		Mackerel Tuna	<i>Euthynnus affinis</i>	171	60	444	235	615	258	72%
		Northern Bluefin Tuna	<i>Thunnus orientalis</i>	465	230	1,127	818	1,592	1,040	71%
Skipjack Tuna		<i>Katsuwonus pelamis</i>	130	70	180	82	310	140	58%	
Southern Bluefin Tuna		<i>Thunnus maccoyii</i>	21	17	36	30	57	47	64%	
Yellowfin Tuna		<i>Thunnus albacares</i>	415	102	262	74	677	141	39%	
Other Tuna		<i>Scombridae</i> spp. (Sardini & Thunnini)	58	37	60	38	118	53	51%	

Reporting Group	Common Name	Scientific Name	Kept Number	se	Released Number	se	Total Number	se	% Rel	
Tuskfish/ Wrasse	Baldchin Groper	<i>Choerodon rubescens</i>	3,093	585	2,325	549	5,418	1,017	43%	
	Blackspot Tuskfish	<i>Choerodon schoenleinii</i>	868	207	2,295	570	3,163	645	73%	
	Blue Tuskfish	<i>Choerodon cyanodus</i>	666	237	991	251	1,657	433	60%	
	Bluespotted Tuskfish	<i>Choerodon cauteroma</i>	<b>98</b>	<b>70</b>	<b>161</b>	<b>81</b>	<b>260</b>	<b>117</b>	<b>62%</b>	
	Goldspot Pigfish	<i>Bodianus perditio</i>	103	<b>70</b>	<b>12</b>	<b>9</b>	<b>115</b>	<b>71</b>	<b>10%</b>	
	Humphead Maori Wrasse	<i>Cheilinus undulatus</i> <sup>PROTECTED</sup>	0	0	<b>15</b>	<b>14</b>	<b>15</b>	<b>14</b>	<b>100%</b>	
	Purple Tuskfish	<i>Choerodon cephalotes</i>	63	38	189	98	<b>252</b>	<b>119</b>	<b>75%</b>	
	Southern Maori Wrasse	<i>Ophthalmolepis lineolatus</i>	17	15	108	76	125	<b>77</b>	<b>87%</b>	
	Other Wrasse	Labridae - undifferentiated	183	63	<b>985</b>	<b>488</b>	<b>1,168</b>	<b>494</b>	<b>84%</b>	
	Whiting	King George Whiting	<i>Sillaginodes punctata</i>	0	0	<b>91</b>	<b>85</b>	<b>91</b>	<b>85</b>	<b>100%</b>
		School Whiting	<i>Sillago bassensis</i> , <i>vittata</i> & <i>schomburgkii</i>	916	354	<b>82</b>	<b>48</b>	997	367	8%

**Table 10.** Estimated annual catch (total, kept and released numbers) and proportion released/discarded in the West Coast bioregion during 2011–12 by RFBL holders aged five years or older.

se is standard error; values in bold indicate relative standard error >40% (i.e. se >40% of estimate); values in italics indicate <30 diarists recorded catches of the species.

Reporting Group	Common Name	Scientific Name	Kept Number	se	Released Number	se	Total Number	se	% Rel
Gastropod	Roe's Abalone	<i>Haliotis roei</i>	6,543	2,665	197	<b>141</b>	<b>6,739</b>	<b>2,705</b>	3%
	Greenlip Abalone	<i>Haliotis laevigata</i>	<b>3,136</b>	<b>1,243</b>	<b>144</b>	<b>83</b>	3,281	1,289	4%
	Brownlip Abalone	<i>Haliotis rubra conicopora</i>	<b>1,341</b>	<b>740</b>	0	0	<b>1,341</b>	<b>740</b>	0%
Cephalopod	Cuttlefish	<i>Sepia</i> spp.	2,813	474	1,899	518	4,711	714	40%
	Octopus	<i>Octopus</i> spp.	1,752	664	<b>1,213</b>	<b>857</b>	<b>2,965</b>	<b>1,494</b>	41%
	Squid	Order Teuthoidea - undifferentiated	83,925	9,117	4,663	924	88,588	9,570	5%
Prawn	Prawn	134,835	58,391	<b>160</b>	<b>108</b>	<b>134,995</b>	<b>58,391</b>	0%	
Lobster	Western Rock Lobster	<i>Panulirus cygnus</i>	120,035	15,732	72,029	11,182	192,065	25,178	38%
	Southern Rock Lobster	<i>Jasus edwardsii</i>	1,136	483	225	172	1,361	<b>549</b>	17%
	Painted Rock Lobster	<i>Panulirus versicolor</i>	<b>54</b>	<b>51</b>	0	0	<b>54</b>	<b>51</b>	0%
Crab	Blue Swimmer Crab	<i>Portunus armatus</i>	379,640	24,635	424,254	31,656	803,894	53,517	53%
	Mud Crab	<i>Scylla olivacea &amp; serrata</i>	<b>961</b>	<b>472</b>	<b>1,562</b>	<b>1,008</b>	<b>2,522</b>	<b>1,315</b>	62%
Sharks	Bronze Whaler	<i>Carcharhinus brachyurus</i>	517	109	697	147	1,214	192	57%
	Greynose Shark	<i>Carcharias taurus</i>	0	0	<b>40</b>	<b>33</b>	<b>40</b>	<b>33</b>	100%
	Gummy Sharks	<i>Mustelus antarcticus &amp; stevensi</i>	897	214	188	64	1,085	234	17%
	Hammerhead Sharks	Sphymidae - undifferentiated	145	52	243	72	388	94	63%
	Port Jackson Shark	<i>Heterodontus portusjacksoni</i>	0	0	2,148	432	2,148	432	100%
	Sandbar Shark	<i>Carcharhinus plumbeus</i>	<b>34</b>	<b>18</b>	0	0	<b>34</b>	<b>18</b>	0%
	Tiger Shark	<i>Galeocerdo cuvier</i>	<b>18</b>	<b>16</b>	<b>77</b>	<b>31</b>	<b>94</b>	<b>42</b>	81%
	Whaler Sharks	Carcharhinidae - undifferentiated	248	70	590	164	839	180	70%
	Whiskery Shark	<i>Furgaleus macki</i>	118	42	<b>62</b>	<b>30</b>	180	61	34%
	Wobbegong	Orectolobidae - undifferentiated	264	212	1,131	495	1,395	<b>696</b>	81%
	Other Sharks	Other Sharks	393	90	2,271	887	2,664	892	85%
	Rays	Western Shovelnose Ray	<i>Aptychotrema vincentiana</i>	<b>18</b>	<b>17</b>	1,343	444	1,361	444
Other Rays and Skates		Other Rays and Skates	<b>12</b>	<b>11</b>	2,940	482	2,952	482	100%
Barracouta	Barracouta	127	56	<b>167</b>	<b>108</b>	<b>294</b>	<b>148</b>	57%	
Bass Groper	Bass Groper	12	11	18	<b>16</b>	<b>30</b>	<b>20</b>	60%	

Reporting Group	Common Name	Scientific Name	Kept Number	se	Released Number	se	Total Number	se	% Rel
Billfish	Black Marlin	<i>Makaira indica</i>	12	11	161	132	174	132	93%
	Blue Marlin	<i>Makaira nigricans</i>	0	0	10	9	10	9	100%
Bonito	Bonito	<i>Sarda</i> spp.	321	191	599	407	920	584	65%
	Oriental Bonito	<i>Sarda orientalis</i>	355	142	158	81	513	202	31%
Bream	Black Bream	<i>Acanthopagrus butcheri</i>	9,996	2,785	38,156	7,790	48,152	9,957	79%
	Northwest Black Bream	<i>Acanthopagrus palmaris</i>	12	11	121	65	133	71	91%
	Snapper	<i>Pagrus auratus</i>	14,354	1,121	48,539	4,730	62,893	5,379	77%
	Tarwhine	<i>Rhabdosargus sarba</i>	736	165	2,787	657	3,523	735	79%
	Western Yellowfin Bream	<i>Acanthopagrus latus</i>	328	196	735	312	1,062	432	69%
	Other Bream	Sparidae - undifferentiated	91	70	1,620	851	1,711	859	95%
Bream Threadfin	Western Butterfish	<i>Pentapodus vitta</i>	3,084	835	22,309	5,534	25,393	5,674	88%
Butterfish	Other Butterfish	Stromateidae - undifferentiated	163	85	2,450	850	2,613	860	94%
	Catfish	Plotosidae - undifferentiated	12	11	17	12	29	17	58%
Cattfish	Estuary Cobbler	<i>Cnidogobius macrocephalus</i>	175	90	54	37	229	97	24%
	Giant Sea Cattfish	<i>Arius thalassinus</i>	0	0	13	8	13	8	100%
	Other Cattfish	Order Siluriformes - undifferentiated	19	18	23	22	43	29	54%
	Chinamanfish	<i>Symphorus nematophorus</i>	52	36	76	40	128	58	59%
Cobia	Cobia	<i>Rachycentron canadum</i>	66	33	0	0	66	33	0%
	Blackspotted Rockcod	<i>Epinephelus malabaricus</i>	331	118	3,470	973	3,801	981	91%
Cod	Blacktip Rockcod	<i>Epinephelus fasciatus</i>	128	62	0	0	128	62	0%
	Breaksea Cod	<i>Epinephelides armatus</i>	9,949	764	8,164	820	18,113	1,399	45%
	Chinaman Rockcod	<i>Epinephelus rivulatus</i>	336	130	2,009	858	2,346	879	86%
	Eightbar Grouper	<i>Epinephelus octofasciatus</i>	48	35	80	65	128	74	62%
	Frostback Rockcod	<i>Epinephelus bilobatus</i>	0	0	179	165	179	165	100%
	Goldspotted Rockcod	<i>Epinephelus coioides</i>	259	77	2,039	924	2,298	939	89%
	Harlequin Fish	<i>Othos dentex</i>	1,158	287	66	33	1,224	289	5%
	Potato Rockcod	<i>Epinephelus tukula</i>	0	0	36	34	36	34	100%
	Rankin Cod	<i>Epinephelus multinotatus</i>	279	89	524	187	803	225	65%
	Temperate Rockcods	Epinephelidae - undifferentiated	47	27	1,392	917	1,440	918	97%
Yellowspotted Rockcod	<i>Epinephelus areolatus</i>	328	232	884	342	1,212	513	73%	

Reporting Group	Common Name	Scientific Name	Kept Number	se	Released Number	se	Total Number	se	% Rel
Coral Trout	Barcheek Coral Trout	<i>Plectropomus maculatus</i>	81	53	0	0	81	53	0%
	Common Coral Trout	<i>Plectropomus leopardus</i>	1,709	511	1,119	451	2,828	898	40%
	Yellowedge Coronation Trout	<i>Variola louti</i>	0	0	56	30	56	30	100%
Dart	Common Dart	<i>Trachinotus botla</i>	0	0	9	7	9	7	100%
Emperor	Bluespotted Emperor	<i>Lethrinus punctulatus</i>	137	75	144	96	281	158	51%
	Grass Emperor	<i>Lethrinus laticaudis</i>	390	128	1,004	347	1,394	411	72%
	Redthroat Emperor	<i>Lethrinus miniatus</i>	1,101	311	1,139	308	2,240	567	51%
	Robinsons' Seabream	<i>Gymnocranius grandoculis</i>	13	12	19	18	32	22	60%
	Spangled Emperor	<i>Lethrinus nebulosus</i>	1,248	513	3,249	1,145	4,497	1,524	72%
	Yellowtail Emperor	<i>Lethrinus atkinsoni</i>	230	153	121	82	351	174	35%
Flathead	Northern Sand Flathead	<i>Platycephalus endrachtensis</i>	463	189	5,065	1,480	5,528	1,530	92%
	Southern Bluespotted Flathead	<i>Platycephalus specularis</i>	1,599	239	12,085	2,955	13,684	3,044	88%
	Yellowtail Flathead	<i>Platycephalus westraliae</i>	1,082	218	8,511	1,923	9,593	1,997	89%
	Other Flathead	Platycephalidae - undifferentiated	1,032	202	12,261	3,796	13,294	3,883	92%
Flounder	Smalltooth Flounder	<i>Pseudorhombus jernynsii</i>	156	60	327	131	482	146	68%
	Other Flatfish	Bothidae & Pleuronectidae spp.	245	77	2,864	2,209	3,110	2,260	92%
Foxfish	Foxfish	<i>Bodianus frenchii</i>	973	167	540	125	1,513	219	36%
Garfish	Robust Garfish	<i>Hemiramphus robustus</i>	1,975	780	42	28	2,017	781	2%
	Southern Garfish	<i>Hyporhamphus melanochir</i>	16,168	3,440	2,761	884	18,929	3,808	15%
	Unspecified Garfish	Hemiramphidae - undifferentiated	3,995	1,137	247	114	4,242	1,200	6%
Goatfish	Bluespotted Goatfish	<i>Upeneichthys vlamingii</i>	335	126	2,269	800	2,604	811	87%
Grunter	Western Striped Grunter	<i>Pelates octolineatus</i>	0	0	14,322	4,571	14,322	4,571	100%
	Western Sooty Grunter	<i>Hephaestus jenkinsi</i>	0	0	851	438	851	438	100%
Grunter Bream	Grunter Bream	Haemulidae - undifferentiated	1,504	850	15,641	4,089	17,145	4,305	91%
Gurnard	Gurnard		361	132	2,610	500	2,971	524	88%
Javelin	Barred Javelin	<i>Pomadasyus kaakan</i>	0	0	12	12	12	12	100%
	Blotched Javelin	<i>Pomadasyus maculatus</i>	10	9	211	196	221	197	95%
Jewfish/ Mulloway	Mulloway	<i>Argyrosomus japonicus</i>	807	183	2,983	1,055	3,790	1,107	79%
Leatherjacket	Horseshoe Leatherjacket	<i>Meuschenia hippocrepis</i>	512	154	2,016	764	2,528	829	80%
	Sixspine Leatherjacket	<i>Meuschenia freycineti</i>	108	42	1,992	863	2,100	869	95%
	Leatherjacket	Monacanthidae - undifferentiated	787	195	5,682	2,051	6,469	2,071	88%

Reporting Group	Common Name	Scientific Name	Kept Number	Released Number	se	Total Number	se	% Rel
Lizardfish/Grinners	Lizardfish/Grinners	Bathysauridae and Synodontidae - undifferentiated	18	17	83	145	84	87%
Longtom	Longtom	Belontiidae - undifferentiated	21	19	30	50	28	59%
Mackerel	Blue Mackerel	<i>Scomber australasicus</i>	1,698	798	689	2,387	855	29%
	Grey Mackerel	<i>Scomberomorus semifasciatus</i>	33	22	0	33	22	0%
	School Mackerel	<i>Scomberomorus queenstandicus</i>	139	104	296	435	205	68%
	Shark Mackerel	<i>Grammatocynus bicarinatus</i>	130	61	150	280	97	54%
	Spanish Mackerel	<i>Scomberomorus commerson</i>	2,994	437	918	3,912	552	23%
	Spotted Mackerel	<i>Scomberomorus munroi</i>	89	43	0	89	43	0%
	Wahoo	<i>Acanthocybium solandri</i>	9	9	0	9	9	0%
	Other Mackerel	Scombridae - undifferentiated	67	40	1,344	1,411	1,197	95%
Mahi Mahi	Mahi Mahi	<i>Coryphaena</i> spp.	721	232	379	1,100	367	34%
Morwong	Blue Morwong	<i>Nemadactylus valenciennesi</i>	1,348	206	527	1,875	254	28%
	Dusky Morwong	<i>Dactylophora nigricans</i>	83	43	5	88	43	6%
	Other Morwong	Cheilodactylidae - undifferentiated	109	62	0	109	62	0%
Mullet	Sea Mullet	<i>Mugil cephalus</i>	7,372	4,177	1,275	8,647	4,416	15%
	Yelloweye Mullet	<i>Aldrichetta forsteri</i>	5,417	4,069	18	5,435	4,069	0%
	Other Mullet	Mugilidae - undifferentiated	4,227	2,400	124	4,351	2,408	3%
Parrotfish	Bluebarred Parrotfish	<i>Scarus ghobban</i> sp. complex	558	174	1,426	1,984	423	72%
	Other Parrotfish	Scaridae - undifferentiated	276	118	1,776	2,052	739	87%
Pearl Perch	West Australian Dhufish	<i>Glaucosoma hebraicum</i>	16,495	1,301	26,031	42,527	3,788	61%
Pike	Snook	<i>Sphyræna novaehollandiae</i>	3,227	1,255	1,556	4,783	1,377	33%
	Striped Barracuda	<i>Sphyræna obtusata</i>	158	82	268	426	177	63%
	Other Pike	Sphyrænidae - undifferentiated	4,901	1,823	1,844	6,745	1,985	27%
Queenfish	Queenfish	<i>Scomberoides</i> spp.	119	42	45	164	51	27%
Rainbow Runner	Rainbow Runner	<i>Elagatis bipinnulata</i>	0	0	12	12	11	100%
Redfish	Bight Redfish	<i>Centroberyx gerrardi</i>	928	162	1,202	2,130	442	56%
	Swallowtail	<i>Centroberyx lineatus</i>	301	97	561	862	199	65%
	Yelloweye Redfish	<i>Centroberyx australis</i>	60	32	6	66	33	10%
Salmon/Herring	Australian Herring	<i>Arripis georgianus</i>	183,940	18,828	30,056	213,996	20,339	14%
	Western Australian Salmon	<i>Arripis truttaceus</i>	1,187	545	725	1,912	687	38%

Reporting Group	Common Name	Scientific Name	Kept Number	se	Released Number	se	Total Number	se	% Rel	
Sand Bass	Sand Bass	<i>Psammoperca waigiensis</i>	242	180	36	24	278	181	13%	
Sergeant Baker	Sergeant Baker	<i>Aulopus purpurissatus</i>	1,627	339	3,640	635	5,268	780	69%	
Snappers (King)	Goldband Snapper	<i>Pristipomoides multidens</i>	167	154	0	0	167	154	0%	
Snappers (Tropical)	Crimson Snapper	<i>Lutjanus erythropterus</i>	55	45	112	77	168	120	67%	
	Darktail Snapper	<i>Lutjanus lemniscatus</i>	8	8	0	0	8	8	0%	
	Golden Snapper	<i>Lutjanus johnii</i>	122	76	47	32	168	92	28%	
	Red Emperor	<i>Lutjanus sebae</i>	125	41	39	26	165	51	24%	
	Saddletail Snapper	<i>Lutjanus malabaricus</i>	59	45	29	27	88	53	33%	
	Stripey Snapper	<i>Lutjanus carponotatus</i>	486	180	1,392	474	1,879	573	74%	
	Other Snapper	<i>Lutjanus</i> spp.	216	88	236	101	452	159	52%	
	Sweep	Banded Sweep	<i>Scorpius georgiana</i>	444	159	460	117	905	221	51%
	Sea Sweep	<i>Scorpius aequipinnis</i>	805	204	635	173	1,440	269	44%	
Sweetlips	Painted Sweetlips	<i>Diagramma labiosum</i>	498	143	555	238	1,053	296	53%	
Tailor	Tailor	<i>Pomatomus saltatrix</i>	21,092	5,868	21,783	6,168	42,875	11,323	51%	
Trevalla	Blue-Eye Trevalla	<i>Hyperoglyphe antarctica</i>	18	17	0	0	18	17	0%	
Trevally	Amberjack	<i>Seriola dumerili</i>	111	58	622	331	733	372	85%	
	Samsonfish	<i>Seriola hippos</i>	1,437	195	9,349	1,733	10,786	1,800	87%	
	Yellowtail Kingfish	<i>Seriola lalandi</i>	908	394	1,158	488	2,066	747	56%	
	Giant Trevally	<i>Caranx ignobilis</i>	74	49	24	22	98	54	24%	
	Golden Trevally	<i>Gnathanodon speciosus</i>	119	59	594	237	714	249	83%	
	Silver Trevally	<i>Pseudocaranx dentex &amp; wrighti</i>	54,573	4,776	37,554	4,469	92,127	8,129	41%	
	Turum	<i>Carangoides fulvoguttatus</i>	0	0	37	35	37	35	100%	
	Other Trevally	<i>Caranginae</i> spp.	49	28	30	20	79	35	38%	
	Trumpeter	Trumpeter	<i>Latridopsis</i> spp.	1,981	1,333	8,433	2,189	10,414	2,684	81%
	Tuna	Mackerel Tuna	<i>Euthynnus affinis</i>	101	46	78	44	179	75	43%
		Northern Bluefin Tuna	<i>Thunnus orientalis</i>	257	95	42	22	299	98	14%
		Skipjack Tuna	<i>Katsuwonus pelamis</i>	2,070	534	952	379	3,023	791	32%
Southern Bluefin Tuna		<i>Thunnus maccoyii</i>	367	98	216	108	583	169	37%	
Yellowfin Tuna		<i>Thunnus albacares</i>	1,061	260	928	366	1,989	495	47%	
Other Tuna		<i>Scorbridae</i> spp. (Sardini & Thunnini)	307	146	20	14	327	154	6%	

Reporting Group	Common Name	Scientific Name	Kept Number	se	Released Number	se	Total Number	se	% Rel	
Tuskfish/ Wrasse	Baldchin Groper	<i>Choerodon rubescens</i>	12,271	1,219	6,208	1,299	18,479	2,321	34%	
	Blackspot Tuskfish	<i>Choerodon schoenleinii</i>	<b>218</b>	<b>148</b>	0	0	<b>218</b>	<b>148</b>	0%	
	Blue Tuskfish	<i>Choerodon cyanodus</i>	206	80	<b>273</b>	<b>210</b>	<b>479</b>	<b>247</b>	57%	
	Bluespotted Tuskfish	<i>Choerodon cauteroma</i>	0	0	<b>13</b>	<b>12</b>	<b>13</b>	<b>12</b>	100%	
	Brownspotted Wrasse	<i>Notolabrus parilus</i>	4,912	1,535	21,308	3,205	26,220	3,920	81%	
	Goldspot Pigfish	<i>Bodianus perditio</i>	<b>4</b>	<b>4</b>	0	0	<b>4</b>	<b>4</b>	0%	
	Humphead Maori Wrasse	<i>Cheilinus undulatus</i> <sup>PROTECTED</sup>	29	20	530	248	559	250	95%	
	Purple Tuskfish	<i>Choerodon cephalotes</i>	<b>25</b>	<b>18</b>	<b>35</b>	<b>33</b>	<b>60</b>	<b>50</b>	58%	
	Southern Maori Wrasse	<i>Ophthalmolepis lineolatus</i>	1,106	276	9,097	1,580	10,203	1,651	89%	
	Western Blue Groper	<i>Achoerodus gouldii</i>	167	57	<b>12</b>	<b>11</b>	179	58	7%	
	Western King Wrasse	<i>Coris auricularis</i>	9,142	2,095	36,925	4,499	46,067	5,697	80%	
	Other Wrasse	Labridae - undifferentiated	1,435	335	14,391	2,163	15,826	2,232	91%	
	Whiting	King George Whiting	<i>Sillaginodes punctata</i>	48,678	7,354	20,238	3,054	68,916	9,111	29%
		School Whiting	<i>Sillago bassensis</i> , <i>vittata</i> & <i>schomburgkii</i>	238,411	21,096	60,121	6,502	298,532	25,869	20%
Yellowtail Scad	Western Trumpeter Whiting	<i>Sillago burrus</i>	<b>1,272</b>	<b>743</b>	2,112	779	3,384	1,134	62%	
	Other Whiting		4,479	1,541	1,821	597	6,300	1,868	29%	
Yellowtail Scad	Yellowtail Scad	<i>Trachurus novaezelandiae</i>	704	228	2,576	747	3,280	836	79%	
Western Blue Devil	Western Blue Devil	<i>Paraplesiops sinclairi</i>	<b>9</b>	<b>9</b>	142	51	151	52	94%	



**Table 11.** Estimated annual catch (total, kept and released numbers) and proportion released/discarded in the South Coast bioregion during 2011–12 by RFBL holders aged five years or older.

se is standard error; values in bold indicate relative standard error >40% (i.e. se >40% of estimate); values in italics indicate <30 diarists recorded catches of the species.

Reporting Group	Common Name	Scientific Name	Kept Number	se	Released Number	se	Total Number	se	% Rel
Gastropod	Roe's Abalone	<i>Haliotis roei</i>	195	135	0	0	195	135	0%
	Greenlip Abalone	<i>Haliotis laevigata</i>	1,733	1,073	60	55	1,793	1,125	3%
Cephalopod	Cuttlefish	<i>Sepia</i> spp.	471	176	219	75	690	219	32%
	Octopus	<i>Octopus</i> spp.	83	37	36	34	120	50	30%
Prawn	Squid	Order Teuthoidea - undifferentiated	14,635	2,901	1,089	458	15,724	3,275	7%
	Prawn	Penaeoidea & Caridea - undifferentiated	408	344	0	0	408	344	0%
Lobster	Western Rock Lobster	<i>Panulirus cygnus</i>	1,462	917	95	88	1,557	986	6%
	Southern Rock Lobster	<i>Jasus edwardsii</i>	170	133	42	26	212	138	20%
Crab	Blue Swimmer Crab	<i>Portunus armatus</i>	12,359	3,069	4,405	1,378	16,765	3,996	26%
	Sand Crab	<i>Ovalipes</i> spp.	50	38	31	23	81	62	38%
	Mud Crab	<i>Scylla olivacea &amp; serrata</i>	75	66	0	0	75	66	0%
	Bronze Whaler	<i>Carcharhinus brachyurus</i>	46	26	19	18	65	32	30%
Sharks	Gummy Sharks	<i>Mustelus antarcticus &amp; stevensi</i>	229	62	54	35	284	87	19%
	Hammerhead Sharks	Sphyrnidae - undifferentiated	9	7	9	8	18	11	50%
	Port Jackson Shark	<i>Heterodontus portusjacksoni</i>	0	0	72	26	72	26	100%
	School Shark	<i>Galeorhinus galeus</i>	5	4	0	0	5	4	0%
	Whaler Sharks	Carcharhinidae - undifferentiated	0	0	14	11	14	11	100%
	Whiskery Shark	<i>Furgaleus macki</i>	65	30	0	0	65	30	0%
	Wobbegong	Orectolobidae - undifferentiated	22	14	0	0	22	14	0%
	Other Sharks		16	7	55	46	71	46	78%
	Western Shovelnose Ray	<i>Aptychotrema vincentiana</i>	0	0	25	16	25	16	100%
	Other Rays and Skates		0	0	51	21	51	21	100%
Barracouta		1,157	942	490	429	1,647	1,371	30%	
Bonito	Bonito	<i>Sarda spp.</i>	261	145	51	43	312	169	16%
	Oriental Bonito	<i>Sarda orientalis</i>	151	75	4	3	156	75	3%

Reporting Group	Common Name	Scientific Name	Kept Number	se	Released Number	se	Total Number	se	% Rel
Bream	Black Bream	<i>Acanthopagrus butcheri</i>	22,839	6,205	48,694	9,391	71,533	14,895	68%
	Snapper	<i>Pagrus auratus</i>	3,296	797	8,246	1,670	11,542	1,932	71%
	Tarwhine	<i>Rhabdosargus sarba</i>	<b>1,118</b>	<b>542</b>	<b>4,986</b>	<b>2,662</b>	<b>6,104</b>	<b>3,144</b>	82%
	Western Yellowfin Bream	<i>Acanthopagrus latus</i>	<b>214</b>	<b>198</b>	<b>0</b>	<b>0</b>	<b>214</b>	<b>198</b>	0%
	Other Bream	Sparidae - undifferentiated	<b>46</b>	<b>34</b>	<b>1,270</b>	<b>1,091</b>	<b>1,316</b>	<b>1,124</b>	97%
Butterfish	Other Butterfish	Stromateidae - undifferentiated	<b>0</b>	<b>0</b>	<b>91</b>	<b>85</b>	<b>91</b>	<b>85</b>	100%
Catfish	Estuary Cobbler	<i>Cnidogobius macrocephalus</i>	<b>47</b>	<b>35</b>	<b>218</b>	<b>205</b>	<b>264</b>	<b>208</b>	82%
Cod	Breaksea Cod	<i>Epinephelides armatus</i>	8,214	1,317	3,691	613	11,905	1,820	31%
	Eightbar Grouper	<i>Epinephelus octofasciatus</i>	<b>17</b>	<b>10</b>	<b>0</b>	<b>0</b>	<b>17</b>	<b>10</b>	0%
	Harlequin Fish	<i>Othos dentex</i>	1,236	258	<b>426</b>	<b>273</b>	1,662	399	26%
	Temperate Rockcods	Epinephelidae - undifferentiated	<b>95</b>	<b>70</b>	577	149	672	172	86%
	Yellowspotted Rockcod	<i>Epinephelus areolatus</i>	20	17	180	<b>82</b>	<b>201</b>	<b>84</b>	90%
Emperor	Robinsons' Seabream	<i>Gymnocranius grandoculis</i>	<b>16</b>	<b>14</b>	<b>31</b>	<b>27</b>	<b>47</b>	<b>41</b>	67%
	Yellowtail Emperor	<i>Lethrinus atkinsoni</i>	31	19	61	<b>38</b>	<b>92</b>	<b>43</b>	67%
	Other Emperor	Lethrinidae - undifferentiated	<b>95</b>	<b>45</b>	<b>14</b>	<b>11</b>	<b>109</b>	<b>50</b>	13%
Flathead	Southern Bluespotted Flathead	<i>Platycephalus speculator</i>	1,995	456	<b>2,750</b>	<b>1,300</b>	4,745	1,717	58%
Flounder	Smalltooth Flounder	<i>Pseudorhombus jerynsii</i>	<b>70</b>	<b>29</b>	85	33	155	57	55%
	Other Flatfish	Bothidae & Pleuronectidae spp.	93	44	58	<b>33</b>	150	55	38%
Foxfish	Foxfish	<i>Bodianus frenchii</i>	<b>554</b>	<b>270</b>	<b>68</b>	<b>37</b>	<b>622</b>	<b>273</b>	11%
Garfish	Robust Garfish	<i>Hemiramphus robustus</i>	418	392	57	<b>38</b>	<b>474</b>	<b>427</b>	12%
	Southern Garfish	<i>Hyporhamphus melanochir</i>	<b>2,375</b>	<b>1,268</b>	<b>1,396</b>	<b>790</b>	<b>3,770</b>	<b>2,014</b>	37%
	Unspecified Garfish	Hemiramphidae - undifferentiated	73	68	146	<b>86</b>	<b>219</b>	<b>110</b>	67%
Goatfish	Bluespotted Goatfish	<i>Upeneichthys vlamingii</i>	<b>47</b>	<b>21</b>	717	265	764	266	94%
Grunter	Western Striped Grunter	<i>Palates octolineatus</i>	0	0	1,076	417	1,076	417	100%
Grunter Bream	Grunter Bream	Haemulidae - undifferentiated	<b>0</b>	<b>0</b>	<b>155</b>	<b>77</b>	<b>155</b>	<b>77</b>	100%
Gurnard	Gurnard		73	32	232	<b>95</b>	305	107	76%
Hapuku	Hapuku	<i>Polyprion oxygeneios</i>	<b>66</b>	<b>45</b>	<b>0</b>	<b>0</b>	<b>66</b>	<b>45</b>	0%
Jewfish/Mulloway	Mulloway	<i>Argyrosomus japonicus</i>	<b>17</b>	<b>11</b>	<b>0</b>	<b>0</b>	<b>17</b>	<b>11</b>	0%

Reporting Group	Common Name	Scientific Name	Kept Number	se	Released Number	se	Total Number	se	% Rel
Leatherjacket	Horseshoe Leatherjacket	<i>Meuschenia hippocrepis</i>	258	98	1,449	490	1,707	543	85%
	Sixspine Leatherjacket	<i>Meuschenia freycineti</i>	416	161	996	267	1,411	355	71%
	Leatherjacket	Monacanthidae - undifferentiated	777	234	2,697	879	3,474	1,040	78%
Mackerel	Blue Mackerel	<i>Scomber australasicus</i>	194	107	192	115	387	168	50%
	School Mackerel	<i>Scomberomorus queenstandicus</i>	87	69	41	34	128	103	32%
	Shark Mackerel	<i>Grammatocynus bicarinatus</i>	20	17	0	0	20	17	0%
	Other Mackerel	Scombridae - undifferentiated	23	12	0	0	23	12	0%
Mahi Mahi	Mahi Mahi	<i>Coryphaena</i> spp.	10	9	0	0	10	9	0%
Morwong	Blue Morwong	<i>Nemadactylus valenciennesi</i>	4,407	659	458	151	4,864	734	9%
	Other Morwong	Cheilodactylidae - undifferentiated	24	18	0	0	24	18	0%
Mullet	Sea Mullet	<i>Mugil cephalus</i>	110	87	51	43	161	97	32%
	Yelloweye Mullet	<i>Aldrichetta forsteri</i>	523	349	128	85	651	362	20%
	Other Mullet	Mugilidae - undifferentiated	192	129	41	24	233	138	18%
Parrotfish	Bluebarred Parrotfish	<i>Scarus ghobban</i> sp. complex	0	0	51	43	51	43	100%
	Other Parrotfish	Scaridae - undifferentiated	71	66	411	184	483	222	85%
Pearl Perch	West Australian Dhufish	<i>Glaucosoma hebraicum</i>	849	335	369	156	1,218	457	30%
Pike	Snook	<i>Sphyaena novaehollandiae</i>	708	222	255	86	962	250	26%
	Striped Barracuda	<i>Sphyaena obtusata</i>	69	31	10	9	79	32	12%
	Other Pike	Sphyaenidae - undifferentiated	2,400	1,270	954	683	3,354	1,849	28%
	Queenfish	<i>Scomberoides</i> spp.	215	78	36	26	251	97	14%
Redfish	Bight Redfish	<i>Centroberyx gerrardi</i>	10,088	1,418	5,013	779	15,101	2,044	33%
	Swallowtail	<i>Centroberyx lineatus</i>	2,654	519	2,368	431	5,022	803	47%
	Yelloweye Redfish	<i>Centroberyx australis</i>	54	49	11	7	65	50	17%
Salmon/Herring	Australian Herring	<i>Arripis georgianus</i>	28,443	5,162	7,282	1,302	35,724	5,726	20%
	Western Australian Salmon	<i>Arripis truttaceus</i>	2,174	505	1,491	480	3,665	921	41%
Sergeant Baker	Sergeant Baker	<i>Aulopus purpurissatus</i>	671	173	2,171	551	2,842	594	76%
	Other Snapper	<i>Lutjanus</i> spp.	487	207	132	82	618	268	21%
Sweep	Banded Sweep	<i>Scorpius georgiana</i>	458	126	646	373	1,105	402	58%
	Sea Sweep	<i>Scorpius aequipinnis</i>	2,398	675	632	145	3,030	708	21%
Sweetlips	Painted Sweetlips	<i>Diagramma labiosum</i>	63	40	3	2	66	40	4%
Tailor	Tailor	<i>Pomatomus saltatrix</i>	18	17	322	205	340	206	95%

Reporting Group	Common Name	Scientific Name	Kept Number	se	Released Number	se	Total Number	se	% Rel
Trevalla	Blue-Eye Trevalla	<i>Hyperoglyphe antarctica</i>	0	0	10	9	10	9	100%
Trevally	Samsonfish	<i>Seriola hippos</i>	670	148	568	137	1,238	216	46%
	Yellowtail Kingfish	<i>Seriola lalandi</i>	504	222	430	192	934	385	46%
	Golden Trevally	<i>Gnathanodon speciosus</i>	71	54	0	0	71	54	0%
	Silver Trevally	<i>Pseudocaranx dentex &amp; wrighti</i>	9,797	1,206	18,936	2,582	28,733	3,380	66%
	Other Trevally	<i>Caranginae</i> spp.	219	148	265	200	484	255	55%
Trumpeter	Trumpeter	<i>Latridopsis</i> spp.	0	0	2,276	1,430	2,276	1,430	100%
Tuna	Mackerel Tuna	<i>Euthynnus affinis</i>	53	36	31	19	84	45	36%
	Northern Bluefin Tuna	<i>Thunnus orientalis</i>	13	12	0	0	13	12	0%
	Skipjack Tuna	<i>Katsuwonus pelamis</i>	443	199	171	122	614	311	28%
	Southern Bluefin Tuna	<i>Thunnus maccoyii</i>	494	105	64	27	558	124	12%
	Yellowfin Tuna	<i>Thunnus albacares</i>	10	9	0	0	10	9	0%
Tuskfish/ Wrasse	Brownspotted Wrasse	<i>Notolabrus parilus</i>	752	284	6,131	1,458	6,883	1,549	89%
	Humphead Maori Wrasse	<i>Chelinus undulatus</i> <sup>PROTECTED</sup>	0	0	315	244	315	244	100%
	Southern Maori Wrasse	<i>Ophthalmolepis lineolatus</i>	196	126	1,497	374	1,693	430	88%
	Western Blue Groper	<i>Achoerodus gouldii</i>	393	136	29	14	422	138	7%
	Western King Wrasse	<i>Coris auricularis</i>	238	107	3,870	1,089	4,107	1,117	94%
	Other Wrasse	Labridae - undifferentiated	50	22	1,547	435	1,597	436	97%
Whiting	King George Whiting	<i>Sillaginodes punctata</i>	59,011	11,211	40,995	8,518	100,006	19,212	41%
	School Whiting	<i>Sillago bassensis, vittata &amp; schomburgkii</i>	16,731	3,308	5,811	1,298	22,542	4,175	26%
	Other Whiting		709	341	1,179	619	1,888	728	62%
Yellowtail Scad	Yellowtail Scad	<i>Trachurus novaezelandiae</i>	761	347	500	236	1,261	420	40%
Western Blue Devil	Western Blue Devil	<i>Paraplesiops sinclairi</i>	41	15	76	28	118	38	65%

## 8.0 Harvest Weights

This section provides an overview of the estimated harvest weights of the recreational catch in each bioregion. The estimated annual catch (kept numbers), average weight and estimated harvest weight for the top 10 scalefish species/species groupings are presented for each bioregion (Table 12), along with the estimated annual catch (kept numbers), average weight and estimated harvest weight for the dominant 15 species in the West Coast Demersal Scalefish Fishery (Table 13), and the top 10 demersal scalefish species/species groupings in the North, Gascoyne and South Coast boregions (Table 14).

Extrapolation of recreational catch by numbers to catch estimates by weight requires estimates of average weights for recreational species, which are influenced by sample design, management, and biological/environmental factors. These have been obtained from concurrent Boat Ramp Surveys, or long-term averages from previous Boat Ramp Surveys or charter logbooks. A table of the estimated average weights for key species taken by RFBL holders aged five years or older during 2011–12 is given Appendix 1.

**Table 12.** Estimated annual catch (kept numbers), average weight and estimated harvest weight for the top 10 scalefish species/species groupings during 2011–12 by RFBL holders aged five years or older.

se is standard error; values in bold indicate relative standard error >40% (i.e. se >40% of estimate); values in italics indicate <30 diarists recorded catches of the species.

	Estimated Catch (kept numbers)	Average weight (kg)	Estimated harvest (tonnes)	se
<b>North Coast</b>				
Barramundi	2,077	4.061 <sup>C</sup>	8.435	2.680
Rankin Cod	2,393	2.994 <sup>S</sup>	7.165	1.078
Barcheek Coral Trout	4,702	2.382 <sup>S</sup>	11.200	1.567
Grass Emperor	12,018	1.340 <sup>B</sup>	16.104	2.968
Spangled Emperor	7,107	2.084 <sup>S</sup>	14.811	1.930
Spanish Mackerel	3,794	6.904 <sup>S</sup>	26.194	3.659
Mangrove Jack	3,297	0.822 <sup>S</sup>	2.710	0.468
Red Emperor	2,698	3.441 <sup>S</sup>	9.284	1.359
Stripey Snapper	8,497	0.602 <sup>S</sup>	5.115	1.044
Blackspot Tuskfish	2,310	2.684 <sup>S</sup>	6.200	1.275
<b>Gascoyne Coast</b>				
Snapper	10,867	2.459 <sup>B</sup>	26.722	3.524
Chinaman Rockcod	<b>6,201</b>	0.524 <sup>B</sup>	<b>3.249</b>	<b>1.295</b>
Rankin Cod	4,837	2.994 <sup>S</sup>	14.482	2.162
Barcheek Coral Trout	1,973	2.382 <sup>S</sup>	4.700	0.953
Grass Emperor	15,538	0.961 <sup>B</sup>	14.932	2.035
Redthroat Emperor	7,527	1.088 <sup>B</sup>	8.189	1.231
Spangled Emperor	16,884	2.093 <sup>B</sup>	35.338	4.751
Spanish Mackerel	3,078	6.904 <sup>S</sup>	21.251	2.796
Red Emperor	4,525	3.441 <sup>S</sup>	15.571	2.622
Baldchin Groper	3,093	2.368 <sup>S</sup>	7.324	1.385

	Estimated Catch (kept numbers)	Average weight (kg)	Estimated harvest (tonnes)	se
<b>West Coast</b>				
Snapper	14,354	2.315 <sup>B</sup>	33.230	2.595
Breaksea Cod	9,949	1.031 <sup>S</sup>	10.257	0.788
Spanish Mackerel	2,994	6.904 <sup>S</sup>	20.671	3.017
West Australian Dhufish	16,495	4.485 <sup>B</sup>	73.980	5.835
Australian Herring	183,940	0.140 <sup>B</sup>	25.752	2.636
Tailor	21,092	0.652 <sup>S</sup>	13.752	3.826
Silver Trevally	54,573	0.468 <sup>B</sup>	25.540	2.235
Baldchin Groper	12,271	2.337 <sup>B</sup>	28.677	2.849
King George Whiting	48,678	0.312 <sup>B</sup>	15.188	2.294
School Whiting	238,411	0.097 <sup>S</sup>	23.126	2.046
<b>South Coast</b>				
Black Bream	22,839	0.312 <sup>B</sup>	7.126	1.936
Snapper	3,296	2.846 <sup>B</sup>	9.380	2.268
Breaksea Cod	8,214	1.031 <sup>S</sup>	8.469	1.358
Blue Morwong	4,407	2.717 <sup>S</sup>	11.974	1.791
West Australian Dhufish	849	4.536 <sup>S</sup>	3.851	1.520
Australian Herring	25,443	0.129 <sup>B</sup>	3.669	0.666
Bight Redfish	10,088	1.171 <sup>S</sup>	11.813	1.660
Western Australian Salmon	2,174	3.135 <sup>B</sup>	6.815	1.583
Silver Trevally	9,797	0.518 <sup>S</sup>	5.075	0.625
King George Whiting	59,011	0.196 <sup>B</sup>	11.566	2.197

Average weights where: <sup>B</sup> is the bioregion estimate from Appendix 1, <sup>S</sup> is the state-wide estimate from Appendix 1, <sup>C</sup> unpublished Charter data, <sup>N</sup> NRFS estimate, n/a is not available

The Integrated Fisheries Management Plan for the West Coast Demersal Scalefish utilised estimates of recreational catch by weight from surveys conducted in 2005/06 (Department of Fisheries 2010). These estimates have been determined from the current survey (Table 12). Average weights from concurrent Boat Ramp Surveys (see Appendix 1), or 4 year averages from Boat Ramp Surveys conducted between 2005/06–2009/10 (unpublished data) were applied to the estimated catch (kept numbers) for the West Coast Demersal Scalefish Fishery to determine estimated harvest (tonnes).

The estimated harvest weights for the West Coast Demersal Scalefish Fishery (Table 12) includes: the top commercial and recreational species, demersal species where boat based catches predominate, and species groupings for comparisons with the commercial catches. The Emperor grouping includes 5 species: Bluespotted Emperor (*Lethrinus punctulatus*), Grass Emperor (*L. laticaudis*), Redthroat Emperor (*L. miniatus*), Spangled Emperor (*L. nebulosus*) and Yellowtail Emperor (*L. atkinsoni*). The 'Bight Redfish' grouping includes Bight Redfish (*Centroberyx gerrardi*), Swallowtail (*C. lineatus*) and Yelloweye Redfish (*C. australis*).

The estimated harvest weight for the top 10 demersal scalefish species/species groupings in the North Coast, Gascoyne Coast and South Coast Bioregions is given in Table 14.

**Table 13.** Estimated annual catch (kept numbers), average weight and estimated harvest weight for the dominant 15 species in the West Coast Demersal Scalefish Fishery during 2011–12 by RFBL holders aged five years or older.

se is standard error; values in bold indicate relative standard error >40% (i.e. se >40% of estimate); values in italics indicate <30 diarists recorded catches of the species.

Indicator Species	Estimated Catch (kept numbers)	Average weight (kg)	Estimated harvest (tonnes)	se
Baldchin Groper	12,271	2.337 <sup>B</sup>	28.677	2.847
Bass Groper	12	n/a	<1	<1
Bight Redfish	1,288	1.171 <sup>S</sup>	1.508	0.252
Blue Morwong	1,348	2.717 <sup>S</sup>	3.663	0.560
Blue-Eye Trevalla	18	n/a	<1	<1
Breaksea Cod	9,949	1.031 <sup>S</sup>	10.257	0.788
Eightbar Grouper	<b>48</b>	5.270 <sup>C</sup>	<b>0.253</b>	<b>0.184</b>
Emperor	3,119	1.18 <sup>C</sup>	3.680	0.786
Foxfish	973	0.811 <sup>S</sup>	0.789	0.135
Hapuku	0	n/a	0	0
Ruby Snapper	0	n/a	0	0
Sea Sweep	805	1.252 <sup>S</sup>	1.008	0.255
Sergeant Baker	1,627	0.940 <sup>S</sup>	1.529	0.319
Snapper	14,354	2.315 <sup>B</sup>	33.230	2.595
West Australian Dhufish	16,495	4.485 <sup>B</sup>	73.980	5.835
<b>Total WCDSF Suite</b>	62,307		158.574	7.122

Average weights where: <sup>B</sup> is the bioregion estimate from Appendix 1, <sup>S</sup> is the state-wide estimate from Appendix 1, <sup>C</sup> unpublished data, n/a is not available

**Table 14.** Estimated annual catch (kept numbers), average weight and estimated harvest weight for the top 10 demersal scalefish species/species groupings during 2011–12 by RFBL holders aged five years or older (excluding West Coast Bioregion, refer to Table 7).

se is standard error; values in bold indicate relative standard error >40% (i.e. se >40% of estimate); values in italics indicate <30 diarists recorded catches of the species.

	Estimated Catch (kept numbers)	Average weight (kg)	Estimated harvest (tonnes)	se
<b>North Coast</b>				
Goldspotted Rockcod	1,489	2.009 <sup>S</sup>	2.991	0.671
Rankin Cod	2,393	2.994 <sup>S</sup>	7.165	1.078
Barcheek Coral Trout	4,702	2.382 <sup>S</sup>	11.200	1.567
Grass Emperor	12,018	1.340 <sup>B</sup>	16.104	2.968
Spangled Emperor	7,107	2.084 <sup>S</sup>	14.811	1.930
Mangrove Jack	3,297	0.822 <sup>B</sup>	2.710	0.468
Red Emperor	2,698	3.441 <sup>S</sup>	9.284	1.359
Stripey Snapper	8,497	0.602 <sup>S</sup>	5.115	1.044
Golden Trevally	1,606	0.815 <sup>B</sup>	1.309	0.249
Blackspot Tuskfish	2,310	2.684 <sup>S</sup>	6.200	1.275
<b>Gascoyne Coast</b>				
Snapper	10,867	2.459 <sup>A</sup>	26.722	3.524
Chinaman Rockcod	<b>6,201</b>	0.524 <sup>A</sup>	<b>3.249</b>	<b>1.295</b>
Goldspotted Rockcod	1,562	2.009 <sup>B</sup>	3.138	0.687
Rankin Cod	4,837	2.994 <sup>B</sup>	14.482	2.162
Barcheek Coral Trout	1,973	2.382 <sup>B</sup>	4.700	0.953
Grass Emperor	15,538	0.961 <sup>A</sup>	14.932	2.035
Redthroat Emperor	7,527	1.088 <sup>A</sup>	8.189	1.231
Spangled Emperor	16,884	2.093 <sup>A</sup>	35.338	4.751
Red Emperor	4,525	3.441 <sup>B</sup>	15.571	2.622
Baldchin Groper	3,093	2.368 <sup>B</sup>	7.324	1.385
<b>South Coast</b>				
Snapper	3,296	2.846 <sup>B</sup>	9.380	2.268
Breaksea Cod	8,214	1.031 <sup>S</sup>	8.469	1.358
Harlequin Fish	1,236	1.401 <sup>S</sup>	1.732	0.361
Foxfish	<b>554</b>	0.811 <sup>S</sup>	<b>0.449</b>	<b>0.219</b>
Blue Morwong	4,407	2.717 <sup>S</sup>	11.974	1.791
West Australian Dhufish	849	4.536 <sup>S</sup>	<i>3.851</i>	<i>1.520</i>
Bight Redfish	10,088	1.171 <sup>S</sup>	11.813	1.660
Swallowtail	2,654	0.378 <sup>S</sup>	1.003	0.196
Sea Sweep	2,398	1.252 <sup>S</sup>	3.002	0.845
King George Whiting	59,011	0.196 <sup>B</sup>	11.566	2.197

Average weights where: <sup>B</sup> is the bioregion estimate from Appendix 1, <sup>S</sup> is the state-wide estimate from Appendix 1, <sup>C</sup> unpublished data, n/a is not available



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## **9.0 Summary and Future Research**

### **9.1 Overview**

The results presented in this report provide estimates of catch and effort from a state-wide survey of boat-based recreational fishing. The recreational catch data presented in this report will now be examined against previous recreational surveys to determine if there have been any material changes in recreational catch levels, particularly for the indicator species used to monitor each of the bioregional level suites that may indicate whether the current management arrangements are operating appropriately. The results of these analyses will be published separately.

Recreational fishing in WA is conducted from boat and shore access across a range of saltwater and freshwater habitats. In 2000/01, boat-based fishers accounted for 43% of fishing effort and 46% of the recreational harvest, with both boat-based and shore-based fishing occurring almost entirely in saltwater (Henry and Lyle 2003).

Over 115,000 boat-based fishers purchase a Recreational Fishing from a Boat Licence each year, with approximately half of these fishers residing in the Perth metropolitan area. The spatial coverage of boat-based fishing effort is indicative of the resident population. The majority of boat-based recreational fishing effort during 1 March 2011 to 29 February 2012 occurred in the West Coast (67%) with the remainder of fishing effort spread among the North Coast (11%), Gascoyne Coast (13%) and South Coast (9%). The temporal coverage of boat-based fishing effort is indicative of seasonal patterns in the north and south of the State. Autumn and winter are the most active seasons in the North Coast and Gascoyne Coast, while summer and autumn are the most active seasons in the West Coast and South Coast.

Although habitat was defined differently in the National Recreational Fishing Survey (2000/01) compared with the current survey, at a state-wide level, the majority of boat-based recreational fishing effort in WA occurs in coastal waters. The majority of boat-based recreational fishing effort occurred in nearshore (51%) and inshore (25%) habitats in 2011-12, compared with coastal habitat (from the shoreline to 5km) (66%) in 2000/01. Similarly, the proportion of boat-based recreational fishing effort in estuarine habitat was 16% in 2011-12 and 19% in 2000/01, and the proportion of effort in offshore and pelagic habitats were 5% and 2% respectively in 2011-12, compared with 11% in 2000/01, where offshore was defined as marine waters >5km from the coast (Henry and Lyle 2003). As shore-based fishing was not in-scope of the survey, inland effort is minimal.

Recreational fishing uses a variety of methods (e.g. line, pot, net and dive). In 2000/01, line fishing accounted for 77% of fishing effort and pot/trap methods accounted for 16% of fishing effort (Henry and Lyle 2003). The majority of boat-based fishing effort during 2011-12 was from line fishing (68%), followed by pots (26%), diving (4%) and nets (2%), but there were differences among bioregions.

### **9.2 Validation of Estimates from On-Site Surveys**

The objective of the on-site Boat Ramp and Remote Camera Surveys are to provide biological information and validation of information collected in the Phone-Diary Survey.

The remote Camera Survey will provide validation of effort estimates from the Phone-Diary Survey. Information gathered will inform the number of launches and retrievals at specific boat

ramps which, when combined with the proportion of all boating activity that involves fishing as derived from the Boat Ramp Surveys, will provide further validation of the effort estimated from the Phone-Diary Survey. This information has been collected at a number of key boat ramps throughout the phone-diary period.

Sampling location and frequency of boat ramps was determined by probability-based sampling of state-wide boat ramps, and covered during the same time period as the Phone-Diary Survey. In addition, detailed information was collected at a number of key boat ramps in the Perth Metropolitan region throughout the phone-diary period. The duration and time of sampling at boat ramps was planned to extend beyond 9 am to 5 pm (used in earlier Boat Ramp Surveys) to overcome a design limitation associated with the earlier methodology. The catch and effort data from these direct, on-site surveys at boat ramps will be used to validate data from the Phone-Diary Survey. In addition, the biological data collected are required to estimate catch weight.

### **9.3 Improving the Precision of Species Catch Estimates**

Recreational fishing surveys are difficult to design in a cost effective manner (Bradford 2000; National Research Council 2006). Recreational fishers are numerous, diverse and diffuse. They use numerous access points and platforms for fishing, including boats launched from harbours, marinas and private docks. Their divergent nature ranges from avid fishers to infrequent participants and different survey methods will encounter avid and infrequent fishers in different relative proportions. This means that there is no single survey method that can be used to accurately and precisely estimate catch and effort from all recreational fishers. Consequently, all surveys of recreational fishing have customised designs, which reflect the specific objectives of the survey, the spatial and temporal scope to be covered, the nature of the recreational fishery, and the constraints on resources that are available to conduct the survey.

A research partnership between the Department of Fisheries, Recfishwest and Edith Cowan University will provide a number of PhD scholarships for students to work on aspects of spatial and temporal modelling and the integration of the data obtained from recreational fishing surveys. As part of the analysis, an exploration of appropriate statistical and modelling methods will be made to produce spatio-temporal data from the survey information and integrate data collected at the different spatial and temporal scales from current surveys, to determine whether integrated data can provide information at the resolution required for management of recreational fisheries.

The recreational fishing from boat licence is still in its initial years since implementation and will likely have a “settling in” period as fishers settle into longer term usage patterns for the new licence. A critical objective of this first integrated survey will be to develop a much better understanding of the types of biases that may be occurring due to potential changes in annual patterns of RFBL usage; by proactively looking for possible biases and behavioural adjustments of fishers we expect to gain guidance as to how to deal with these.

It is very likely that some components of the integrated survey methodology will need to be modified in subsequent surveys to address problems; in some cases it may be necessary to apply emerging techniques in survey design to further improve accuracy and precision of estimates. Furthermore, as the pattern of fishing changes, the survey design needs to be flexible enough to accommodate these changes. A critical element of the research project is having the expertise across several related disciplines (experimental design, data mining, spatial statistics, temporal statistics, Phone Survey methodology) to allow real-time development and implementation

of changes to the survey if warranted. This research partnership will also have a focus on developing human capital in the fields directly relevant to the state-wide survey.

For this report, raw data collected from diarists have been expanded to population estimates based on the total number of RFBL holders divided by the number of RFBL holders sampled for each residential stratum. Further research will investigate the statistical and sampling elements of this survey and whether improvements can be made to increase the robustness of the estimates. This could include adjustment of weighting factors to account for avidity bias and non-intending fishing. Estimates (and errors) may be revised on this basis. Further research will also examine if there have been any material changes in recreational catch levels compared to previous surveys that may have potential management implications.

Finally, the Department will be actively working with its research partners to ascertain what other sorts of information might be able to contribute to better understanding the behaviours of recreational fishers to improve catch and effort estimates. Of particular interest is developing a clearer understanding of how avid and/or expert fishers contribute to the overall catches.

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## **10.0 Acknowledgements**

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## 11.0 References

- Allen GR (2009). *Field Guide to the Marine Fishes of Tropical Australia and South-East Asia*, Fourth Edition. Western Australia Museum, Perth, Western Australia. 287 pp.
- Bradford E (2000). Sample sizes needed for reliable estimates in marine recreational fishing surveys. New Zealand Fisheries Assessment Report No. 2000/36. Ministry of Fisheries, Wellington. 38 pp.
- Cochran WG (1977). *Sampling Techniques*. Third Edition. Wiley, New York. 428 pp.
- Currie DR, Sorokin SJ, Ward TJM (2006). Survey of recreational Rock Lobster Fishing in South Australia during 2004/05. South Australia Research and Development Institute Research Report Series No. 123. South Australia Research Development Institute, South Australia. 36 pp.
- de Lestang S, Caputi N, How J, Melville-Smith R, Thomson A, Stephenson P (2012). Stock Assessment for the West Coast Rock Lobster Fishery. Fisheries Research Report No. 217. Department of Fisheries, Western Australia. 200 pp.
- Department of Fisheries (2010). Integrated Fisheries Management Report: West Coast Demersal Scalefish Resource. Fisheries Management Paper No. 247. Department of Fisheries, Western Australia. 65 pp.
- Department of Fisheries (2011a). Recreational Fishing in Western Australia - Fishing Location Guide, March 2011. Fisheries Occasional Publication No. 92. Department of Fisheries, Western Australia. 20 pp.
- Department of Fisheries (2011b). Recreational Fishing in Western Australia - Northern Fish Identification Guide, March 2011. Fisheries Occasional Publication No. 87. Department of Fisheries, Western Australia. 24 pp.
- Department of Fisheries (2011c). Recreational Fishing in Western Australia - Southern Fish Identification Guide, March 2011. Fisheries Occasional Publication No. 86. Department of Fisheries, Western Australia. 20 pp.
- Department of Fisheries (2011d). Resource Assessment Framework (RAF) for Finfish Resources in Western Australia. Fisheries Occasional Publication No. 85. Department of Fisheries, Western Australia. 28 pp.
- Department of Fisheries (2012a). Annual Report to the Parliament 2011/12. Department of Fisheries, Western Australia. 218 pp.
- Department of Fisheries (2012b). A Resource-based Management Approach for Recreational Fishing in Western Australia 2012–2017: State-wide management proposals for finfish, crustaceans, molluscs and other invertebrates. Fisheries Management Paper No. 252. Department of Fisheries, Western Australia. 54 pp.
- Fletcher WJ, Curnow I (2002). Processes for the allocation, reallocation and governance of resource access in connection with a framework for the future management of fisheries in Western Australia: a scoping paper developed for consideration and use by the Integrated Fisheries Management Review Committee. Fisheries Management Report No. 7. Department of Fisheries, Western Australia. 59 pp.
- Fletcher WJ, Santoro K (2012). Status Reports of the Fisheries and Aquatic Resources of Western Australia 2011/12: The State of the Fisheries. Department of Fisheries, Western Australia, 359 pp.
- Fletcher WJ, Shaw J, Gaughan DJ, Metcalf SJ (2011). Ecosystem Based Fisheries Management case study report – West Coast Bioregion. Fisheries Research Report No. 225. Department of Fisheries, Western Australia. 116 pp.
- Hartill BW, Cryer M, Lyle JM, Rees EB, Ryan KL, Steffe AS, Taylor SM, West L, Wise BS (2012). Scale- and Context-Dependent Selection of Recreational Harvest Estimation Methods: The Australasian Experience. *North American Journal of Fisheries Management* 32(1), 109-123
- Henry GW, Lyle JM (2003). The National Recreational and Indigenous Fishing Survey. Final Report

- for FRDC Project No. 99/158. Australian Government Department of Agriculture, Fisheries and Forestry, Canberra. 188 pp.
- Hutchins B, Swainston R (1999). *Sea Fishes of Southern Australia: complete field guide for anglers and divers*, Second Edition. Gary Allen Pty Ltd. 180 pp.
- Jones DS, Morgan GJ (2002). *A Field Guide to Crustaceans of Australian Waters*. Reed, New Holland. 224 pp.
- Jones K. (2009). South Australian Recreational Fishing Survey. South Australian Fisheries Management Series Paper No 54. PIRSA Fisheries, Adelaide. 84 pp.
- Lhor S (2010). *Sampling: design and analysis*, Second Edition. Brooks/Cole, Cengage Learning. 596 pp.
- Lindner RK, McLeod PB (1991). An economic impact of recreational fishing in Western Australia. Fisheries Management Paper No. 38. Department of Fisheries, Western Australia. 48 pp.
- Lumley T (2004). Analysis of complex survey samples. *Journal of Statistical Software* 9(1), 1–19
- Lumley T (2010). *Complex Surveys: a guide to analysis using R*. John Wiley and Sons Inc., New Jersey. 276 pp.
- Lyle JM, Coleman APM, West L, Campbell D, Henry GW (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 TJ, Hollingworth CE (Editors), pp. 207–226. (Fish and Aquatic Resources Series No. 8, Blackwell Science, Oxford, UK).
- Lyle JM, Tracey SR (2010). Tasmanian recreational rock lobster and abalone fisheries: 2008-09 fishing season, Tasmanian Aquaculture and Fisheries Institute Report, 35 pp.
- Lyle JM, Tracey SR, Stark KE, Wotherspoon S (2009). 2007-08 survey of recreational fishing in Tasmania, TAFI Technical Report, Tasmanian Aquaculture and Fisheries Institute, Hobart. 107 pp.
- Lyle JM, Wotherspoon S, Stark KE (2010). Developing an analytical module for large-scale recreational fishery data based on phone-diary survey methodology. Final report to Fisheries Research and Development Corporation Project No. 2007/064. Tasmanian Aquaculture and Fisheries Institute, Hobart. 105 pp.
- Malvestuto SP (1996). Sampling the Recreational Creel. In: *Fisheries Techniques*. Murphy BR, Willis DW (Editors) pp. 591–624. (American Fisheries Society, Bethesda, Maryland, USA).
- Melville-Smith R, Anderton SM (2000). Western rock lobster mail surveys of licensed recreational fishers 1986/87 to 1998/99. Fisheries Research Report No. 122. Department of Fisheries, Western Australia. 39 pp.
- National Research Council (2006). *Review of recreational fisheries survey methods*. Ocean Studies Board. National Academies Press, Washington DC. 129 pp.
- Pollock KH, Jones CM, Brown TL (1994). *Angler survey methods and their applications in fisheries management*. (American Fisheries Society Special Publication 25), American Fisheries Society, Bethesda. 371 pp.
- R Development Core Team (2008). *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing, Vienna, Austria.
- Rees AJ, Yearsley GK, Gowlett-Holmes K, Pogonoski J (2012). Codes for Australian Aquatic Biota (online version). CSIRO Marine and Atmospheric Research, World Wide Web electronic publication, 1999 onwards. Retrieved 2012 from <http://www.cmar.csiro.au/caab/>
- Ryan KL, Morison AK, Conron S (2009). Evaluating methods of obtaining total catch estimates for individual Victorian bay and inlet recreational fisheries. Final report to Fisheries Research and Development Corporation Project No. 2003/047. Department of Primary Industries, Queenscliff. 124 pp.

- Särndal CE, Swensson B, Wretman J (2003). *Model Assisted Survey Sampling*. Springer Series in Statistics, New York. 265 pp.
- SAS Institute Inc. (2004). *SAS/STAT® 9.1 User's Guide*. Cary, NC: SAS Institute Inc. Chapter 72 PROC SURVEYSELECT pp 4419–4470
- Smallwood CB, Sumner NR (2007). A 12-month survey of recreational estuarine fishing in the South Coast bioregion of Western Australia during 2002/03. Fisheries Research Report No. 159. Department of Fisheries, Western Australia, 56 pp.
- Sumner NR, Williamson PC (1999). A 12-month survey of coastal recreational boat fishing between Augusta and Kalbarri on the west coast of Western Australia during 1996–97. Fisheries Research Report No. 117. Department of Fisheries, Western Australia. 58 pp.
- Sumner NR, Williamson PC, Blight SJ, Gaughan DJ (2008). A 12-month survey of recreational boat-based fishing between Augusta and Kalbarri on the west coast of Western Australia during 2005–06. Fisheries Research Report No. 177. Department of Fisheries, Western Australia. 44 pp.
- Sumner NR, Williamson PC, Malseed BE (2002). A 12-month survey of recreational fishing in the Gascoyne bioregion of Western Australia during 1998–99. Fisheries Research Report No. 139. Department of Fisheries, Western Australia. 60 pp.
- Survey Development Working Group (2000). Development of the National Recreational and Indigenous Fishing Survey, FRDC Project No. 98/169. NSW Fisheries Final Report Series No. 23 (Volume 1). 36 pp.
- Taylor S, Webley J, McInnes K (2012). 2010 Statewide Recreational Fishing Survey. Department of Agriculture, Fisheries and Forestry, Queensland. 82 pp.
- Tracey S, Lyle KM (2008). Tasmanian Recreational Scallop Fishery: 2005–2008. Tasmanian Aquaculture and Fisheries Institute Internal Report. 30 pp.
- West LD, Lyle JM, Matthews SR, Stark KE, Steffe AS (2012). Survey of recreational fishing in the Northern Territory, 2009/10. Northern Territory Fisheries. Department of Resources, Northern Territory. 128 pp.
- Williamson PC, Sumner NR, Malseed BE (2006). A 12-month survey of recreational fishing in the Pilbara region of Western Australia during 1999-2000. Fisheries Research Report No. 153. Department of Fisheries, Western Australia. 61 pp.
- Wise BS, Fletcher WJ (2013). Determination and development of cost effective techniques to monitor recreational catch and effort in Western Australian demersal finfish fisheries. Final Report for FRDC Project 2005/034 and WAMSI Subproject 4.4.3. Fisheries Research Report No. 245. Department of Fisheries, Western Australia.

## 12.0 Appendices

### Appendix 1: State-wide and bioregion estimates of average weight of key species from Boat Ramp Surveys in 2011-12.

Av wt is the average weight (measured in grams); n is the number of weight measurements recorded; se is standard error; values in bold indicate < 10 recorded weights of the species.

Reporting Group	Common Name	Scientific Name	State-wide			North Coast			Gascoyne Coast			West Coast			South Coast		
			n	Av Wt	se	n	Av Wt	se	n	Av Wt	se	n	Av Wt	se	n	Av Wt	se
Lobster	Western Rock Lobster	<i>Panulirus cygnus</i>	21	1186	111				16	1406	89	5	483	13			
Crab	Blue Swimmer Crab	<i>Portunus armatus</i>	382	229	2				22	280	12	358	225	2	2	348	38
Bream	Black Bream	<i>Acanthopagrus butcheri</i>	25	312	20										25	312	20
	Western Yellowfin Bream	<i>Acanthopagrus latus</i>	17	563	38	16	540	32	1	930							
	Snapper	<i>Pagrus auratus</i>	162	2476	119				19	2459	181	99	2315	136	44	2846	297
Butterfish	Western Butterfish	<i>Pentapodus vitia</i>	46	191	11							46	191	11			
Cod	Breaksea Cod	<i>Epinephelides armatus</i>	162	1031	38							76	998	53	86	1061	54
	Chinaman Rockcod	<i>Epinephelus rivulatus</i>	55	493	23	1	300		50	524	21	4	157	43			
	Goldspotted Rockcod	<i>Epinephelus coioides</i>	19	2009	301	14	1849	344	5	2456	639						
	Harlequin Fish	<i>Othos dentex</i>	23	1401	112				7	1127	128				16	1520	143
	Rankin Cod	<i>Epinephelus multinotatus</i>	37	2994	283	7	2824	541	30	3033	329						
Coral Trout	Barcheek Coral Trout	<i>Plectropomus maculatus</i>	31	2382	229	19	1990	192	9	3111	617	3	2673	396			
Emperor	Grass Emperor	<i>Lethrinus laticaudis</i>	205	1092	36	71	1340	58	134	961	42						
	Redspot Emperor	<i>Lethrinus lentjan</i>	13	678	88				13	678	88						
	Redthroat Emperor	<i>Lethrinus miniatus</i>	39	1179	95				34	1088	89	5	1802	338			
	Spangled Emperor	<i>Lethrinus nebulosus</i>	144	2084	73	2	1445	55	142	2093	73						
Flathead	Southern Bluespotted Flathead	<i>Platycephalus speculator</i>	24	548	77							14	743	102	10	276	35



Reporting Group	Common Name	Scientific Name	State-wide		North Coast		Gascoyne Coast		West Coast		South Coast	
			n	AV Wt se	n	AV Wt se	n	AV Wt se	n	AV Wt se	n	AV Wt se
Foxfish		<i>Bodianus frenchii</i>	11	811 57					7	768 55	4	886 125
Garfish	Southern Garfish	<i>Hyporhamphus melanochir</i>	68	104 4					68	104 4		
Grunter	Trumpeter	<i>Latridopsis</i> spp.	36	83 5					36	83 5		
Herring	Australian Herring	<i>Arripis georgianus</i>	469	135 2					271	140 2	198	129 3
Mackerel	School Mackerel	<i>Scomberomorus queenslandicus</i>	18	1876 213	8	1415 165	7	1707 214	3	3497 344		
	Spanish Mackerel	<i>Scomberomorus commerson</i>	21	6904 368	6	6840 738	10	6991 443	5	6805 1064		
Morwong	Blue Morwong	<i>Nemadactylus valenciennesi</i>	72	2717 167					14	2963 446	58	2658 178
Pearl Perch	West Australian Dhufish	<i>Glaucosoma hebraicum</i>	128	4536 164					123	4485 164	5	5780 1080
Pike	Snook	<i>Sphyaena novaehollandiae</i>	15	862 116					5	999 230	10	793 134
	Striped Barracuda	<i>Sphyaena obtusata</i>	25	417 48					24	427 49	1	179
Redfish	Bight Redfish	<i>Centroberyx gerrardi</i>	118	1171 53					2	1102 17	116	1173 54
	Swallowtail	<i>Centroberyx lineatus</i>	40	378 13					1	262	39	381 13
Salmon	Western Australian Salmon	<i>Arripis truttaceus</i>	26	3135 336							26	3135 336
Samsonfish	Samsonfish	<i>Seriola hippos</i>	16	5374 549					11	4583 592	5	7114 766
Sergeant Baker	Sergeant Baker	<i>Aulopus purpurissatus</i>	22	940 71					9	761 70	13	1064 97
Snapper	Mangrove Jack	<i>Lutjanus argentimaculatus</i>	16	822 76	16	822 76						
	Red Emperor	<i>Lutjanus sebae</i>	27	3441 357	11	3181 451	15	3228 370	1	9500		
	Saddletail Snapper	<i>Lutjanus malabaricus</i>	24	774 62	22	728 57	2	1280 120				
	Stripey Snapper	<i>Lutjanus carponotatus</i>	28	602 41	17	520 46	11	728 60				

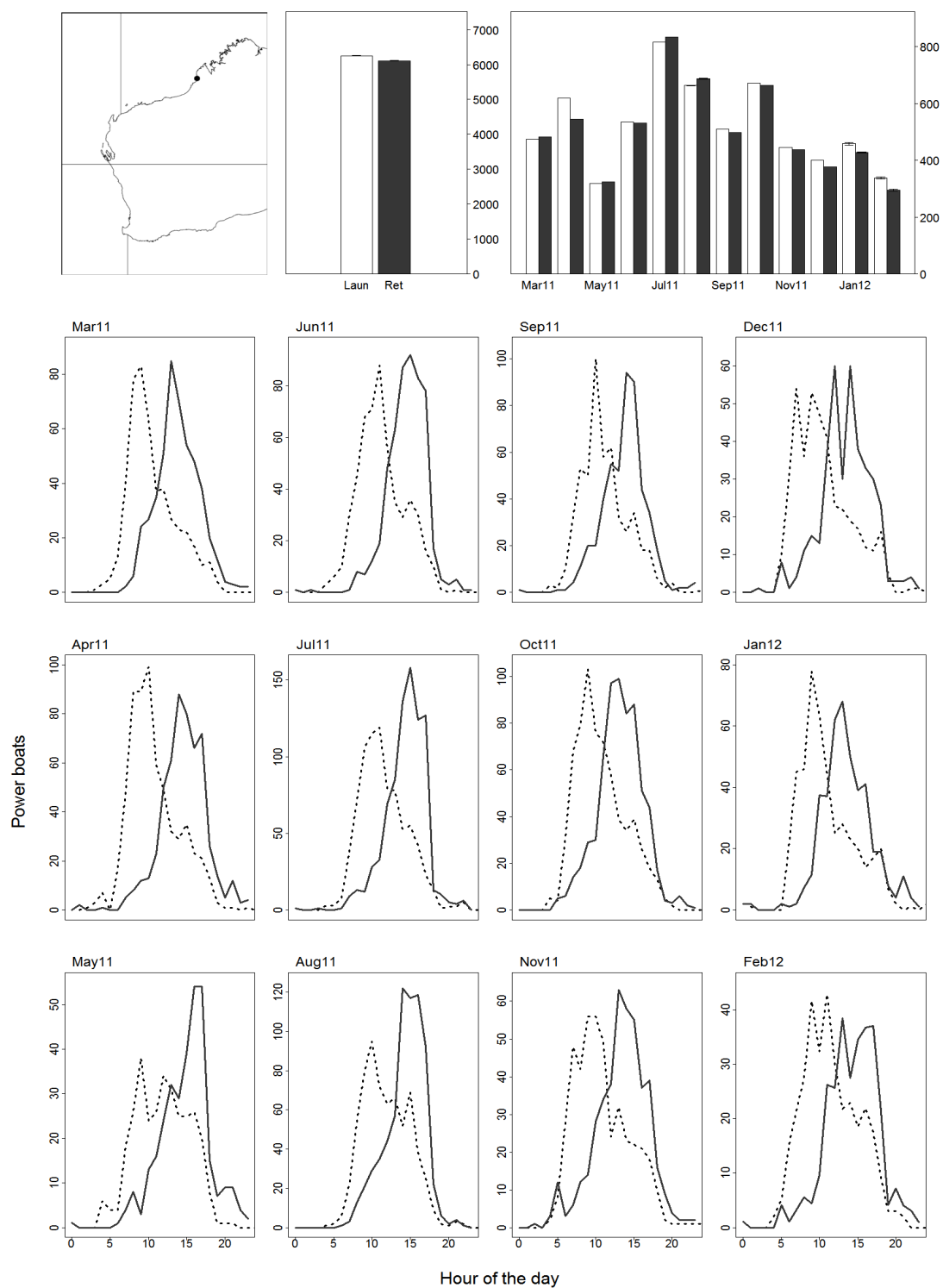


## **Appendix 2: Summary of power boat launches and retrievals at 13 public boat ramps during 2011–12 from Remote Camera Surveys in 2011–12.**

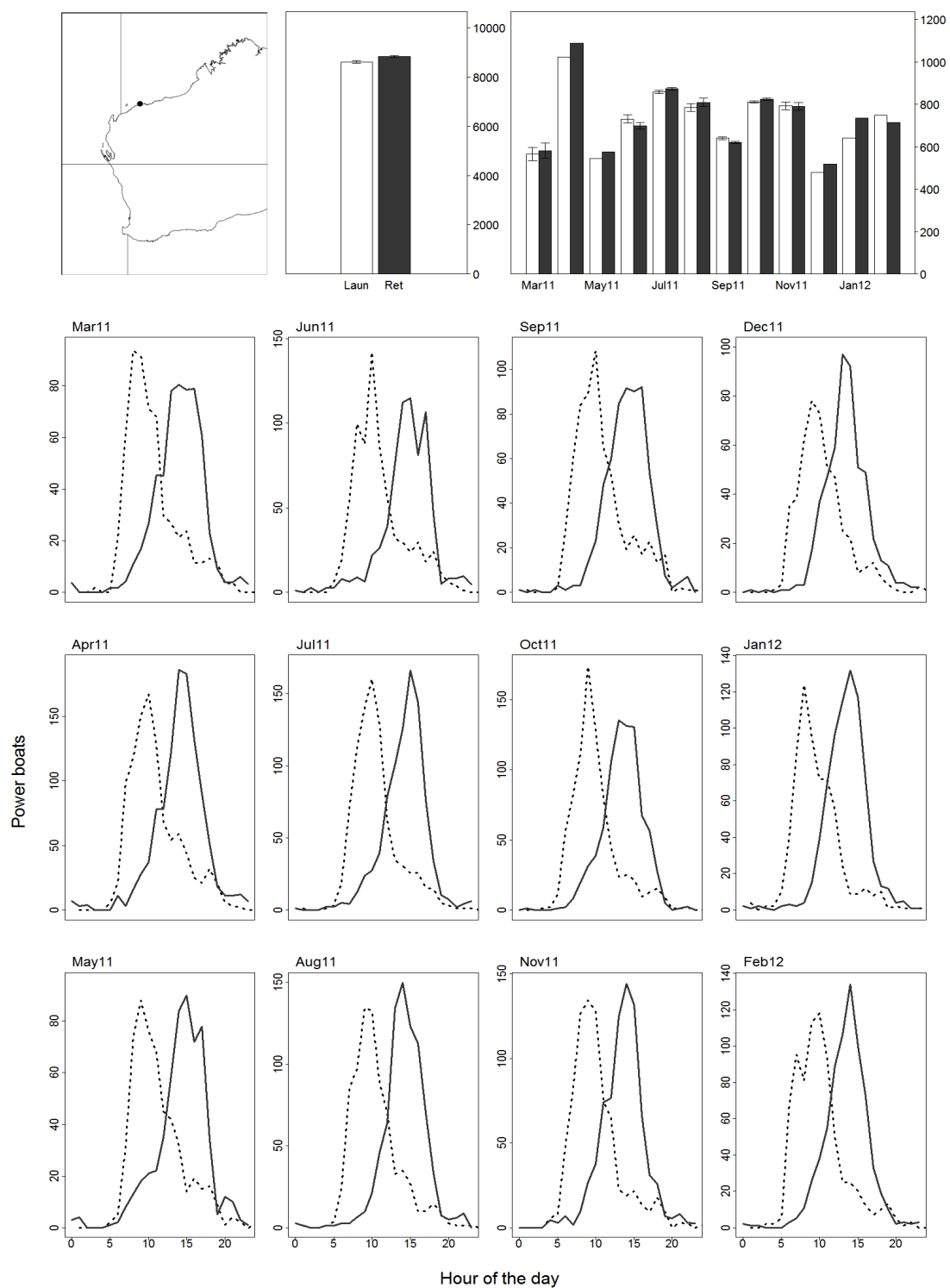
The following pages provide summaries of the total power boat launches and retrievals during 2011–12, including: the location of the boat ramp; total annual launches and retrievals; total launches and retrievals by month; and hourly launches and retrievals by month. Error bars are 1 standard error where data imputation required for missing data.

Results are presented for the 13 public boat ramps monitored in the Remote Camera Survey:

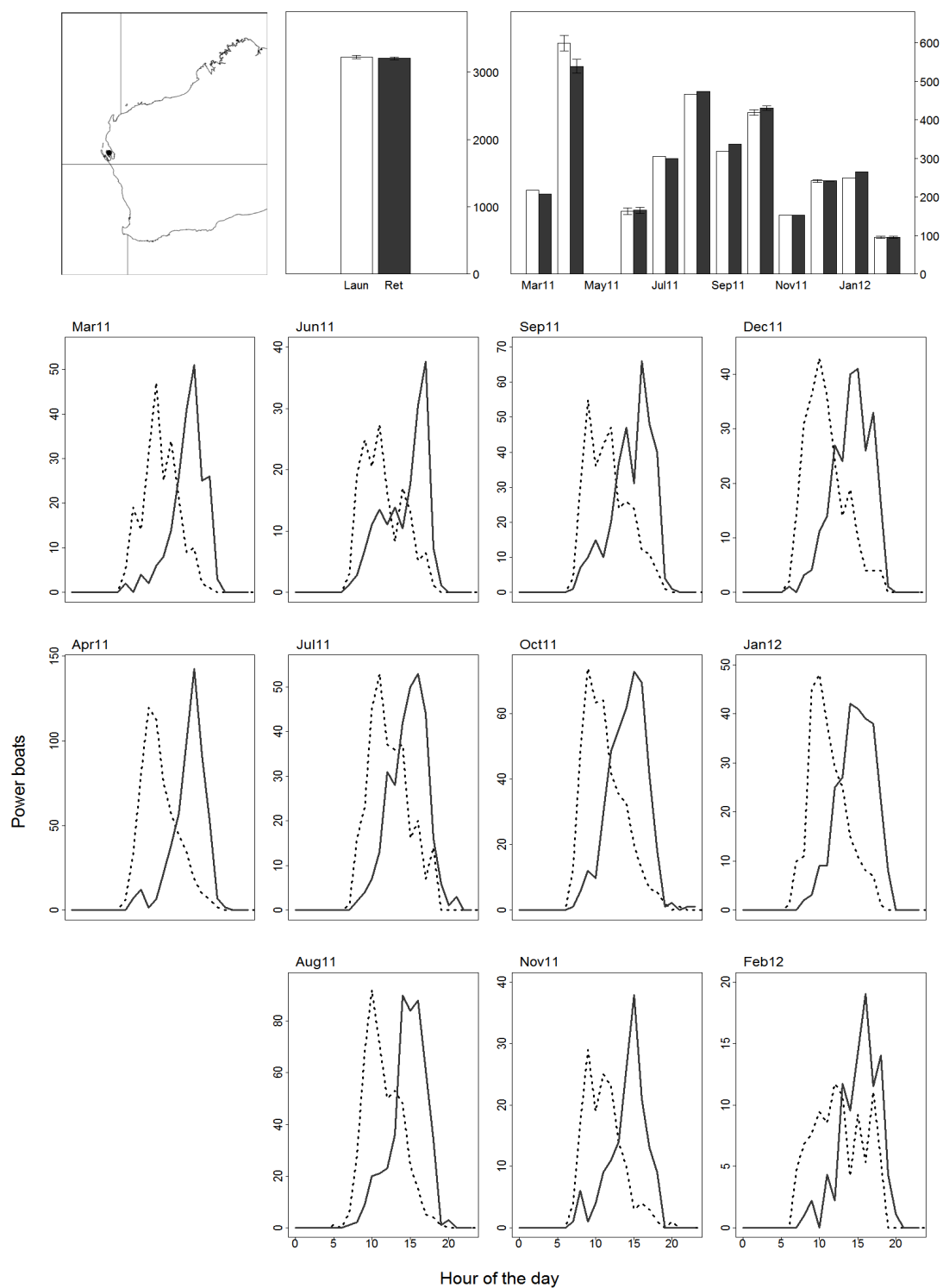
- Broome (Lat 18.008, Long 122.208)
- Dampier (Lat 20.656, Long 116.707)
- Monkey Mia (Lat 25.793, Long 113.720)
- Denham (Lat 25.928, Long 113.533)
- Mindarie (Lat 31.692, Long 115.702)
- Ocean Reef (Lat 31.762, Long 115.728)
- Hillarys (Lat 31.822, Long 115.739)
- Leeuwin (Lat 32.030, Long 115.762)
- Woodmans Point Public Ramp (Lat 32.139, Long 115.762)
- Woodmans Point Private Ramp (Lat 32.139, Long 115.762)
- Point Peron (Lat 32.271, Long 115.698)
- Emu Point (Lat 34.995, Long 117.945)
- Bandy Creek (Lat 33.831, Long 121.932)



**Figure 77.** Total power boat launches (white bar) and retrievals (black bar) from Broome (Lat 18.008, Long 122.208) during 2011–12 (top centre); total launches (white bars) and retrievals (black bars) by month (top right); and hourly launches (dotted line) and retrievals (solid line) by month. Error bars are 1 standard error where data imputation required for missing data.

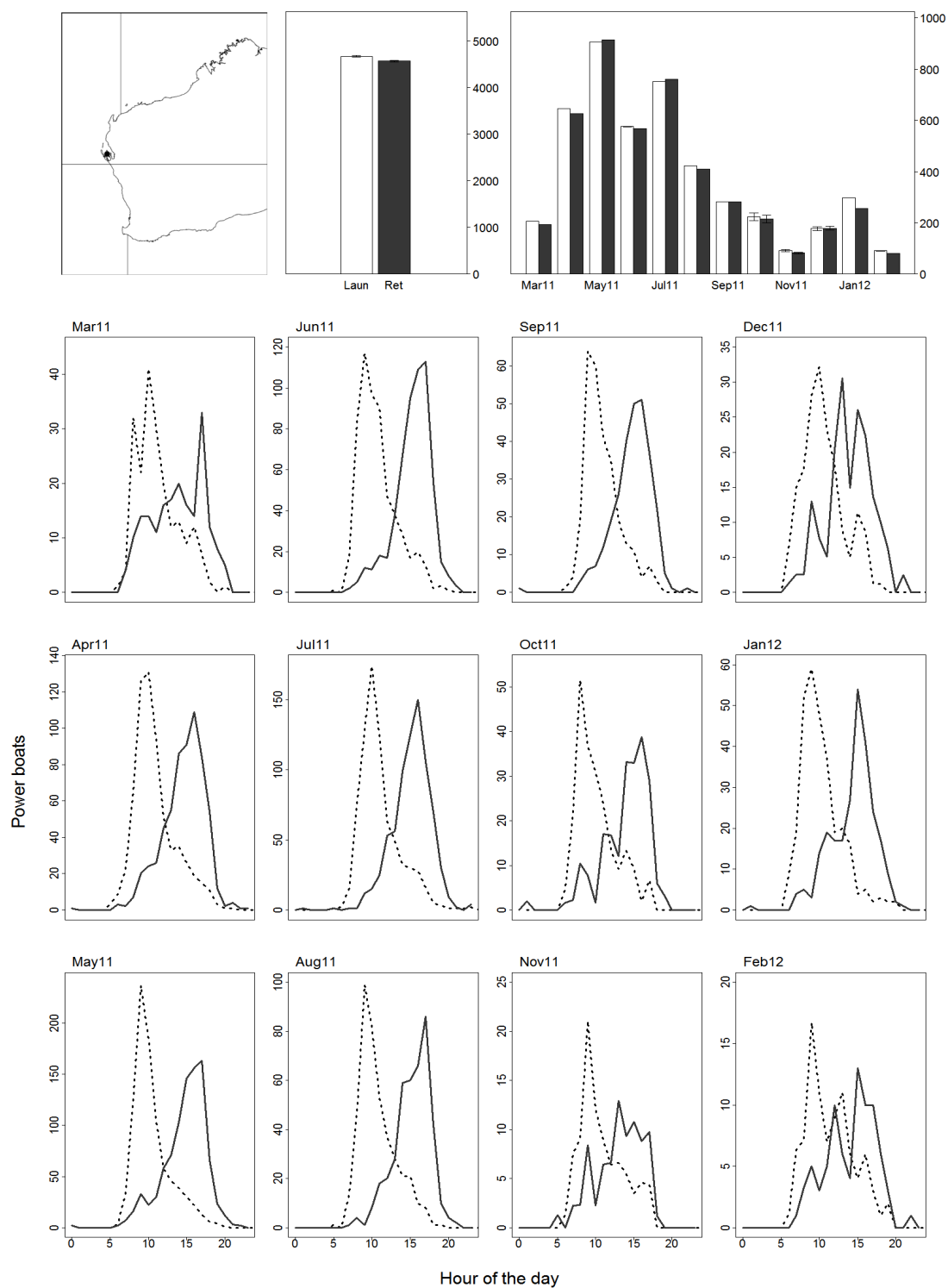


**Figure 78.** Total power boat launches (white bar) and retrievals (black bar) from Dampier (Lat 20.656, Long 116.707) during 2011–12 (top centre); total launches (white bars) and retrievals (black bars) by month (top right); and hourly launches (dotted line) and retrievals (solid line) by month. Error bars are 1 standard error where data imputation required for missing data.

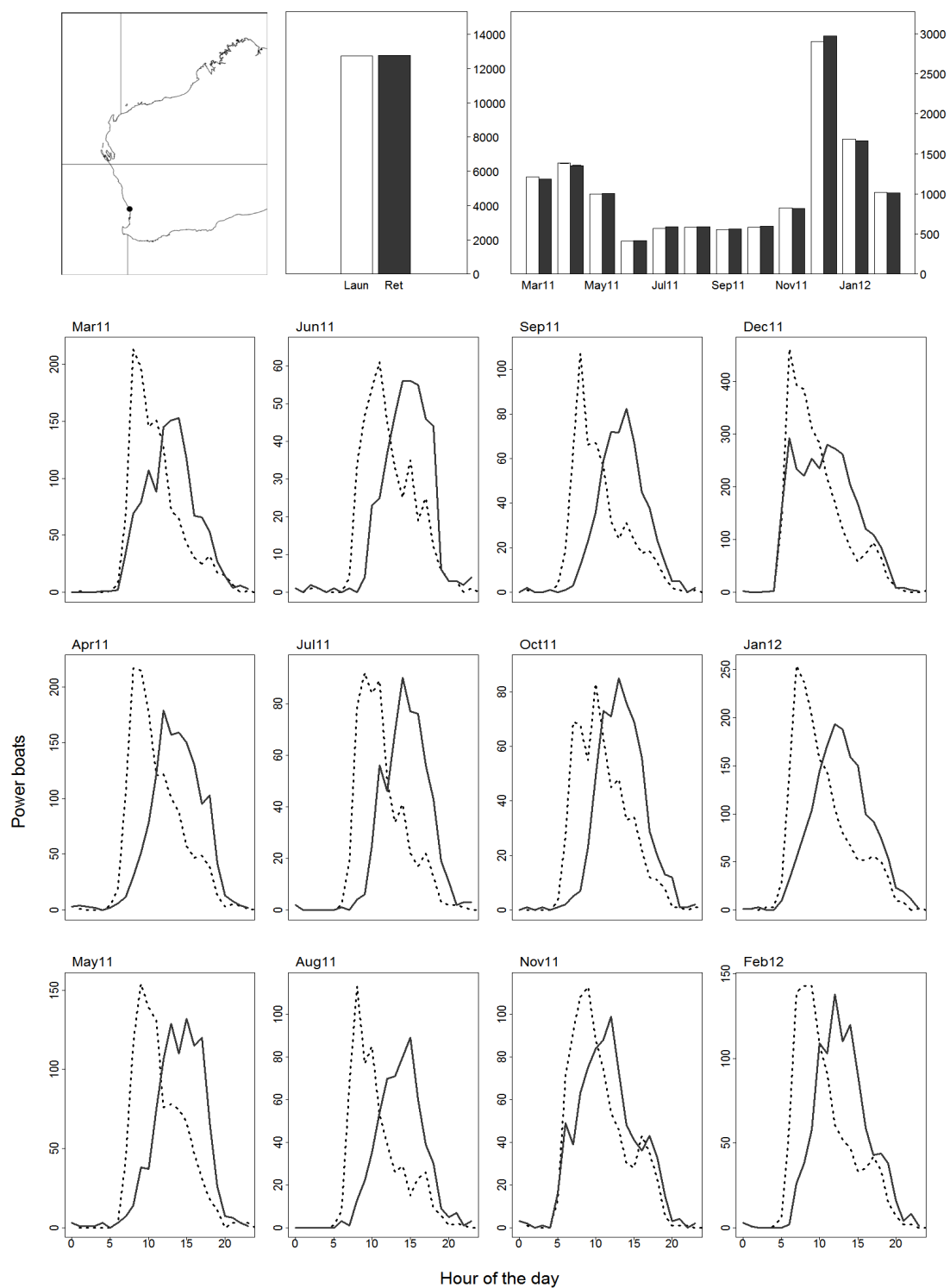


**Figure 79.** Total power boat launches (white bar) and retrievals (black bar) from Monkey Mia (Lat 25.793, Long 113.720) during 2011–12 (top centre); total launches (white bars) and retrievals (black bars) by month (top right); and hourly launches (dotted line) and retrievals (solid line) by month. Error bars are 1 standard error where data imputation required for missing data.

Data for May 2011 was unavailable.

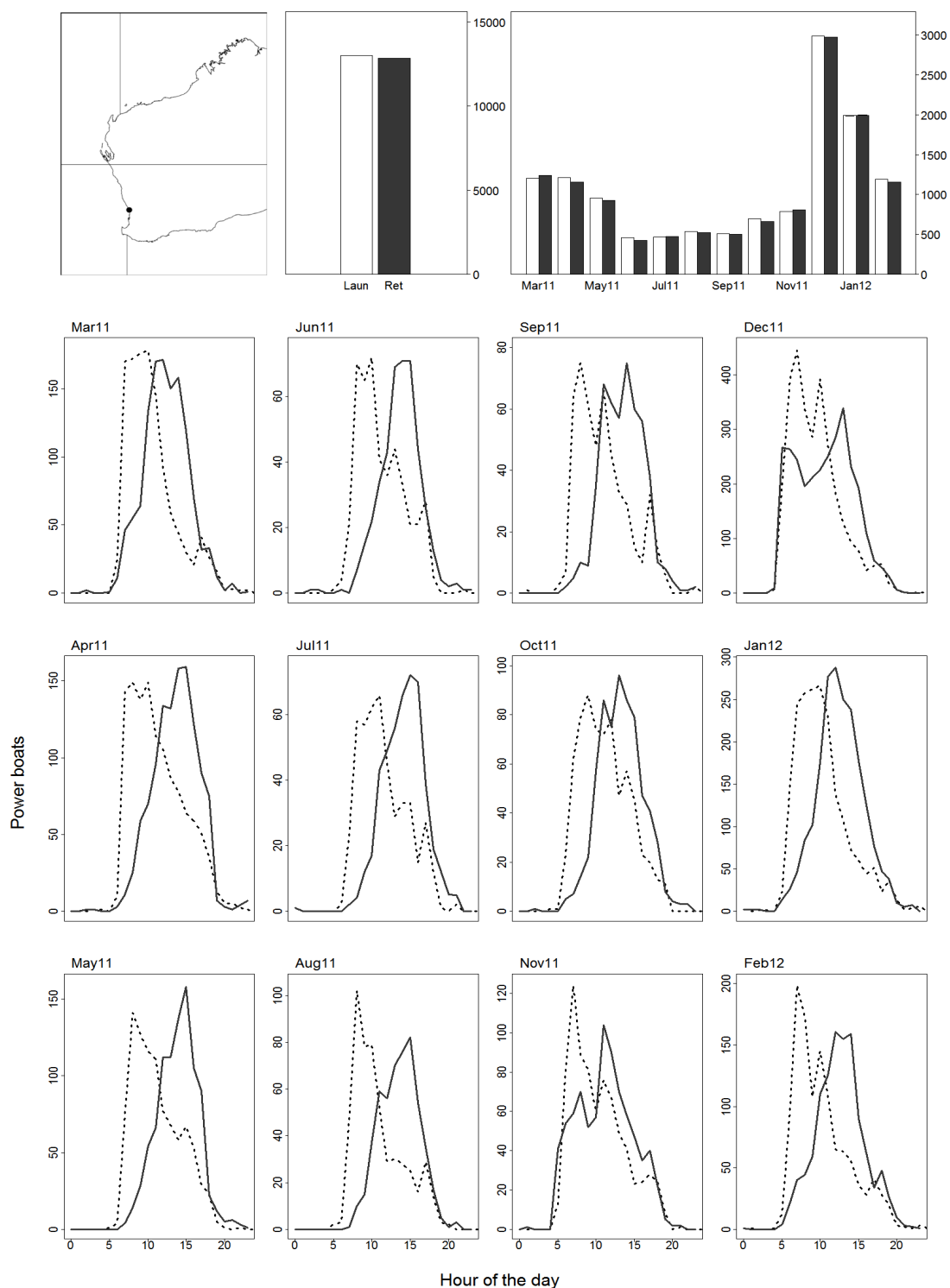


**Figure 80.** Total power boat launches (white bar) and retrievals (black bar) from Denham (Lat 25.928, Long 113.533) during 2011–12 (top centre); total launches (white bars) and retrievals (black bars) by month (top right); and hourly launches (dotted line) and retrievals (solid line) by month. Error bars are 1 standard error where data imputation required for missing data.

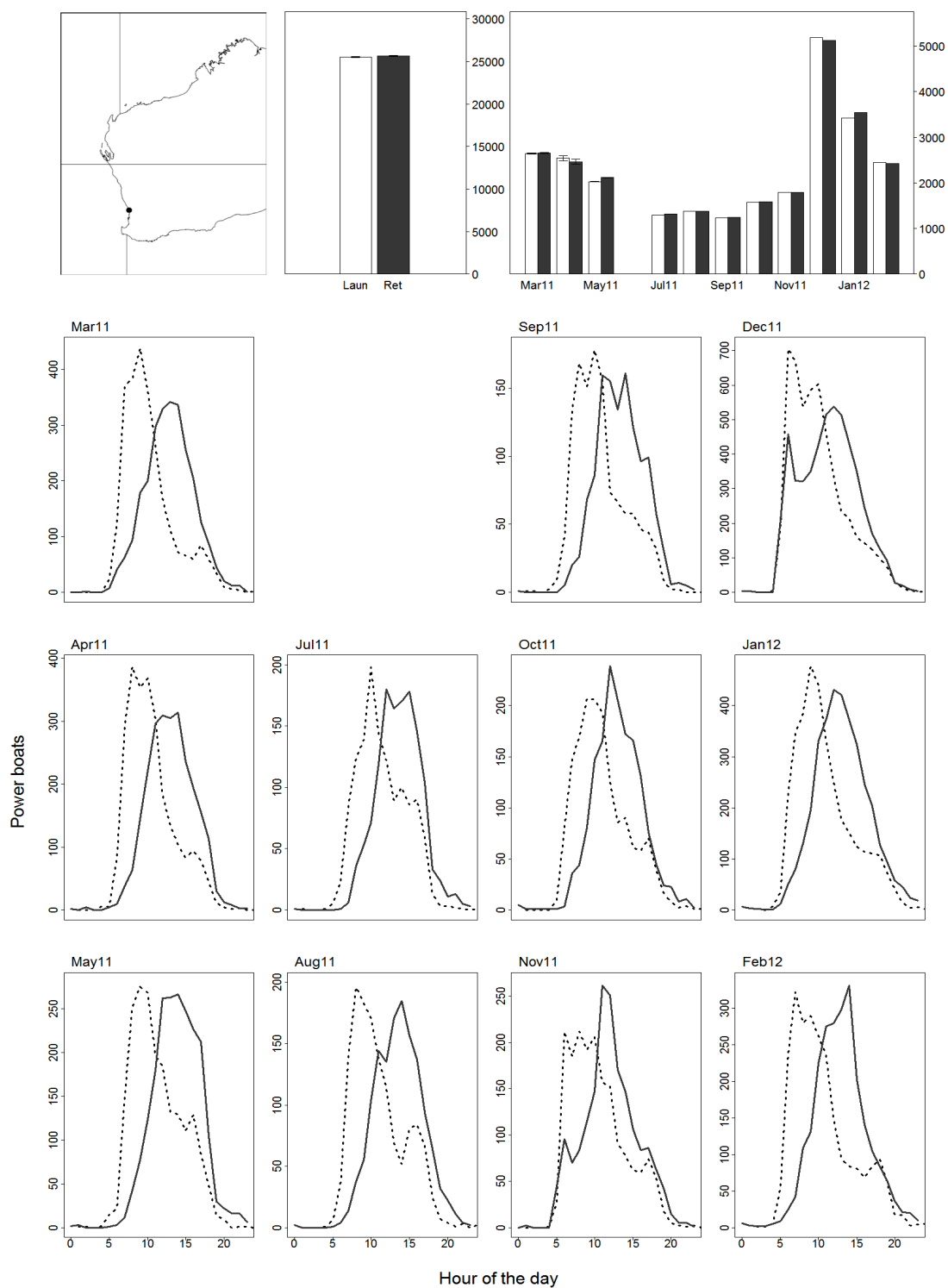


**Figure 81.** Total power boat launches (white bar) and retrievals (black bar) from Mindarie (Lat 31.692, Long 115.702) during 2011–12 (top centre); total launches (white bars) and retrievals (black bars) by month (top right); and hourly launches (dotted line) and retrievals (solid line) by month. Error bars are 1 standard error where data imputation required for missing data.



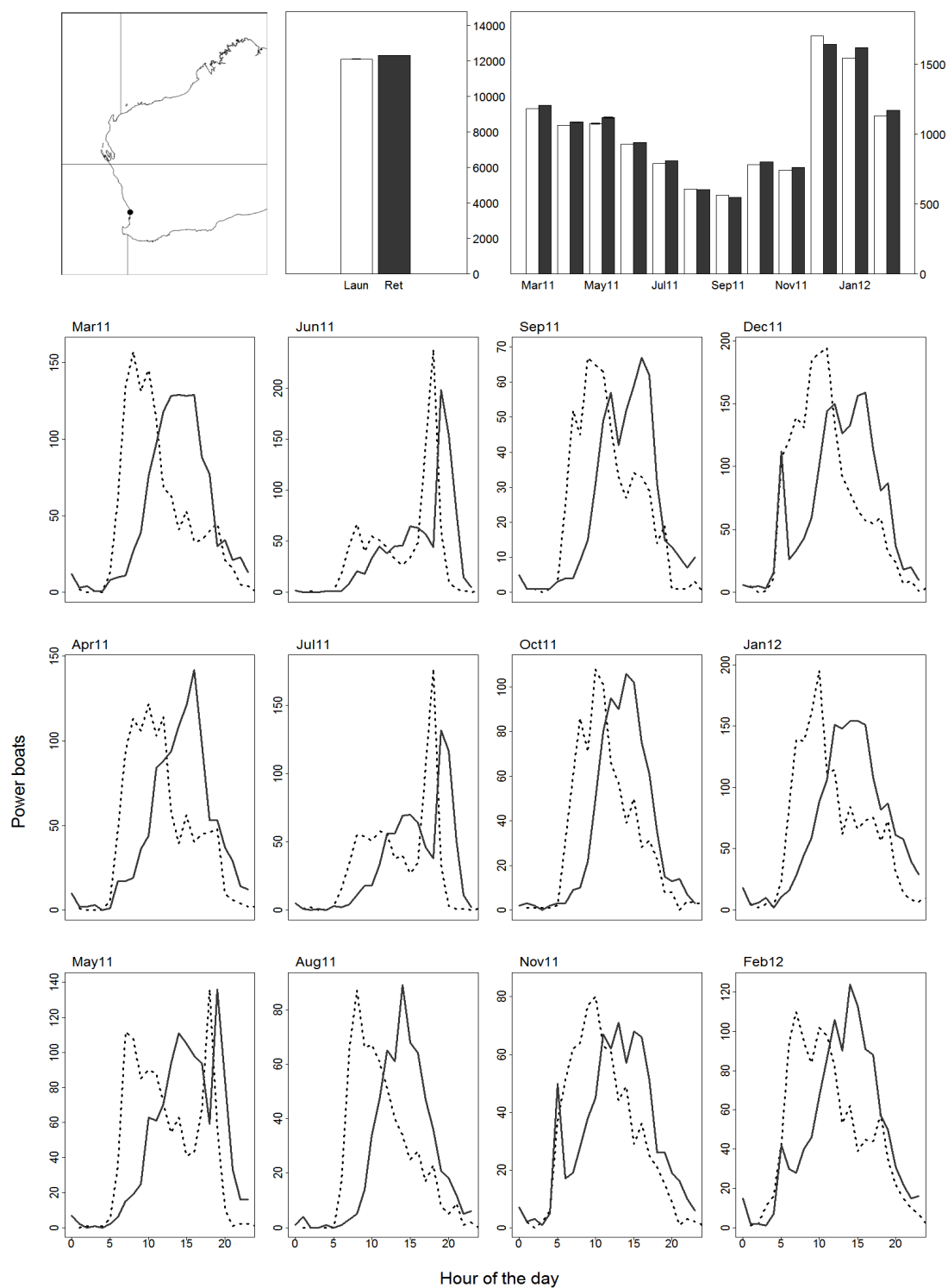


**Figure 82.** Total power boat launches (white bar) and retrievals (black bar) from Ocean Reef (Lat 31.762, Long 115.728) during 2011–12 (top centre); total launches (white bars) and retrievals (black bars) by month (top right); and hourly launches (dotted line) and retrievals (solid line) by month. Error bars are 1 standard error where data imputation required for missing data.

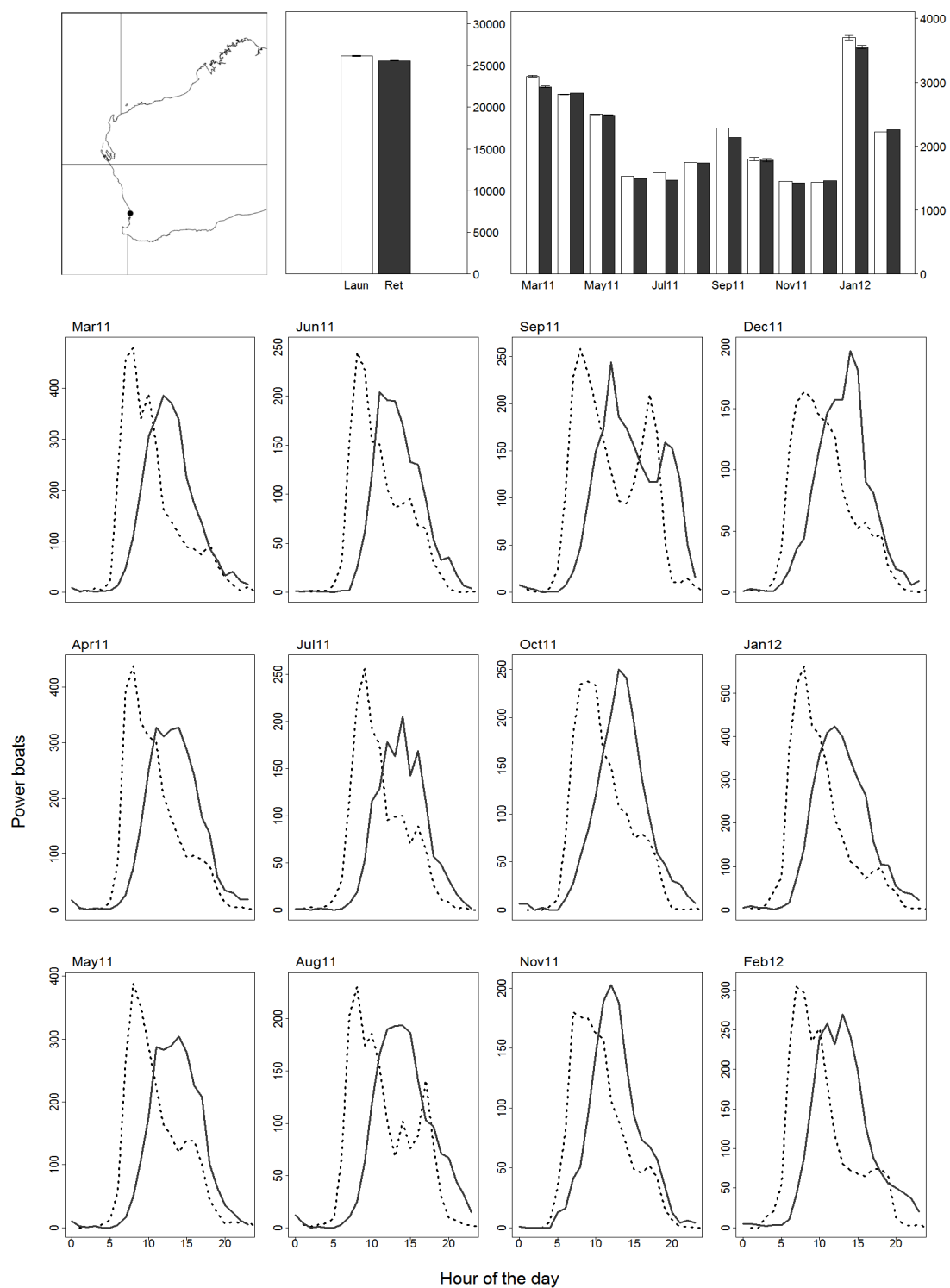


**Figure 83.** Total power boat launches (white bar) and retrievals (black bar) from Hillarys (Lat 31.822, Long 115.739) during 2011–12 (top centre); total launches (white bars) and retrievals (black bars) by month (top right); and hourly launches (dotted line) and retrievals (solid line) by month. Error bars are 1 standard error where data imputation required for missing data.

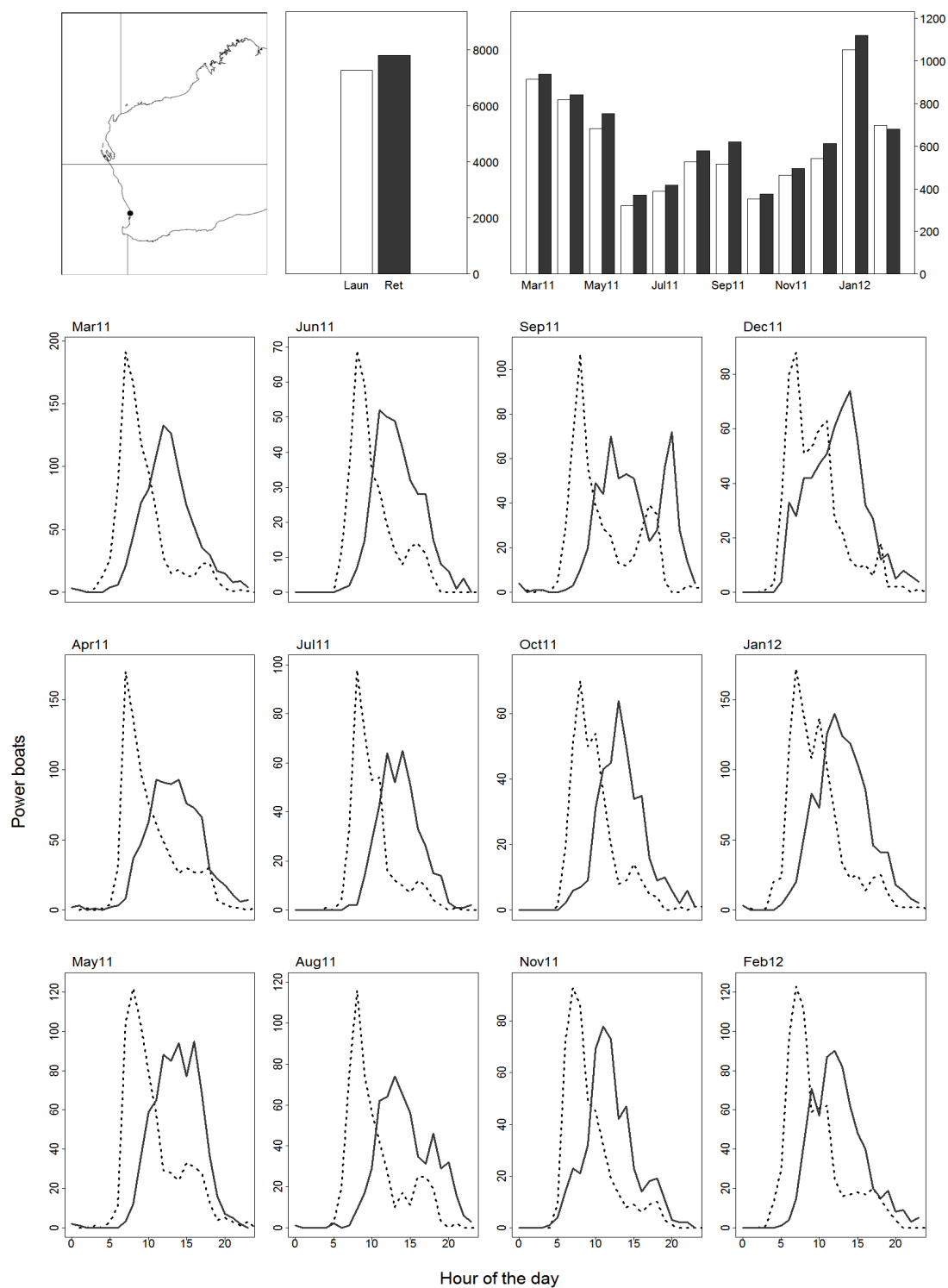
Data for June 2011 was unavailable.



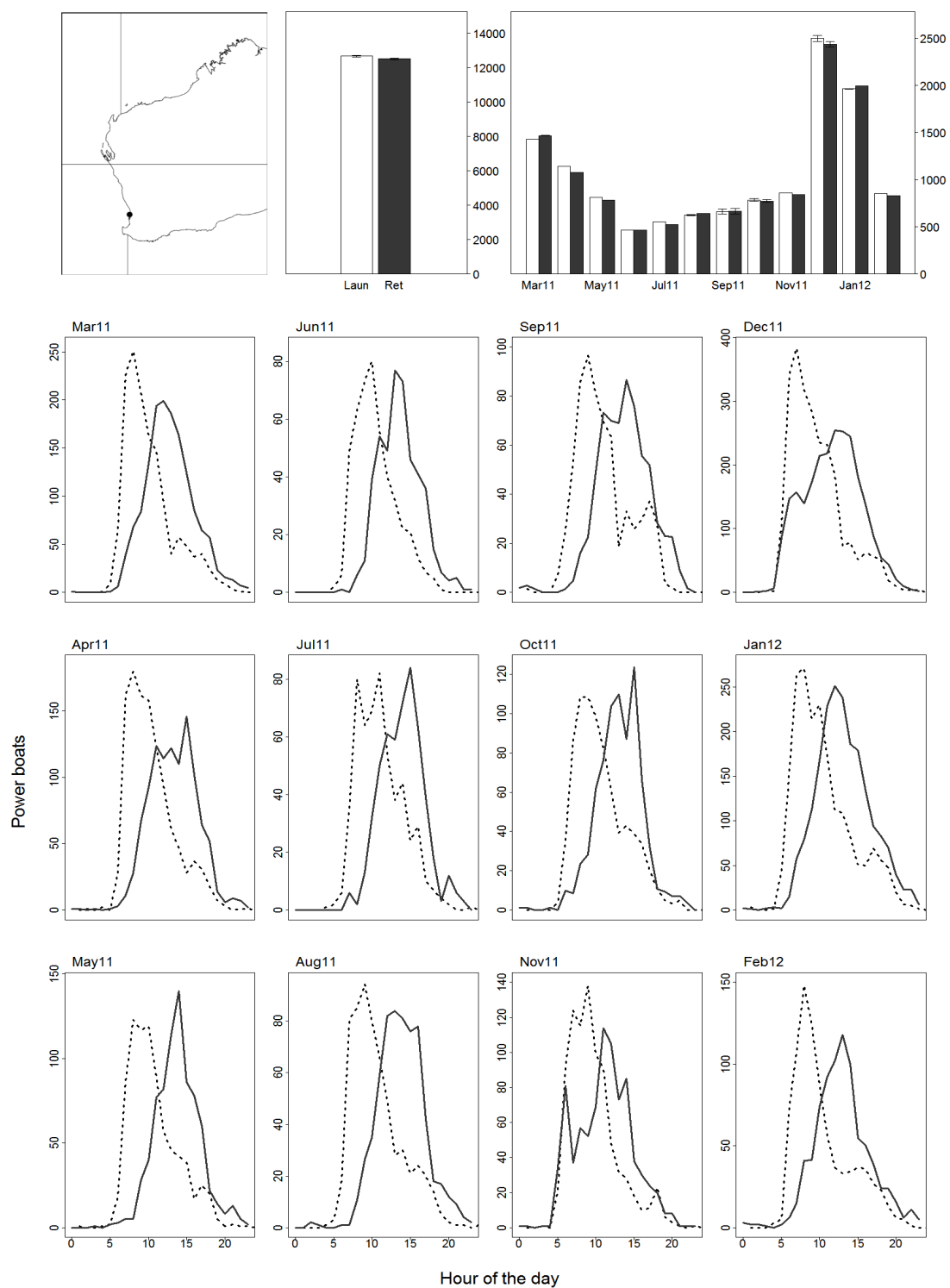
**Figure 84.** Total power boat launches (white bar) and retrievals (black bar) from Leeuwin (Lat 32.030, Long 115.762) during 2011–12 (top centre); total launches (white bars) and retrievals (black bars) by month (top right); and hourly launches (dotted line) and retrievals (solid line) by month. Error bars are 1 standard error where data imputation required for missing data.



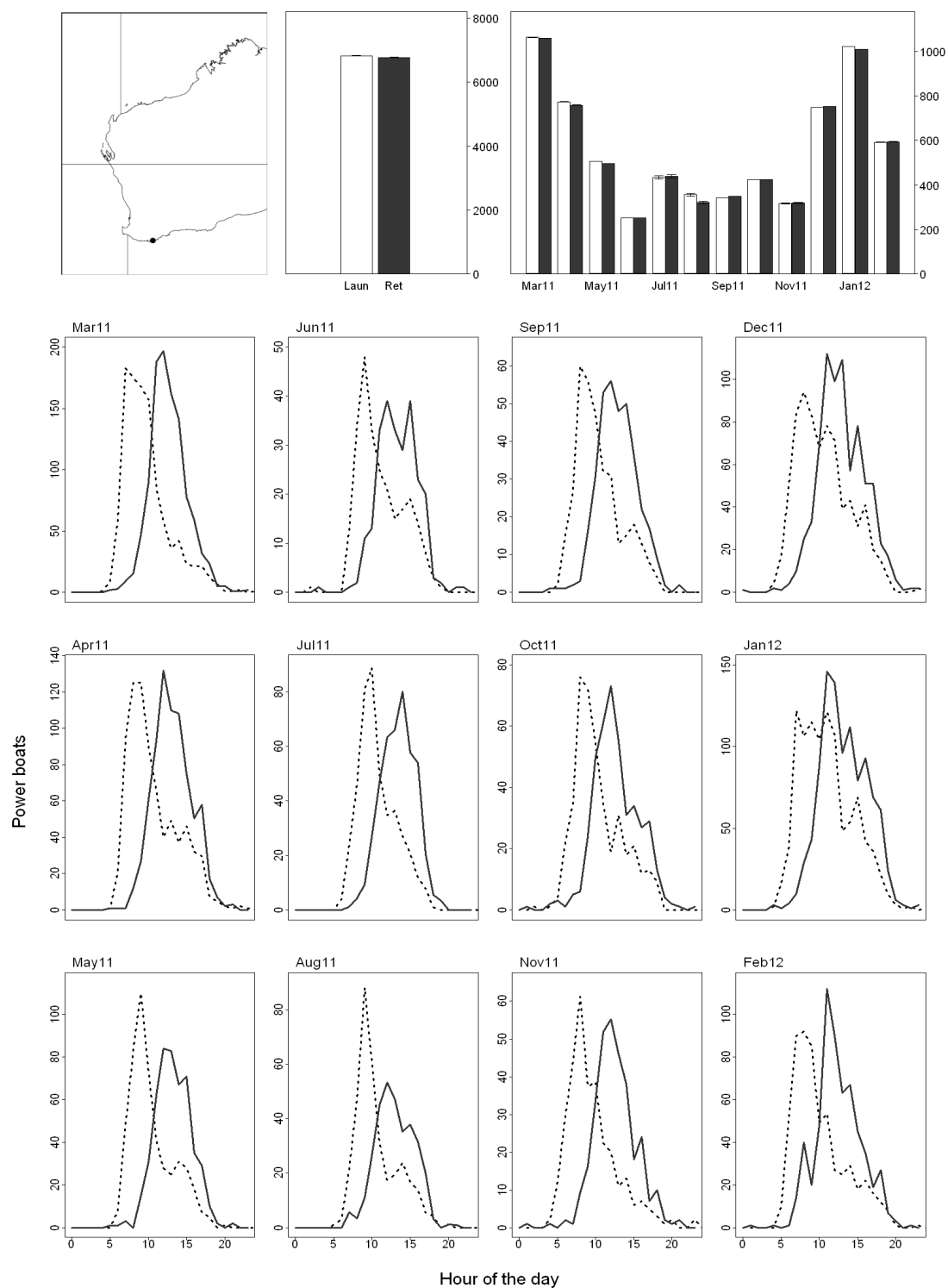
**Figure 85.** Total power boat launches (white bar) and retrievals (black bar) from Woodmans Point Public Ramp (Lat 32.139, Long 115.762) during 2011–12 (top centre); total launches (white bars) and retrievals (black bars) by month (top right); and hourly launches (dotted line) and retrievals (solid line) by month. Error bars are 1 standard error where data imputation required for missing data.



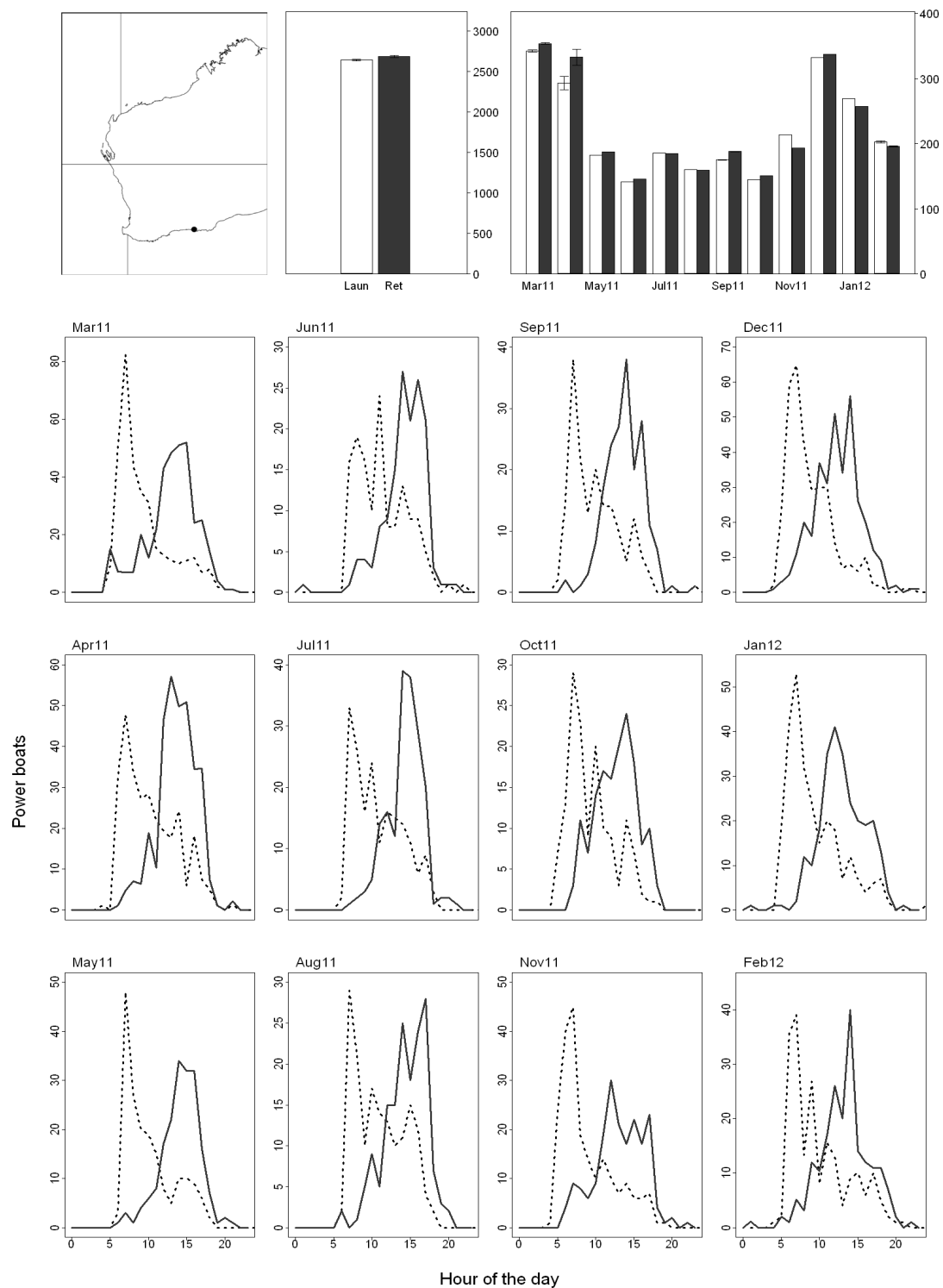
**Figure 86.** Total power boat launches (white bar) and retrievals (black bar) from Woodmans Point Private Ramp (Lat 32.139, Long 115.762) during 2011–12 (top centre); total launches (white bars) and retrievals (black bars) by month (top right); and hourly launches (dotted line) and retrievals (solid line) by month. Error bars are 1 standard error where data imputation required for missing data.



**Figure 87.** Total power boat launches (white bar) and retrievals (black bar) from Point Peron (Lat 32.271, Long 115.698) during 2011–12 (top centre); total launches (white bars) and retrievals (black bars) by month (top right); and hourly launches (dotted line) and retrievals (solid line) by month. Error bars are 1 standard error where data imputation required for missing data.



**Figure 88.** Total power boat launches (white bar) and retrievals (black bar) from Emu Point (Lat 34.995, Long 117.945) during 2011–12 (top centre); total launches (white bars) and retrievals (black bars) by month (top right); and hourly launches (dotted line) and retrievals (solid line) by month. Error bars are 1 standard error where data imputation required for missing data.



**Figure 89.** Total power boat launches (white bar) and retrievals (black bar) from Bandy Creek (Lat 33.831, Long 121.932) during 2011–12 (top centre); total launches (white bars) and retrievals (black bars) by month (top right); and hourly launches (dotted line) and retrievals (solid line) by month. Error bars are 1 standard error where data imputation required for missing data.