Department of Primary Industries and Regional Development

GOVERNMENT OF WESTERN AUSTRALIA

recfish west

Recreational Fishing Initiatives Fund

ECONOMIC DIMENSION OF RECREATIONAL FISHING IN WESTERN AUSTRALIA

RESEARCH REPORT FOR THE RECREATIONAL FISHING INITIATIVES FUND

FINAL REPORT

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Economic Research Associates

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Disclaimer

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However, the analysis and conclusions are the work of the researchers and do not represent any official position of either the Department of Primary Industries and Regional Development or Recfishwest. The purpose of the study was to provide general background information on the economic value of recreational fishing in Western Australia. It is not intended to provide a basis for any commercial decisions.

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Executive Summary

The aim of this study was to determine the economic value of recreational fishing in Western Australia. It is based on an estimation of the aggregate expenditure by recreational fishers for the major categories of fishing related expenditure. Fishing costs are voluntarily incurred by recreational fishers in return for the mainly non-market benefits they derive from recreational fishing. Hence the estimated expenditure to go recreational fishing should be interpreted as a lower bound on the economic value of the benefit derived from recreational fishing. A more complete measure of economic value would incorporate non-market values for recreational fishing. Recreational fishing has experiential value as an outdoor leisure activity. This is complemented and enhanced for many species by the value of catch as a source of food and/or the value of catch as the thrill or sporting value of landing the catch.

A survey of recreational fishers was undertaken to collect data on the costs that they incur to go fishing. To ensure the sampling frame included all recreational fishers, and not just those who currently hold a valid recreational fishing boat licence (RFBL), a phone survey of anyone in a household in Western Australia who could be contacted by any type of phone was initiated in 2016 to provide the necessary benchmark data. The comprehensive sampling frame for this survey was the Electronic White Pages (EWP), and the aim, inter alia, of the EWP survey was to estimate the proportion and expenditure patterns of boat- and shore-based fishers in Western Australia.

For each household taking part in the survey, data collected included: household size and structure, fishing activity for each fisher household member, and economic expenditure over the previous 12 months for the main fisher in each household.

An initial positive response was obtained from 1,810 households. Western Australia has 866,777 occupied private households at the 2016 Census. The sample of 1,810 is 0.21% of Census households. Each household in the sample equates to 479 households in the population.

For each household the number of people in the household was recorded. In total 4,663 persons were recorded in 1,810 households in the sample. The Western Australia population at the 2016 Census was 2,217,302 persons in private dwellings. Each person in the sample equates to 475 persons in the total population.

Of the 1,810 households in the EWP survey, no fishing activity was recorded for 5 households, so these were recoded as non-fishing households, and 459 households were classified as fishing households because at least one member of the household participated in some recreational fishing during the previous 12 months. For the other 1,351 households, no one engaged in any recreational fishing during the previous 12 months. In the 459 fishing households, there are 1,427 residents, but only 857 active fishers.

In the sample of 4,663 residents in 1,810 households, in the previous 12 months there were 376 persons who fished only from the shore, while 219 persons fished only from

a boat, and 262 persons fished from both shore and a boat. Of the 1,810 households in the sample, 378 households indicated that they owned a boat.

Fishing activity in terms of catch was not collected, but effort measured by days spent fishing was collected for each household member. Mean shore fishing days per household was estimated to be 12.6 days, while mean boat fishing days was 10.77, so mean total fishing days per household was equal to 23.40. Of the 459 fishing households, around 26 percent fished only from a boat, 38 percent fished only from the shore and 36 percent fished from both shore and boat. Mean shore days per fisher was 6.76, mean boat days was 5.77, and mean total days per fisher was 12.53.

Out of the 459 fishing households in the sample, 34 respondents provided no expenditure information. These observations have been treated as missing values and excluded from the primary expenditure analysis. After adjusting for 5 inconsistent observations, there are 459 households with fishing activity, but only 425 households containing 789 recreational fishers with expenditure data.

Only 27% of these 789 recreational fishers were what might be termed more avid fishers (i.e. fishers who fished 15 or more days per year), while a higher proportion (57%) were less avid fishers (i.e. fishers who fished less than 10 days per year). For Western Australia, 357 (45%) recreational fishers fished only from a shore-based platform, while 189 (24%) fished only from boat-based platform, and 243 (31%) fished from both platforms during the year. Avidity varies across the fishing platforms. While some 57% of all recreational fishers in Western Australia were less avid, a much higher proportion (78%) of shore only recreational fishers were less avid. Conversely, less than half (47%) of boat only fishers were less avid, and only 37% of shore and boat fishers were less avid. Then again, the proportion of more avid fishers was highest among shore and boat fishers at 46%, followed by boat only fishers at 31%, while only 15% of shore only fishers were more avid.

As well as the choice of fishing platform, the fishery bioregion where recreational fishers choose to fish is an important determinant of both the fishing experience and the impact on the various fisheries. For most bioregions, annual effort from shore-based fishers was more or less equal to effort from boat-based recreational fishers, the notable exception being the South Coast bioregion, where shore-based fishing effort was more than double boat-based recreational fishing effort.

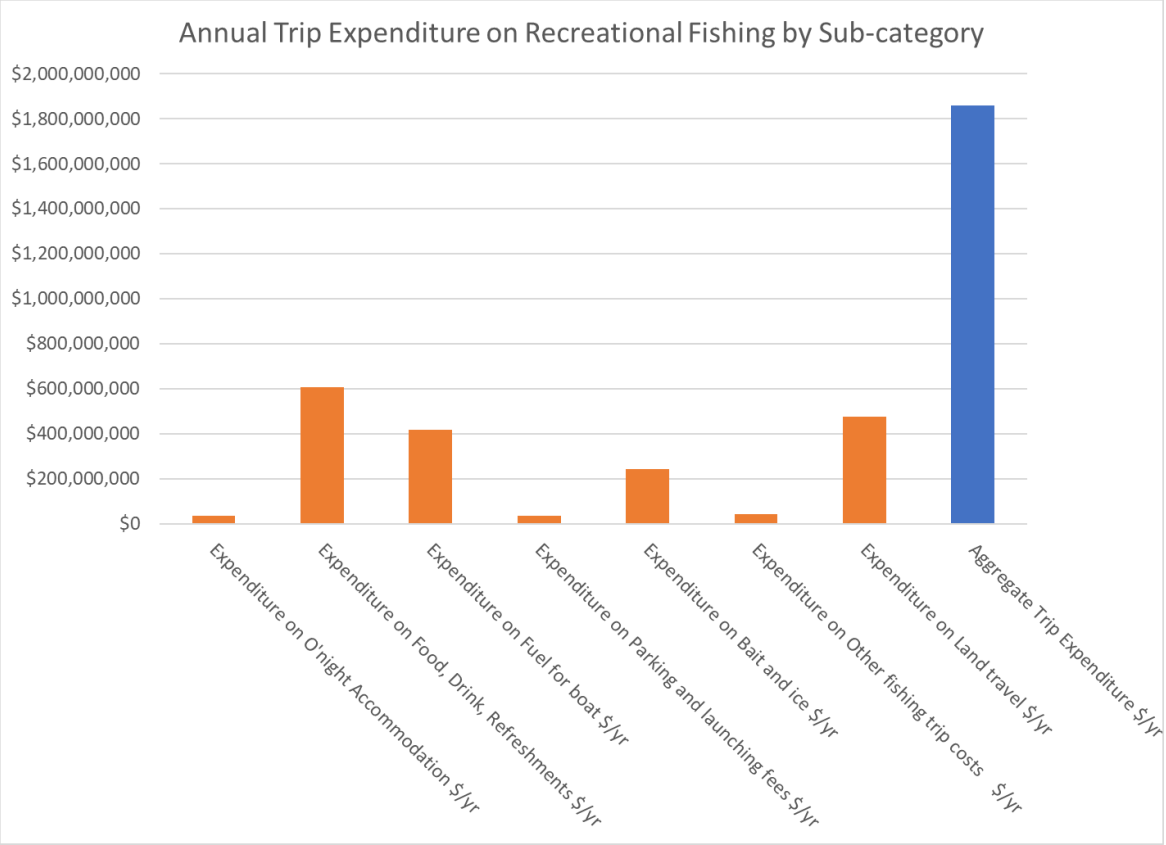
Estimation of household expenditure by recreational fishers is based on the 425 household observations with data on recreational fishing expenditure, which can be subdivided into three main categories as follows:

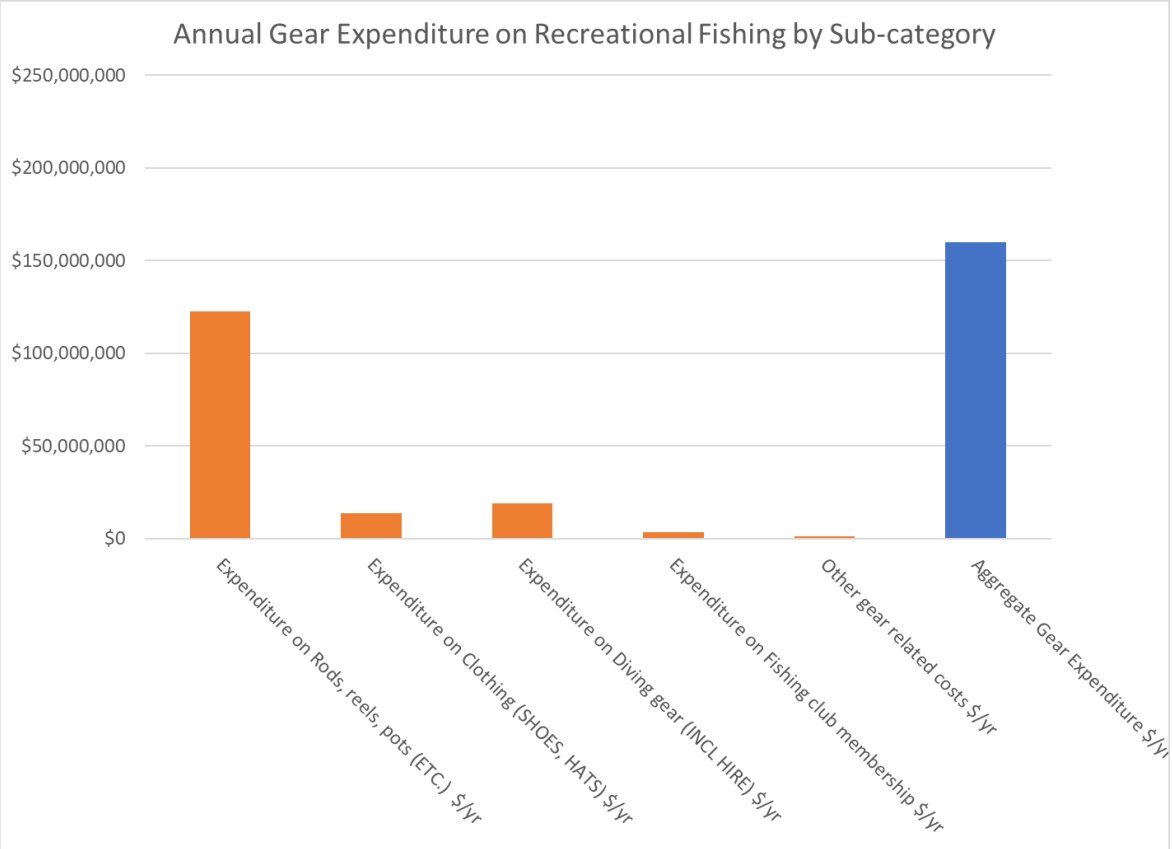
- Trip related expenditures – incurred per trip by each fisher (e.g. fuel, bait, ice, food) plus resources spent to travel from the place of residence to the boat launch site for boat-based recreational fishing trips, or to the site on the shore for shore-based fishing trips. Trip related expenditures also includes accommodation costs for trips involving one or more overnight stays.
- Gear related expenditures - incurred annually by each fisher (e.g. rods, reels)

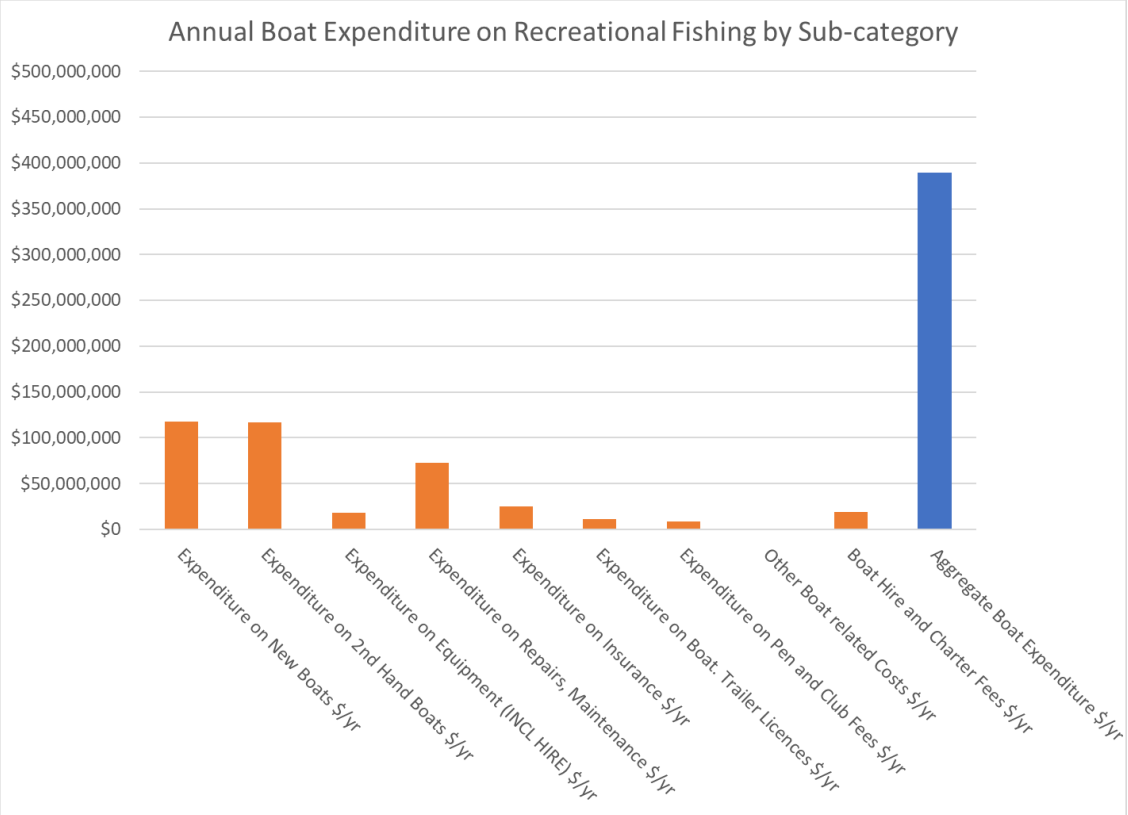
- Boat related expenditure - incurred annually for own boat use for recreational fishing (e.g. repairs, insurance, etc.) plus boat and charter hire.

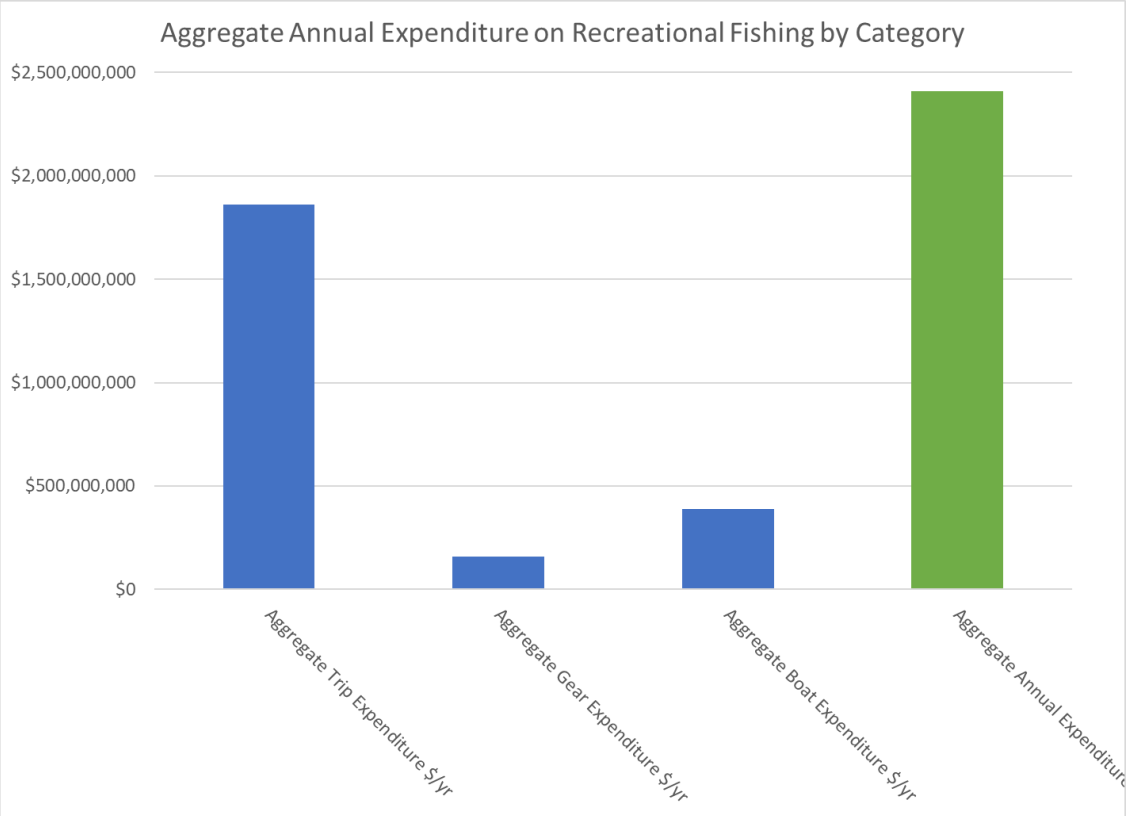
The sample aggregate expenditure attributable to fishing households among the whole 1,810 EWP sample households is representative of the fishing expenditure that would occur in all Western Australian households. Hence aggregate expenditure by households in the sample can be scaled up to the estimated population of Western Australia. A detailed breakdown of aggregate expenditure into component parts is provided in the Table and Figures below.

	Avg$ /HH	**Avg$ /fisher**	**Avg$ /trip**	**Population $**
Expenditure on O'night Accommodation $/yr	$171	$92	$7	$37,394,182
Expenditure on Food, Drink, Refreshments $/yr	$2,775	$1,495	$120	$605,675,342
Expenditure on Fuel for boat $/yr	$1,918	$1,033	$83	$418,546,256
Expenditure on Parking and launching fees $/yr	$160	$86	$7	$34,968,170
Expenditure on Bait and ice $/yr	$1,120	$604	$49	$244,539,414
Expenditure on Other fishing trip costs $/yr	$189	$102	$8	$41,315,141
Expenditure on Land travel $/yr	$2,186	$1,178	$95	$477,169,314
Aggregate Trip Expenditure $/yr				**$1,859,607,819**
Expenditure on Rods, reels, pots (ETC.) $/yr	$561	$307	$24	$122,464,856
Expenditure on Clothing (SHOES, HATS) $/yr	$63	$34	$3	$13,658,904
Expenditure on Diving gear (INCL HIRE) $/yr	$87	$47	$4	$19,032,183
Expenditure on Fishing club membership $/yr	$16	$9	$1	$3,574,312
Other gear related costs $/yr	$5	$3	$0	$1,160,624
Aggregate Gear Expenditure $/yr				**$159,890,879**
Expenditure on New Boats $/yr	$537	$289	$23	$117,258,994
Expenditure on 2nd Hand Boats $/yr	$534	$288	$23	$116,531,293
Expenditure on Equipment (INCL HIRE) $/yr	$84	$45	$4	$18,307,306
Expenditure on Repairs, Maintenance $/yr	$332	$179	$14	$72,418,586
Expenditure on Insurance $/yr	$115	$62	$5	$25,117,962
Expenditure on Boat. Trailer Licences $/yr	$53	$29	$2	$11,597,717
Expenditure on Pen and Club Fees $/yr	$39	$21	$2	$8,404,255
Other Boat related Costs $/yr	$2	$1	$0	$448,073
Boat Hire and Charter Fees $/yr	$87	$47	$4	$18,944,879
Aggregate Boat Expenditure $/yr				**$389,029,065**
Aggregate Annual Expenditure				**$2,408,527,764**


Annual Trip Expenditure on Recreational Fishing by Sub-category
$2,000,000,000
$1,800,000,000
$1,600,000,000
$1,400,000,000
$1,200,000,000
$1,000,000,000
$800,000,000
$600,000,000
$400,000,000
$200,000,000
$0
Expenditure on O'night Accommodation $/yr
Expenditure on Food, Drink, Refreshments $/yr
Expenditure on Fuel for boat $/yr
Expenditure on Parking and launching fees $/yr
Expenditure on Bait and ice $/yr
Expenditure on Other fishing trip costs $/yr
Expenditure on Land travel $/yr
Aggregate Trip Expenditure $/yr


Annual Gear Expenditure on Recreational Fishing by Sub-category
$250,000,000
$200,000,000
$150,000,000
$100,000,000
$50,000,000
$0
Expenditure on Rods, reels, pots (ETC.) $/yr
Expenditure on Clothing (SHOES, HATS) $/yr
Expenditure on Diving gear (INCL HIRE) $/yr
Expenditure on Fishing club membership $/yr
Other gear related costs $/yr
Aggregate Gear Expenditure $/yr


Annual Boat Expenditure on Recreational Fishing by Sub-category
$500,000,000
$450,000,000
$400,000,000
$350,000,000
$300,000,000
$250,000,000
$200,000,000
$150,000,000
$100,000,000
$50,000,000
$0
Expenditure on New Boats $/yr
Expenditure on 2nd Hand Boats $/yr
Expenditure on Equipment (INCL HIRE) $/yr
Expenditure on Repairs, Maintenance $/yr
Expenditure on Insurance $/yr
Expenditure on Boat, Trailer Licences $/yr
Expenditure on Pen and Club Fees $/yr
Other Boat related Costs $/yr
Boat Hire and Charter Fees $/yr
Aggregate Boat Expenditure $/yr


Aggregate Annual Expenditure on Recreational Fishing by Category
$2,500,000,000
$2,000,000,000
$1,500,000,000
$1,000,000,000
$500,000,000
$0
Aggregate Trip Expenditure $/yr
Aggregate Gear Expenditure $/yr
Aggregate Boat Expenditure $/yr
Aggregate Annual Expenditure

In summary, aggregate expenditures are estimated to be:

• $ 1,859,607,819 for trip related expenditure

(incl. land travel to site of fishing platform and accommodation on overnight trips)

• $ 159,890,879 for gear related expenditure

• $ 389,029,065 for boat related expenditure (incl. boat hire and charter fees)

Aggregate expenditure was $2.41 billion, or $1.80 billion if costs for Food & Refreshments are excluded.

However, these costs are a lower bound on the economic value of the benefits from recreational fishing, because willingness to pay (WTP) will be greater than or equal to the costs voluntarily incurred to go fishing. If an item can be acquired at a lower price than the WTP then the difference, called consumer surplus, equals the WTP for that item less the cost that needs to be incurred to acquire it. WTP for recreational fishing incorporates non-market values that are multidimensional. For many species, the non market value encompasses catch as a source of food as well as the thrill or sporting value of landing the catch These values complement and enhance the experiential value of recreational fishing as an outdoor leisure activity.

Measuring WTP for non-market goods and services is a complex task that was beyond the scope of this study. Benefit transfer analysis was employed to arrive at a separate estimate of consumer surplus from recreational fishing that could be added to the estimated expenditure by recreational fishers to derive a comprehensive measure of the economic value, or gross willingness to pay for the recreational fishing experience.

A literature survey identified the Recreation Use Values Database (RUVD) for North America as a comprehensive compilation of economic valuation studies of a variety recreational activities, including recreational fishing (Rosenberger 2016). For the most relevant comparable activity of “Saltwater Fishing”, the database referenced 134 documents, almost all of which contained multiple estimates of consumer surplus. After filtering out some less credible sources, a useable subset of 121 documents remained that yielded some 15,285 estimates of consumer surplus from Saltwater Fishing.

After standardising these 15,285 consumer surplus estimates to 2016 USD values, and excluding outliers, 100 estimates of consumer surplus with an average value of USD133.75 per person per fishing day remained. Converted to AUD at the prevailing exchange rate of AUD1.33 per USD yields an estimate of consumer surplus from recreational fishing of AU$178 per person per fishing day.

The aggregate number of fishing trips made during the 12 month survey period by the 789 recreational fishers in the 425 EWP households that provided expenditure data was 9,796. Scaling up to the WA population yields an estimate of consumer surplus of $908.1 million. When combined with estimated expenditure on recreational fishing of $2,408.53 million, it is estimated that economic value, or gross willingness to pay, for recreational fishing in Western Australia was $3,316.64 million. At $908.1 million the

consumer surplus is 37.7 percent of the underlying expenditure and 27.4 percent of the gross value or gross willingness to pay.

Derivation of these estimates followed standard practice of including all expenditure on food, drink, and refreshments during recreational fishing trips. However, not everyone accepts this procedure as valid. They argue that fishers would have incurred some expenditure on refreshments even if they did not go recreational fishing. If calculated expenditure of $605.68 million is deducted from the total, then gross expenditure on recreational fishing is estimated to be $1,802.84. million, so the estimate of economic value, or gross willingness to pay, for recreational fishing in Western Australia would be $2,710.96 million.

1 INTRODUCTION

The aim of this project was to determine the economic value of recreational fishing in Western Australia. There are two dimensions of aggregate value that can be estimated - the expenditure made by recreational fishers in Western Australia; and the surplus economic value associated with that expenditure.

The first involves estimation of the aggregate expenditure incurred by recreational fishers for the major expenditure categories, and the documentation of the economic contribution made to the Western Australian economy through this expenditure. This was the focus of the first fully comprehensive economic impact study of recreational fishing in Western Australia (Lindner & McLeod 1991).

However, the costs of recreational fishing are a lower bound on the economic value of the benefits from recreational fishing, because such costs are voluntarily incurred by recreational fishers in return for benefits that, in the main, cannot be observed in market transactions. This alternative measure of economic value incorporates non-market values that are multidimensional. For many species this includes catch as a source of food and/or as the thrill or sporting value of landing the catch, that complement and enhance the experiential value of an outdoor leisure activity. This dimension of the economic value of recreational fishing is often not appreciated in discussion of economic policy decisions.

A study that assembles detailed information on the economic value of recreational fishing also provides a foundation for the evaluation of a variety of management decisions. For instance, there is a legislative requirement to manage Western Australian fisheries to enhance their economic and social value. Existing data to do this are limited. This project helps remedy this deficiency by collecting relevant data to assess the economic value of recreational fishing and by linking this to ongoing recreational fishing surveys conducted by the Department of Fisheries.

One supplementary objective of this study was to calculate the bioregion and species breakdown of the estimates of the economic expenditure on recreational fishing, as well as the overall value of the recreational fishing experience. Another supplementary objective was to structure an appropriate methodology to determine economic value of recreational fishing consistent with extant Western Australian fisheries surveys.

This report contains expenditure estimates obtained from adding expenditure questions to surveys already being undertaken by the Department of Fisheries. Expenditure questions were added to two separate surveys that used different sampling frames. Questions were added to the WASHF survey. WASHF is the recall survey administered to respondents at the end of a twelve-month state-wide survey of holders of an RFBL (recreational fishing boat licence). This survey is therefore focussed on expenditures associated with boat-based recreational fishing. The same questions were also included in an Electronic White Pages (EWP) survey of the

population. This was a general population survey that included both boat-based and shore-based fishers.

The EWP is the primary data source for this study. Expenditure data from this survey was used to estimate fishing expenditure by the population of recreational fishers in Western Australia. This expenditure estimate was then used as the basis for estimating gross fishing value by applying an estimate of consumer surplus. This was done based on a review of the literature on the consumer surplus associated with recreational fishing.

The results are broken down into relevant categories – shore versus boat-based recreational fishing, development region and bioregion.

2 PREVIOUS SURVEYS

The original economic impact study of recreational fishing in Western Australia was completed in 1991 by Lindner and McLeod of Economic Research Associates. Two surveys, one by telephone interviews of 401 recreational fishers, and another via a self-enumeration questionnaire of a non-random self-selecting sample were conducted to determine how much recreational fishers spend during a year on goods and services on activities related to fishing. Total annual expenditure associated with recreational fishing was estimated to lie within the range from $200 million to $415 million.

Subsequently, as part of a national survey of recreational and indigenous fishing in Australia conducted during 2000/01, data was collected on not only on participation levels, fishing effort and catch by recreational fishers, but also on economic activity associated with recreational fishing at a national, state, and regional level. The economic report with outcomes based on survey data on fishing and fishing-related expenditure activities between May 2000 and April 2001 was published in 2005.

A review of subsequent studies reveals that available information on the economic value of recreational fishing in Western Australia is limited in scope, fragmented, and dated. The Lindner and McLeod study is now more than 25 years out of date, and more recent studies are limited in both geographic scope and fishing platform. Most of these studies (van Bueren 1999; Raguragavan et al. 2013) employed less direct methods, such as revealed preference techniques, to impute economic value. Van Bueren (1999) estimated values for share based fishing for five categories of fish (namely prize fish, reef fish, key sports fish, butter fish and table fish) and for 13 recreational fishing sites on the southwest coast. He found that angler benefits range from A$13.00 to $39.00 per day of fishing. Raguragavan et al. (2013) used essentially the same methodology, but with an expanded, albeit dated data set drawn from the 2000/01 National Survey of Recreational Fishing. Their published economic welfare estimates for a 100 per cent catch rate increase ($/trip) for the five categories of fish ranged from $14.88 for table fish to $31.41 for prize fish. They also estimated the access value for forty-eight Western Australian fishing sites, defined as the welfare

loss suffered by an angler if a site became unavailable. Averaged across all sites, welfare losses from a site closure amount to $3.81 per trip per angler.

The most recent detailed expenditure survey for recreational fishing is one for Victoria in 2008/09 (Ernst & Young 2009a). This was updated in 2013/14 ((Ernst & Young 2015). From the 2008/09 the following key findings.

- an estimated 721,000 Victorians participated in recreational fishing. Victoria's population in June 2009 was 5.44 million. Recreational fishers were 13 percent of this population and 19 percent of the adult population.
- the number of fishing trips taken in Victoria is estimated at an average of 12 per year per fisher, making total fishing trips 8.7 million;
- average expenditure per trip per fisher is estimated to be $250 inclusive of variable costs (such as accommodation, bait, fuel etc) and fixed costs (such as equipment and capital);
- aggregate direct expenditure was valued at $2.3 billion in 2008-09.
- aggregate direct expenditure is estimated to increase to $2.9 billion in 2028-29;
- The later study (Ernst & Young 2015) reported the following.
- lower average trips per fisher of 7.3 although the participation rate has stayed about the same at 18 percent of the adult population.
- average per trip expenditure by fishers of $326 excluding boat purchase.
- aggregate direct expenditure was valued at $2.6 billion in 2008-09.
- aggregate direct expenditure is estimated to increase to $3.3 billion in 2028-29;
- A 2012/13 survey of recreational fishers in Tasmania (Lyle et al. 2014) found the following.
- 98,000 Tasmanian residents aged 5 years or older fished at least once in Tasmania, representing an overall participation rate of 22%.
- recreational fishers accounted for about 507,000 person days of effort, with an average of 5.5 days per fisher.
- direct expenditure is estimated to $93 million on goods and services relevant to fishing, $1008 per fisher or $183 per day.

In 2012 a NSW survey of recreational fishers (Mcllgorm & Pepperell 2013) found the following.

- 905,048 anglers fished in NSW with 773,000 adults over 18 years of age. The NSW population in June 2012 was 7.29 million. Recreational fishers were 12.4 percent of this population and 14 percent of the adult population
- average trips per year were 10.7 combined saltwater and freshwater. Average days fished per year were 14.6.
- average expenditure per angler of $225.24 per trip. - $154.05 on fishing trip related items plus $71.20 was spent on tackle and boat fuel per trip.
- annual fishing related boat expenditure averaged $768.15 per angler.

- aggregate expenditure was estimated at $1.626bn per year, $1.439bn from NSW residents alone.

3 METHODOLOGY

3.1 VALUE DERIVED FROM RECREATIONAL FISHERS OPTIMAL CHOICES

To understand how value is derived from recreational fishing, it is useful to begin with a model of recreational fisher behaviour. Such models have been an accepted part of the economics literature for many years, and assist in the analysis of value because it helps to:

- clarify how value is derived from the choices that recreational fishers make
- allows inferences to be made about expenditures and value
- helps to put intelligible bounds on value
- Assuming fishers go fishing to maximize the value derived from fishing, a simple model implies that:
- the resource cost of going fishing is expenditure (money outlays plus opportunity cost of time)
- fishers choose to expend these resources because the value derived from fishing is greater than or equal to the value of these resources expended in some other way, so
    - the value of resources expended (money plus time) is a minimum or lower bound estimate of the value of recreational fishing
- the principal components of the higher value that justifies incurring these resource costs are:
    - experiential value – related to the wider trip experience irrespective of whether any fish are caught and kept or released
    - sport value – related to the excitement of catching sporting species of fish irrespective of whether kept or released
    - food value - directly connected to kept catch of edible species

This measure of the value of recreational fishing imputed from the choices that fishers make enables analysis of policies such as bag limits and closures that impact the quantity and quality of options available to fishers, and so have the potential to directly enhance or diminish the value of recreational fishing, even if the resource cost is little impacted.

The following diagram is a simple representation of this concept.

Assume a recreational fisher makes several trips per year to go fishing. The “price paid” for each trip is composed of money costs (trip, gear, and boat) and time cost as reflected in the opportunity lost by committing the time to fishing.

The money cost includes:

- direct per trip costs such as boat fuel, food, launch fees, bait and ice, plus the financial cost of land transport to get to the location of the fishing platform. The annual cost is the sum of the individual trip costs, or the average trip cost multiplied by the annual number of trips chosen
- annual gear cost for items such as rods and reels, clothing, and other annual costs that are independent of fishing effort levels
- annual boat costs which can be apportioned based on the percent of times the boat is used for recreational fishing.

The time cost includes;

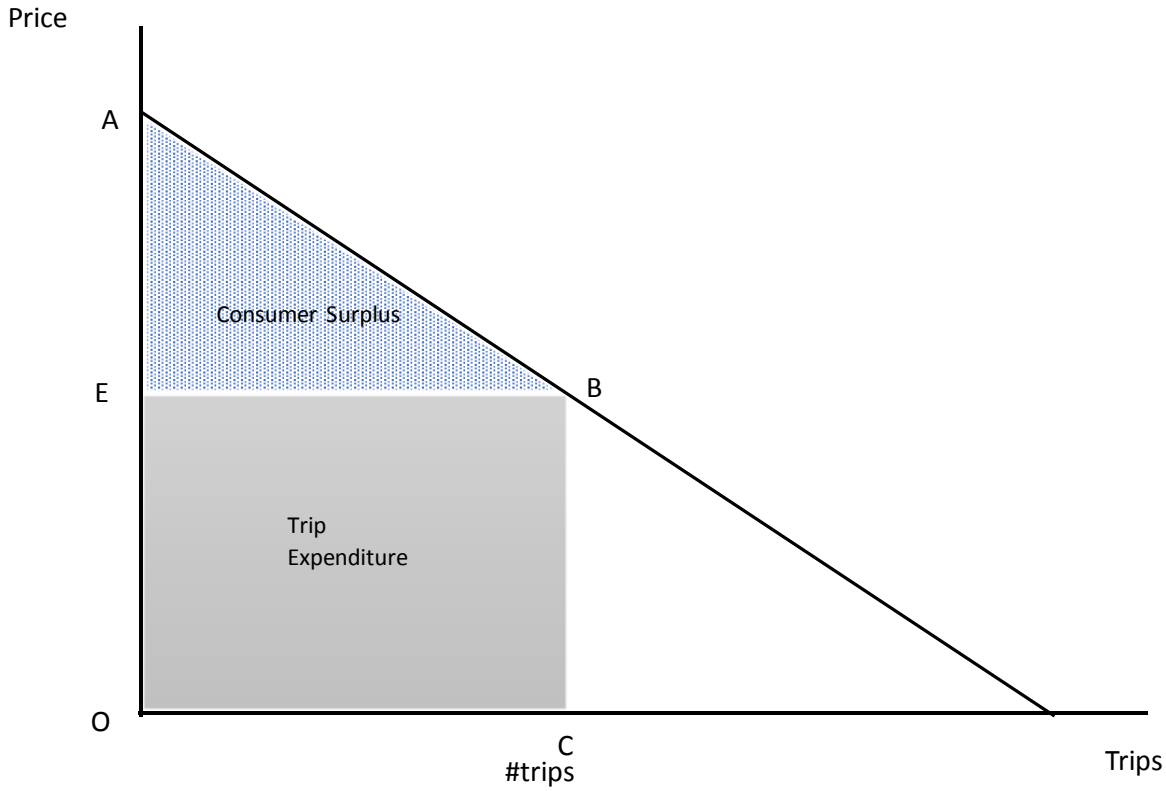
- total trip time is composed of;
  - travel time from residence to launch site or shore location,
  - time spent fishing and,
  - time spent on the water or at the shore location when not fishing.
- The opportunity cost value of time which might be different for the different types of time.

To the recreational fisher, the economic value of each trip is the maximum sum of money the fisher would be willing to pay for that trip. In the literature, the demand for a non-market good or service, such as recreational fishing, is expressed as the maximum willingness to pay (WTP) for that experience, and the demand to go fishing can be represented by a conventional demand curve making chosen trips per year a function of WTP for the trip. This is illustrated in Figure 1. the total value derived from OC trips is the area under the demand curve or ABCO. Of this gross value, the shaded area EBCO is the cost of going fishing for OC trips. Assuming OC trips at average cost E is the optimal solution for the fisher, EBCO also is the lower bound on the value that can be ascribed to recreational fishing activity; because for all but the marginal trip at OC, the WTP for the trip exceeds the price paid as measured by the resource cost of going fishing. The excess of WTP over and above resource costs incurred is depicted by the triangle ABE, and is referred to in the literature as the consumer surplus from the recreational fishing experience

Hence, a more complete valuation is based on area ABCO which encompasses:

- experiential value – related to wider trip experiences
- sport value – related to sport of landing kept and released catch
- food value - directly connected to kept catch

Figure 1: Expenditure and Consumer Surplus for Recreational Fishing



3.2 ESTIMATING VALUE

3.2.1 Economic Value from Fishing Costs plus Consumer Surplus

Conducting surveys of recreational fishers to collect data on the costs that they incur to go recreational fishing has been the most common approach adopted in studies of the economic value of recreational fishing, and such a survey is at the heart of the current study. However, as explained above, on its own such a measure will underestimate the full economic value of recreational fishing because it excludes any measure of the consumer surplus realised from this activity. While a further survey could have been conducted to directly estimate WTP for recreational fishing, the resources to do so were not available for this study. Instead, a technique known as benefit transfer was employed to arrive at a separate estimate of consumer surplus from recreational fishing that could be added to estimated expenditure by recreational fishers to derive a comprehensive measure of the economic value, or gross willingness to pay for the recreational fishing experience.

Benefit transfer is a technique used to infer the non-market value of a specific environmental and/or natural resource-based attributes from estimates already obtained in previous studies that are carried out in another location and/or in a different context. It is often used when it is too expensive or difficult to conduct a valuation study de novo, but a measure of benefits is needed. For the case of recreational fishing, estimates of consumer surplus for the case of interest may be

obtained by applying measures of recreational fishing values from studies conducted in one or more other situations. Essentially, the aim of benefit transfer is to estimate benefits for one context by adapting estimates of benefits from other contexts. Clearly, the more similar the nature of the amenity value and circumstances in the original studies is to those for the object of the benefit transfer, the better.

3.2.2 Estimating the Value of Recreational Fishing from the Market for Charter Fishing Trips

While in most cases, there is no established market for recreational fishing that reveals the non-market value for the recreational fishing experience, there is a small but important exception in the form of the market for charter fishing trips. For boat-based recreational fishing, paying for a fishing boat trip run by a charter operator can be an alternative to directly paying for, or otherwise gaining access to a privately-owned boat for the day, as well as to meeting most if not all trip related costs, such as purchasing fuel for the boat, bait and ice, etc. Furthermore, while some charter operators also have some fishing gear available for novices, many avid fishers prefer to use their own gear.

Typically, the cost of a one-day fishing charter will exceed the variable costs of one days fishing by a substantial margin. Therefore, the total cost of the charter provides a market-based measure of the minimum WTP for one day's recreational fishing experience, including the experiential value of being on the fishing platform, the option of the thrill of catching one or more fish, and the culinary benefit of consuming any retained catch.

In addition, there is an admittedly small group of potential clients who are willing to pay the charter operator a reduced fee for the one-day boat trip so long as they do not participate in the fishing experience (i.e. they do not use any fishing gear or have a "line in the water").

4 EWP SURVEY

4.1 THE EWP SURVEY

The Recreational Fishing from a Boat Licence (RFBL) has provided a cost-effective state-wide sampling frame for biennial state-wide surveys of boat-based recreational fishers since 2011/12 (Ryan et al 2017). These surveys provide the most detailed data using a consistent, probability-based survey design about activities and behaviour of boat-based recreational fishers in Western Australia. However, the scope of the sampling frame is limited to those recreational fishers who currently hold a valid recreational fishing boat licence (RFBL).

Because it is not necessary to hold an RFBL to fish from the shore, nor to fish as a client on a licensed charter boat, recreational fishers who only fish in these ways do not need to hold an RFBL, and as a result are excluded from the sampling frame for the state-wide surveys.

To cover this gap, a further phone survey of anyone in a household in Western Australia who could be contacted by any type of phone was initiated in 2016 to provide the necessary benchmark data to make proportional estimates of effort by shore-based recreational fishers. The more comprehensive sampling frame for this survey was the Electronic White Pages (EWP), and the primary aim of the EWP survey is to estimate the proportion and characteristics of boat- and shore-based recreational fishers in Western Australia.

Any household member who answered a phone call from the survey centre and agreed to participate was asked a series of retrospective questions to:

- determine household size and structure, i.e. age & gender for each household member, whether fished or not
- identify fisher members within household, and to collect information on fishing activity for each fisher household member
- determine licence status for each household member, whether fished or not
- determine future fishing of household members
- collect information on economic activity over the previous 12 months for the main fisher in each household

4.1.1 Total Sample

An initial positive response was obtained from 1,810 households. Western Australia has 866,777 occupied private households at the 2016 Census. The sample of 1,810 is 0.21% of census households. Each household in the sample equates to 479 households in the population.

For each household the number of people in the household was recorded. A total of 4,663 persons was recorded in 1,810 households in the sample. The Western Australian population at the 2016 Census was 2,217,302 persons in private dwellings. Each person in the sample equates to 475 persons in the total population.

4.1.2 Distribution by Household Size

The distributions of the sample by household size compared to the Census is shown below. Table 1 Relative to the Western Australian population, the EWP sample has a greater concentration in 2-person households.

Table 1; Distribution of Households by Household Size in EWP Sample Relative to Population

	EWP Sample				2016 Census	
Household Size	Freq	Percent		Household Size	Freq	Percent
1	368	20.33		1	204,202	23.56
2	738	40.77		2	293,927	33.91
3	222	12.27		3	141,315	16.30
4	308	17.02		4	142,071	16.39
5	136	7.51		5	57,978	6.69
6	27	1.49		6 and above	27,275	3.15
7	9	0.5				
8	2	0.11				
Total	1,810	100			866,777	100

Table 2: Distribution of Persons by Household Size in EWP Sample Relative to Population

	EWP Sample				2016 Census	
Persons	Freq	Percent		Household Size	Freq	Percent
1	368	7.89		1	204,202	9.21
2	1,476	31.65		2	587,854	26.51
3	666	14.28		3	423,945	19.12
4	1,232	26.42		4	568,284	25.63
5	680	14.58		5	289,890	13.07
6	162	3.47		6 and above	143,127	6.46
7	63	1.35				
8	16	0.34				
Total	4,663	100			2,217,302	100

4.1.3 Distribution by Region of Residence

The location of each household was determined as part of the survey. The distribution of all households (1,810) across regions is shown below, along with the distribution of households (425) with recorded expenditure.

Table 3: Distribution of EWP Sample by Region of Residence

REGION	Freq.	Percent	Freq.	Percent
	Full Sample		Fishing HH with Expenditure Records	
Gascoyne	62	3.43	23	5.41
Goldfields	72	3.98	25	5.88
Great Southern	131	7.24	38	8.94
Kimberley	43	2.38	23	5.41
Metro	1,018	56.24	169	39.76
Mid West	93	5.14	31	7.29
Peel	105	5.8	33	7.76
Pilbara	43	2.38	18	4.24
South West	144	7.96	42	9.88
Wheat Belt	99	5.47	23	5.41
Total	1,810	100	425	100

4.1.4 Fishing Households

Of the 1,810 households in the EWP survey, 464 answered yes to any fishing activities (including yabbies, lobster etc.). However, for 5 households, no fishing activity (days or expenditure) of any kind was recorded. Hence, these were recoded as non-fishing households. Household participation in fishing is shown in Table 4. In all, 459 households were classified as fishing households because at least one member of the household participated in some recreational fishing during the previous 12 months. For the other 1,351 households, no one engaged in any recreational fishing during the previous 12 months.

Table 4: Fishing Participation by Household

	# HH	Percent	# Persons	Percent	# Fishing Persons
Fishing HH	459	25.36	1,427	30.60	857
Non-fishing HH	1,351	74.64	3,236	69.40	0
Total	1,810	100	4,663	100	857

Average household size for fishing households is 3.1 persons. For non-fishing households, average size is smaller at 2.39 persons. The 459 fishing households is equivalent to 219,807 fishing households in the population. The higher household size means that 30 percent of sampled persons are in fishing households.

Not all persons in fishing households are active fishers. Respondents were asked about fishing activity by each member of the household. This allows an estimate of the number of fishers in each household and in the sample of fishing households. In the 459 fishing households, there are 1,427 residents, but only 857 active fishers.

Shore only fishers by number in household are shown below. In the sample of 1810 households there are 376 persons who fished only from the shore in the previous 12 months. This is 8.06 percent of the 4,663 sampled persons.

Table 5: Shore Only recreational Fishers in EWP sample

# of shore fishers in HH	Freq.	Percent	# Shore Fishers
0	1,591	87.9	0
1	122	6.74	122
2	60	3.31	120
3	21	1.16	63
4	10	0.55	40
5	5	0.28	25
6	1	0.06	6
Total	1,810	100	376

Boat only fishers by number in household are shown below. In the sample of 4,663 residents in 1,810 households, there are 219 persons who fished only from a boat in the previous 12 months, which is 4.70 percent of the sampled persons.

Table 6: Boat Only Fishers in EWP Sample

# of boat fishers in HH	Freq.	Percent	# Boat fishers
0	1,675	92.54	0
1	85	4.7	85
2	28	1.55	56
3	14	0.77	42
4	4	0.22	16
5	4	0.22	20
Total	1,810	100	219

Fishers by household who fished from both shore and boat are shown below. In the sample of 1,810 households there are 262 persons who fished from both shore and a boat in the previous 12 months, which is 5.62 percent of the sampled persons.

Table 7: Both Shore and Boat Fishers in EWP Sample

Shore and Boat fishers				
# in HH	Freq.	Percent	Cum.	# fishers
0	1,650	91.16	91.16	0
1	98	5.41	96.57	98
2	39	2.15	98.73	78
3	9	0.5	99.23	27
4	11	0.61	99.83	44
5	3	0.17	100	15
Total	1,810	100		262

Of the 1,810 households in the sample, 378 households indicated that they owned a boat. There were 1,103 persons in these boat owning households.

Table 8: Boat Ownership for EWP Sample

Boat Ownership	Freq.	Percent
Owns Boat	378	20.88
No Boat	1,432	79.12
Total	1,810	100

4.1.5 Fishing Activity

Fishing activity in terms of catch was not collected. However, effort as measured by days spent shore fishing and days spent boat fishing were collected for each household member.

Using this data, an estimate of fishing days is possible for each household. Mean shore fishing days per household is 12.6. Mean boat fishing days is 10.77 with mean total fishing days per household equal to 23.40.

Table 9: Fishing Days per Household

Fishing Days (days per household)	Obs	Mean days per household	Std. Dev.	Min	Max
Shore-based	459	12.6187	24.9646	0	198
Boat-based	459	10.7778	17.9265	0	150
Total	459	23.3965	34.1473	1	340

Total fishing days are shown below along with mean days per fisher. Mean shore days per fisher are 6.76. Mean boat days are 5.77 and mean total days per fisher are 12.53.

Table 10: Fishing Days per Fisher

Fishing Days (days per fisher)	Obs	Total days	# Fishers	Mean Days per fisher

Shore-based	459	5,792	857	6.758
Boat-based	459	4,947	857	5.772
Total	459	10,739	857	12.530

Using the data on days fished from shore, boat and both shore and boat households can be classified into shore only, boat only and mixed shore/boat households. Of the 459 fishing households, around 26 percent fished only from a boat, 38 percent fished only from the shore and 36 percent fished from both shore and boat.

Table 11: Household Fishing Activity

Household Fishing Type	Freq.	Percent	Cum.
Shore-based Only	175	38.13	64.05
Boat-based Only	119	25.93	25.93
Both Shore- and Boat-based	165	35.95	100.00
Total	459	100.00	

4.2 THE EWP EXPENDITURE SAMPLE

Out of the 459 fishing households in the sample, 34 respondents provided no expenditure information even though they indicated that they were in a fishing household. These observations have been treated as missing values and excluded from the primary expenditure analysis.

After adjusting for the 5 inconsistent observations and the 34 with no expenditure data, there are 459 households with fishing activity, but only 425 household observations with expenditure data.

The region of residence for the 425 is shown in Table 3 above which shows the regional distribution of the full sample (1,810) alongside the regional distribution of households (425) with expenditure records.

Table 12 compares information for the full sample of 1,810 households classified by region of residence and household size. Table 13 presents equivalent information for those households for which there is expenditure information.

Table 12: Distribution of All Households in Sample by Region and Household size

	Number in Household								
REGION	1	2	3	4	5	6	7	8	Total
Gascoyne	12	26	7	9	6	1	1	0	62
Goldfields	10	31	8	10	9	3	1	0	72
Great Southern	26	60	13	19	9	2	2	0	131
Kimberley	7	13	12	8	3	0	0	0	43
Metro	211	389	134	187	73	19	3	2	1,018
Mid West	20	40	11	13	9	0	0	0	93
Peel	24	45	10	16	8	1	1	0	105
Pilbara	6	15	7	12	3	0	0	0	43
South West	28	70	14	20	12	0	0	0	144
Wheat Belt	24	49	6	14	4	1	1	0	99
Total	368	738	222	308	136	27	9	2	1,810

Table 13: Distribution of Fishing Households in Sample by Region and Household Size

	Number in Household							
REGION	1	2	3	4	5	6	7	Total
Gascoyne	2	9	4	5	2	1	0	23
Goldfields	0	11	4	3	4	2	1	25
Great Southern	6	14	1	13	3	1	0	38
Kimberley	3	6	6	5	3	0	0	23
Metro	10	61	24	47	21	5	1	169
Mid West	1	13	5	6	6	0	0	31
Peel	0	15	3	9	5	0	1	33
Pilbara	1	5	4	7	1	0	0	18
South West	1	14	8	11	8	0	0	42
Wheat Belt	4	10	3	4	2	0	0	23
Total	28	158	62	110	55	9	3	425

In total, there were 1,320 residents in the 425 fishing households. Table 14 shows the information for these residents classified by region of residence and age group.

Table 14: Persons in Fishing Households by Region and Age

4.2.1 EWP Fishing Households by Income

Age	0-14	15–29	30–44	45–59	60–74	75 and over	Total
Gascoyne	12	15	8	23	10	0	68
Goldfields-Esperance	22	15	17	16	14	1	85
Great Southern	25	19	20	18	23	5	110
Kimberley	17	11	12	19	9	0	68
Metro	104	120	107	117	66	20	534
Mid West	16	17	13	22	24	4	96
Peel	25	15	25	17	20	5	107
Pilbara	16	10	16	6	6	2	56
South West	33	20	27	33	18	6	137
Wheatbelt	11	7	14	14	13	0	59
Total	281	249	259	285	203	43	1,320

Respondents who answered expenditure questions were also asked their individual income in ranges. The income distribution of respondents is shown in Table 15.

Table 15: Income Distribution of EWP Fishing Respondents

Personal Income	Freq.	Percent
Nil or negative	20	4.71
up to $25,999 pa	46	10.82
$26,000 to $51,999 pa	47	11.06
$52,000 to $77,999 pa	65	15.29
$78,000 to $103,999 pa	66	15.53
$104,000 to $155,999	54	12.71
$156,000 to $207,999 pa	24	5.65
$208,000 pa or more	21	4.94
Don't know	13	3.06
Refused	69	16.24
Total	425	100

The ABS publishes individual income data based on total personal income. Income ranges are slightly different to those in Table 15. In the table below, the income distribution of respondents is compared to the 2016 Census data with comparable income categories and for persons 15 years and older.

Table 16: Income Distribution of EWP Fishing Respondents Compared to WA Census

4.2.2 Boat-based Recreational Fishing

	Census	Percent	EWP	Percent
Nil or negative	202,458	10%	20	5%
up to $25,999 pa	502,553	25%	46	11%
$26,000 to $51,999 pa	409,503	20%	47	11%
$52,000 to $77,999 pa	284,141	14%	65	15%
$78,000 to $103,999 pa	186,491	9%	66	16%
$104,000 to $155,999	136,710	7%	54	13%
$156,000 and above pa	84,514	4%	45	11%
Don't know and Refused	668,026	33%	82	19%
	1,997,722	100%	425	100%

Of the 425 households with recorded fishing expenditure, 206 were boat owning households. There were 636 persons in these households.

Table 17: Boat Ownership for Fishing Households

	Freq.	Percent
Owns Boat	206	48.47
No Boat	219	51.53
Total	425	100

4.2.3 Avidity

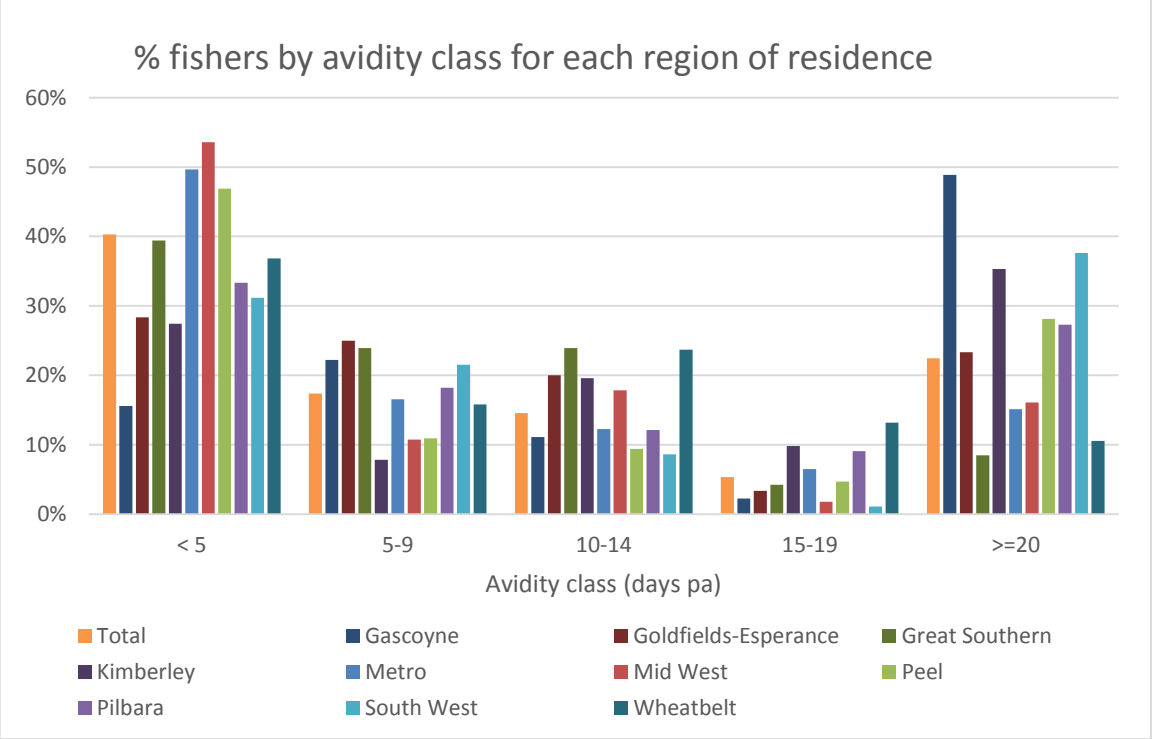
Of the 1,320 residents in the 425 fishing households, only 789 of these residents participated in at least some recreational fishing during the previous 12 months. The rest of this report focusses on the 425 fishing households and the 789 recreational fishers in these households. Table 18 shows fishing avidity for the 789 recreational fishers.

Table 18 Fishing Avidity by Region of Residence for EWP Fishers

All Fishers		Avidity Days pa									
Total	# days pa	< 5 days	5 to 9 (days)	10 to 14 (days)	15 to 19 (days)	>= 20 (days)	< 5 days	5 to 9 (days)	10 to 14 (days)	15 to 19 (days)	>= 20 (days)
45	Gascoyne	7	10	5	1	22	16%	22%	11%	2%	49%
60	Goldfields-Esperance	17	15	12	2	14	28%	25%	20%	3%	23%
71	Great Southern	28	17	17	3	6	39%	24%	24%	4%	8%
51	Kimberley	14	4	10	5	18	27%	8%	20%	10%	35%
278	Metro	138	46	34	18	42	50%	17%	12%	6%	15%
56	Mid West	30	6	10	1	9	54%	11%	18%	2%	16%
64	Peel	30	7	6	3	18	47%	11%	9%	5%	28%
33	Pilbara	11	6	4	3	9	33%	18%	12%	9%	27%
93	South West	29	20	8	1	35	31%	22%	9%	1%	38%
38	Wheatbelt	14	6	9	5	4	37%	16%	24%	13%	11%
789	Total	318	137	115	42	177	40%	17%	15%	5%	22%

State-wide, only 27% were what might be termed more avid fishers (i.e. fishers who fished 15 or more days per year), while a higher proportion (57%) were less avid fishers (i.e. fishers who fished less than 10 days per year). However, these proportions differed considerably depending on region of residence. The Gascoyne region contained the highest proportion (51%) of more avid fishers, followed by the Kimberley with 45% of more avid fishers. Less avid fishers dominated in the Metro region (66%), the Mid West region (64%), and the Great Southern region (63%).

Figure 2: Avidity by Region



For Western Australia, 357 (45%) recreational fishers fished only from a shore-based platform, while 189 (24%) fished only from boat-based platform, and 243 (31%) fished from both platforms during the year. Table 19 shows the number of recreational fishers in these three subgroups classified by region of residence. Again, there were marked differences between the regions. The smallest proportion of shore only fishers were in the Kimberley (22%) and the Pilbara (30%), while shore only fishers made up more than 50% of all recreational fishers in the Great Southern, the Goldfields-Esperance, and the Kimberley.

Table 19: Fishers in EWP by Region of Residence and Fishing Platform

		# Fishers by Platform					
Total		Shore	Boat	Both	Shore	Boat	Both
45	Gascoyne	23	6	16	51%	13%	36%
60	Goldfields-Esperance	31	16	13	52%	27%	22%
71	Great Southern	45	8	18	63%	11%	25%
51	Kimberley	11	17	23	22%	33%	45%
278	Metro	132	67	79	47%	24%	28%
56	Mid West	20	23	13	36%	41%	23%
64	Peel	31	20	13	48%	31%	20%
33	Pilbara	10	9	14	30%	27%	42%
93	South West	39	14	40	42%	15%	43%
38	Wheatbelt	15	9	14	39%	24%	37%
789	Total	357	189	243	45%	24%	31%

Avidity varies across the fishing platforms. The following tables show fishing avidity for these three subgroups of recreational fishers.

Table 20: Fishing Avidity for Shore only Fishers

Shore Only Fishers	# days pa	< 5 days	5 to 9 (days)	10 to 14 (days)	15 to 19 (days)	>= 20 (days)	< 5 days	5 to 9 (days)	10 to 14 (days)	15 to 19 (days)	>= 20 (days)
23	Gascoyne	5	7	2	0	9	22 %	30%	9%	0%	39%
31	Goldfields-Esperance	17	2	4	0	8	55 %	6%	13%	0%	26%
45	Great Southern	20	15	6	2	2	44 %	33%	13%	4%	4%
11	Kimberley	7	1	1	1	1	64 %	9%	9%	9%	9%
132	Metro	87	24	5	4	12	66 %	18%	4%	3%	9%
20	Mid West	12	4	3	0	1	60 %	20%	15%	0%	5%
31	Peel	19	4	2	2	4	61 %	13%	6%	6%	13%
10	Pilbara	5	4	1	0	0	50 %	40%	10%	0%	0%
39	South West	20	10	4	0	5	51 %	26%	10%	0%	13%
15	Wheatbelt	7	6	2	0	0	47 %	40%	13%	0%	0%
357	Total	199	77	30	9	42	56 %	22%	8%	3%	12%

While some 57% of all recreational fishers in Western Australia were less avid, a much higher proportion (78%) of shore only recreational fishers were less avid. Conversely, less than half (47%) of boat only fishers were less avid, and only 37% of shore & boat fishers were less avid. Then again, the proportion of more avid fishers was highest among shore & boat fishers at 46%, followed by boat only fishers at 31%, while only 15% of shore only fishers were more avid.

Table 21: Fishing Avidity for Boat Only Fishers

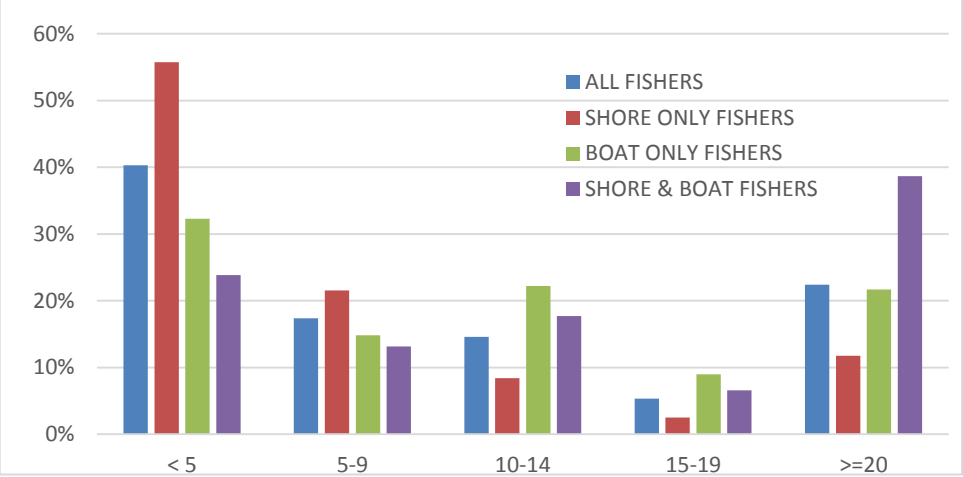
Boat Only Fishers	# days pa	< 5 days	5 to 9 (days)	10 to 14 (days)	15 to 19 (days)	>= 20 (days)	< 5 days	5 to 9 (days)	10 to 14 (days)	15 to 19 (days)	>= 20 (days)
6	Gascoyne	1	1	1	0	3	17%	17%	17%	0%	50%
16	Goldfields-Esperance	0	7	6	2	1	0%	44%	38%	13%	6%
8	Great Southern	3	0	4	0	1	38%	0%	50%	0%	13%
17	Kimberley	5	1	5	2	4	29%	6%	29%	12%	24%
67	Metro	21	12	12	6	16	31%	18%	18%	9%	24%
23	Mid West	14	1	6	1	1	61%	4%	26%	4%	4%
20	Peel	8	3	3	0	6	40%	15%	15%	0%	30%
9	Pilbara	3	0	1	1	4	33%	0%	11%	11%	44%
14	South West	3	3	2	1	5	21%	21%	14%	7%	36%
9	Wheatbelt	3	0	2	4	0	33%	0%	22%	44%	0%
189	Total	61	28	42	17	41	32%	15%	22%	9%	22%

Table 22:Fishing Avidity for Fishers Using Boat and Shore

Both Shore and Boat	# days pa	< 5 days	5 to 9 (days)	10 to 14 (days)	15 to 19 (days)	>= 20 (days)	< 5 days	5 to 9 (days)	10 to 14 (days)	15 to 19 (days)	>= 20 (days)
16	Gascoyne	1	2	2	1	10	6%	13%	13%	6%	63%
13	Goldfields-Esperance	0	6	2	0	5	0%	46%	15%	0%	38%
18	Great Southern	5	2	7	1	3	28%	11%	39%	6%	17%
23	Kimberley	2	2	4	2	13	9%	9%	17%	9%	57%
79	Metro	30	10	17	8	14	38%	13%	22%	10%	18%
13	Mid West	4	1	1	0	7	31%	8%	8%	0%	54%
13	Peel	3	0	1	1	8	23%	0%	8%	8%	62%
14	Pilbara	3	2	2	2	5	21%	14%	14%	14%	36%
40	South West	6	7	2	0	25	15%	18%	5%	0%	63%
14	Wheatbelt	4	0	5	1	4	29%	0%	36%	7%	29%
243	Total	58	32	43	16	94	24%	13%	18%	7%	39%

Among shore & boat fishers, the highest proportion of more avid fishers resided in the Peel region (70%) and the Gascoyne region (69%).

Figure 3: Per cent of fishers by avidity class for each fishing platform



Even though shore only fishers are the most numerous of the three groups of recreational fishers, these results indicate that fishers who do at least some fishing from a boat are more avid fishers, and in aggregate may exert more fishing effort than shore only fishers.

Table 23 shows fishing effort, measured as days fished per year from the shore or from a boat, for all recreational fishers in the EWP sample, by region and by fisher subgroup. The total effort of 9,706 days comprised 5,395 days of shore-based effort and 4,401 days of boat-based effort. The 243 fishers who fished from both the shore and from a boat during the year exerted 4,674 days of effort, which was 48% of all fishing effort. The 357 fishers who only fished from the shore exerted 2,915 days (30%) of all effort, while the 189 fishers who only fished from a boat exerted 2,207 days (23%) of effort.

Table 23: Fishing Effort

Effort/platform		5,395	Shore days		4,401	Boat days		9,796	All days	
All		shore	Boat	Both	shore	boat	Both	shore	boat	Both
967	Gascoyne	378	0	220	0	147	222	378	147	442
725	Goldfields-Esperance	332	0	115	0	162	116	332	162	231
609	Great Southern	345	0	101	0	73	90	345	73	191
1,096	Kimberley	77	0	449	0	197	373	77	197	822
2,530	Metro	786	0	551	0	730	463	786	730	1014
554	Mid West	133	0	137	0	177	107	133	177	244
923	Peel	413	0	103	0	282	125	413	282	228
567	Pilbara	53	0	215	0	132	167	53	132	382
1,396	South West	319	0	505	0	196	376	319	196	881
429	Wheatbelt	79	0	84	0	111	155	79	111	239
9,796	Total	2,915	0	2,480	0	2,207	2,194	2,915	2,207	4,674

As well as the choice of fishing platform, the fishery bioregion where recreational fishers fish is an important determinant of both the fishing experience and of the impact on the state of various fisheries. Fishers by bioregion is shown in Table 24.

Table 25 shows aggregate fishing effort, as measured by total days fished per year, from both shore and from boat, for each of the four fishery bioregions, as well as by region of residence of recreational fishers. For most bioregions, annual effort from shore-based fishers was more or less equal to effort from boat-based recreational fishers, the notable exception being the South Coast bioregion, where shore-based fishing effort was more than double boat-based fishing effort.

Table 24: Number of Fishers by Bio-region

		# Fishers/fishery bioregion			
All		North Coast	Gascoyne Coast	West Coast	South Coast
45	Gascoyne	2	38	2	3
60	Goldfields-Esperance	1	5	8	46
71	Great Southern	0	2	5	64
51	Kimberley	41	0	8	2
278	Metro	25	17	190	46
56	Mid West	1	4	50	1
64	Peel	3	0	43	18
33	Pilbara	21	2	10	0
93	South West	2	7	43	41
38	Wheatbelt	1	4	27	6
789	Total	97	79	386	227

Table 25: Fishing Effort by Bio-region

	North Coast		Gascoyne Coast		West Coast		South Coast		All WA	
# days/year from	shore	boat	Shore	boat	shore	boat	shore	boat	shore	boat
Gascoyne	70	40	497	329	10	0	21	0	598	369
Goldfields-Esperance	0	5	4	48	7	50	436	175	447	278
Great Southern	0	0	17	3	21	12	408	148	446	163
Kimberley	437	553	0	0	81	15	8	2	526	570
Metro	50	138	136	109	934	865	217	81	1,337	1,193
Mid West	2	0	6	12	258	272	4	0	270	284
Peel	2	48	0	0	195	329	319	30	516	407
Pilbara	247	145	4	22	17	132	0	0	268	299
South West	20	9	68	31	333	313	403	219	824	572
Wheatbelt	5	0	22	3	117	211	19	52	163	266
Total	833	938	754	557	1,973	2,199	1,835	707	5,395	4,401

Boats used for fishing are not fully committed to fishing. On average, as shown below, they are used around 51 percent of the time for recreational fishing.

Table 26: Percent of Time Boats Used for Fishing

	Obs.	Mean	Std. Dev.	Min	Max
% of time boat used for fishing	206	51.06	42.21	0	100

5 ESTIMATED EXPENDITURE ON RECREATIONAL FISHING

5.1 EXPENDITURE QUESTIONS

Household expenditure on recreational fishing activities can be subdivided into three main categories as follows;

- Trip related expenditures – incurred on a per trip basis by each fisher (e.g. fuel, bait, ice, food)
- Gear related expenditures - incurred on an annual basis by each fisher (e.g. rods, reels)
- Boat related expenditure - incurred on an annual basis by one or more fishers (e.g. repairs, insurance)

Expenditure questions were 12 month recall questions, and separate questions related to categories of average trip related expenditure, annual gear related expenditure and annual boat related expenditure. The survey questions used to collect expenditure data are reproduced in Appendix 1.

The person completing the survey was asked to fill out expenditure questions on their own behalf

As already noted, of the 459 fishing households, there were 34 observations that had no expenditure information. These have been treated as missing values and excluded from the expenditure analysis. Expenditure calculations are based on the 425 observations with expenditure data.

For trip and gear expenditure, the representative answer was given by the respondent on their own behalf. Boat expenditure is assumed to apply to all fishers in the household.

5.1.1 Trip Related Expenditure

Trip expenditure is for the average trip and is assumed to apply to the person.

The trip expenditures reported for the average trip are shown in Table 27 and average trip expenditures by region of residence are shown in Table 28.

Table 27: Average Trip Expenditures – Unweighted and Weighted by # of Trips

Variable	Obs	Mean Expenditure per Trip	Weighted Mean Expenditure per Trip (weight = # trips)
Expenditure Food, Drink, Refreshments	425	$95.87	$120.39
Expenditure Fuel for boat	425	$63.17	$83.20
Expenditure Parking and boat launching fees	425	$6.33	$6.95
Expenditure Bait and ice	425	$38.90	$48.61
Expenditure Other fishing trip related costs	425	$14.55	$8.21
		$218.84	**$267.36**

Table 28: Average Trip Expenditure by Region of Residence - Unweighted

	Expenditure Food, Drink, Refreshments	Expenditure Fuel for boat	Expenditure Parking and boat launching fees	Expenditure Bait and ice	Expenditure Other fishing trip related costs	Aggregate Trip Expenditure
Gascoyne	$206.52	$32.39	$0.00	$29.78	$4.35	$273.04
Goldfields	$81.20	$56.20	$7.20	$27.00	$21.00	$192.60
Great Southern	$66.42	$45.00	$0.00	$20.32	$2.63	$134.37
Kimberley	$110.22	$156.52	$2.17	$42.83	$101.74	$413.48
Metro	$90.15	$73.58	$12.47	$45.80	$7.04	$229.04
Mid West	$77.87	$47.52	$5.16	$30.19	$20.97	$181.71
Peel	$88.64	$43.33	$4.09	$30.00	$13.94	$180.00
Pilbara	$145.00	$99.44	$0.56	$71.39	$0.00	$316.39
South West	$108.10	$40.60	$1.19	$38.79	$2.86	$191.52
Wheat Belt	$51.52	$24.13	$0.00	$36.43	$30.43	$142.52
Total	$95.88	$63.17	$6.33	$38.91	$14.55	$218.84

Table 29: Average Trip Expenditure by Region of Residence – Weighted by # of Trips

	Expenditure Food, Drink, Refreshments	Expenditure Fuel for boat	Expenditure Parking and boat launching fees	Expenditure Bait and ice	Expenditure Other fishing trip related costs	Aggregate Trip Expenditure
Gascoyne	$157.19	$37.17	$0.00	$22.79	$1.86	$219.01
Goldfields	$98.66	$55.02	$7.63	$25.79	$10.83	$197.93
Great Southern	$97.13	$41.77	$0.00	$29.05	$4.93	$172.88
Kimberley	$97.40	$133.30	$1.28	$29.85	$16.81	$278.64
Metro	$150.13	$140.43	$17.92	$91.91	$7.28	$407.67
Mid West	$83.72	$65.24	$14.37	$41.48	$22.20	$227.01
Peel	$70.31	$50.04	$6.34	$23.74	$10.30	$160.73
Pilbara	$128.64	$64.34	$0.46	$41.31	$0.00	$234.74
South West	$145.73	$55.19	$1.25	$50.18	$1.55	$253.90
Wheat Belt	$52.37	$38.44	$0.00	$32.94	$16.32	$140.06
Total	$120.39	$83.20	$6.95	$48.61	$8.21	$267.37

5.1.2 Annual Gear Related Expenditure

Annual Boat Related Expenditure Gear expenditure is on an annual basis for the respondent.

The annual gear expenditures reported are shown in Table 27.

Table 30: Annual Gear expenditures – Unweighted and Weighted by # Fishers in Household

Variable	Obs	Mean Annual Gear Expenditure	Weighted Mean Annual Gear Expenditure (Weight = # fishers in HH)
Expenditure Rods, reels, pots (ETC.)	425	$277.24	$307.18
Expenditure Special clothing for fishing (INCL HATS, FOOTWEAR, ETC.)	425	$28.43	$33.71
Expenditure Diving gear (INCL HIRE)	425	$49.76	$46.97
Expenditure Fishing club membership fees	425	$10.47	$8.82
Expenditure Other gear related costs	425	$3.32	$2.86
		$369.22	$399.55

Table 31: Average Gear Expenditure by Region of Residence - Unweighted

	Expenditure Rods, reels, pots (ETC.)	Expenditure Special clothing for fishing (INCL HATS, FOOTWEAR, ETC.)	Expenditure Diving gear (INCL HIRE)	Expenditure Fishing club membership fees	Other gear related costs	Aggregate Gear Expenditure
Gascoyne	$422.61	$31.96	$103.48	$2.17	$4.35	$564.57
Goldfields	$264.20	$41.60	$50.00	$10.40	$0.40	$366.60
Great Southern	$198.08	$1.58	$2.37	$0.79	$0.00	$202.82
Kimberley	$455.43	$91.30	$0.00	$11.30	$6.52	$564.57
Metro	$239.53	$23.20	$89.20	$15.62	$1.95	$369.50
Mid West	$430.65	$30.65	$29.19	$7.10	$0.00	$497.58
Peel	$368.94	$36.21	$12.12	$15.15	$6.06	$438.48
Pilbara	$240.00	$32.61	$19.44	$5.56	$27.78	$325.39
South West	$176.07	$15.71	$4.76	$1.90	$2.86	$201.31
Wheat Belt	$251.30	$36.30	$21.74	$13.48	$0.00	$322.83
Total	$277.24	$28.43	$49.76	$10.47	$3.32	$369.22

Table 32: Average Gear Expenditure by Region of Residence – Weighted by # Fishers in HH

	Expenditure Rods, reels, pots (ETC.)	Expenditure Special clothing for fishing (INCL HATS, FOOTWEAR, ETC.)	Expenditure Diving gear (INCL HIRE)	Expenditure Fishing club membership fees	Other gear related costs	Aggregate Gear Expenditure
Gascoyne	$503.11	$62.22	$144.44	$1.11	$2.22	$713.11
Goldfields	$363.50	$47.17	$62.67	$11.83	$0.67	$485.83
Great Southern	$229.68	$1.55	$2.54	$0.42	$0.00	$234.18
Kimberley	$547.94	$122.06	$0.00	$14.90	$14.71	$699.61
Metro	$232.70	$22.37	$75.81	$12.52	$1.55	$344.95
Mid West	$353.75	$21.43	$46.34	$5.00	$0.00	$426.52
Peel	$414.61	$52.03	$18.75	$7.81	$3.13	$496.33
Pilbara	$299.39	$38.70	$13.64	$3.03	$15.15	$369.91
South West	$250.43	$17.74	$8.60	$2.26	$2.58	$281.61
Wheat	$248.95	$25.13	$13.16	$22.11	$0.00	$309.34

Belt						
Total	$307.18	$33.71	$46.97	$8.82	$2.86	$399.55

5.1.3 Annual Boat Related Expenditure

Annual boat related expenditures are shown in Table 33.

Table 33: Annual Boat Expenditures

Variable	Obs	Mean Annual Boat Expenditure
Expenditure New Boat	206	$1,552.43
Expenditure Second Hand Boat	206	$1,821.31
Expenditure Equipment separate from boat	206	$282.18
Expenditure Repairs and maintenance for boat, motor, or trailer	206	$883.98
Expenditure Insurance for boat, motor, or trailer	206	$340.89
Expenditure Boat and trailer licence fees	206	$158.13
Expenditure Boat club membership and pen fees	206	$119.82
Other Boat and Related Equipment Expenditure	206	$6.12
		$5,164.87

Table 34: Average Boat Expenditure by Region of Residence

region	Expenditure New Boat	Expenditure Second Hand Boat	Expenditure Equipment separate from boat	Expenditure Repairs and maintenance for boat, motor, or trailer	Expenditure Insurance for boat, motor, or trailer	Expenditure Boat and trailer licence fees	Expenditure Boat club membership and pen fees	Expenditure Boat Other
Gascoyne	$0.00	$1,041.67	$91.67	$1,583.33	$180.83	$16.67	$0.00	$3,218.33
Goldfields	$0.00	$8,000.00	$70.00	$235.00	$265.00	$0.00	$0.00	$9,830.00
Great Southern	$75.00	$2,718.75	$165.63	$2,078.13	$128.75	$162.50	$0.00	$5,397.50
Kimberley	$0.00	$6,214.29	$610.71	$682.14	$143.14	$0.00	$50.00	$8,038.86
Metro	$2,581.08	$144.59	$324.05	$698.92	$113.69	$243.92	$1.69	$4,405.76
Mid West	$21.05	$1,886.84	$284.21	$1,848.95	$283.16	$0.00	$0.00	$4,696.84
Peel	$6,666.67	$2,411.11	$385.00	$1,019.44	$255.17	$27.78	$1.94	$11,193.78
Pilbara	$0.00	$2,777.78	$33.33	$320.00	$145.56	$0.00	$33.33	$3,665.56
South West	$9.52	$154.29	$43.81	$146.19	$94.05	$0.00	$4.76	$659.05
Wheat Belt	$538.46	$2,615.39	$584.62	$523.08	$155.38	$256.46	$0.00	$4,965.69
Total	$1,552.43	$1,821.31	$282.18	$883.98	$158.13	$119.83	$6.12	$5,164.80

5.1.4 Charter Boat and Hire Boat Expenditure

Two other expenditures were also asked about – boat hire and boat charter. Data on these is shown below.

Table 35: Boat Hire and Charter Fees Expenditures

Variable	Obs	Mean	Std. Dev.	Min	Max
Expenditure Boat Hire	324	$1.38	14.91	$0	$200
Expenditure Charter Fees	324	$51.60	288.83	$0	$3000

5.1.5 Expenditure on Overnight Trips

Respondents were asked whether they had undertaken overnight trips, number of days fishing on those trips and accommodation costs. Of the 425 fishers with expenditure data, 160 had overnight stays.

Table 36: Overnight Trips

Overnight Stay	Freq.	Percent	Cum.
YES	160	37.65	37.65
NO	265	62.35	100.00
Total	425	100.00	

Table 37: Nights Away on Overnight Trip

Nights on Trip	Freq.	Percent	Cum.
1	40	25.00	25.00
2	34	21.25	46.25
3	21	13.13	59.38
4	12	7.50	66.88
5	17	10.63	77.50
6	1	0.63	78.13
7	14	8.75	86.88
8	1	0.63	87.50
10	1	0.63	88.13
14	10	6.25	94.38
15	4	2.50	96.88
20	1	0.63	97.50
21	1	0.63	98.13
28	2	1.25	99.38
90	1	0.63	100.00
Total	160	100.00	

Table 38: Days Fished on Overnight Trip

Days Fished on Trips	Freq.	Percent	Cum.
1	29	18.13	18.13
2	52	32.50	50.63
3	26	16.25	66.88
4	14	8.75	75.63
5	13	8.13	83.75
6	1	0.63	84.38
7	6	3.75	88.13
10	8	5.00	93.13
12	2	1.25	94.38
14	5	3.13	97.50
15	1	0.63	98.13
20	2	1.25	99.38
28	1	0.63	100.00
Total	160	100.00	

Mean nights away are 5.08 with mean days fished 3.98.

Table 39: Mean Nights Away and Days Fished on Overnight Trip

Variable	Obs	Mean	Std. Dev.	Min	Max
Nights Away on Trip	160	5.08	8.35	1	90
Days Fished on trip	160	3.98	4.11	1	28

5.2 EXPENDITURE ANALYSIS

To estimate recreational fishing expenditure for the population on a household basis, we need an estimate of average mean trip, gear, and boat expenditure per household in the sample, which can then be applied to the 866,768 households in the population.

Alternatively, we can apply an estimate of average mean trip, gear, and boat expenditure per person in the sample to the 2,217,302 persons in the population.

An estimate of aggregate trip expenditure, aggregate gear expenditure and aggregate boat expenditure for the sample of fishing households is required as the starting point. This requires assumptions as outlined below.

5.2.1 Trip Expenditure

This expenditure was recorded as the average per trip for the respondent over the last 12 months. To get aggregate expenditure it needs to be multiplied by the number of fishing trips per year to get annual fishing trip expenditure for the person. However, the survey did not identify which household member was answering the expenditure

question, so we estimate aggregate household expenditure based on the number of trips by the household and work back to expenditure per person.

To estimate the number of trips it is assumed that each day equals one trip. The average days per household are shown in Table 40

Table 40: Boat-based and Shore-based Fishing Days per Household

Variable	Obs	Mean	Std. Dev.	Min	Max
Boat based fishing days per HH	425	10.35	17.68	0	150
Shore_ based fishing days per HH	425	12.69	24.79	0	198
Total fishing days per HH	425	23.04	34.13	1	340

For each household, average trip expenditure is multiplied by the number of fishing trips per year to get annual household trip expenditure. Aggregate expenditure for the sample of households is also shown based on the 459 fishing households.

Table 41: Annual Household Trip Expenditure

Variable	Obs	Mean Annual Trip Expenditure per HH	Total Expenditure by Sample HH
Expenditure Food, Drink, Refreshments	425	$2,775.03	$1,273,738.77
Expenditure Fuel for boat	425	$1,917.66	$880,205.94
Expenditure Parking and boat launching fees	425	$160.21	$73,538.23
Expenditure Bait and ice	425	$1,120.41	$514,268.19
Expenditure Other fishing trip related costs	425	$189.29	$86,885.95
		$6,162.61	$2,828,637.07

5.2.2 Gear Expenditure

To get annual household gear expenditure we need to multiply gear expenditure for the individual respondent by the number of fishers in the household. Annual mean household gear expenditure, and aggregate household gear expenditure for the fishing households in the sample are shown in Table 42.

Table 42: Annual Household Gear Expenditure

Variable	Obs	Mean Annual Gear Exp by Fishers in HH	Total Expenditure by Sample HH
Expenditure Rods, reels, pots (ETC.)	425	$570.28	$261,756.23
Expenditure Special clothing for fishing (INCL HATS, FOOTWEAR, ETC.)	425	$62.58	$28,724.68
Expenditure Diving gear (INCL HIRE)	425	$87.20	$40,024.80
Expenditure Fishing club membership fees	425	$16.38	$7,516.13
Expenditure Other gear related costs	425	$5.32	$2,440.50
		$741.75	$340,462.33

5.2.3 Boat Expenditure

Boats are not 100 percent used for fishing. On average, 51 percent of boat use is fishing related. Annual boat expenditure needs to be discounted to only allow for the portion of boat use that is fishing related. Annual boat expenditure per household allowing for the percentage of time the boat is used for fishing and aggregate boat expenditure by households in the sample are shown in

Table 43: Annual Household Boat Expenditure and Boat Expenditure by Households in the Sample

Variable	Obs	Mean of Boat Expenditure by % fishing use	Total Expenditure by Sample HH
Expenditure New Boat	206	$1,108.40	$228,330.40
Expenditure Second Hand Boat	206	$1,101.52	$226,913.12
Expenditure Equipment separate from boat	206	$173.05	$35,648.51
Expenditure Repairs and maintenance for boat, motor or trailer	206	$684.54	$141,015.45
Expenditure Insurance for boat, motor, or trailer	206	$237.43	$48,910.37
Expenditure Boat and trailer licence fees	206	$109.63	$22,583.37
Expenditure Boat club membership and pen fees	206	$79.44	$16,365.05
Other Boat and Related Equipment Expenditure	206	$4.24	$872.41
		$3,498.25	$720,638.68

5.2.4 Charter and Boat Hire

Table 44: Charter and Boat Hire by Sample HH

Variable	Obs	Mean	
	Obs	Mean HH Expenditure	Total Expenditure by Sample HH
Expenditure Boat Hire	324	$1.39	$450.00
Expenditure Charter Fees	324	$51.60	$16,719.99

5.2.5 Accommodation Expenditure on Nights Away

Fishers who had overnight stays spent on average 5 nights away and has on average 4 fishing days. The per night accommodation costs for nights away are shown in

Table 45: Average Accommodation Cost

	Obs	Mean	Std. Dev.	Min	Max
Average Accommodation Cost Per Night	160	$105.69	106.32	$0	$500

Several issues arise in estimating accommodation costs. The number of trips with overnight stays was not collected. One trip per respondent has been assumed. Many respondents have trip nights greater than fishing days. A conservative approach is to set the fishing nights equal to the fishing days. Estimating aggregate expenditure per household is then based on multiplying fishing days by average accommodation costs.

Table 46: Annual Household Accommodation Costs

Variable	Obs	Mean	Std. Dev.	Min	Max
Annual Accommodation Costs	160	$427.16	637.19	$0	$4,000

5.2.6 Land travel Costs

In addition to expenditure on recreational fishing discussed above that was estimated from data collected in the EWP survey, recreational fishers also spend resources to travel from their place of residence to the boat launch site for boat-based recreational fishing trips, or to the site on the shore for shore-based fishing trips. The EWP survey did not contain any questions that would enable either the distance or time taken for land travel for individual fishing trips to be directly calculated. Hence, an indirect approximation procedure had to be used to estimate these costs. First, the number of trips made by households in the survey sample between their residential Regional Development Commission (RDC) and the fishery bioregion where they fished was calculated. The results are shown in Table 47.

Table 47: Trips by Households Between Residential RDC and Bioregion Fished

	North Coast		Gascoyne Coast		West Coast		South Coast	
# days/year	shore	boat	shore	boat	shore	boat	shore	boat

Gascoyne	70	40	497	329	10	0	21	0
Goldfields-Esperance	0	5	4	48	7	50	436	175
Great Southern	0	0	17	3	21	12	408	148
Kimberley	437	553	0	0	81	15	8	2
Metro	50	138	136	109	934	865	217	81
Mid West	2	0	6	12	258	272	4	0
Peel	2	48	0	0	195	329	319	30
Pilbara	247	145	4	22	17	132	0	0
South West	20	9	68	31	333	313	403	219
Wheatbelt	5	0	22	3	117	211	19	52

Next, notional centrally located hubs for each RDC and fishery bioregion were specified, and the distance between each pair of hubs calculated. This distance was multiplied by an assumed travel cost of $0.22 per km to derive an average cost per fishing trip of travel from region of residence to bioregion site, which in turn were multiplied by the respective number of trips between hubs to estimate aggregate land travel costs. The results are shown in Table 48 and Table 49.

Table 48: Notional Cost per Trip of Land Based Travel from District of Residence to Site of Fishing Platform

	North Coast	Gascoyne Coast	West Coast	South Coast
Gascoyne	$302	$80	$272	$364
Goldfields-Esperance	$479	$294	$160	$176
Great Southern	$557	$274	$84	$11
Kimberley	$48	$355	$547	$604
Metro	$488	$196	$7	$90
Mid West	$425	$105	$89	$180
Peel	$508	$214	$22	$83
Pilbara	$188	$142	$335	$426
South West	$538	$246	$52	$73
Wheatbelt	$479	$209	$24	$90

Table 49: Aggregate Estimated Cost per Trip of Land Based Travel from District of Residence to Site of Fishing Platform

	North Coast		Gascoyne Coast		West Coast		South Coast		All WA
	shore	boat	shore	boat	shore	boat	shore	boat	
Gascoyne	$21,113	$12,065	$39,690	$26,274	$2,724	$0	$7,637	$0	$109,503
Goldfields Esperance	$0	$2,397	$1,177	$14,129	$1,120	$7,997	$76,928	$30,877	$134,625
Great Southern	$0	$0	$4,653	$821	$1,765	$1,008	$4,578	$1,661	$14,485
Kimberley	$21,151	$26,765	$0	$0	$44,301	$8,204	$4,833	$1,208	$106,462
Metro	$24,420	$67,399	$26,719	$21,414	$6,575	$6,090	$19,526	$7,288	$179,431
Mid West	$849	$0	$627	$1,254	$22,988	$24,235	$722	$0	$50,675
Peel	$1,015	$24,362	$0	$0	$4,247	$7,166	$26,528	$2,495	$65,813
Pilbara	$46,461	$27,275	$569	$3,131	$5,689	$44,170	$0	$0	$127,294
South West	$10,758	$4,841	$16,710	$7,618	$17,363	$16,320	$29,435	$15,996	$119,041
Wheatbelt	$2,396	$0	$4,608	$628	$2,780	$5,013	$1,714	$4,690	$21,829
Total	$128,163	$165,104	$94,753	$75,270	$109,550	$120,203	$171,900	$64,215	$929,157

5.3 AGGREGATE EXPENDITURE

The sample aggregate expenditure is attributable to fishing households. By definition, non-fishing households have zero fishing related expenditure. Hence, the estimated aggregate expenditure is assumed to apply across the whole 1,810 households as representative of the fishing participation and expenditures that would occur in a sample of Western Australian households.

There are 1,810 households and 4663 persons in the sample. Table 50 shows the aggregate expenditure by households in the sample, the number or persons in the sample and estimated aggregate expenditure when this average per person is applied to the estimated population of Western Australia.

On this basis estimated aggregate expenditures are:

- **$ 1,859,607,819 for trip related expenditure**
  (incl. land travel to site of fishing platform and accommodation on overnight trips)
- **$ 159,890,879 for gear related expenditure**
- **$ 389,029,065 for boat related expenditure (incl. boat hire and charter fees)**
- **$ 18,944,879 for boat hire and charter fees**

Aggregate expenditure is $2.41 billion, or $1.80 billion if costs for Food & Refreshments are excluded.

Estimates of the value of expenditure on recreational fishing in Western Australia were also derived from the WASHF survey mentioned above. Further details on the WASHF survey and the expenditure estimates derived from it are reported in Appendix 2.

Table 50: Aggregate Expenditure on Recreational Fishing

	Data Sum	Avg$/HH	Avg$/fisher	Avg$/trip	Sample Sum	Population $
Expenditure on O'night Trip Accommodation $/yr	$72,815	$171	$92	$7	$78,640	$37,394,182
Expenditure on Food, Drink, Refreshments $/yr	$1,179,388	$2,775	$1,495	$120	$1,273,739	$605,675,342
Expenditure on Fuel for boat $/yr	$815,005	$1,918	$1,033	$83	$880,205	$418,546,256
Expenditure on Parking and launching fees $/yr	$68,091	$160	$86	$7	$73,538	$34,968,170
Expenditure on Bait and ice $/yr	$476,174	$1,120	$604	$49	$514,268	$244,539,414
Expenditure on Other fishing trip costs $/yr	$80,450	$189	$102	$8	$86,886	$41,315,141
Expenditure on Land travel $/yr	$929,157	$2,186	$1,178	$95	$1,003,490	$477,169,314
Aggregate Trip Expenditure $/yr						**$1,859,607,819**
Expenditure on Rods, reels, pots (ETC.) $/yr	$238,467	$561	$307	$24	$257,544	$122,464,856
Expenditure on Fishing Clothing (FOOTWEAR, HATS, ETC.) $/yr	$26,597	$63	$34	$3	$28,725	$13,658,904
Expenditure on Diving gear (INCL HIRE) $/yr	$37,060	$87	$47	$4	$40,025	$19,032,183
Expenditure on Fishing club membership fees $/yr	$6,960	$16	$9	$1	$7,517	$3,574,312
Other gear related costs $/yr	$2,260	$5	$3	$0	$2,441	$1,160,624
Aggregate Gear Expenditure $/yr						**$159,890,879**
Expenditure on New Boats $/yr	$228,330	$537	$289	$23	$246,596	$117,258,994
Expenditure on 2nd Hand Boats $/yr	$226,913	$534	$288	$23	$245,066	$116,531,293
Expenditure on Equipment (INCL HIRE) $/yr	$35,649	$84	$45	$4	$38,500	$18,307,306
Expenditure on Repairs, Maintenance $/yr	$141,016	$332	$179	$14	$152,297	$72,418,586
Expenditure on Insurance $/yr	$48,910	$115	$62	$5	$52,823	$25,117,962
Expenditure on Boat. Trailer Licences $/yr	$22,583	$53	$29	$2	$24,390	$11,597,717
Expenditure on Pen and Club Fees $/yr	$16,365	$39	$21	$2	$17,674	$8,404,255
Other Boat related Costs $/yr	$873	$2	$1	$0	$942	$448,073
Boat Hire and Charter Fees $/yr	$36,890	$87	$47	$4	$39,841	$18,944,879
Aggregate Boat Expenditure $/yr						**$389,029,065**
Aggregate Annual Expenditure						**$2,408,527,764**

5.4 EXPENDITURE BY SHORE-BASED FISHERS VERSUS BOAT-BASED RECREATIONAL FISHERS

Not all the data from the EWP survey is amenable to a comparison of expenditure by shore-based fishers versus boat-based recreational fishers because expenditure data was only collected for one member of each fishing household. Even for households with only one fisher, while some fishers fished only from the shore, or only from a boat, other fishers fished from each platform on different fishing trips, making it impossible to apportion expenditure between shore-based trips and boat-based trips. Furthermore, for households with multiple fishers, not all members fished only from one platform or the other, with the same problem of apportioning expenditure between shore-based trips and boat-based trips.

However, for a sizeable subset of households, all members of the household fished only from the shore, while for a separate subset of households, all members fished only from a boat. Expenditure data from the EWP survey was collated for each of the sample subsets and is displayed in Table 51.

Table 51: Expenditure by Shore and Boat-based recreational Fishers

	Trip Expenditure	Gear Expenditure	Boat Expenditure	Misc. Expenditure	Aggregate Expenditure
	$/yr	$/yr	$/yr	$/yr	$/yr
Shore only	**HH #s**	**Fisher #s**	**Trip #s**	**Trips/fisher**	
	165	**305**	**2,582**	**8.47**	
Data Sum	633,711	45,364	5,838	2,350	687,263
Avg$/HH	3,841	275	35	14	4,165
Avg$/fisher	2,078	149	19	8	2,253
Avg$/trip	245	18	2	1	266
Boat only	**HH #s**	**Fisher #s**	**Trip #s**	**Trips/fisher**	
	108	**173**	**2,053**	**11.87**	
Data Sum	1,068,481	106,485	1,166,214	4,460	2,345,640
Avg$/HH	9,893	986	10,798	41	21,719
Avg$/fisher	6,176	616	6,741	26	13,559
Avg$/trip	520	52	568	2	1,143
Whole sample	**HH #s**	**Fisher #s**	**Trip #s**	**Trips/fisher**	
	425	**789**	**9,796**	**12.42**	
Data Sum	3,621,080	315,244	1,574,220	36,890	5,547,434
Avg$/HH	8,520	742	3,704	87	13,053
Avg$/fisher	4,589	400	1,995	47	7,031
Avg$/trip	370	32	161	4	566

As expected, average annual expenditure by boat-based recreational fishers of $13,559 was much greater than the $2,253 per annum spent by shore-based recreational fishers, largely due to an annual amount per boat-based recreational fisher of $6,741 paid for boat related costs. However, it can be seen from the table

that boat-based recreational fishers also spent considerably more per annum on both trip related costs ($6,176 versus $2,078) and gear related costs ($616 versus $149).

On a per trip basis, aggregate shore-based fishing costs were $266 compared to $1,143 for each boat-based recreational fishing trip. Trip expenditure is the principal variable cost component of recreational fishing costs, with shore-based recreational fishers expending $245 per trip as opposed to $520 per trip spent by boat-based recreational fishers. Thus, fishing charter fees of about $300 to $400 per day for all but high-end game fishing charters is a market-based measure at the upper bound for a day's shore-based recreational fishing, and a lower bound for one day's boat-based recreational fishing.

The breakdown of these variable trip related recreational fishing expenditure into its component parts is presented in Table 52

The main source of differences in cost per trip between fishing platforms was larger expenditure by boat-based recreational fishers relative to shore-based recreational fishers on Expenditure on Food, Drink, Refreshments ($134 versus $106), Expenditure on Fuel for Boat ($203 versus $2), Expenditure on Parking and Launching Fees ($15 versus $0), and Expenditure on Bait and Ice ($55 versus $28). Fishing charter fees would be a substitute for most, if not all these variable trip costs.

Table 52: Component Expenditure for Shore and Boat-based recreational Fishers

	Expenditure on O'night Trip Accommodation	Expenditure on Food, Drink, Refreshments	Expenditure on Fuel for boat	Expenditure on Parking and launching fees	Expenditure on Bait and ice	Expenditure on Other fishing trip costs	Expenditure on Land travel	Aggregate Trip Expenditure
	$/yr	$/yr	$/yr	$/yr				$/yr
Shore only	**HH #s**	**Fisher #s**	**Trip #s**	**Trips/fisher**				
	165	**305**	**2,582**	**8.47**				
Data Sum	18,947	274,325	5,430	320	73,184	16,600	244,905	633,711
Avg$/HH	115	1,663	33	2	444	101	1,484	3,841
Avg$/fisher	62	899	18	1	240	54	803	2,078
Avg$/trip	7	106	2	0	28	6	95	245
Boat only	**HH #s**	**Fisher #s**	**Trip #s**	**Trips/fisher**				
	108	**173**	**2,053**	**11.87**				
Data Sum	18,695	274,847	417,345	31,559	113,707	17,600	194,728	1,068,481
Avg$/HH	173	2,545	3,864	292	1,053	163	1,803	9,893
Avg$/fisher	108	1,589	2,412	182	657	102	1,126	6,176
Avg$/trip	9	134	203	15	55	9	95	520
Whole sample	**HH #s**	**Fisher #s**	**Trip #s**	**Trips/fisher**				
	425	**789**	**9,796**	**12.42**				
Data Sum	72,815	1,179,388	815,005	68,091	476,174	80,450	929,157	3,621,080
Avg$/HH	44	647	982	74	268	41	458	2,514
Avg$/fisher	24	348	529	40	144	22	247	1,354
Avg$/trip	2	28	43	3	12	2	20	109

6 VALUE DERIVED FROM RECREATIONAL FISHING

Conceptually, the economic value derived from the acquisition of any good, service, or experience, whether purchased in a market or acquired by non-market means, is measured in monetary terms by the willingness to pay (WTP) for that good, service, or experience. In turn, the WTP for any individual item is defined as the price at which the individual would be indifferent between paying that price or forgoing its acquisition. If the item can be acquired at a lower price than the WTP, then the difference, called consumer surplus, equals the WTP for that item less the actual cost that needs to be incurred to acquire it. The basics of this analysis were presented previously in Figure 1. The analysis below derives an estimate of the consumer surplus (area ABE in Figure 1) that can be added to the estimate of expenditure to get an estimate of gross value or gross willingness to pay.

6.1 ESTIMATING CONSUMER SURPLUS FROM RECREATIONAL FISHING

As discussed above, it was not feasible to conduct the necessary survey to directly estimate consumer surplus from recreational fishing, so the technique of benefit transfer was used instead. A literature survey identified the Recreation Use Values Database (RUVD) for North America as a comprehensive compilation of economic valuation studies of a variety recreational activities, including recreational fishing (Rosenberger 2016). The RUVD reviews and indexes estimates of consumer surplus from economic valuation studies of the use value derived from a wide range of recreational activities in the U.S. and Canada from 1958 to 2015.

As of the 2016 update, the RUVD contained 421 documents of studies that yielded 3,192 estimates of consumer surplus from twenty-one primary activity types in per standardised person per activity day units. The primary activity type relevant to the current study is “Saltwater Fishing”, for which the database studies contained 134 documents, almost all of which contained multiple estimates of consumer surplus. Some of these multiple estimates reflect plausible differences in values of consumer surplus from the fish species targeted by recreational fishers, but much of the variability reflected alternative estimation techniques. After filtering out documents classed as PhD Dissertation; Working Paper; or Proceedings Paper, 121 documents remained comprising published Journal articles; Government Agency or University Report; or Consulting Report; that yielded some 15,285 estimates of consumer surplus from Saltwater Fishing.

For consistency these estimates need to be adjusted for time and currency differences. After standardising these 15,285 consumer surplus estimates to 2016 USD values, the overall average was USD 126.32 per person per fishing day. However, the span was very wide, ranging from less than USD1 per day per person to nearly USD700 per day per person. The judgment was made to exclude outliers that were either less than USD10 or greater than USD500, which left 100 estimates of consumer surplus with an average value of USD133.75 per person per fishing day. Converted to AUD at

the prevailing exchange rate of AUD1.33 per USD yields an estimate of consumer surplus from recreational fishing of $178 per person per fishing day.

Some of the higher estimated values were for prized sport fish such as Blue Fin Tuna with an upper bound of USD339.59 and an average of USD268.94, and an average of USD336.98 per person per fishing day for unspecified species of Tuna. The estimated consumer surplus from recreational fishing for other most other fish species, including many keenly sought species such as snapper and grouper was substantially less. For instance, the average of 15 estimates of consumer surplus for associated fish species, including snapper, sea trout, grouper, catfish, and red snapper, was USD79.10.

The aggregate number of fishing trips made during the twelve-month survey period by the 789 recreational fishers in the 425 EWP households that provided expenditure data was 9,796. For the 857 fishers in the 459 EWP households that provided trip data the aggregate number of fishing trips was 10739. Hence, estimated consumer surplus for the fishers in the EWP sample survey was $1,909,762 for the full sample of 459 households that fished. Scaling up to the Western Australian population yields an estimate of consumer surplus of $908.1 million. When combined with estimated expenditure on recreational fishing of $2,408.53 million, it is estimated that economic value, or gross willingness to pay, for recreational fishing in Western Australia is to be $3,316.64 million.

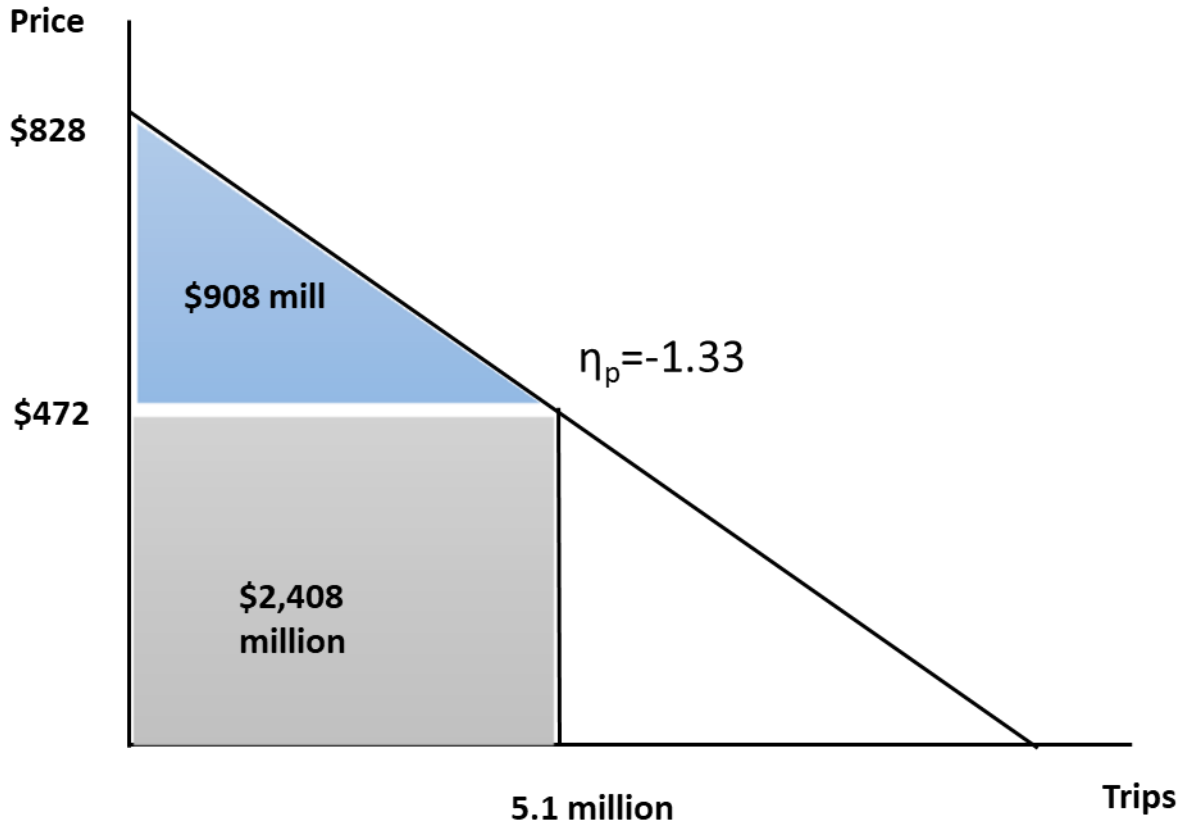
At $908.1 million the consumer surplus is 37.7 percent of the underlying expenditure and 27.4 percent of the gross value or gross willingness to pay.

Derivation of these estimates followed standard practice of including all expenditure on food, drink, and refreshments during recreational fishing trips. However, not everyone accepts this procedure as valid. They argue that fishers would have incurred some expenditure on refreshments even if they did not go recreational fishing. If calculated expenditure of $605.68 million is deducted from the total, then gross expenditure on recreational fishing is estimated to be $1,802.84. million, so the estimate of economic value, or gross willingness to pay, for recreational fishing in Western Australia would be $2,710.96 million.

In this case the estimated consumer surplus is 50 percent of the underlying expenditure and 33.5 percent of the gross value or gross willingness to pay. The sample consumer surplus and expenditure are shown in Figure 4.

Because the consumer surplus estimate was derived using benefit transfer, it is independent of the sample data. If we assume the demand curve through the sample average cost per trip and volume is linear, the intercept price is $828 per trip and the implied price elasticity is -1.33.

Figure 4: Consumer Surplus and Expenditure Estimate for EWP Survey Sample



The range of consumer surplus estimates reported in the literature is wide. If a higher per trip figure was used, the implied consumer surplus would be higher and price elasticity would be lower, as shown in Table 53. Estimates of price elasticity in the literature are few but are typically less than -1. A 2004 comprehensive review of recreational demand models (Phaneuf & Smith 2005) found typical price elasticities in the range –0.365 to –0.501 with re-estimation of earlier results suggesting it is a low as -.017. Most recreational fishing studies focus on estimates of willingness to pay not demand functions. A study of salmon angling in Ireland (Curtis 2002) estimated the price elasticity of demand at -.19. A study of separate fisher types (Curtis & Breen 2016) estimated price elasticity of angling days demanded for coarse anglers to be -0.5, and -0.3 for game fishers. A study of sport fishing in Idaho estimated the price elasticity with respect to out-of-pocket travel cost at-0.7891 (Mckean 2000). A systems of demand analysis study of fishing at locations in Long Island Sound (LI et al. 2016) estimated the aggregate elasticity of recreational fishing in the study areas is 0.78. Our consumer surplus estimate therefore is, if anything, conservative.

Table 53: Implied Price Elasticity at Different Consumer Surplus Per Trip value

Trips	Consumer Surplus per Trip	Consumer Surplus ($mill)	Intercept Price	Implied Price Elasticity at Current Trips
10729	125	$1,341,125	$722.09	-1.89
10729	178	$1,909,762	$828.09	-1.33
10729	200	$2,145,800	$872.09	-1.18

6.2 RECREATIONAL FISHING CATCH & ECONOMIC VALUE

In theory, the economic value of recreational fishing is the total willingness to pay (WTP) for all aspects of the recreational fishing experience. *Inter alia*, it is widely cited in the literature that these components include the experiential value of the recreational fishing event, the sport value of the recreational fishing catch, and the food value of the kept catch. Respectively, the principal determinants of these three components are duration of fishing effort, number and type of fish caught and released, and number and type of fish caught and retained. Because the EWP survey did not collect any catch data, and only limited evidence about recreational fishing effort, available evidence on these three measures from the WASHF survey is discussed in the next section. had to be drawn on to utilise in assessment of the economic value or recreational fishing. In three sub-sections below, an attempt is made to assess each of these mutually exclusive components of economic value for recreational fishers in Western Australia.

6.2.1 Experiential Value of Recreational Fishing

For boat-based recreational fishing, the experiential value is defined as the WTP to be on the fishing platform from the time the boat is launched until the time it is retrieved at the completion of the recreational fishing event. This benefit is obtained irrespective of whether any fish are caught. Many people who go boating but do not engage in recreational fishing, also benefit from essentially the same experiential value.

While most recreational fishing boating trips are not traded in the market place, an exception is the market for fishing charter boat tours. Some of these charter boat tours are based around the same recreational fishing activity as experienced by private boat-based recreational fishers, but some elements of some charter boat tours do not involve any recreational fishing. Hence, the willingness to pay the market price for non-fishing charter boat tours is a WTP for other aspects of the boat-based experience, including specifically the experiential value component of recreational fishing.

The most compelling evidence about the magnitude of the experiential value component of recreational fishing comes from those charter boat tour operators who provide for both recreational fishers and non-fishers on the same boat at the same time, but who charge a substantially higher price for customers who want to fish relative to those who do not. This premium price paid by recreational fishers can be

interpreted as an estimate of their willingness to pay for the expected sport and food value components of the recreational fishing experience.

Since the basic price for non-fishers also is incorporated into the higher price paid by customers who are fishers, it provides market based evidence on the size of the experiential value component of the fishing trip. In 2009/10, a study found that clients who did not fish, or who shared a line, were about 14% of the number of clients who did fish. These non-fishers were reported to be paying around $110/day, which was about half the rate that fishing clients were charged by fishing charter boat operators.

Anecdotal evidence from this market place is that the experiential value of a day on the water in a nice boat with some food is around $200 to $300 per day, while the market price paid by recreational fishers for the expected sport and food value components of the recreational fishing experience that includes catching, and in some cases keeping the catch, starts around $350. However, it can be much higher depending on factors such as the fish being targeted, the location and fish abundance at the chosen location, and knowledge and skill of the charter boat tour staff. For this exercise, an experiential value of $250 per trip was assumed for boat-based recreational fishing trips. Implicitly, this value assumes the existential value of a place on fishing boat tour is essentially the same as the existential value of a place on one's own, or a friend's boat, which may be far from the case.

In the case of shore-based recreational fishing, the experiential value is defined as the WTP to be at the site of the recreational fishing event irrespective of whether any fish are caught. Based on evidence discussed above, it is likely that an upper bound on WTP for all aspects of the shore-based recreational fishing experience will be no more than $300 per day, but may well be considerably less than that for most shore-based recreational fishers. Furthermore, anecdotal evidence suggests the experiential value of shore-based recreational fishers is a comparatively small proportion of total WTP for shore-based recreational fishing. For this exercise, an experiential value of $150 per trip was assumed for boat-based recreational fishing trips.

The WASHF survey has more detailed information on frequency, nature, and duration of both boat-based recreational fishing trips and shore-based recreational fishing trips than the EWP survey. For this study, analysis of this dataset revealed that the RFBL holders who took part in the WASHF survey made a total of 5,263 shore-based recreational fishing trips, and 13,505 boat-based recreational fishing trips. Multiplying the former number of trips by $150 per trip, and the latter number of trips by $250 per trip, yields an estimate of aggregate experiential value of $ 5,402,000 for all RFBL holders in the WASHF survey. However, we know shore-based recreational fishers are underrepresented in the WASHF, so adjusting for this bias suggests that a more realistic estimate of experiential value for recreational fishers in Western Australia might be as large as $91,400,597.

6.2.2 Food Value of Recreational Fishing Catch

The food value of the recreational fishing catch is defined as the WTP for any fish taken during the recreational fishing event that are retained to be eaten. As already discussed, key measures, including both catch weight and fish price per kg. differ

considerably between different fish categories as defined in this study, so estimates from the WASHF survey of number of fish caught and kept in each category were multiplied by the product of wholesale prices per kg and estimated average weight per fish caught and retained. The results are presented in Table 54.

Table 54: Estimate of Food Value of Recreational Catch by Categories of Fish Species

	# events	Nos. of fish kept	Food value/fish	Value of catch kept for food
Abalone	109	1,783	$5.89	$10,502
All Whiting	1,696	19,677	$0.93	$18,241
Australian Herring	1,637	12,563	$0.30	$3,709
Australian Salmon	443	976	$1.30	$1,268
Baldchin Groper	772	1,554	$24.38	$37,892
Cephalopod	956	4,641	$4.64	$21,531
Crab	1,350	13,346	$2.14	$28,590
Dhufish	1,277	1,826	$64.91	$118,529
Finfish Demersal High	976	2,153	$12.15	$26,166
Finfish Demersal Low	2,563	10,116	$9.81	$99,245
Finfish Nearshore High	1,866	6,088	$3.63	$22,101
Finfish Nearshore Low	1,792	8,435	$3.20	$26,964
Finfish Others	168	598	$0.00	$0
Finfish Pelagic High	903	1,752	$41.79	$73,222
Finfish Pelagic Semi High	28	39	$215.73	$8,413
Lobster	3,115	21,474	$36.29	$779,249
Pink Snapper	1,119	2,647	$17.87	$47,300
Red Emperor	231	648	$41.53	$26,911
Shark	157	205	$226.78	$46,490
Total for sample	21,158	110,521		$1,396,322
Total for WA				$84,597,881

Arguably this estimate that the food value of the recreational catch is only $84,597,881 is a gross under-estimate because it is based on using beach prices to value fish caught and retained. If recreational fishermen purchase similar fish from their local fishmonger when they do not catch “a feed” during any given fishing trip, then the food value of their catch could be twice or even three times the value **in** Table 54

6.2.3 Sport Value of Recreational Fishing Catch

The sport value of the recreational fishing catch is defined as the WTP for the satisfaction of landing any fish caught during the recreational fishing event irrespective of whether any of the catch are kept or released. Without any hard data that is directly relevant to the value of this component of the recreational fishing experience, a necessarily subjective and speculative approach was adopted. First an ordinal ranking of the fish species categories was developed using ratings by a few

recreational fishing organisations. This was then converted to a cardinal ranking by reference to benchmark values derived from estimates for consumer surplus for a small number of "big game" fisheries that were primarily catch and release fisheries.

Table 55: Guestimate of Sport Value of Recreational Fishing by Categories of Fish Species

	# events	Nos. of fish caught	Sport value/fish caught	Sport value of total catch
Abalone	109	1,800	$0.50	$900
All Whiting	1,955	27,005	$5.00	$135,025
Australian Herring	1,857	16,883	$5.00	$84,415
Australian Salmon	628	2,843	$100.00	$284,300
Baldchin Groper	926	2,587	$50.00	$129,350
Cephalopod	1,005	4,914	$1.00	$4,914
Crab	1,563	43,099	$2.00	$86,198
Dhufish	1,830	5,510	$50.00	$275,500
Finfish Demersal High	1,212	4,185	$50.00	$209,250
Finfish Demersal Low	3,385	20,322	$5.00	$101,610
Finfish Nearshore High	2,800	15,516	$50.00	$775,800
Finfish Nearshore Low	3,899	25,279	$5.00	$126,395
Finfish Others	688	2,480	$5.00	$12,400
Finfish Pelagic High	1,301	4,006	$250.00	$1,001,500
Finfish Pelagic Semi High	99	195	$1,250.00	$243,750
Lobster	3,253	32,962	$2.00	$65,924
Pink Snapper	1,860	9,825	$50.00	$491,250
Red Emperor	287	1,292	$50.00	$64,600
Shark	659	1,247	$75.00	$93,525
Total for sample	29,316	221,950		$4,186,606
Total for WA				$253,650,644

6.3 SUMMARY

Based on data collected in the EWP survey, aggregate expenditure by recreational fishers in Western Australia was estimated to be $2.41billon, or $1.80billon if costs for food and refreshments are excluded. The additional value of consumer surplus was estimated to be $908.38 million, so in combination it is estimated that economic value, or gross willingness to pay, for recreational fishing in Western Australia is to be between $2,7112.23million and $3,316.91million.

By contrast, an attempt to estimate the underlying WTP for the components of the recreational fishing experience estimated the economic value of recreational fishing in Western Australia to be only $429.64 million.

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8 APPENDIX 1: ECONOMIC QUESTIONS IN SURVEYS

Section 4 below was added to the general population survey relating to fishing behaviour.

SECTION 4: ECONOMIC QUESTIONS

(We would like to know about your costs for recreational fishing in Western Australia during the past 12 months on fishing tackle, fishing-related equipment, food and fuel, as well as large durable items such as boats and electronic equipment. NOTE SOME EXPENSES WE ASK FOR WILL BE ANNUAL COSTS AND SOME WILL BE TRIP COSTS.THE FOLLOWING RECREATIONAL FISHING EXPENDITURE QUESTIONS RELATE TO EXPENSES OVER THE LAST 12 MONTH, BY RECALL) RECORD FOR MAIN FISHER (PROXY TO BE CONFIRMED)

Q7	(a)	(i) **Thinking back over the last 12 months, did any of your fishing trips involve an overnight stay?**	Yes No (go to Q7(b))	1 2
		(ii) **On average, how many nights did you stay away from home on each of these fishing trips?**	Record as appropr.	1
		(iii) **On average, how many days did you fish during each of these fishing trips?**	Record as appropr.	1
		(iv) **What was the average cost per night (FOR ACCOMMODATION PLUS FOOD) during these overnight fishing trips?**	Record as appropr.	1

(b) (FISHING TRIPS) For the following question I would like you to think about costs incurred on your average or typical trip during the last 12 months. **Thinking back over the last 12 months, approximately how much did you personally spend during on your average fishing trip on the following** (ROUND TO THE NEAREST $1; READ EACH, PROBE AS REQUIRED)

Food, drink and refreshments	$____
Fuel for boat	$____
Parking and boat launching fees	$____
Bait and ice	$____
Other fishing trip related costs (please specify) [NOT GEAR OR BOAT RELATED]	
_____	$____

(c) (FISHING GEAR) Some costs are not typically trip related but are incurred on an annual basis. **Thinking back over the last 12 months, approximately how much did you personally spend on the following on average for each fishing trip?** (ROUND TO THE NEAREST $1; READ EACH, PROBE AS REQUIRED; OTHER DOES NOT INCLUDE BAIT & ICE)

Rods, reels, pots (ETC.)	$____
Special clothing for fishing (INCL HATS, FOOTWEAR, ETC.)	$____
Diving gear (INCL HIRE)	$____
Fishing club membership fees	$____
Other fishing gear related costs (please specify) [NOT TRIP OR BOAT RELATED]	
_____	$____

(d) (BOAT OWNERSHIP) **(And) does anyone in your household own a boat of any kind … including canoes, jet skis … or commercially-used boats?** (INCL.

PARTIAL/CORPORATE OWNERSHIP; 'GUNWALE' RULE)

Yes	1
No	2

(e) (BOATS AND RELATED EQUIPMENT) **Thinking back over the last 12 months, for your boats and related equipment, approximately how much did you personally spend on the following?** (ROUND TO THE NEAREST $10; READ EACH, PROBE AS REQUIRED; *ONLY ASK IF CODE 2 OR 3 FOR Q4(c)*)

New boat (WITHIN THE LAST 12 MONTHS; MAIN BOAT FOR FISHING)	$____
Second-hand boat (WITHIN THE LAST 12 MONTHS; MAIN BOAT FOR FISHING)	$____
Equipment separate from boat(E.G. FISH FINDER, GPS, ROPES)	$____
Repairs and maintenance for boat, motor or trailer	$____
Insurance for boat, motor or trailer	$____
Boat and trailer licence fees	$____
Boat club membership and pen fees	$____
Other boat related costs (please specify) [NOT TRIP OR GEAR RELATED]	
_____	$____

(f) Thinking about the total usage of your boat, what percentage of the time in the past 12 months did you use this boat for recreational fishing?

Record as appropr.	1
	2

(g) (OTHER BOAT RELATED COSTS) **Thinking back over the last 12 months, approximately how much did you personally spend on the following?** (ROUND TO THE NEAREST $10; READ EACH, PROBE AS REQUIRED; *ONLY ASK IF CODE 2 OR 3 FOR Q4(c)*)

Boat hire	$____
Charter fees	$____

(h) (INCOME) **What is your income before tax?** (READ OUT ANNUAL INCOME AS APPROPRIATE, WEEKLY INCOME INDICATED IN BRACKETS, SINGLE RESPONSE REQUIRED)

Nil or Negative income	1
$1–$25,999 pa ($1–$499 per week)	2
$26,000–$51,799 pa ($500–$999 per week)	3
$52,000–$77,999 pa ($1,000–$1,499 per week)	4
$78,000–$103,999 pa ($1,500–$1,999 per week)	5
$104,000–$155,999 pa ($2,000–$2,999 per week)	6
$156,000–$207,999 pa ($3,000–$3,999 per week)	7
$208,000 pa or more ($4,000 or more per week)	8
Don't know (DO NOT READ OUT)	98
Refused (DO NOT READ OUT)	99

THANK/TERMINATION: **That is the end of the survey. Thank you for your time. Just to remind you my name is ___ from the Survey Research Centre at Edith Cowan University.**

9 APPENDIX 2: WASHF SURVEY

The EWP survey is a representative sample of Western Australian households. As such it enables an analysis of fishing participation by households, and persons and the allocation of that participation across boat-based and shore-based fishing. Results can be scaled to the population based on activity and expenditure per household and/or per person. Scaling up based on the population was used in the previous section to develop the estimate for aggregate recreational fishing expenditure.

The WASHF survey was conducted at the end of the 12 month state-wide survey of recreational fishing of RFBL licence holders. Throughout the year RFBL holders in the survey fill in diaries on fishing events. The focus of the state-wide surveys is understanding recreational fishing effort for boat-based recreational fishers and estimating their fishing catch in detail by species and various geographic and biological regions.

This WASHF survey is administered at the end of a 12 month state-wide survey to check aspects of the previous 12 months diary records on a recall basis.

For this project, the WASHF survey represented an opportunity to collect expenditure data by RFBL holders. This data collection was both a safeguard in the event that the EWP proved unreliable, and a way of cross checking EWP expenditure data against the findings from the RFBL. If the EWP survey had proved too unreliable as a way of securing a sample of fishers and their expenditures, reliance would have had to be placed on the results from the WASHF survey, notwithstanding the fact that it omits shore-based fishing undertaken by fishers not holding RFBLs. This would be an issue for deriving a population estimate, because in the EWP survey, total recreational fishing days from a boat were only 45% of total recreational fishing days, compared to 55% for shore-based recreational fishing days. Clearly shore-based recreational fishing is under represented in the WASHF survey.

Nevertheless, combined data from the 12-month state-wide survey plus the subsequent WASHF survey is a valuable source of information about the economic value of recreational fishing even though shore-based recreational fishing is under represented. Inter alia, it is instructive to consider the expenditure results from the WASHF survey because it enables relationships between expenditure on fishing effort and the nature of the consequential catch to be investigated. In doing so, expenditure results for boat-based recreational fishers from the WASHF survey can be compared to the results for boat-based recreational fishers in the EWP survey.

9.1 THE WASHF SURVEY

The survey has 2,163 respondents covering some 18,768 fishing events, an average of 8.68 per licence holder. Unlike the EWP which focussed on households, the WASHF survey focussed only on holders of a Recreation Fishing Boat Licence (RFBL), some of whom also held a rock lobster licence (RL).

The WASHF survey is limited to RFBL holders, whereas the more general EWP survey covers fishers and non fishers. The EWP also covers boat and shore-based fishers, and consequently has both licence holders and non RFBL holders. It is most useful therefore to compare these surveys by reference to the fishers and RFBL component of the EWP.

The EWP survey had 789 fishers in the 425 households. Distribution of fishers by region is shown in Table 56.

Table 56: Distribution of Fishers by Region in the WASHF and EWP Surveys

	WASHF Survey		EWP Survey	
	Fishers	Percent	Fishers	Percent
Gascoyne	104	4.14	45	5.70
Goldfields	114	4.54	60	7.60
Great Southern	141	5.62	71	9.00
Kimberley	127	5.06	51	6.46
Metro	1,068	42.53	278	35.23
Mid West	144	5.73	56	7.10
Peel	206	8.20	64	8.11
Pilbara	111	4.42	33	4.18
South West	345	13.74	93	11.79
Wheatbelt	120	4.78	38	4.82
Interstate	31	1.23	0	0.00
Total	2511	100	789	100

The WASHF survey has a greater metropolitan presence, most likely reflecting a higher incidence of boat ownership in the metropolitan region.

While the WASHF only deals with licence holders, the EWP is broader. Respondents in the EWP were asked whether members of the household had renewed an RFBL in the previous year. The survey covered multiple people in the household so there can be more than one RFBL per household. For the WASHF there are 2,511 RFBL holders. In the EWP there are 357 RFBL holders out of 857 fishers in the 459 fishing households.

Table 57 shows the regional distribution of RFBL holders from the WASHF survey and the regional distribution of RFBL holders from the EWP. The metropolitan region is much more highly represented with the WASHF with its RFBL focus.

Table 57: Distribution of RFBL Holders by Region in WASHF and EWP

	WASHF Survey		EWP Survey	
	RFBL	Percent	RFBL	Percent
Gascoyne	98	4.40	26	6.72
Goldfields	111	4.98	22	5.68
Great Southern	139	6.24	26	6.72
Kimberley	126	5.65	40	10.34
Metro	921	41.32	113	29.20
Mid West	107	4.80	38	9.82
Peel	185	8.30	33	8.53
Pilbara	109	4.89	27	6.98
South West	298	13.37	38	9.82
Wheatbelt	104	4.67	24	6.20
Interstate	31	1.39	0	0.00
Total	2,229	100.00	387	100.00

Respondents who were asked expenditure questions also were asked to indicate their income in ranges. Only respondents 12 years old or older than were asked expenditure questions and income questions.

Table 58 compares the personal income distribution from the 2016 Census for Western Australia for persons 15 years and older with the income distribution for respondents from the EWP and WASHF surveys. Both fishing surveys have higher incomes.

Table 58: Income Distribution, Census, EWP and WASHF

	Census	Percent	EWP	Percent	WASHF	Percent
Nil or negative	202,458	10%	20	5%	41	1.92
up to $25,999 pa	502,553	25%	46	11%	234	10.98
$26,000 to $51,999 pa	409,503	20%	47	11%	205	9.62
$52,000 to $77,999 pa	284,141	14%	65	15%	306	14.35
$78,000 to $103,999 pa	186,491	9%	66	16%	388	18.20
$104,000 to $155,999	136,710	7%	54	13%	375	17.59
$156,000 and above pa	84,514	4%	45	11%	248	11.63
Don't know and Refused	668,026	33%	82	19%	335	15.71
	1,997,722	100%	425	100%	2132	100.00

9.2 CATCH AND EFFORT DATA FROM WASHF

Unlike the EWP survey, the sample of RFBL holders in the WASHF survey contains comprehensive and detailed data on catch as well as on effort for each individual fishing event for each respondent for the preceding 12 months. Effort measures included data on geographical information, trip duration and fishing platform, while catch information included numbers of fish caught and kept or released by species. The catch data needed to be condensed to more manageable dimensions by aggregating data for individual fish species into 19 mutually exclusive categories. While a separate single species category was designated for some of the more iconic recreational fishing species, most less commonly sought fish species were allocated to a category based on other species with similar sporting value in catching the fish. The fish categories so chosen are illustrated in Table 59.

Table 59: Fish Categories in WASHF Data

Categories	Sport Rating	# spp.	# events	# Kept	# Released
Abalone	Very low	3	109	1,783	19
All Whiting	Low	7	1,696	19,677	8,502
Australian Herring	Moderate	1	1,637	12,563	4,718
Australian Salmon	High	1	443	976	2,044
Baldchin Groper	Moderate	1	772	1,554	1,205
Cephalopod	Low	3	956	4,641	290
Crab	Low	4	1,350	13,346	44,200
Dhufish	Moderate	1	1,277	1,826	4,152
Finfish Demersal H	High	11	976	2,153	2,281
Finfish Demersal L	Low	54	2,563	10,116	11,476
Finfish Nearshore H	High	8	1,866	6,088	10,529
Finfish Nearshore L	Low	70	1,792	8,435	20,403
Finfish Others	Low	21	168	598	2,418
Finfish Pelagic H	High	23	903	1,752	2,646
Finfish Pelagic SH	Very high	5	28	39	157
Lobster	Very low	4	3,115	21,474	13,252
Pink Snapper	Moderate	1	1,119	2,647	8,123
Red Emperor	Moderate	1	231	648	709
Shark	High	21	157	205	1,134

Table 60 below shows WASHF aggregate catch data for all species groups broken down by bioregion and fishing platform. Data are shown separately for each species groups by bioregion and platform in Appendix 2.

Table 60: Catch from WASHF data for all Fish Species

ALL Fish	Shore		Boat		Shore+Boat	
	# events	# fish	# events	# fish	# events	# fish
North Coast	372	3,452	1,266	13,495	1,638	16,947
Gascoyne Coast	519	4,846	1,544	19,988	2,063	24,834
West Coast	2645	33,916	8,272	116,585	10,917	150,501
South Coast	924	10,756	951	18,912	1,875	29,668
WA	**4,460**	**52,970**	**12,033**	**168,980**	**16,493**	**221,950**

9.3 EXPENDITURE ANALYSIS FROM WASHF

The expenditure questions used in the WASHF survey were the same as those used in the EWP survey.

Expenditure questions were twelve month recall questions with separate questions related to categories of average trip related expenditure, annual gear related expenditure and annual boat related expenditure. The survey questions used to collect expenditure data are reproduced in Appendix 1. The person completing the expenditure in this case is the RFBL holder who completed the fishing activity diaries over the previous 12 months.

The process for estimating aggregate expenditure is different to that used for the EWP. The EWP expenditure was adjusted for the number of fishers in the household and the number of trips undertaken by the household for fishing and percent of time boats were used for fishing. This allowed an estimate of the aggregate expenditure by households on recreational fishing. This was then put on a per person basis and then scaled up to a population estimate.

Household information such as household size is not available for the WASHF survey. The focus is on the fishing activity of the RFBL respondents.

The approach is to estimate average expenditure per RFBL holder, and then scale to a population estimate based on this and the estimated share of recreational fishing activity attributable to the RFBL holder.

The first step is to estimate the mean expenditure per RFBL holder for each of the major categories and scale this to the number of licence holders.

9.3.1 Trip Expenditure

The average trip expenditure is shown in Table 61. This is higher than that which was recorded for the EWP survey where the average total expenditure was $218 dollars. One possible reason for the discrepancy could be that shore-based fishing trips comprise a large component of all fishing trips in the EWP survey, but only a small component of fishing trips in the WASHF survey.

Table 61: Average Trip Expenditure in WASHF Survey

Variable	Obs	Mean Expenditure per Trip
Expenditure Food, Drink, Refreshments	2,163	$120.90
Expenditure Fuel for boat	2,163	$112.74
Expenditure Parking and boat launching fees	2,163	$8.18
Expenditure Bait and ice	2,163	$42.05
Expenditure Other fishing trip related costs	2,163	$13.15
		$297.02

9.3.2 Gear Expenditure

Average gear expenditure is shown in *Table 62* Table 62. This is almost twice that which was recorded for the EWP survey where average annual gear expenditure was $369. The largest difference is in rods, reels etc where the WASHF average is $457 and the EWP is $277, possibly because in the EWP there was a broader coverage of shore-based fishers who had smaller budgets relative to shore-based fishers who could afford an RFBL.

Table 62: Average Annual Gear Expenditure in WASHF Survey

Variable	Obs	Mean Annual Gear Expenditure
Expenditure Rods, reels, pots (ETC.)	2,163	$457.95
Expenditure Special clothing for fishing (INCL HATS, FOOTWEAR, ETC.)	2,163	$58.27
Expenditure Diving gear (INCL HIRE)	2,163	$67.66
Expenditure Fishing club membership fees	2,163	$22.49
Expenditure Other gear related costs	2,163	$7.07
		$613.46

9.3.3 Boat Expenditure

Boat expenditure from the WASHF survey is shown in Table 63. Not all RFBL holders own boats or incur boat related expenditures. Sixty five percent or 1409 licence holders indicated boat ownership (Table 63). Across the whole sample average annual boat expenditures averaged $4,000. For boat owners only, the average annual cost is $5,248. This is similar to the average annual boat costs reported in the EWP of $5,186 for boat owners. Only boat owners recorded boat expenditure in the EWP.

Table 63: Boat Ownership in WASHF

	Freq.	Percent
No	754	34.86
Yes	1,409	65.14

Table 64: Average Annual Boat Expenditures for WASHF Survey

Variable	Obs	Mean Annual Boat Expenditure
Expenditure New Boat	1,840	$923.87
Expenditure Second Hand Boat	1,840	$992.57
Expenditure Equipment separate from boat	1,840	$461.44
: Expenditure Repairs and maintenance for boat, motor or trailer	1,840	$971.34
Expenditure Insurance for boat, motor or trailer	1,840	$310.09
Expenditure Boat and trailer licence fees	1,840	$140.14
Expenditure Boat club membership and pen fees	1,840	$133.20
Expenditure Other Boat Related Costs	1,840	$68.88
		$4,001.53

Table 65: Average Annual Boat Expenditures for WASHF Survey – Boat Owners Only

Variable	Obs	Mean Annual Boat Expenditure
Expenditure New Boat	1,289	$1,241.21
Expenditure Second Hand Boat	1,289	$1,271.00
Expenditure Equipment separate from boat	1,289	$600.14
: Expenditure Repairs and maintenance for boat, motor or trailer	1,289	$1,257.84
Expenditure Insurance for boat, motor or trailer	1,289	$420.97
Expenditure Boat and trailer licence fees	1,289	$190.95
Expenditure Boat club membership and pen fees	1,289	$172.58
Expenditure Other Boat Related Costs	1,289	$93.45
		$5,248.14

9.3.4 Charter Boat and Hire Expenditure

Charter and boat hire expenditure from the WASHF Survey are shown in Table 66.

Table 66: Charter and Boat Hire in WASHF Survey

Variable	Obs	Mean	Std. Dev.	Min	Max
Expenditure Boat Hire	1,840	$8.37	121.16	$0	$3,000
Expenditure Charter Fees	1,840	$60.70	394.62	$0	$6,000

9.3.5 Expenditure on Overnight Trips

As for the EWP, Respondents were asked whether they had undertaken overnight trips, fishing days on those trips and accommodation costs. Of the 2,163 licence holders 692 had overnight stays.

Table 67: Overnight Trips

Overnight Stay	Freq.	Percent	Cum.
YES	1,471	68.01	68.01
NO	692	31.99	100
Total	2163		

Table 68: Nights Away on trip

Nights Away	Freq.	Percent	Cum.
1	140	20.23	20.23
2	152	21.97	42.20
3	74	10.69	52.89
4	42	6.07	58.96
5	50	7.23	66.18
6	11	1.59	67.77
7	73	10.55	78.32
8	10	1.45	79.77
9	2	0.29	80.06
10	30	4.34	84.39
11	1	0.14	84.54
12	3	0.43	84.97
13	3	0.43	85.40
14	49	7.08	92.49
15	3	0.43	92.92
17	1	0.14	93.06
20	5	0.72	93.79
21	9	1.30	95.09
24	1	0.14	95.23
25	1	0.14	95.38
28	1	0.14	95.52
30	12	1.73	97.25
31	1	0.14	97.40
38	1	0.14	97.54
40	2	0.29	97.83
45	1	0.14	97.98
60	6	0.87	98.84
70	1	0.14	98.99
90	4	0.58	99.57
93	1	0.14	99.71
150	1	0.14	99.86
180	1	0.14	100.00
Total	692	100.00	

Table 69: Days Fished on Trip

Days Fished	Freq.	Percent	Cum.
0	5	0.72	0.72
1	108	15.61	16.33
2	204	29.48	45.81
3	89	12.86	58.67
4	57	8.24	66.91
5	64	9.25	76.16
6	24	3.47	79.62
7	49	7.08	86.71
8	9	1.30	88.01
9	5	0.72	88.73
10	13	1.88	90.61
12	9	1.30	91.91
13	3	0.43	92.34
14	15	2.17	94.51
15	7	1.01	95.52
16	2	0.29	95.81
17	1	0.14	95.95
20	12	1.73	97.69
21	4	0.58	98.27
22	1	0.14	98.41
24	1	0.14	98.55
28	1	0.14	98.70
30	5	0.72	99.42
38	1	0.14	99.57
44	1	0.14	99.71
46	1	0.14	99.86
100	1	0.14	100.00
Total	692	100.00	

Mean nights away are 7.26 with mean days fished 4.84.

Table 70: Mean Nights Away and Fishing Days

Variable	Obs	Mean	Std. Dev.	Min	Max
Nights Away on Trip	692	7.26	13.98	1	180
Days Fished on trip	692	4.84	6.48	0	100

Fishers who had overnight stays spent on average 7.26 nights away and has on average 4.84 fishing days. The per night accommodation costs for nights away are shown in *Table 71*.

Table 71: Average Accommodation Cost

	Obs	Mean	Std. Dev.	Min	Max
Average Cost Per Night of Accommodation	692	$135.13	232.37	$0	$2,780

9.4 AGGREGATE WASHF EXPENDITURE

Adjustments are needed to transform the expenditure data for scaling to the population of RFBL holders. As with the EWP, aggregate trip expenditure is based on multiplying average trip expenditure by the number of trips per year undertaken by licence holders. Similarly, boat expenditure is adjusted to allow for the percent of time the boat is used for recreational fishing. Gear expenditure is already on an annual basis and no further adjustments are needed.

9.4.1 Trip Expenditure (excluding land travel costs)

Each fisher undertakes several trips per year. The WASHF survey focussed on events, some of which happen on the same day. To treat each event as an average trip would imply overstatement of expenditure. It has been assumed that, as for the EWP 1 day=1 trip. Events on the same day were aggregated and treated as one trip so the trip basis for calculating annual trip expenditure was the number of unique days/dates where fishing took place. Estimated annual trip expenditure is $2,598. This is for each licence holder. The EWP treated as 1 day=1 trip and estimated annual household trip expenditure as $6,100, which equates to $3,500 per fisher.

Table 72: Trip Expenditure Adjusted for the Number of Trips by Licence Holders

Variable	Obs	Mean Trip Expenditure per Licence Holder	Mean Annual Expenditure by Licence Holder (exp/trip*#trips)
Expenditure Food, Drink, Refreshments	2,163	$120.90	$999.58
Expenditure Fuel for boat	2,163	$112.74	$1,107.81
Expenditure Parking and boat launching fees	2,163	$8.18	$47.55
Expenditure Bait and ice	2,163	$42.05	$348.27
Expenditure Other fishing trip related costs	2,163	$13.15	$94.91
		$297.02	$2,598.14

9.4.2 Land Travel Cost from Place of Residence to Site of Fishing Platform

The cost of land travel from place of residence to site of fishing platform was calculated using essentially the same procedure used in processing the EWP data, except that WASHF data on number of trips from place of residence to site of fishing platform was used in the calculation.

9.4.3 Gear Expenditure

Table 73: Gear Expenditure

Variable	Obs	Mean Annual Gear Expenditure by Licence Holder
Expenditure Rods, reels, pots (ETC.)	2,163	$457.95
Expenditure Special clothing for fishing (INCL HATS, FOOTWEAR, ETC.)	2,163	$58.27
Expenditure Diving gear (INCL HIRE)	2,163	$67.66
Expenditure Fishing club membership fees	2,163	$22.49
Expenditure Other gear related costs	2,163	$7.07
		$613.46

9.4.4 Boat Expenditure

Boat expenditure is adjusted to allow for the percent of time the boat is used for recreational fishing. This time is shown in *Table 74*. Perhaps not surprisingly this is a higher percent in the boat focussed RFBL survey. Compared to the 71% reported in WASHF, the EWP reports only 51%.

Table 74: Percent of Time Boats Used for recreational Fishing WASHF Survey

	Obs.	Mean	Std. Dev.	Min	Max
% of time boat used for fishing	1180	71.50	37.00	0	100

Table 75 shows annual boat expenditure adjusted to allow for the precent of time the boat is used for fishing.

Table 75: Annual Boat Expenditure Adjusted for Percent Boat Used in Fishing in WASHF Survey

Variable	Obs	Mean of Boat Expenditure by % fish use
Expenditure New Boat	1,151	$937.92
Expenditure Second Hand Boat	1,151	$1,100.09
Expenditure Equipment separate from boat	1,151	$513.20
Expenditure Repairs and maintenance for boat, motor or trailer	1,151	$942.61
Expenditure Insurance for boat, motor or trailer	1,151	$315.65
Expenditure Boat and trailer licence fees	1,151	$140.32
Expenditure Boat club membership and pen fees	1,151	$103.72
Expenditure Other Boat Related Costs	1,151	$102.10
		$4,155.62

9.4.5 Charter, For-Hire and Nights Away

The average expenditure per licence holder costs for charter, for-hire and nights away can be scaled to the estimated population of RFBL holders.

Adjustment is needed for overnight stays. The number of trips with overnight stays was not collected. One trip per respondent has been assumed. Many respondents have trip nights greater than fishing days. A conservative approach is to set the fishing nights equal to the fishing days. Estimating aggregate expenditure per household is then based on multiplying fishing days by average accommodation costs. Annual accommodation costs are shown in *Table 76*.

Table 76: Annual Accommodation Costs WASHF Survey

Variable	Obs	Mean	Std. Dev.	Min	Max
Annual Accommodation Costs	692	$723.81	2288.54	$0	$38,920

9.5 AGGREGATE EXPENDITURE

Table 77: Aggregate Expenditure for RFBL Holders

					Licences		193,718	
Trip Expenditure	Obs	Mean	Std. Dev.	Mean Trip Expenditure by # \trips	Agg Exp per Year		Licence #	Aggregate Expenditure
Expenditure Food, Drink, Refreshments	2,163	$120.90	354.858	$999.59	$999.59		193,718	$193,638,381.90
Expenditure Fuel for boat	2,163	$112.74	348.085	$1,107.81	$1,107.81		193,718	$214,602,737.58
Expenditure Parking and boat launching fees	2,163	$8.18	132.766	$47.55	$47.55		193,718	$9,211,329.64
Expenditure Bait and ice	2,163	$42.05	80.9264	$348.28	$348.28		193,718	$67,467,523.89
Expenditure Other fishing trip related costs	2,163	$13.15	145.837	$94.92	$94.92		193,718	$18,387,538.21
		$297.02	702.934	$2,598.15	$2,598.15		193,718	**$503,307,511.23**
Gear Expenditure	Obs	Mean	Std. Dev.		Agg Exp per Year		Licence #	Aggregate Expenditure
Expenditure Rods, reels, pots (ETC.)	2,163	$457.95	900.732		$457.95		193,718	$88,713,932.97
Expenditure Special clothing for fishing (INCL HATS, FOOTWEAR, ETC.)	2,163	$58.27	164.667		$58.27		193,718	$11,288,044.72
Expenditure Diving gear (INCL HIRE)	2,163	$67.67	352.404		$67.67		193,718	$13,108,780.83
Expenditure Fishing club membership fees	2,163	$22.50	170.217		$22.50		193,718	$4,358,422.54
Expenditure Other gear related costs	2,163	$7.07	101.36		$7.07		193,718	$1,369,638.56
		$613.46	1132.57		$613.46		193,718	**$118,838,819.62**

Boat Expenditure	Obs	Mean	Std. Dev.	Mean Boat Expenditure by % Use	Agg Exp per year	% Boat Owners	Boat Owners	Aggregate Expenditure
Expenditure New Boat	1,289	$1,241.21	9600.88	$937.92	$937.92	65%	125,916.7	$118,100,294.93
Expenditure Second Hand Boat	1,289	$1,271.00	10970.9	$1,100.09	$1,100.09	65%	125,916.7	$138,519,702.50
Expenditure Equipment separate from boat	1,289	$600.14	2716.93	$513.20	$513.20	65%	125,916.7	$64,620,702.27
Expenditure Repairs and maintenance for boat, motor or trailer	1,289	$1,257.84	4864.88	$942.61	$942.61	65%	125,916.7	$118,689,711.00
Expenditure Insurance for boat, motor or trailer	1,289	$420.97	1097.84	$315.65	$315.65	65%	125,916.7	$39,745,984.11
Expenditure Boat and trailer licence fees	1,289	$190.95	277.921	$140.32	$140.32	65%	125,916.7	$17,668,001.76
Expenditure Boat club membership and pen fees	1,289	$172.58	1065.42	$103.72	$103.72	65%	125,916.7	$13,060,457.87
Expenditure Boat Other	1,289	$93.45	2795.64	$102.10	$102.10	65%	125,916.7	$12,856,472.82
		$5,248.14		$4,155.62	$4,155.62	65%	125,916.7	**$523,261,327.27**
Variable	Obs	Mean	Std. Dev.		Mean Annual Expenditure		Licence #	Aggregate Expenditure
Expenditure Boat Hire	1,840	$8.38	121.16		$8.38		193,718	$1,622,388.25
Expenditure Charter Fees	1,840	$60.70	394.62		$60.70		193,718	$11,758,779.46
								$13,381,167.71
Variable	Obs	Mean	Std. Dev.	Annual	Per Licence Persons		Licence #	Aggregate Expenditure
Annual Accommodation Costs	692	$723.82	2288.54	$500,880.67	$231.67		193,718	**$44,879,556.90**
								$1,203,668,382.73

10 APPENDIX 3: WASHF SURVEY CATCH DATA FOR SPECIES GROUPS BY BIOREGION AND PLATFORM

Abalone	Shore		Boat		Shore+Boat	
	# events	# fish	# events	# fish	# events	# fish
North Coast	0	0	0	0	0	0
Gascoyne Coast	0	0	1	1	1	1
West Coast	58	934	31	548	89	1,482
South Coast	14	238	5	79	19	317
WA	**72**	**1,172**	**37**	**628**	**109**	**1,800**

Cephalopods	Shore		Boat		Shore+Boat	
	# events	# fish	# events	# fish	# events	# fish
North Coast	6	56	59	319	65	375
Gascoyne Coast	25	77	119	698	144	775
West Coast	150	749	494	2,462	644	3,211
South Coast	46	120	106	433	152	553
WA	**227**	**1,002**	**778**	**3,912**	**1,005**	**4,914**

Crab	Shore		Boat		Shore+Boat	
	# events	# fish	# events	# fish	# events	# fish
North Coast	37	396	100	1,343	137	1,739
Gascoyne Coast	30	488	69	2,040	99	2,528
West Coast	318	8,120	921	28,529	1,239	36,649
South Coast	35	1,015	53	1,168	88	2,183
WA	**420**	**10,019**	**1,143**	**33,080**	**1,563**	**43,099**

Demersal	Shore		Boat		Shore+Boat	
High value	# events	# fish	# events	# fish	# events	# fish
North Coast	48	267	265	1,162	313	1,429
Gascoyne Coast	56	224	325	1,124	381	1,348
West Coast	43	148	295	740	338	888
South Coast	43	106	137	414	180	520
WA	**190**	**745**	**1,022**	**3,440**	**1,212**	**4,185**

Baldchin Groper	Shore		Boat		Shore+Boat	
	# events	# fish	# events	# fish	# events	# fish
North Coast	1	2	8	14	9	16
Gascoyne Coast	29	81	133	491	162	572
West Coast	61	144	673	1,801	734	1,945
South Coast	10	25	11	29	21	54
WA	**101**	**252**	**825**	**2,335**	**926**	**2,587**

Dhufish	Shore		Boat		Shore+Boat	
	# events	# fish	# events	# fish	# events	# fish
North Coast	5	16	18	64	23	80
Gascoyne Coast	8	23	58	234	66	257
West Coast	181	603	1,425	4,148	1,606	4,751
South Coast	42	135	93	287	135	422
WA	**236**	**777**	**1,594**	**4,733**	**1,830**	**5,510**

Red Emperor	Shore		Boat		Shore+Boat	
	# events	# fish	# events	# fish	# events	# fish
North Coast	11	59	72	391	83	450
Gascoyne Coast	5	16	124	569	129	585
West Coast	8	20	63	224	71	244
South Coast	3	11	1	2	4	13
WA	**27**	**106**	**260**	**1,186**	**287**	**1,292**

Snapper	Shore		Boat		Shore+Boat	
	# events	# fish	# events	# fish	# events	# fish
North Coast	4	16	24	94	28	110
Gascoyne Coast	88	519	466	3,744	554	4,263
West Coast	162	772	963	3,714	1,125	4,486
South Coast	51	183	102	783	153	966
WA	**305**	**1,490**	**1,555**	**8,335**	**1,860**	**9,825**

Demersal	Shore		Boat		Shore+Boat	
Low value	# events	# fish	# events	# fish	# events	# fish
North Coast	88	646	512	3,643	600	4,289
Gascoyne Coast	109	511	695	4,311	804	4,822
West Coast	229	927	1,345	5,099	1,574	6,026
South Coast	115	732	292	4,453	407	5,185
WA	**541**	**2,816**	**2,844**	**17,506**	**3,385**	**20,322**

Near shore Fish	Shore		Boat		Shore+Boat	
High value	# events	# fish	# events	# fish	# events	# fish
North Coast	109	356	374	1,494	483	1,850
Gascoyne Coast	71	260	143	508	214	768
West Coast	663	3,593	872	4,866	1,535	8,459
South Coast	308	2,096	260	2,343	568	4,439
WA	**1,151**	**6,305**	**1,649**	**9,211**	**2,800**	**15,516**

Herring	Shore		Boat		Shore+Boat	
	# events	# fish	# events	# fish	# events	# fish
North Coast	10	96	25	224	35	320
Gascoyne Coast	10	68	29	235	39	303
West Coast	578	4,654	634	6,347	1,212	11,001
South Coast	322	2,514	249	2,745	571	5,259
WA	**920**	**7,332**	**937**	**9,551**	**1,857**	**16,883**

WA Salmon	Shore		Boat		Shore+Boat	
	# events	# fish	# events	# fish	# events	# fish
North Coast	2	3	9	22	11	25
Gascoyne Coast	3	4	6	24	9	28
West Coast	173	677	163	1,110	336	1,787
South Coast	190	701	82	302	272	1,003
WA	**368**	**1,385**	**260**	**1,458**	**628**	**2,843**

Whiting	Shore		Boat		Shore+Boat	
	# events	# fish	# events	# fish	# events	# fish
North Coast	14	121	32	427	46	548
Gascoyne Coast	103	1,064	102	1,202	205	2,266
West Coast	444	5,027	903	14,728	1,347	19,755
South Coast	148	1,197	209	3,239	357	4,436
WA	**709**	**7,409**	**1,246**	**19,596**	**1,955**	**27,005**

Near shore Fish	Shore		Boat		Shore+Boat	
Low value	# events	# fish	# events	# fish	# events	# fish
North Coast	156	1,128	416	2,746	572	3,874
Gascoyne Coast	181	939	366	2,602	547	3,541
West Coast	708	4,798	1,510	10,049	2,218	14,847
South Coast	280	1,246	282	1,771	562	3,017
WA	**1,325**	**8,111**	**2,574**	**17,168**	**3,899**	**25,279**

Other finfish	Shore		Boat		Shore+Boat	
	# events	# fish	# events	# fish	# events	# fish
North Coast	41	116	111	509	152	625
Gascoyne Coast	10	20	67	260	77	280
West Coast	172	672	245	779	417	1,451
South Coast	27	97	15	27	42	124
WA	**250**	**905**	**438**	**1,575**	**688**	**2,480**

Pelagic	Shore		Boat		Shore+Boat	
High value	# events	# fish	# events	# fish	# events	# fish
North Coast	30	65	238	647	268	712
Gascoyne Coast	48	120	298	991	346	1,111
West Coast	93	218	440	1,236	533	1,454
South Coast	42	107	112	622	154	729
WA	**213**	**510**	**1,088**	**3,496**	**1,301**	**4,006**

Pelagic	Shore		Boat		Shore+Boat	
Super high value	# events	# fish	# events	# fish	# events	# fish
North Coast	3	4	22	55	25	59
Gascoyne Coast	2	8	55	89	57	97
West Coast	2	6	13	26	15	32
South Coast	1	2	1	5	2	7
WA	**8**	**20**	**91**	**175**	**99**	**195**

Rock lobster	Shore		Boat		Shore+Boat	
	# events	# fish	# events	# fish	# events	# fish
North Coast	5	44	27	175	32	219
Gascoyne Coast	30	333	55	547	85	880
West Coast	221	1,715	2,881	29,806	3,102	31,521
South Coast	18	191	16	151	34	342
WA	**274**	**2,283**	**2,979**	**30,679**	**3,253**	**32,962**

Shark	Shore		Boat		Shore+Boat	
	# events	# fish	# events	# fish	# events	# fish
North Coast	38	61	75	166	113	227
Gascoyne Coast	35	91	122	318	157	409
West Coast	85	139	248	373	333	512
South Coast	26	40	30	59	56	99
WA	**184**	**331**	**475**	**916**	**659**	**1,247**