

The Economic Contribution of the New Zealand Recreational Billfish Fishery in 2000–2001

Prepared for

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1. Introduction

1.1 Background to the Study

The economic contribution of recreational billfishing is believed to be significantly greater than many other recreational fisheries. This is because the fishery supports a significant dedicated fleet of charter vessels and because many private vessels have also been built or purchased primarily to participate in the fishery. As the billfish fishery occurs primarily in the north of New Zealand, it makes an important economic contribution to local areas and northern regions as well as to the national economy.

The New Zealand Marine Research Foundation has therefore commissioned this research project to obtain detailed knowledge of the present economic contribution of the New Zealand recreational billfishery. This report provides the results of this study.

1.2 Overview of the Billfish Fishery

Fishing for billfish is popular in northern New Zealand and the fishery has an international reputation attracting both overseas fishers and many New Zealanders from other parts of the country. Over a thousand private boats ranging in size from 5 to 20 metres participate to varying degrees in this fishery. However, the exact numbers and details of these vessels are unknown, as there is no system of licensing for recreational vessels or marine recreational fishers in New Zealand.

The game-fish charter boat fleet, consists of approximately 100 licensed boats between 11 and 18 metres in length. The operators of these vessels provide the professional base for the fishery, with vessel operations covering a wide geographical area and charter vessel fishing activity extending over the whole of the billfish season. The charter vessels, while relatively few in number compared to the number of private vessels, are responsible for a significant proportion of the billfish catch each year.

The recreational marlin fishery in NZ is unique in that there are accurate club records for at least 95% of all billfish caught in the country since 1924 (Holdsworth and Saul 2001). A break down of catch by species over the last 30 years from these records reveals that 93% of recreationally caught billfish were striped marlin, 3% pacific blue marlin, 2% black marlin and one percent each for broadbill swordfish and shortbill spearfish.

The striped marlin fishery in particular has a reputation for being world class. All fourteen world line class records for 6 kg line and heavier were caught in NZ, including the all-tackle world record of 224.1 kg.

1.3 Previous Studies of the Economic Contribution of Billfishing

Shaw (1989) provides the most recent comprehensive estimates of the value of game-fishing in NZ. His research gave estimates of expenditure and the capital value of private assets used in the fishery and summarised game-fishers views on

the state of the resource. Shaw's (1989) study estimated the total expenditure for the 1988-89 billfish season at \$25.8 million with 39% of this expenditure on private boats and 14% of expenditure on food and refreshments and 14% on travel. Shaw (1989) also estimated that anglers used \$286 worth million of assets (boats, fishing gear and other equipment) of which 56 % was directly associated with big game fishing (\$160 million). No regional breakdown of these values was provided and the contribution of this expenditure to regional economies was not estimated.

The National Research Bureau (1991) conducted a nation-wide survey to estimate the economic value of recreational fishing (both marine and freshwater) in New Zealand based on expenditure. That survey valued the annual national economic expenditure on recreational fishing in 1991 at \$745 million, but there was no breakdown by fishery and it is not possible to estimate the expenditure on the billfishery from the 1991 survey. While the methodology of the NRB (1991) survey was robust and the sample size was adequate, it provided a single national expenditure result without a regional breakdown of expenditure.

The South Australian Centre for Economic Studies (SACES) undertook a study under contract to the Ministry of Fisheries in 1999/99 (SACES 1999) to estimate the non-market value of the recreational fishery for five important New Zealand recreational fish species, snapper, kahawai, blue cod, kingfish and rock lobster. Billfish were not included in the survey. The SACES (1999) survey indicated that the marginal willingness to pay value of the snapper fishery was in the order of \$16 million with the fisheries for the other four species having somewhat lower values. No data was collected on the non-market value of the billfishery in the SACES (1999) study.

2. Methods

2.1 Background to Survey Approach

The Request for Tenders from the New Zealand Marine Research Foundation indicated that *“the project is designed to provide information that will help define the role of the billfish fishery in regional economies and provide decision makers with relevant economic information about the New Zealand billfish fishery”*. The project’s objective also used the phrase *“economic value, including market and non-market value”*.

In order to address these project objectives, the methods adopted for the survey sought to determine both the market value and economic contribution of the billfish fishery at a regional and national level (i.e., actual expenditure, including cash inflows to and leakages from regional economies) as well as obtaining information on non-market values.

2.2 Data Collection - Questionnaire Survey

A questionnaire survey was used to collect expenditure data from billfish fishers for the purpose of generating expenditure estimates and the contribution of the billfish fishery to regional economies by sector. The questionnaire also collected demographic data (e.g., age, sex, place of residence). The questionnaire used for the survey is shown in Appendix 1.

The questionnaire was administered using two main approaches; face to face interviews with billfish anglers at selected clubs or ports; and follow-up telephone interviews with fishers where timing or logistics prevented a face-to-face interview being made at the time of initial dockside contact.

The sample frame consisted of two primary strata, each with two substrata as follows:

- i. Fishing Region: Northland, Bay of Plenty, Other
- ii. Fisher type: Private vessel, Charter Vessel

Survey staff were deployed at the main clubs and ports in each region to obtain a representative sample of fishers during the main fishing periods, including during competitions. Interviews were conducted only for trips where billfish was the target species. Where fishing gear or a boat was used for other purposes anglers were asked to estimate what proportion of use was for billfish fishing.

A target sample size of 1000 interviews was set. However, due to poor weather and lower than average participation in the billfish fishery throughout the 1990-91 billfish season, it was not possible to complete the target number of completed interviews in spite of concerted effort. While overall co-operation of anglers was good, some anglers and vessels were not willing to participate in the survey and this contributed to the difficulty in reaching the target sample size. Throughout the survey, close liaison was maintained with fishing clubs and with charter vessel operators in order to obtain a representative sample.

2.3 Data Analysis

2.3.1 Scaling Methodology

The survey results were scaled up to estimate total expenditure in the billfish fishery for the 2000-2001 billfish season (the survey period covered the full billfish season from December 2000 to June 2001).

The scaling methodology is set out in detail in Appendix 2. In concept, the scaling methodology is straightforward with the data from each respondent weighted (scaled) according to the reciprocal of the respondent's selection probability.

The following principle of sample design is fundamental to the scaling process. If we know the sample selection probabilities p_i for each respondent, we can get unbiased survey results by weighting each respondent's answers by the reciprocal of their selection probability¹. That is, each respondent should be given a weight (or scaling factor) of $1/p_i$, and these weights should be used to produce the survey results.

Key properties of the survey design and scaling approach were as follows:

- An assumption that a random sample of boat days was selected within each stratum (and in particular that each boat day had an equal chance of being selected, at least within each stratum).
- One angler was selected at random from each boat.
- The boat day sampling fraction was not measured directly.
- Information was collected to determine the number of anglers in the boat, and the number of days the respondent spent billfishing each year.
- Respondents' billfish catch was combined with club records to calculate the sampling fraction, and scaled up appropriately.

Survey questions were grouped together into 12 groups of similar categories of expenses. All these expenditure groups were measured in terms of the annual cost so those variables that were measured on a different base have been adjusted accordingly. For example, daily billfishing costs would be multiplied by the number of days spent billfishing per annum to estimate annual expenditure.

For capital and maintenance expenditure on vessels, berths, electronics and tow vehicles, respondents were asked the percentage that each of these items were used for billfishing. This allowed the estimation of the proportion of expenditure on those items that were related to billfishing.

Finally, detailed billfish catch records were obtained from game-fish clubs and the gamefish tagging data base. In most cases the anglers country of origin was recorded in the records and catch and this was used to determine the billfish catch by international visitors. Data from a survey question on the number of fish not entered into club records were used to adjust the total catch for non-reporting. The catch records were partitioned by fleet (charter, private) and by region (Northland, Bay of Plenty, Other) to give billfish catch per strata.

2.3.2 Multiplier Analysis

The billfish fishery has significant economic impacts on regional economies adjacent to the billfish fishery as well as on the national economy. The expenditure by

¹ See Kish (1965), Survey Sampling, John Wiley & Sons, New York, for more details.

billfishers generates important downstream economic effects in local communities by providing employment and creating additional economic activity in the places where the expenditure occurs. An assessment of the magnitude of these economic impacts can be undertaken using so-called regional input-output (I-O) multiplier analysis.

The basic framework for a multiplier analysis is called an input-output table. An input-output table shows the distribution of inputs purchased and outputs sold by industry sectors. Industry specific multipliers can be estimated for a particular region from an input-output table and these can then be applied to a specific programme or policy to estimate the total impact of the programme or policy on regional output, earnings, and employment.

Multiplier analysis is widely used in both the public and private sectors in New Zealand and elsewhere to estimate the regional impacts of a wide variety of initiatives such as the regional impacts of airport construction and expansion and the development of shopping malls and sporting facilities.

Appendix 3 provides additional detailed background on multiplier analysis.

3. Results

3.1 The Fishing Season and Survey Coverage

The survey was designed to cover the 2000-2001 billfishery in the various regions in which billfishing takes place, including Northland, Bay of Plenty, the north west coast of the North Island and Gisborne (Figure 1).

A relatively poor billfish season had a strong effect on interview success, reducing the number of completed survey interviews below expectations. This meant that it was only possible to obtain a total of 577 interviews from nine fishing ports in northern New Zealand between 7 January and 14 June in spite of concerted sampling effort. The billfish season provided difficult fishing conditions, with strong easterly winds for long periods and inconsistent fishing success. These conditions meant that many fishers either did not fish or fished fewer days than usual, so that the numbers of fishers available to interview during scheduled interview session was frequently less than expected. NZ Big Game Fishing Council recorded 1460 billfish tagged or landed this season, about half of the recent peak of 2633 in 1999. While there were fewer striped marlin available this year there were more blue marlin taken in the fishery than is normally the case, although this had little impact on fisher numbers. A break down of the number of completed survey interviews by strata is given in Table 1.

Generally the survey results indicate there were greater number of private vessels fishing for billfish than charter vessels. The target number of interviews from private vessels was achieved in Northland and nearly achieved (90% of the target) in Bay of Plenty. However, only 60% of the targeted number of interviews were obtained from Northland charter vessels and only 10 % of the target was reached from the Bay of Plenty charter vessels. The amount of charter fishing for billfish in the Bay of Plenty may have been overestimated in the initial survey design. Other factors such as the closing of the entrance to Whakatane Harbour, which prevented the use of the port by charter vessels during the fishing season, also contributed to the poor Bay of Plenty charter vessel result. A number of Bay of Plenty charter skippers who were contacted said that the yellowfin tuna season was also poor and gamefishing bookings were down. A useful sample of interviews from areas outside of Northland and Bay of Plenty was also obtained.

The distribution of completed interviews by port are presented in Table 2. There is a reasonable spread of interviews in Northland and Other regions. In Bay of Plenty the major population centre of Tauranga dominated, providing 61% of survey interviews in that region.

The distribution of angler days fished per trip from the survey is given in Figure 2. Nearly a third of all trips were two days long while a further 22% were for one day only. The numbers of 4 and 5 day trips are relatively high and may be a consequence of anglers fishing in competitions of this duration. Long range trips to the Three Kings Islands and associated banks are normally of longer duration.

Anglers were asked to estimate the number of days fished per annum. The question asked anglers to think about the last couple of years and estimate the average number of days' billfish fishing they did per year. The question needed to ask for an average value because anglers intercepted at the beginning of the season would not be able to say how many days they may fish in the current season. The estimate of days fished per season is an important component of the scaling factor. Responses

to this question are summarised in Figure 3. A tendency for anglers to round their estimate off to 20, 30, 40 etc. days is apparent.

The number of billfish caught per trip by survey participants is summarised in Figure 4. This plot shows over 70% of respondents' trips were unsuccessful with a small number of fishing trips catching four to twelve billfish. Figure 4 does not distinguish the trip length or the location of the trip. The survey catch rate of billfish by strata expressed as the number of billfish per boat day is given in Table 3.

Table 3 shows that fishing success (billfish catch per unit effort or CPUE) was higher in Northland and by respondents fishing from charter vessels. Northland charter vessel CPUE is boosted by the high catch rate experienced in the Three Kings Islands fishery to the north of the East Northland fishery.

The average number of anglers per trip is fairly consistent at 3 to 3.5 anglers across all strata with the exception of Bay of Plenty charter vessels who recorded an average of one angler more per trip than other vessels. The estimate of the proportion of billfish not recorded in club records is 6.5% for Northland and 7.7% for Bay of Plenty vessels.

Catch records were collected from 24 gamefishing clubs at the end of the fishing season. Detail on date, angler and country of origin, species, weight, vessel name and area caught were provided in most cases. In some instances cross referencing to the gamefish tagging database filled in gaps in the data set. The species composition of the New Zealand billfish catch is summarised in Figure 5. Striped marlin dominates with 84% of the catch followed by blue marlin 12% and broadbill swordfish at 2%.

The number of fish caught by area and fleet is detailed in Figure 6. This separates out the Three Kings catch from East Northland catch. When these two areas are combined the charter catch is almost equal to the private vessel catch in the whole Northland fishery this season. In 2000-01, 41% of the New Zealand recreational billfish catch was taken from charter boats.

It was evident from early runs of the expenditure totals that the low billfish catch rate in the Bay of Plenty from the survey did not give realistic estimates when combined with the catch tallies for the region. As noted earlier most of the Bay of Plenty interviews came from Tauranga while an examination of catch records show that most of the billfish were caught in the area of Waihou Bay at the eastern extreme of the region. Tauranga is in the western Bay of Plenty some 80 nautical miles from the billfish "hot spot". To take account of this within-region variation the Bay of Plenty was split into eastern and western sub-areas for calculation of the scaling factor to use in estimating the total economic contribution.

3.2 Demographics

Respondents were asked a number of questions that provide a useful picture of the demographics of billfish fishers.

Figure 7 shows that billfishers are overwhelmingly male and aged in their 30's, 40's and 50s. Over 90% of respondents were male.

Figure 8 breaks down respondents by income category. Overall, billfishers fell into the higher income categories with two thirds of all billfishers having annual personal

gross incomes of \$40,000 or higher. Nearly a quarter of billfishers had annual incomes of \$80,000 or more.

Figure 9 shows the main occupational groups of respondent billfishers. Nearly 60% of respondents fell into the professional/technical/self employed categories. This is consistent with the high average incomes in Figure 7.

Overall, the demographic survey results show that billfish fishers are predominantly males aged 30 to 50 and relatively well off and are more likely than not to be self employed or working as executives or professionals.

3.3 Billfishing Expenditure

Estimated billfishing expenditure in the 2000-2001 billfish is given in Tables 4 to 13. Table 14 and Figure 10 summarise the total expenditure in all categories.

Gross estimated expenditure by billfishers in the 2000/01 fishing season was just over \$65 million. Expenditure by billfishers was highest for boat purchase which comprised nearly two thirds of all expenditure, followed by charter fees and private boat expenses, food and beverages and travel in that order.

3.3.1 Travel, Accommodation and Food and Beverages

Estimated total expenditure on travel, accommodation and food and beverages is summarised in Figure 11 and totalled \$9.53 million. Details of this expenditure by region, boat type and visitor type are given in Tables 4, 5 and 6.

Total travel expenditure was just over \$3.2 million (Table 4), with nearly two thirds of this (\$1.95 million) from the use of personal vehicles. Rental vehicles accounted for a further \$0.65 million. Only minor expenditure was incurred in other forms of travel.

Expenditure on accommodation totalled \$1.57 million with more than half of this expenditure by overseas visitors (Table 5).

Expenditure on food and beverages was \$4.73 million (Table 6), with nearly \$1.8 million of this on beverages alone. Food and beverage expenditure by overseas visitors and fishers visiting from outside regions was higher than expenditure by other fishers.

3.3.2 Charter Costs and Private Vessels Operating Costs

The costs of chartering vessels and private vessel operating costs totalled \$5.65 million in the 2000-2001 billfish season (Table 8).

Charter costs by billfishers comprised nearly two thirds of this expenditure (\$3.70 million), with the remaining expenditure incurred by private vessel owners. A high proportion of expenditure on chartering was incurred in Northland where the majority of billfish charter vessels are located.

3.3.3 Bait, Tackle and Fishing Equipment

Expenditure on bait, fishing tackle (lures etc.) and fishing equipment (including maintenance) totalled \$3.66 million, with the majority of this expenditure (over \$2.76 million) on fishing equipment (Tables 9 and 10).

3.3.4 Boats, Berths, Electronics and Tow Vehicles

Expenditure on the purchase of boats, berths, electronics and towing vehicles totalled over \$43 million², with \$36 million of this from the purchase of boats alone (Table 11 and Figure 12). All of this capital expenditure was in the private vessel category (Table 11). These capital expenditures make up two thirds of all billfish related expenditure in the 2000-2001 billfish season.

An additional \$2.2 million in maintenance expenditure was incurred on boats, berths, electronics and tow vehicles during the year (Table 12).

3.3.5 Willingness to pay

The questionnaire asked respondents if they would be willing to pay an extra daily fee if it was necessary to pay an additional amount to ensure the preservation of the fishery. Respondents were given a range of hypothetical fees to choose from, ranging from nil to more than \$120 per day. Figure 13 shows the responses broken down according to the additional daily fee respondents indicated they would be prepared to pay.

A total of 39% of respondents either refused to pick a value or indicated they would not be prepared to pay any additional fee to participate in the fishery, and a further 43% of respondents chose the two smallest amounts of \$10 or \$20/day. Scaled up, the total estimated willingness to pay in the 2000-2001 billfish fishery was \$0.86 million (Table 13). A breakdown of the estimated total willingness to pay is shown in Figure 14.

This estimate of \$0.86 million represents the additional amount that billfishers indicated they would be willing to pay, over and above the significant expenditure they are already making to participate in the fishery.

3.4 Economic Impacts

The regional and national economic impacts of the billfish fishery are provided in Table 15.

Gross reported expenditure by billfishers for the 2000-01 fishing season was \$65.3 million. Expenditures were highest for the travel, accommodation, motor vehicle and vessel supplies sectors.

Overall, the survey results show that New Zealand resident billfishers accounted for just under \$53 million (or 80 per cent) of expenditure with overseas resident

² Only the annualised proportion of the purchase costs of these items that is directly related to billfishing is included in this estimate.

billfishers responsible for \$12.9m of gross expenditures. These expenditures are the 'direct effects' of expenditure in the billfishery. Of the overseas fisher expenditure, about \$4.9 million, may not benefit New Zealand as it represents direct expenditure on imports of mainly boats and other capital equipment. Another \$0.9 million of overseas fisher expenditure is paid to the government in the form of excise taxes and GST. Technically this is a leakage from the business sector although it may be subsequently spent by the government. However, the economic multipliers used in this analysis do not include the effects of how the government might ultimately spend this revenue. Therefore, the direct or 'trade creation' effect that is generated by the expenditure of foreign resident fishers' participation in the New Zealand billfishery is about \$7.1m.

The analysis of regional economic impacts shows that Northland and the Bay of Plenty benefit the most from the billfishery. Gross reported expenditures by billfishers in the Northland region were \$34 and accounted for 53% of total expenditure in the billfishery in 2000-2001. A further 42% of total expenditure (\$27 million) took place in the Bay of Plenty region. Other regions (mainly Taranaki/Waikato) accounted for 5% (\$3 million) of gross expenditures by billfishers in the 2000-2001 season.

The regional economic impacts of the billfishery in Northland were significant. Table 15 shows that in the Northland region, the billfish fishery generated a direct plus indirect 'up-stream' effect in industries supplying the billfish fishery of nearly \$9 million, employment of about 53 FTEs (full-time equivalents) and added-value of nearly \$4 million. Much of the benefit of these downstream effects occurs in localised areas such as the Bay of Islands where much of the billfish charter fleet is based. In Northland, the total economic activity from the billfishery, including indirect production effects show a gross output of nearly \$13 million, 94.4 FTEs and value added of \$5.8 million. Including induced consumption effects, the 2000-2001 billfishery in Northland generated a gross output of \$14.9 million, employment of 116.6 FTEs and a value added of \$7.2 million.

In the Bay of Plenty region, the billfish fishery generated direct plus indirect output of just over \$3 million, employment of about 23 FTEs (full-time equivalents) and added-value of nearly \$1.2 million. Taking into account the total economic activity generated by the billfishery, including indirect production effects in the Bay of Plenty show a gross output of nearly \$5.1 million, 40.1 FTEs and value added of \$2.1 million. Including induced consumption effects, the 2000-2001 billfishery in the Bay of Plenty generated a gross output of \$6.0 million, employment of 48.2 FTEs and a value added of \$2.7 million.

In terms of its contribution to the national economy, the billfish fishery generated total economic activity, including induced consumption effects of over \$17.4 million in gross output, employment of more than 151 FTEs and value added of \$8.4 million. When these economic impacts are taken into account along with the \$65.3 million in direct expenditure, the billfishery makes a significant contribution to the regional and national economies both in terms of expenditure and employment generation.

4. Discussion

The primary sampling strategy for this study focussed on obtaining a representative sample through intercept sampling of fishers at dockside. However, some problems were experienced in obtaining the planned number of completed interviews because of the relatively poor weather conditions experienced in the 2000-2001 billfishing season. As a result, the sample sizes achieved for some strata or categories of billfishers were smaller than expected and may not have been fully representative of some strata. Because of the small and dispersed numbers of billfish fishers, random sampling (simple or stratified) using approaches such as a nation-wide telephone survey is not a feasible or cost effective option for selecting respondents. It was also believed that sampling from club membership lists as in previous surveys (e.g., Shaw 1989) might not provide a representative sample of private vessel fishers, many of whom are not associated with clubs. However, given the effects of weather conditions on fishing as experienced in the 2000-2001 fishery, there are risks associated with dockside intercept sampling as interview numbers can be significantly affected by poor or variable weather.

In spite of the problems experienced, the overall sample of 577 completed interviews for the 2000-2001 survey is comparable to the survey sample of 461 respondents obtained in the 1988-89 survey (Shaw, 1989). Overall, good sample sizes were achieved in the 2000-2001 survey, especially in Northland where much of the billfishery takes place.

Overall, the demographic profile of billfishers indicates that they are middle aged and reasonably well off. This is not surprising as participation in the billfishery is reasonably expensive. Unlike many other recreational fisheries, participation in billfishing frequently involves the costs of travelling to a billfishing region and requires a vessel capable of offshore operation. Suitable vessels for offshore fishing are expensive to purchase and maintain and the cost of chartering big game vessels is reasonably high. The estimated annualised cost of private vessel purchase alone in the 2000-2001 fishing season exceeded \$36 million.

The scaled up data on expenditure provides base data on expenditure of domestic and international billfish fishers on fishing assets and goods and services in each region. This shows where game-fishers are spending their resources (which sectors) and the levels of expenditure.

The results of survey show that total estimated expenditure in the 2000-2001 billfish season was \$65.3 million, with the most significant items being expenditure on capital items such as boats, berths, electronic equipment and towing vehicles. The 2000-2001 billfishery was adversely affected by poor weather conditions (catches were down by 30% compared to recent years) and it is probable that the estimated expenditure on fishing related activities, such as travel, accommodation and food was well below the average annual expenditure in the fishery.

Expenditure on vessels is the single largest expenditure in the billfishery at \$36.3 million, representing 56% of total billfish expenditure in 2000-2001. Fishers spent a further \$6.8 million on the purchase of boat-related items such as berths, electronics and towing vehicles. Private fishing vessels have become progressively larger and better equipped over the years and are expensive to purchase and maintain.

The results of the study show that the overall economic impacts of the billfishery are significant, both regionally and nationally. The analysis that has been undertaken

shows the true 'trade creation' effect or real increase in economic activity resulting from the billfish fishery in the Northland and Bay of Plenty regions as well as the national economy. The analysis shows that the expenditures by billfishers make an important contribution to output, value added and employment in both regions and to the national economy.

The main stimulus to economic activity from the billfishery is derived from expenditure by visiting billfish fishers who are normally resident outside the main billfishing regions of Northland and the Bay of Plenty. This includes expenditure by both New Zealand and overseas resident billfishers. A conservative approach has been adopted in looking at the expenditure by resident anglers within each region. It is assumed that expenditure by anglers who fish within the region they live in makes no contribution to new economic activity in each region and the national economy. However, this expenditure does contribute to the local economy in a variety of ways by supporting local businesses associated with the billfish industry.

Once the expenditure of billfishers from outside the immediate Northland and Bay of Plenty regions including international resident fishers has been adjusted for tax effects, the level of expenditure that remains to contribute to real economic activity is about \$7m. Nevertheless we have calculated the economic contribution of the billfish fishery to regional GDP to be of the order of 0.2% for Northland and 0.05% for the Bay of Plenty. The fishery also directly contributes 0.12% to employment in Northland and 0.03% to employment in the Bay of Plenty.

While this contribution is relatively modest, the gamefish fishery is highly seasonal, lasting 4 or 5 months in the north and 3 months in other areas. Also this survey only includes expenditure on billfish fishing which are just one component of the gamefish fishery that targets a number of tuna and shark species. The contribution of the billfish fishery is focused around a number of small ports and makes a significant contribution to the local economy at these ports. When considered on a local basis, the billfishery makes a very significant contribution to the economy of local areas such as the Bay of Islands.

The billfish fishery needs to be viewed not only in the context of its economic contribution to the regions and the national economy but also the linkages between the fishery and other regions and activities. For example, the fishery is a major draw-card for tourists to the Northland region. For a region such as Northland where the economy is not well-diversified, the economic contribution of the billfish fishery is very important. In addition, the New Zealand big-game fishery has an international reputation. Many overseas anglers come to New Zealand to participate in the fishery each year. In addition to their expenditure on billfishing, it is highly likely that overseas billfish fishers also undertake additional expenditure in other regions such as Auckland on the way to, and from, the billfish fishery therein providing additional economic activity in these areas with added benefits to the national economy.

The survey that forms the basis for the economic analysis in this report that has been undertaken is for the 2000-2001 billfish season. It does not reveal trends in the economic contribution of the fishery over time but the results can be used as a baseline for measuring future changes in the value and economic contribution of the New Zealand billfish fishery. We have also made a number of conservative assumptions about 'trade creation' effects that mean the estimates of the level of real economic activity generated by the fishery are conservative.

Gamefish clubs have observed a trend over the last 10 years of many more trailer boats entering the billfish fishery. Improved reliability of outboard motors, advances in electronic navigation and communications and the Kiwi desire to “have a go” have all contributed to this trend. The result is that keen fishers can now access the billfish fishery relatively cheaply in New Zealand. This appears to be reflected in the results of this survey with many fishers using private vessels and spending less to participate than would be the case if fishing from charter vessels.

Contingent valuation (willingness to pay) techniques were used to estimate the non-market value of the recreational fishery. The name of the method refers to the fact that the values revealed by respondents are contingent upon the simulated situation presented in the survey. There is no standard approach to the design of a contingent valuation survey (Portney, 1994). However, such surveys generally include a hypothetical scenario (e.g., how much more would you have been willing to pay today to catch a fish) and demographic and socio-economic questions (as willingness to pay is obviously linked to ability to pay). Mitchell & Carson (1989) provide a full description of the contingent valuation method.

In this survey, the contingent valuation method involved asking a question that asked how much the respondent would be willing to pay for each day they went marlin fishing, given a hypothetical situation that the fishery would disappear unless they paid an extra fee to pay for the preservation of this fishery (see Appendix 1 for the full text of the question). A show card was used with values ranging from “nothing” to “more than \$120 per day”.

A high proportion of anglers said that they would not be prepared to pay any extra for their days fishing in response to the Willingness To Pay (WTP) question and a further 5% refused to answer at all. It is possible that a fault in this question did not illicit the actual WTP from billfish fishers or that the complexity of the question near the end of a 10 minute questionnaire meant respondents were less inclined to think carefully about the hypothetical situation they were asked to consider.

From the reaction of many respondents to the WTP question it is clear that the concept of contingent valuation was not well understood by many of the respondents. While there has been considerable use of contingent valuation in the United States of America to assess the importance of a range of environmental values (Carson, 1994), little use of the technique has been made in New Zealand. Also there was a strong link made by some respondents between this question and the prospect of paying for a recreational saltwater fishing licence. At the time licensing had been proposed as one possible option in a Government discussion document on recreational fishing a few months prior to this survey and had met loud and well organised opposition by sport fishing clubs and others.

Lastly, the overall expenditure on the 2000-2001 billfishery is likely to have been well below expenditure in a typical fishing year. The billfishery was adversely affected by poor weather conditions throughout much of the fishing season. It is probably that the estimated expenditure of \$65.3 million is well below that of an average fishing season. Also a number of conservative assumptions are made about the contribution of expenditure by anglers inside the region they live. In this regard, the results of this survey probably underestimate the full economic contribution of the billfishery in a normal fishing year.

5. Conclusions

The 2000-2001 billfishery generated significant economic benefits for New Zealand, both regionally and nationally.

Total expenditure by billfishers in 2000-2001 was \$65 million, of which \$13 million was expenditure by overseas fishers. More than half of billfish expenditure is related to spending on vessels and associated items. However, significant expenditure also occurs on travel, food and beverages, charter fees, fishing equipment and maintenance.

The billfishery has its greatest economic impact in Northland and the Bay of Plenty. Expenditure by billfishers in Northland was \$34 million, and in the Bay of Plenty expenditure was \$27 million. A total expenditure of \$3 million occurred in the billfishery in other regions.

The additional economic activity generated by the billfishery is significant. On a nation-wide basis, and taking into account indirect production effects and induced consumption effects, the economic contribution of the billfishery is estimated to generate \$17 million in gross output, 151 full time equivalent jobs and a further \$8.4 million in value added.

Within Northland, the expenditure by billfishers (visiting from elsewhere in New Zealand or overseas) generates \$12 million in value added, 116 full time equivalent jobs and \$7 million in value added.

Within the Bay of Plenty, the expenditure by billfishers (visiting from elsewhere in New Zealand or overseas) generates \$5 million in value added, 48 full time equivalent jobs and \$3 million in value added.

The contingent valuation survey suggests a low willingness to pay in the billfishery. This result may have been affected by angler concern about Ministry of Fisheries proposals that included the introduction of recreational fishing licences, which are strongly opposed by the recreational fishing community. Therefore, the estimated non-market value of the 2000-2001 billfishery of \$0.86 million is unlikely to reflect the true value placed on the fishery by participants.

The 2000-2001 billfishery was badly affected by poor weather conditions and both participation and expenditure will have been lower than in an average fishing season. Therefore, the economic impacts measured in this survey probably underestimate the full economic impact of the billfishery in a typical year.

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Table 1: Interviews by region and vessel type.

Region	Vessel Type	Total
Northland	Private	201
Northland	Charter	120
Bay of Plenty	Private	180
Bay of Plenty	Charter	20
Other areas	Private	56
Total		577

Table 2: Interviews by port

Region	Port	Number of interviews
Northland	Houhora	20
	Mangonui	7
	Whangaroa	81
	BOI	90
	Tutukaka	123
Bay of Plenty	Whitianga	33
	Tauranga	122
	Whakatane	38
	Waihau Bay	7
	Kaipara	3
Other	Manukau	11
	Raglan	14
	New Plymouth	26
	Total Interviews	577

Table 3: Summary statistics from the billfish survey forms.

Region	Boat type	Number of interviews	Billfish caught per boat day	Anglers per trip	% of billfish not recorded in club records
Northland	Charter	120	0.275	3.26	6%
Northland	Private	201	0.172	3.08	6%
BOP	Charter	20	0.086	4.4	39%
BOP	Private	180	0.062	3.43	15%
Other	Private	56	0.010	3.27	0%

Table 4: Expenditure on travel (\$000)

Region	Boat Type	Visitor Type	Sample Size	Air NZ Airfares - OUTSIDE the area	Water travel - OUTSIDE the area	Bus and Train - OUTSIDE the area	Bus and Train - WITHIN the area	Rental Cars - OUTSIDE the area	Rental Cars - WITHIN the area	Own Car - IN and OUT of area	Other Travel Costs - WITHIN the area
Northland	Charter	Overseas	36	\$0	\$1,000	\$800	\$2,100	\$236,500	\$42,200	\$16,900	\$14,400
Northland	Charter	Outside Region	62	\$0	\$1,300	\$84,500	\$0	\$75,600	\$72,000	\$609,100	\$40,600
Northland	Charter	Within Region	24	\$0	\$0	\$0	\$0	\$0	\$0	\$36,900	\$41,800
Northland	Private	Overseas	10	\$0	\$11,300	\$0	\$0	\$51,400	\$0	\$20,500	\$1,600
Northland	Private	Outside Region	80	\$0	\$72,400	\$19,300	\$0	\$0	\$0	\$437,600	\$23,500
Northland	Private	Within Region	111	\$0	\$0	\$0	\$0	\$0	\$0	\$109,900	\$1,100
West BOP	Charter	Outside Region	2	\$0	\$0	\$0	\$0	\$0	\$0	\$7,200	\$0
West BOP	Private	Overseas	3	\$0	\$0	\$0	\$0	\$22,900	\$14,600	\$6,900	\$900
West BOP	Private	Outside Region	32	\$0	\$114,200	\$0	\$9,400	\$0	\$0	\$111,500	\$0
West BOP	Private	Within Region	120	\$0	\$0	\$0	\$0	\$0	\$0	\$91,200	\$0
East BOP	Charter	Overseas	1	\$0	\$0	\$0	\$0	\$45,000	\$0	\$0	\$0
East BOP	Charter	Outside Region	9	\$0	\$0	\$0	\$0	\$0	\$0	\$179,200	\$2,000
East BOP	Charter	Within Region	6	\$0	\$0	\$0	\$0	\$0	\$0	\$49,700	\$0
East BOP	Private	Overseas	4	\$31,900	\$0	\$0	\$0	\$211,600	\$0	\$0	\$15,800
East BOP	Private	Outside Region	6	\$0	\$1,100	\$0	\$0	\$1,300	\$0	\$76,000	\$0
East BOP	Private	Within Region	15	\$0	\$0	\$0	\$0	\$0	\$0	\$66,900	\$0
Other	Private	Outside Region	14	\$0	\$5,400	\$0	\$0	\$6,500	\$0	\$90,800	\$3,800
Other	Private	Within Region	42	\$0	\$0	\$0	\$0	\$0	\$0	\$40,100	\$2,400
		Total	577	\$31,900	\$206,700	\$104,600	\$11,500	\$650,900	\$128,800	\$1,950,400	\$148,000

Table 5 Expenditure on accommodation

Region	Boat Type	Visitor Type	Sample Size	Accommodation -		Total Accommodation Expenses
				OUTSIDE the area	Accommodation - WITHIN the area	
Northland	Charter	Overseas	36	\$182,900	\$145,800	\$328,700
Northland	Charter	Outside Region	62	\$28,300	\$261,900	\$290,200
Northland	Charter	Within Region	24	\$0	\$50,300	\$50,300
Northland	Private	Overseas	10	\$39,800	\$31,900	\$71,700
Northland	Private	Outside Region	80	\$15,000	\$94,300	\$109,300
Northland	Private	Within Region	111	\$0	\$5,600	\$5,600
West BOP	Charter	Outside Region	2	\$0	\$0	\$0
West BOP	Private	Overseas	3	\$2,000	\$31,300	\$33,300
West BOP	Private	Outside Region	32	\$3,500	\$7,700	\$11,200
West BOP	Private	Within Region	120	\$0	\$14,300	\$14,300
East BOP	Charter	Overseas	1	\$49,100	\$6,600	\$55,700
East BOP	Charter	Outside Region	9	\$2,500	\$9,200	\$11,700
East BOP	Charter	Within Region	6	\$0	\$0	\$0
East BOP	Private	Overseas	4	\$388,500	\$126,800	\$515,300
East BOP	Private	Outside Region	6	\$0	\$9,300	\$9,300
East BOP	Private	Within Region	15	\$0	\$13,800	\$13,800
Other	Private	Outside Region	14	\$22,900	\$13,500	\$36,400
Other	Private	Within Region	42	\$0	\$17,700	\$17,700
		Total	577	\$734,700	\$840,100	\$1,574,800

Table 6 Expenditure on food and beverages

Region	Boat Type	Visitor Type	Sample Size	Food - OUTSIDE the area	Food - WITHIN the area	Liquor - OUTSIDE the area	Liquor - WITHIN the area	Total Food and Beverages Expenditure
Northland	Charter	Overseas	36	\$192,500	\$99,000	\$116,200	\$61,100	\$468,800
Northland	Charter	Outside Region	62	\$132,800	\$234,600	\$165,900	\$202,200	\$735,500
Northland	Charter	Within Region	24	\$0	\$88,700	\$0	\$89,100	\$177,800
Northland	Private	Overseas	10	\$46,600	\$50,400	\$31,700	\$48,200	\$176,900
Northland	Private	Outside Region	80	\$112,500	\$136,100	\$96,000	\$130,000	\$474,600
Northland	Private	Within Region	111	\$0	\$157,600	\$0	\$226,600	\$384,200
West BOP	Charter	Outside Region	2	\$500	\$1,500	\$600	\$2,300	\$4,900
West BOP	Private	Overseas	3	\$3,800	\$32,800	\$7,500	\$10,800	\$54,900
West BOP	Private	Outside Region	32	\$72,500	\$65,600	\$64,800	\$76,900	\$279,800
West BOP	Private	Within Region	120	\$0	\$159,800	\$0	\$183,600	\$343,400
East BOP	Charter	Overseas	1	\$28,700	\$4,100	\$6,100	\$400	\$39,300
East BOP	Charter	Outside Region	9	\$13,600	\$22,000	\$5,300	\$12,700	\$53,600
East BOP	Charter	Within Region	6	\$0	\$13,800	\$0	\$6,900	\$20,700
East BOP	Private	Overseas	4	\$1,046,200	\$91,400	\$42,700	\$32,000	\$1,212,300
East BOP	Private	Outside Region	6	\$7,300	\$9,500	\$14,200	\$5,200	\$36,200
East BOP	Private	Within Region	15	\$0	\$32,000	\$0	\$44,100	\$76,100
Other	Private	Outside Region	14	\$28,600	\$14,400	\$22,800	\$13,100	\$78,900
Other	Private	Within Region	42	\$0	\$52,300	\$0	\$56,400	\$108,700
		Total	577	\$1,685,600	\$1,265,300	\$573,700	\$1,201,600	\$4,726,600

Table 7 Expenditure on other items

Region	Boat Type	Visitor Type	Sample Size	Other Expenses - OUTSIDE the area	Other Expenses - IN and OUT of area - annual costs	Other Expenses - IN and OUT of area - trip costs	Total expenditure on other items
Northland	Charter	Overseas	36	\$9,200	\$22,000	\$3,300	\$34,500
Northland	Charter	Outside Region	62	\$58,500	\$4,800	\$69,100	\$132,400
Northland	Charter	Within Region	24	\$0	\$23,300	\$38,800	\$62,100
Northland	Private	Overseas	10	\$1,200	\$1,100	\$14,700	\$17,000
Northland	Private	Outside Region	80	\$55,900	\$16,000	\$66,600	\$138,500
Northland	Private	Within Region	111	\$0	\$7,600	\$58,000	\$65,600
West BOP	Charter	Outside Region	2	\$10,500	\$0	\$500	\$11,000
West BOP	Private	Overseas	3	\$2,000	\$0	\$2,900	\$4,900
West BOP	Private	Outside Region	32	\$240,500	\$38,600	\$36,400	\$315,500
West BOP	Private	Within Region	120	\$0	\$11,400	\$78,300	\$89,700
East BOP	Charter	Overseas	1	\$8,200	\$0	\$0	\$8,200
East BOP	Charter	Outside Region	9	\$9,500	\$0	\$0	\$9,500
East BOP	Charter	Within Region	6	\$0	\$7,600	\$0	\$7,600
East BOP	Private	Overseas	4	\$0	\$0	\$0	\$0
East BOP	Private	Outside Region	6	\$400	\$700	\$0	\$1,100
East BOP	Private	Within Region	15	\$0	\$0	\$9,300	\$9,300
Other	Private	Outside Region	14	\$96,200	\$2,900	\$16,000	\$115,100
Other	Private	Within Region	42	\$0	\$0	\$50,900	\$50,900
		Total	577	\$492,100	\$136,000	\$444,900	\$1,072,900

Table 8 Expenditure on charter and private boats

Region	Boat Type	Visitor Type	Sample Size	Total Charter or Private Boat Expenses
Northland	Charter	Overseas	36	\$588,500
Northland	Charter	Outside Region	62	\$2,002,400
Northland	Charter	Within Region	24	\$608,200
Northland	Private	Overseas	10	\$120,600
Northland	Private	Outside Region	80	\$459,500
Northland	Private	Within Region	111	\$356,100
West BOP	Charter	Outside Region	2	\$4,600
West BOP	Private	Overseas	3	\$42,300
West BOP	Private	Outside Region	32	\$296,800
West BOP	Private	Within Region	120	\$439,200
East BOP	Charter	Overseas	1	\$32,800
East BOP	Charter	Outside Region	9	\$299,100
East BOP	Charter	Within Region	6	\$160,600
East BOP	Private	Overseas	4	\$57,900
East BOP	Private	Outside Region	6	\$13,600
East BOP	Private	Within Region	15	\$800
Other	Private	Outside Region	14	\$50,400
Other	Private	Within Region	42	\$112,000
		Total	577	\$5,645,400

Table 9 Expenditure on bait and fishing tackle

Region	Boat Type	Visitor Type	Sample Size	Cost of Bait	Cost of Fishing Tackle	Total expenditure on bait and fishing tackle
Northland	Charter	Overseas	36	\$0	\$4,200	\$4,200
Northland	Charter	Outside Region	62	\$3,700	\$1,400	\$5,100
Northland	Charter	Within Region	24	\$8,700	\$14,600	\$23,300
Northland	Private	Overseas	10	\$2,000	\$12,700	\$14,700
Northland	Private	Outside Region	80	\$11,300	\$39,000	\$50,300
Northland	Private	Within Region	111	\$10,100	\$55,100	\$65,200
West BOP	Charter	Outside Region	2	\$0	\$200	\$200
West BOP	Private	Overseas	3	\$0	\$0	\$0
West BOP	Private	Outside Region	32	\$26,100	\$160,900	\$187,000
West BOP	Private	Within Region	120	\$7,900	\$185,600	\$193,500
East BOP	Charter	Overseas	1	\$0	\$0	\$0
East BOP	Charter	Outside Region	9	\$2,900	\$21,500	\$24,400
East BOP	Charter	Within Region	6	\$2,100	\$14,000	\$16,100
East BOP	Private	Overseas	4	\$0	\$0	\$0
East BOP	Private	Outside Region	6	\$0	\$1,100	\$1,100
East BOP	Private	Within Region	15	\$6,300	\$237,000	\$243,300
Other	Private	Outside Region	14	\$4,600	\$30,800	\$35,400
Other	Private	Within Region	42	\$12,100	\$24,700	\$36,800
		Total	577	\$97,900	\$802,800	\$900,600

Table 10 Expenditure on fishing equipment purchase and maintenance

Region	Boat Type	Visitor Type	Sample Size	Equipment Purchase	Equipment Maintenance - OUTSIDE the area	Equipment Maintenance - WITHIN the area	Total expenditure on equipment purchase and maintenance
Northland	Charter	Overseas	36	\$14,600	\$200	\$0	\$14,800
Northland	Charter	Outside Region	62	\$288,300	\$27,100	\$3,000	\$318,400
Northland	Charter	Within Region	24	\$25,600	\$500	\$0	\$26,100
Northland	Private	Overseas	10	\$216,800	\$12,700	\$8,900	\$238,400
Northland	Private	Outside Region	80	\$396,900	\$36,100	\$3,600	\$436,600
Northland	Private	Within Region	111	\$266,800	\$7,000	\$30,200	\$304,000
West BOP	Charter	Outside Region	2	\$900	\$100	\$0	\$1,000
West BOP	Private	Overseas	3	\$37,000	\$3,900	\$0	\$40,900
West BOP	Private	Outside Region	32	\$178,900	\$18,000	\$6,500	\$203,400
West BOP	Private	Within Region	120	\$457,000	\$7,900	\$59,500	\$524,400
East BOP	Charter	Overseas	1	\$0	\$0	\$0	\$0
East BOP	Charter	Outside Region	9	\$49,200	\$0	\$0	\$49,200
East BOP	Charter	Within Region	6	\$54,400	\$5,000	\$2,100	\$61,500
East BOP	Private	Overseas	4	\$0	\$0	\$0	\$0
East BOP	Private	Outside Region	6	\$56,200	\$2,100	\$0	\$58,300
East BOP	Private	Within Region	15	\$231,900	\$300	\$5,800	\$238,000
Other	Private	Outside Region	14	\$54,700	\$5,600	\$2,600	\$62,900
Other	Private	Within Region	42	\$166,800	\$800	\$16,400	\$184,000
		Total	577	\$2,496,100	\$127,300	\$138,600	\$2,761,900

Table 11 Expenditure on purchase of boats, berths, electronics and tow vehicles

Region	Boat Type	Visitor Type	Sample Size	Boat Purchase	Berth Purchase	Electronics Purchase	Tow Vehicle Purchase	Total capital expenditure
Northland	Charter	Overseas	36	\$0	\$0	\$0	\$0	\$0
Northland	Charter	Outside Region	62	\$0	\$0	\$0	\$0	\$0
Northland	Charter	Within Region	24	\$0	\$0	\$0	\$0	\$0
Northland	Private	Overseas	10	\$7,088,000	\$750,500	\$2,000	\$0	\$7,840,500
Northland	Private	Outside Region	80	\$9,898,300	\$259,700	\$155,400	\$109,100	\$10,422,500
Northland	Private	Within Region	111	\$2,848,300	\$484,900	\$72,200	\$134,000	\$3,539,400
West BOP	Charter	Outside Region	2	\$0	\$0	\$0	\$0	\$0
West BOP	Private	Overseas	3	\$0	\$0	\$0	\$0	\$0
West BOP	Private	Outside Region	32	\$8,303,400	\$417,100	\$155,900	\$153,200	\$9,029,600
West BOP	Private	Within Region	120	\$4,678,000	\$554,100	\$174,300	\$352,100	\$5,758,500
East BOP	Charter	Overseas	1	\$0	\$0	\$0	\$0	\$0
East BOP	Charter	Outside Region	9	\$0	\$0	\$0	\$0	\$0
East BOP	Charter	Within Region	6	\$0	\$0	\$0	\$0	\$0
East BOP	Private	Overseas	4	\$0	\$0	\$0	\$0	\$0
East BOP	Private	Outside Region	6	\$0	\$46,400	\$11,200	\$169,900	\$227,500
East BOP	Private	Within Region	15	\$2,130,200	\$1,181,300	\$93,000	\$423,900	\$3,828,400
Other	Private	Outside Region	14	\$79,800	\$155,000	\$8,300	\$8,400	\$251,500
Other	Private	Within Region	42	\$1,331,500	\$649,100	\$119,100	\$177,000	\$2,276,700
		Total	577	\$36,357,400	\$4,498,100	\$791,400	\$1,527,800	\$43,174,600

Table 12 Maintenance expenditure on boats, berths, electronics and tow vehicles

Region	Boat Type	Visitor Type	Sample Size	Boat Maintenance - OUTSIDE the area	Boat Maintenance - WITHIN the area	Berth Maintenance - OUTSIDE the area	Berth Maintenance - WITHIN the area	Electronics Maintenance - OUTSIDE the area	Electronics Maintenance - WITHIN the area	Tow Vehicle Maintenance - OUTSIDE the area	Tow Vehicle Maintenance - WITHIN the area
Northland	Charter	Overseas	36	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Northland	Charter	Outside Region	62	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Northland	Charter	Within Region	24	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Northland	Private	Overseas	10	\$36,000	\$55,300	\$9,400	\$0	\$0	\$0	\$0	\$0
Northland	Private	Outside Region	80	\$188,600	\$166,800	\$11,100	\$12,300	\$42,400	\$7,400	\$3,000	\$0
Northland	Private	Within Region	111	\$195,900	\$372,900	\$2,600	\$26,200	\$1,100	\$4,500	\$1,700	\$600
West BOP	Charter	Outside Region	2	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
West BOP	Private	Overseas	3	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
West BOP	Private	Outside Region	32	\$163,700	\$34,200	\$13,200	\$26,700	\$2,900	\$300	\$2,600	\$400
West BOP	Private	Within Region	120	\$43,900	\$312,500	\$7,600	\$49,700	\$2,500	\$4,800	\$3,200	\$8,100
East BOP	Charter	Overseas	1	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
East BOP	Charter	Outside Region	9	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
East BOP	Charter	Within Region	6	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
East BOP	Private	Overseas	4	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
East BOP	Private	Outside Region	6	\$5,100	\$4,400	\$2,700	\$2,000	\$1,100	\$0	\$500	\$0
East BOP	Private	Within Region	15	\$21,800	\$45,200	\$26,300	\$45,500	\$700	\$5,200	\$4,700	\$2,400
Other	Private	Outside Region	14	\$40,900	\$8,800	\$6,000	\$4,300	\$900	\$0	\$15,800	\$17,700
Other	Private	Within Region	42	\$14,600	\$99,900	\$12,000	\$26,800	\$2,900	\$5,100	\$3,200	\$2,000
		Total	577	\$710,400	\$1,099,900	\$90,900	\$193,500	\$54,500	\$27,200	\$34,800	\$31,300

Table 13 Willingness to pay

Region	Boat Type	Visitor Type	Sample Size	Willingness to Pay
Northland	Charter	Overseas	36	\$35,500
Northland	Charter	Outside Region	62	\$198,700
Northland	Charter	Within Region	24	\$53,500
Northland	Private	Overseas	10	\$13,500
Northland	Private	Outside Region	80	\$125,300
Northland	Private	Within Region	111	\$100,600
West BOP	Charter	Outside Region	2	\$4,000
West BOP	Private	Overseas	3	\$1,800
West BOP	Private	Outside Region	32	\$14,900
West BOP	Private	Within Region	120	\$154,700
East BOP	Charter	Overseas	1	\$800
East BOP	Charter	Outside Region	9	\$56,300
East BOP	Charter	Within Region	6	\$22,400
East BOP	Private	Overseas	4	\$9,100
East BOP	Private	Outside Region	6	\$11,900
East BOP	Private	Within Region	15	\$20,000
Other	Private	Outside Region	14	\$7,600
Other	Private	Within Region	42	\$25,000
		Total	577	\$855,700

Table 14 Summary of expenditure by category

Region	Boat Type	Visitor Type	Sample Size	Total Travel Expenses	Total Accommodation Expenses	Total Food and Beverages Expenditure	Total expenditure on other items	Total Charter or Private Boat Expenses	Total expenditure on bait and fishing tackle	Total expenditure on equipment purchase and maintenance	Total capital expenditure
Northland	Charter	Overseas	36	\$313,900	\$328,700	\$468,800	\$34,500	\$588,500	\$4,200	\$14,800	\$0
Northland	Charter	Outside Region	62	\$883,100	\$290,200	\$735,500	\$132,400	\$2,002,400	\$5,100	\$318,400	\$0
Northland	Charter	Within Region	24	\$78,700	\$50,300	\$177,800	\$62,100	\$608,200	\$23,300	\$26,100	\$0
Northland	Private	Overseas	10	\$84,800	\$71,700	\$176,900	\$17,000	\$120,600	\$14,700	\$238,400	\$7,840,500
Northland	Private	Outside Region	80	\$552,800	\$109,300	\$474,600	\$138,500	\$459,500	\$50,300	\$436,600	\$10,422,500
Northland	Private	Within Region	111	\$111,000	\$5,600	\$384,200	\$65,600	\$356,100	\$65,200	\$304,000	\$3,539,400
West BOP	Charter	Outside Region	2	\$7,200	\$0	\$4,900	\$11,000	\$4,600	\$200	\$1,000	\$0
West BOP	Private	Overseas	3	\$45,300	\$33,300	\$54,900	\$4,900	\$42,300	\$0	\$40,900	\$0
West BOP	Private	Outside Region	32	\$235,100	\$11,200	\$279,800	\$315,500	\$296,800	\$187,000	\$203,400	\$9,029,600
West BOP	Private	Within Region	120	\$91,200	\$14,300	\$343,400	\$89,700	\$439,200	\$193,500	\$524,400	\$5,758,500
East BOP	Charter	Overseas	1	\$45,000	\$55,700	\$39,300	\$8,200	\$32,800	\$0	\$0	\$0
East BOP	Charter	Outside Region	9	\$181,200	\$11,700	\$53,600	\$9,500	\$299,100	\$24,400	\$49,200	\$0
East BOP	Charter	Within Region	6	\$49,700	\$0	\$20,700	\$7,600	\$160,600	\$16,100	\$61,500	\$0
East BOP	Private	Overseas	4	\$259,300	\$515,300	\$1,212,300	\$0	\$57,900	\$0	\$0	\$0
East BOP	Private	Outside Region	6	\$78,400	\$9,300	\$36,200	\$1,100	\$13,600	\$1,100	\$58,300	\$227,500
East BOP	Private	Within Region	15	\$66,900	\$13,800	\$76,100	\$9,300	\$800	\$243,300	\$238,000	\$3,828,400
Other	Private	Outside Region	14	\$106,500	\$36,400	\$78,900	\$115,100	\$50,400	\$35,400	\$62,900	\$251,500
Other	Private	Within Region	42	\$42,500	\$17,700	\$108,700	\$50,900	\$112,000	\$36,800	\$184,000	\$2,276,700
		Total	577	\$3,232,600	\$1,574,800	\$4,726,600	\$1,072,900	\$5,645,400	\$900,600	\$2,761,900	\$43,174,600

Table 15: Summary of economic impacts of the New Zealand billfish fishery, 2000-2001 season

		<u>Northland</u>		<u>Bay of Plenty</u>		<u>Other Regions</u>		<u>Total</u>		<u>Grand Total</u>
		Internal	External	Internal	External	Internal	External	Domestic	Overseas	
Expenditure										
Gross Reported Expenditure	(\$m)	6.463	27.862	12.831	14.349	2.996	0.832	52.466	12.866	65.332
less Expenditure Outside Region	(\$m)		18.062		10.520		0.550		4.858	4.858
less Trade Diversion	(\$m)	6.463		12.831		2.996		52.466		52.466
less Tax	(\$m)		1.187		0.466		0.036		0.922	0.922
	(\$m)	0.000	8.613	0.000	3.363	0.000	0.246	0.000	7.086	7.086
Net Expenditure Inside Region ("Direct Effects")										
Gross Output	(\$m)		8.613		3.363				7.086	
Employment	(FTE)		53.2		22.9				52.6	
Value Added	(\$m)		3.761		1.291				2.798	
Multipliers - Type IB										
Gross Output			1.45		1.52				1.89	
Employment			1.77		1.76				2.18	
Value Added			1.55		1.69				2.24	
Multipliers - Type II										
Gross Output			1.73		1.80				2.47	
Employment			2.19		2.11				2.87	
Value Added			1.93		2.10				3.02	
Total Activity by Type IB Multipliers ("Direct plus Indirect Effects")										
Gross Output	(\$m)		12.459		5.127				13.399	
Employment	(FTE)		94.4		40.1				114.5	
Value Added	(\$m)		5.845		2.180				6.268	
Total Activity by Type II Multipliers ("Direct plus Indirect plus Induced Effects")										
Gross Output	(\$m)		14.886		6.039				17.484	
Employment	(FTE)		116.6		48.2				151.3	
Value Added	(\$m)		7.248		2.713				8.462	

Notes: 1. Tax for whole NZ is less than the sum of tax for the regions because it is only identified for expenditure defined as external/overseas.
2. All expenditure by local residents within a region is assumed to be 100% trade diversion.

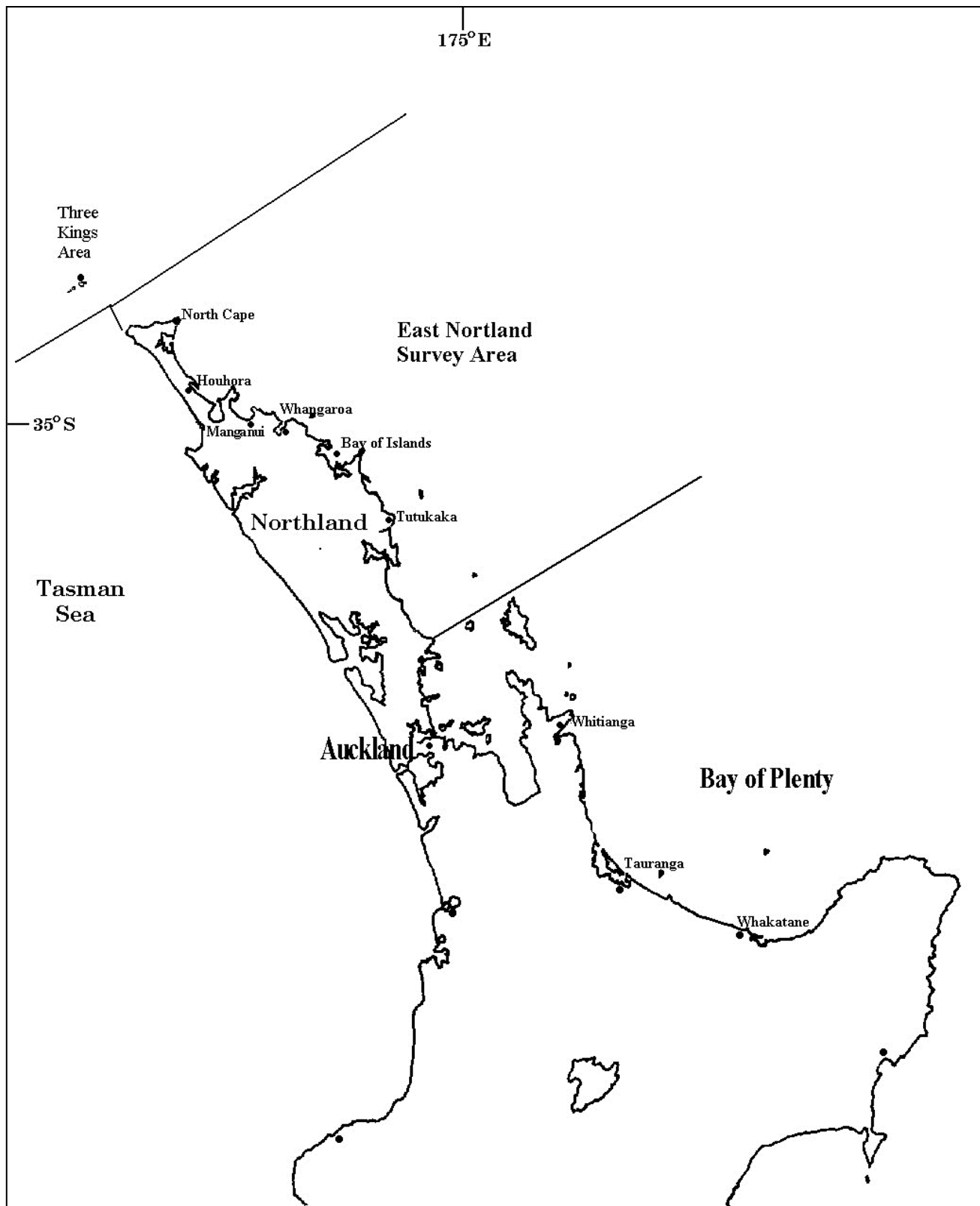


Figure 1 Survey area showing regions and locations

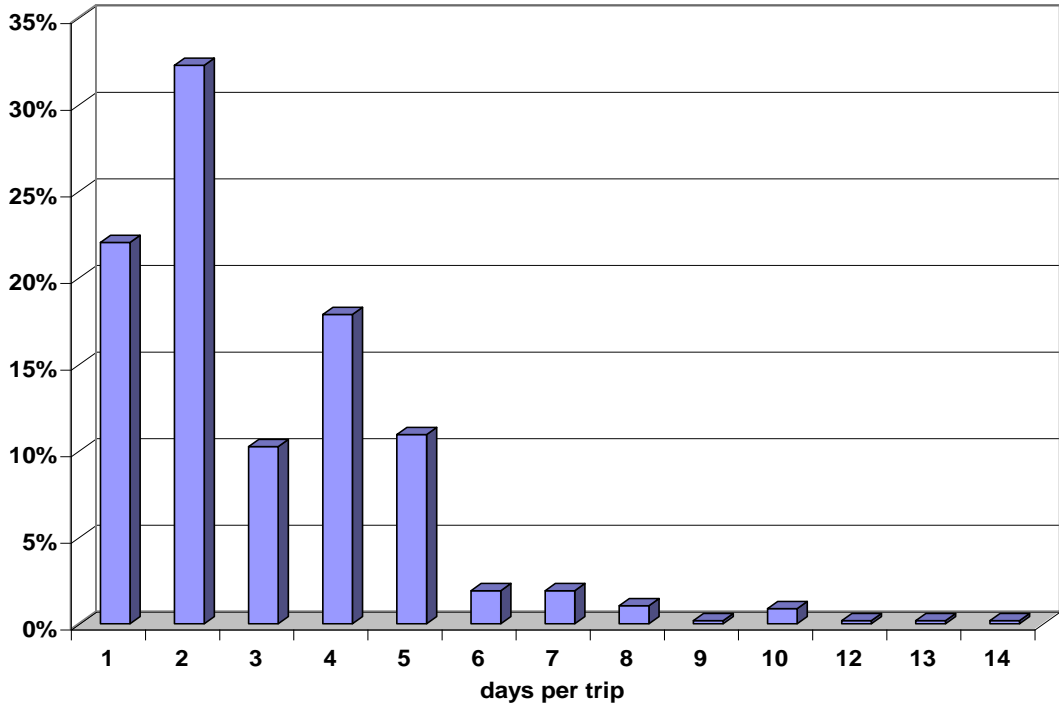


Figure 2 Number of days fished per trip by survey participants

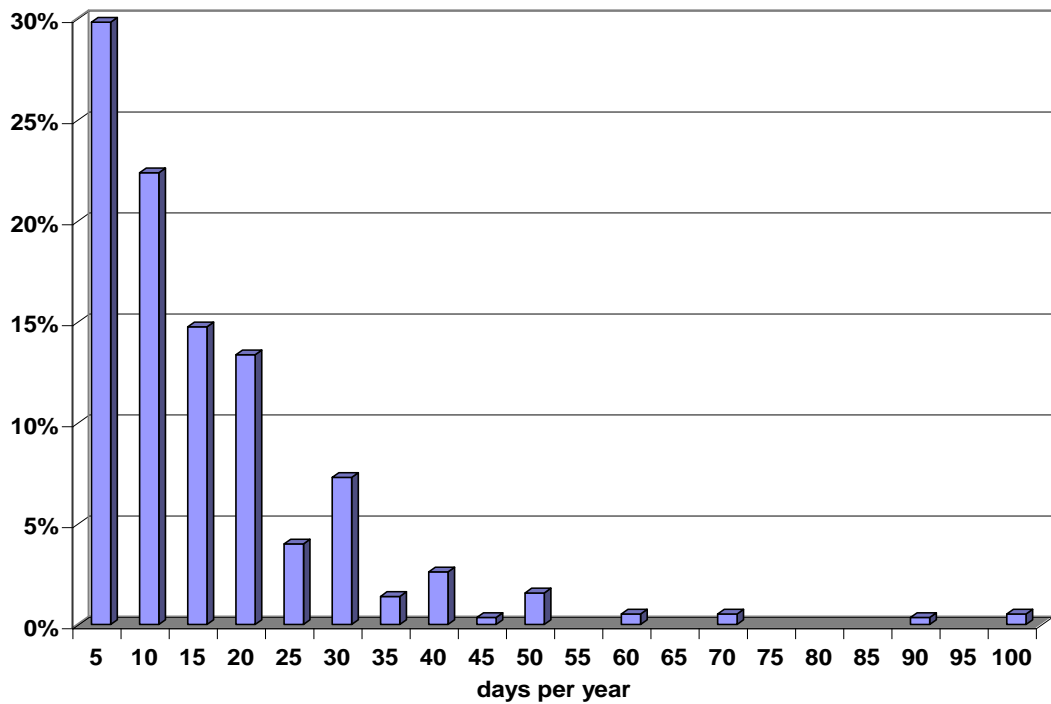


Figure 3 Number of days fished per year by survey participants

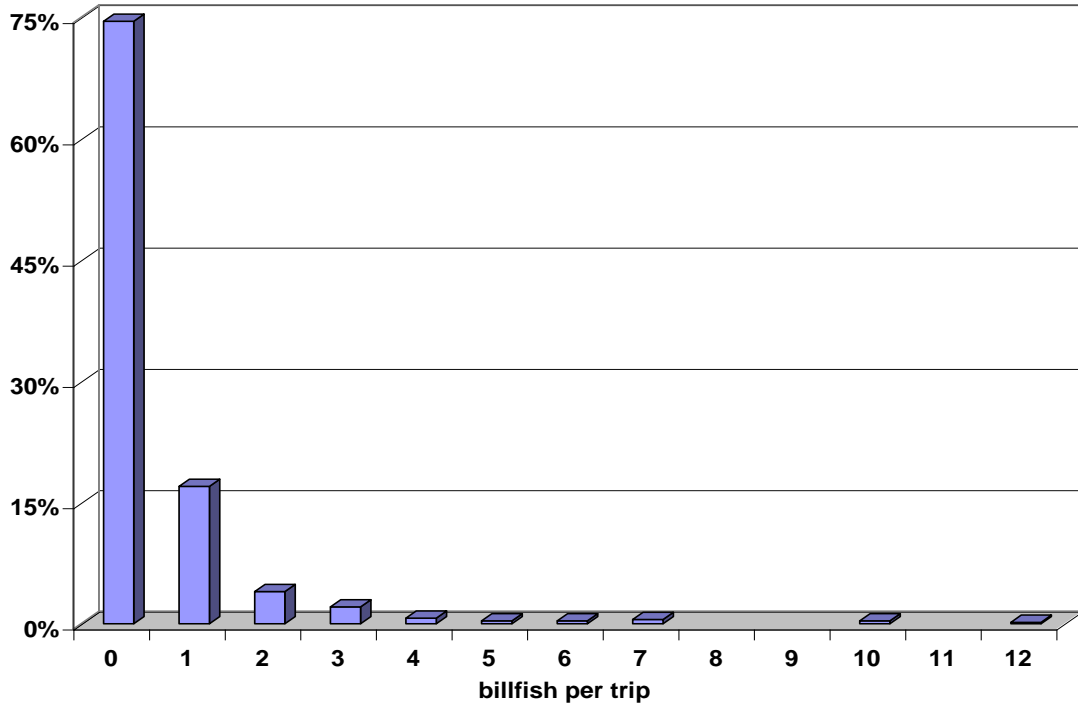


Figure 4 Number of billfish caught per trip by survey participants

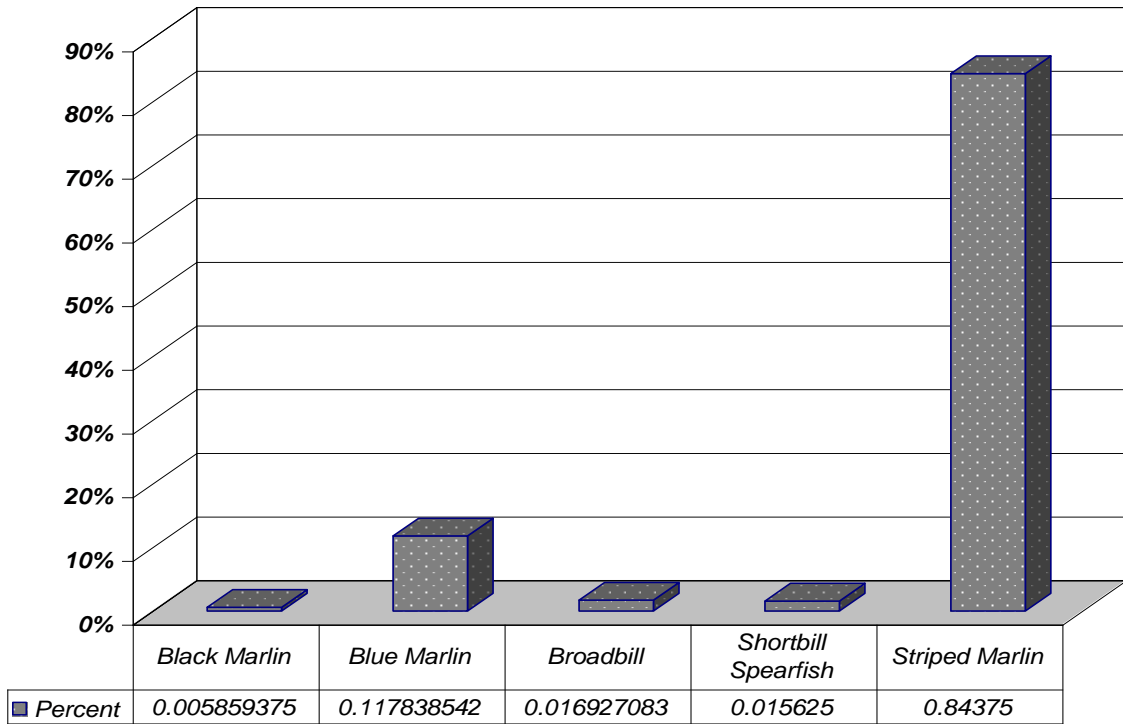


Figure 5 New Zealand billfish catch by species from club records 2000-01 season

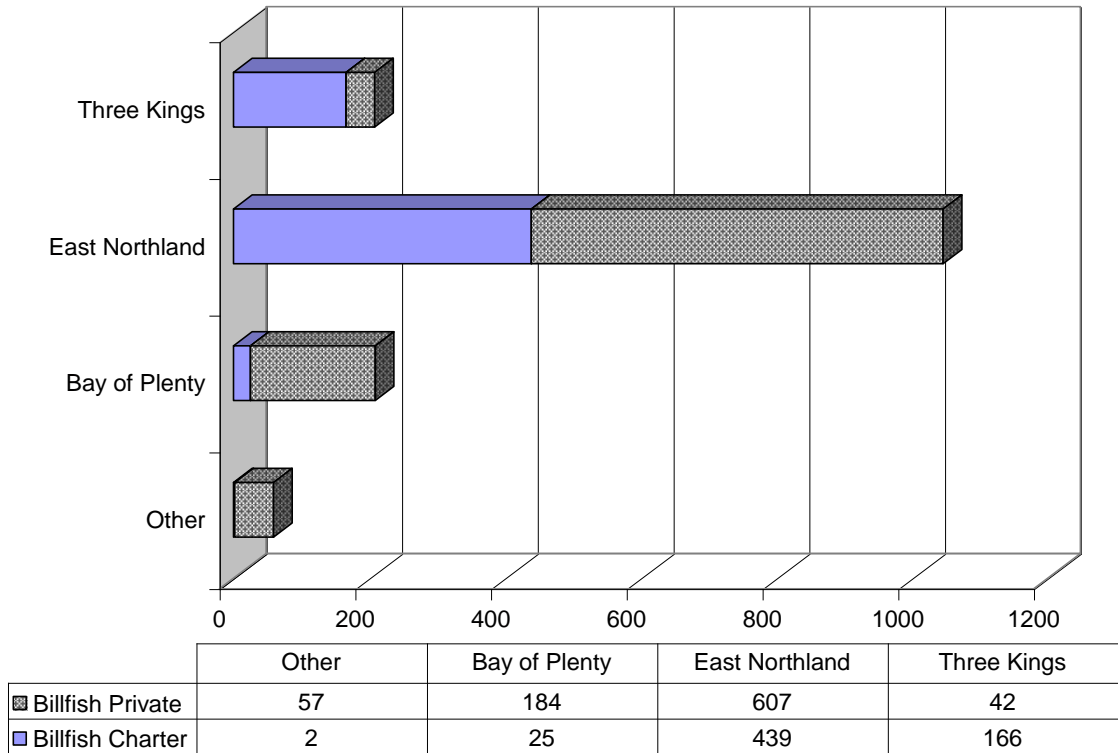


Figure 6 New Zealand billfish catch by area from club records 2000-01 season.

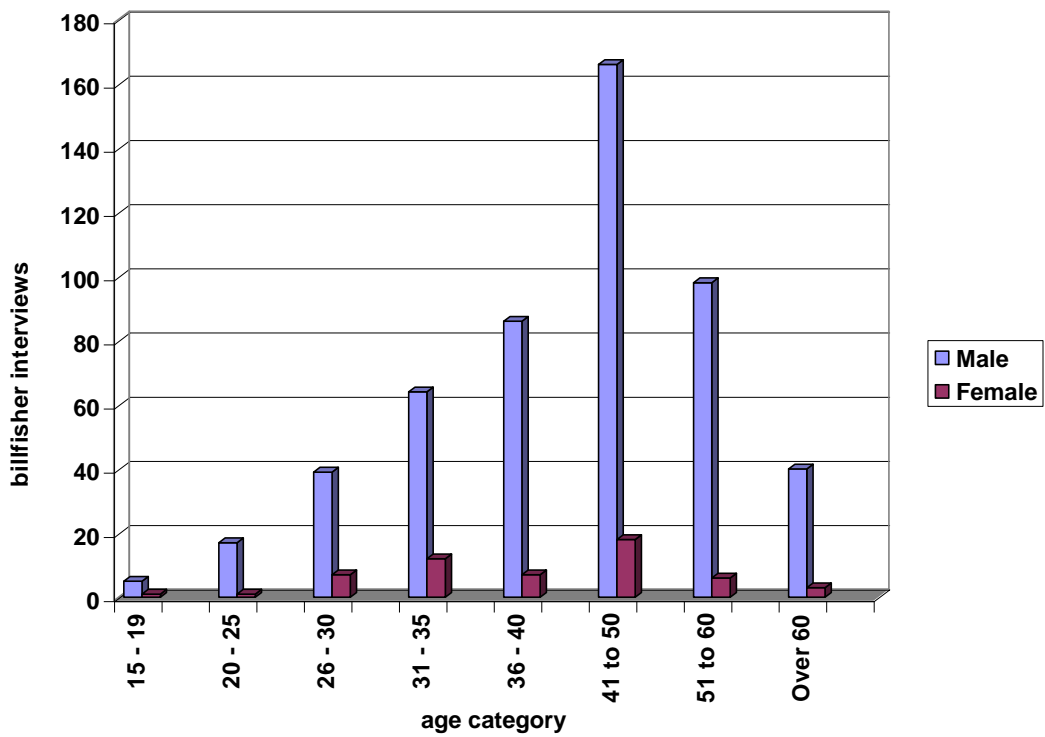


Figure 7 Age and sex of respondents

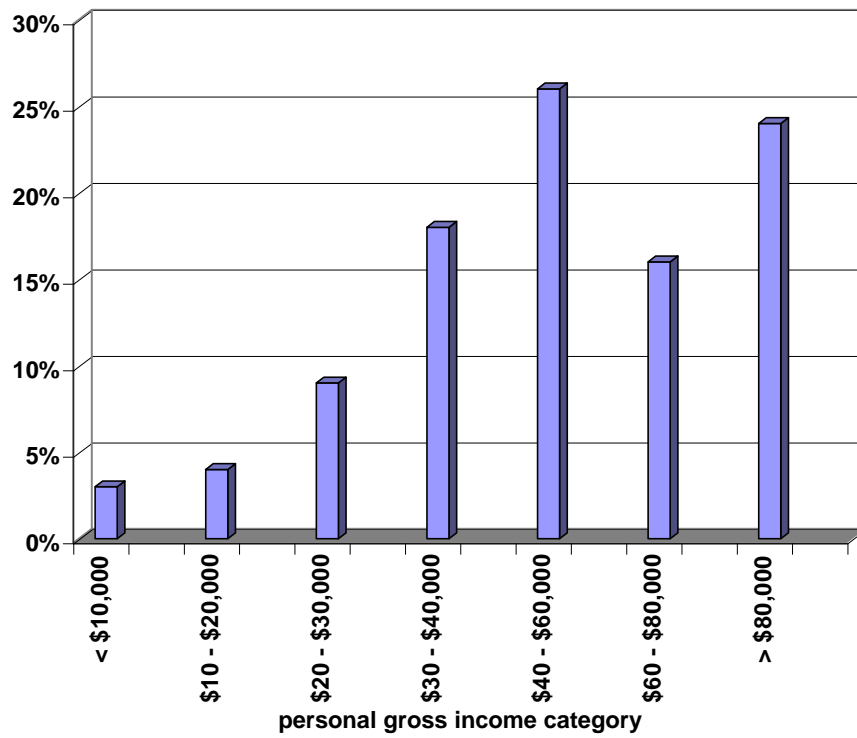


Figure 8 Billfishers' incomes

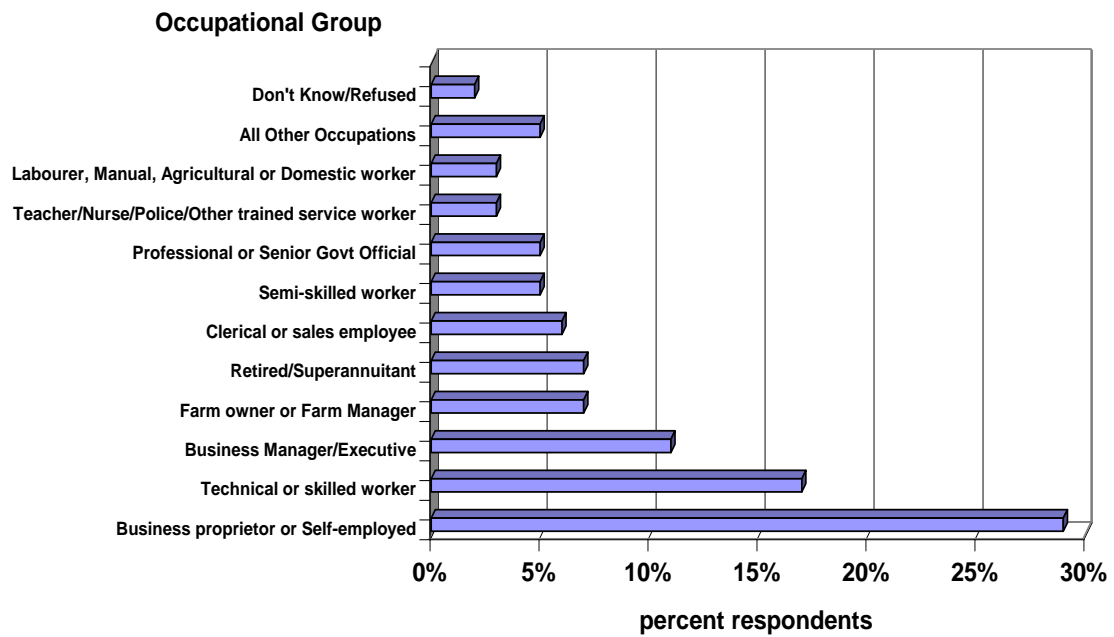


Figure 9 Billfishers' occupations

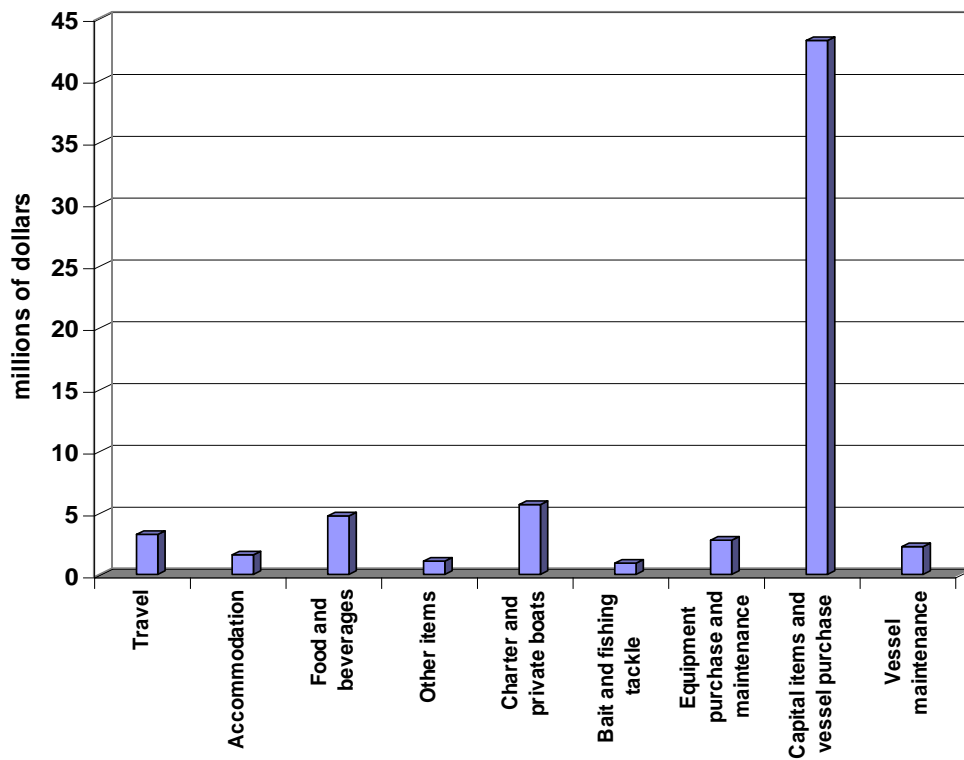


Figure 10 Total estimated expenditure by sector in the 2000-1001 billfish fishery (\$ millions)

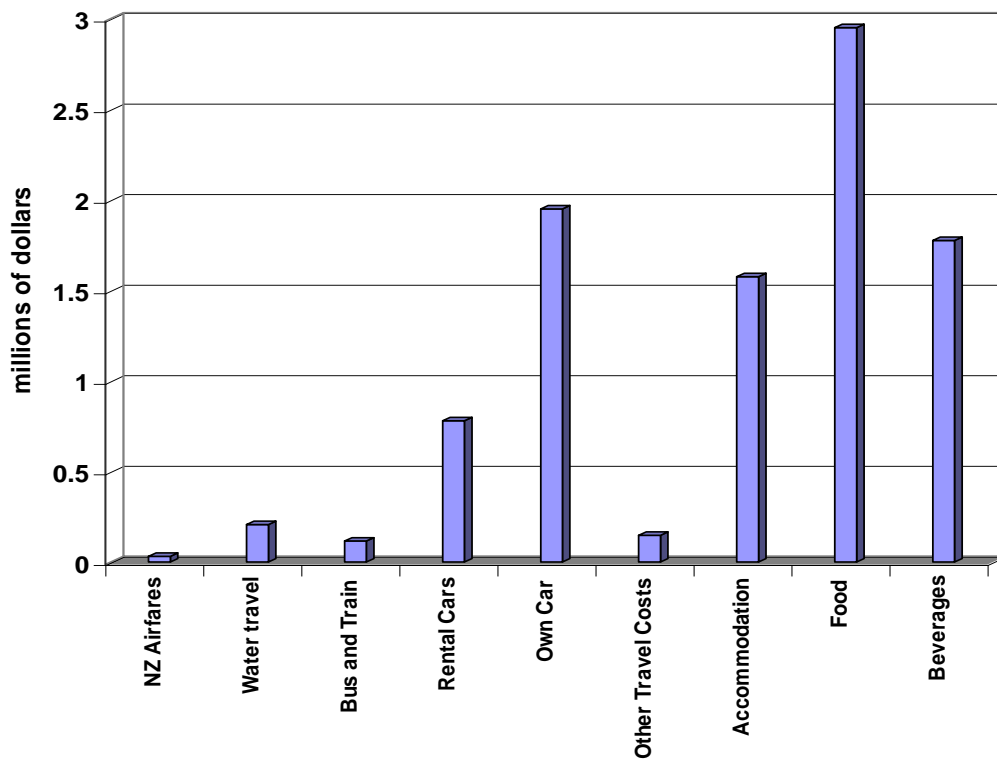


Figure 11 Estimated travel, accommodation and food expenditure by category (\$ millions)

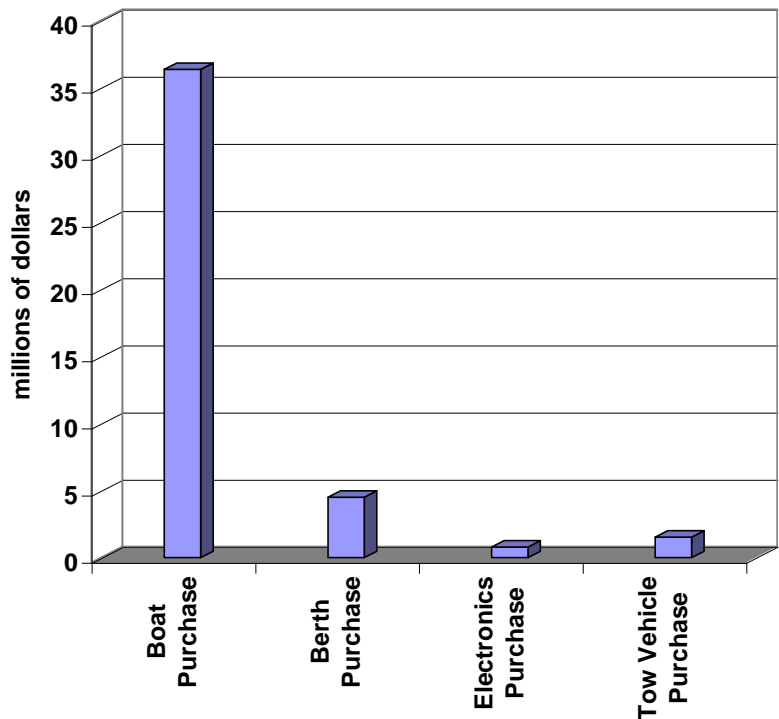


Figure 12 Estimated capital expenditure on vessels, berths, electronics and tow vehicles (\$ millions)

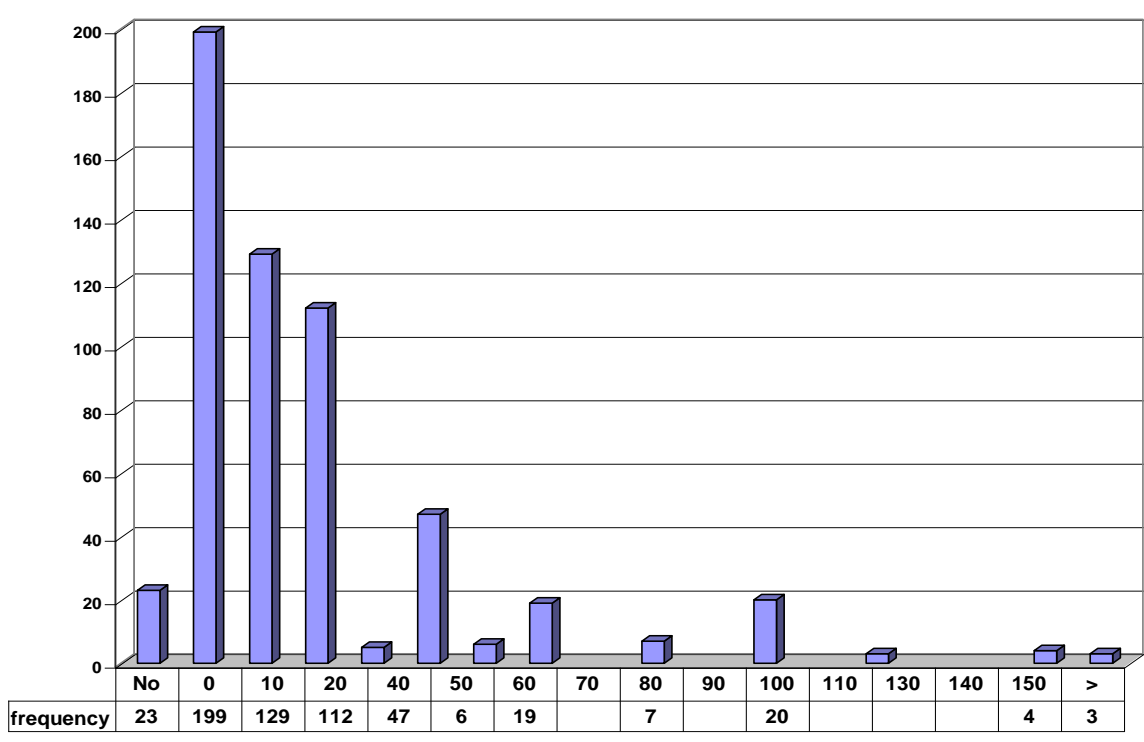


Figure 13 Individual responses to the contingent valuation question.

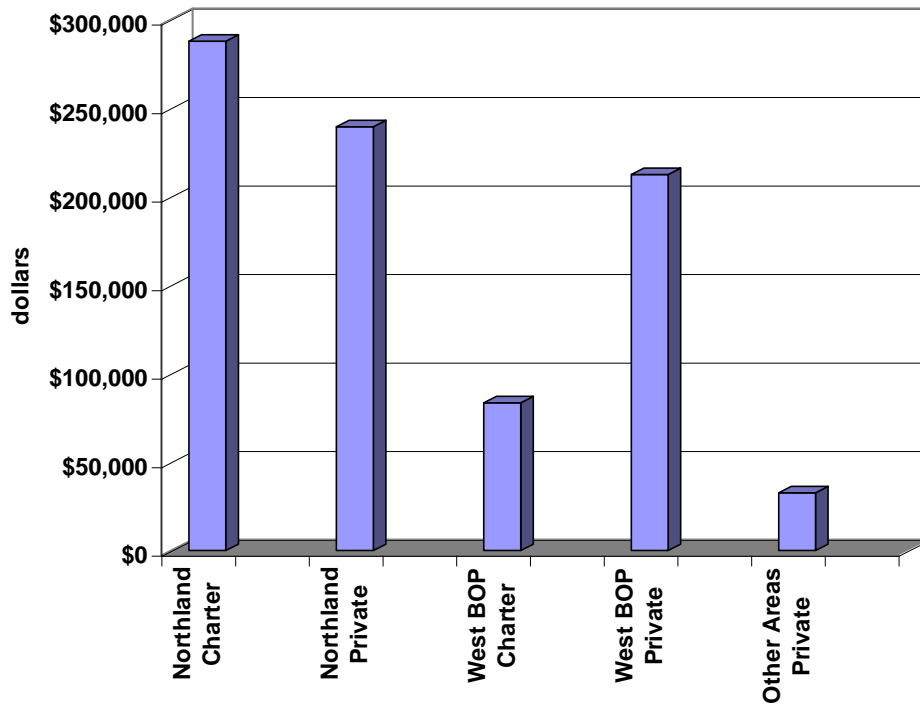


Figure 14 Estimated total willingness to pay by region and boat type (dollars)

APPENDIX 1

SURVEY QUESTIONNAIRE

Questionnaire
Economic Value of the Billfish Fishery

Interviewer Name:			
Date:/...../.....		
Time of Interview:			
Location:			
Boat ramp 1	Wharf 2	Marina 3	Other 7
Launch 1	Trailer Boat 2		
Name of boat			

INTRODUCTION:

Hi, my name is and I am conducting a survey for the NZ Marine Research Foundation on the economic value of billfish fishing.

<p>Q.1 <i>Have you been fishing for marlin or other billfish today?</i></p> <p style="text-align: right;">Yes 1 No 2</p> <p>IF YES This survey is confidential – you will not be identified – and will take about 15 minutes to complete. It involves answering some questions about your trip and in particular the cost to you of your marlin fishing trip. REFER TO RESPONDENT SELECTION INSTRUCTIONS</p>	1 2	TERMINATE		
<p>Q.2 <i>Is now a convenient time to interview you? Or would you prefer me to ring you at a later time?</i></p> <p style="text-align: right;">Now 1 Late 2</p> <p>IF DON'T WANT TO PARTICIPATE, TERMINATE WITH THANKS; OTHERWISE CONTINUE IF LATER EXPLAIN THAT YOU NEED A FEW DETAILS ABOUT THE TRIP AND A PHONE NUMBER</p>	1 2			
<p>Q.3 <i>Is this a chartered or private trip?</i></p> <p style="text-align: right;">Chartered 1 Private 2</p>	1 2			
<p>Q.4 <i>Are you an overseas visitor?</i></p> <p style="text-align: right;">Yes 1 No 2</p>	1 2			
<p>Q.5 <i>How many days have you been/or will you be, fishing for marlin on this trip?</i> Write in number of days:</p>	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="width: 30px; height: 20px;"></td> <td style="width: 30px; height: 20px;"></td> </tr> </table>			

Q.6 <i>How many anglers were on this boat trip?</i> Write in number of anglers:	<table border="1"> <tr> <td style="width: 30px; height: 20px;"></td> <td style="width: 30px; height: 20px;"></td> </tr> </table>																																									
Q.7 <i>Have you been fishing as part of a game fish competition this trip?</i> Yes 1 No 2																																										
Q.8 <i>Is this the last day of your marlin fishing trip?</i> Yes 1 No 2 A TRIP MAY BE A SINGLE DAY OR A NUMBER OF DAYS FISHING IN A ROW	SKIP TO Q.12 CONTINUE																																									
<p>In order to get complete information for this survey, we would like to contact you at the end of your fishing trip.</p> Q.9 <i>Can you please tell me when your fishing trip will finish?</i> Write in date:/...../.....																																									
ASK Q10 AND Q11 (a & b) IF Q2 IS 'LATER' AND/OR Q8 IS 'NO' Q.10 <i>Can you please give me a telephone number we can use to contact you for the interview</i> Write in telephone number: Day Night	<table border="1"> <tr> <td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td> </tr> <tr> <td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td><td style="width: 20px; height: 20px;"></td> </tr> </table>																																									
Q.11a <i>To ensure that we contact the right person, can I please have your first name?</i> Write in first name:																																										
Q.11b <i>What day would you like me to ring you?</i> Write in date:/...../.....																																									
YOU WILL NEED TO RE-INTRODUCE YOURSELF IF THIS PART OF THE INTERVIEW IS COMPLETED BY TELEPHONE																																										
Q.12 <i>How many billfish did you personally catch this trip?</i> Write in number of all billfish personally caught	<table border="1"> <tr> <td style="width: 30px; height: 20px;"></td> <td style="width: 30px; height: 20px;"></td> </tr> </table>																																									
Q.13 <i>What was the total number of billfish caught this trip by all anglers on board your vessel?</i> Write in total number of billfish caught by all anglers on this trip	<table border="1"> <tr> <td style="width: 30px; height: 20px;"></td> <td style="width: 30px; height: 20px;"></td> </tr> </table>																																									
Q.14 <i>How many, if any, of all the billfish caught, were <u>not</u> recorded in club records?</i> Write in number of billfish caught and not recorded in club records	<table border="1"> <tr> <td style="width: 30px; height: 20px;"></td> <td style="width: 30px; height: 20px;"></td> </tr> </table>																																									
Q.15 <i>Are you currently a member of a game fishing club?</i>																																										

Q.16	Firstly, do you normally reside in [AREA BEING SURVEYED]?	Yes No	1 SKIP TO Q.31 2 CONTINUE
Q.17	IF A VISITOR TO [AREA BEING SURVEYED] Was your fishing trip the <u>main</u> reason for your holiday/visit?	Yes No	1 SKIP TO Q.21 2 CONTINUE
Q.18	What is the total number of days of your visit/holiday (Include only days spent in New Zealand) Write in number of days:		<input type="text"/> <input type="text"/>
<p>These next questions are about how much you have spent on this current holiday or visit. In order to show the value of billfish to <u>this</u> region we have split the following questions between spending outside and spending inside [AREA BEING SUVEYED]</p> <p>Thinking about your travel costs from home to [AREA BEING SURVEYED] and from [AREA BEING SURVEYED] home again – or to your next destination. Please tell me how much you spent on travel <u>outside</u> of [AREA BEING SURVEYED]:</p>			
Q.21	What, if anything, did you spend on air fares?		\$.....
Q.22	IF SPENT ANYTHING ON AIR FARES ASK: Which airline did you use? Write in airline used		
Q.23	What, if anything, did you spend on cruise ship fares?		\$.....
Q.24	If you came by boat, what if anything was your share of vessel costs spent outside [AREA BEING SURVEYED] eg fuel?		\$.....
Q.25	What, if anything, did you spend on bus or train fares?		\$.....
Q.26	What, if anything, did you spend on rental cars?		\$.....
Q.27	Still thinking about your expenses <u>outside</u> of [AREA BEING SURVEYED] what would you have spent on? Accommodation costs outside of [AREA BEING SURVEYED]		\$.....
Q.28	Food costs outside of [AREA BEING SURVEYED]		\$.....
Q.29	Liquor costs outside of [AREA BEING SURVEYED]		\$.....
Q.30	Other costs relating to this trip spent outside of [AREA BEING SURVEYED] e.g. Fishing gear		\$.....

<p>Q.31 <i>Have you used your own car for any part of this trip – inside and/or outside of [AREA BEING SURVEYED]?</i></p> <p style="text-align: right;">Yes No</p>	<p>1 CONTINUE 2 SKIP TO Q40</p>				
<p>IF YES ASK:</p> <p>Q.32 <i>How many kilometers have you travelled in total? Include travel inside and outside [AREA BEING SURVEYED]</i> Write in number of kilometres</p>	<table border="1" style="width: 100%; height: 20px;"> <tr> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> </table>				
<p>Q.33 <i>Is your car Large, Medium, Small?</i> (Please circle appropriate letter)</p>	<table border="1" style="width: 100%; text-align: center;"> <tr> <td style="width: 33%;">L</td> <td style="width: 33%;">M</td> <td style="width: 33%;">S</td> </tr> </table>	L	M	S	
L	M	S			
<p>Q.40 <i>Now thinking about your expenses within [AREA BEING SURVEYED] what would you have spent on other means of transport:</i> <i>Bus or Train fares</i> Write in amount spent</p>	<table border="1" style="width: 100%; height: 20px;"> <tr> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> </table>				
<p>Q.41 <i>Rental car</i> Write in amount spent</p>	<table border="1" style="width: 100%; height: 20px;"> <tr> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> </table>				
<p>Q.42 <i>Other means of travel</i> Write in amount spent</p>	<table border="1" style="width: 100%; height: 20px;"> <tr> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> <td style="width: 25%;"></td> </tr> </table>				
<p>Q.43 <i>Accommodation costs within [AREA BEING SURVEYED]</i></p>	<p>\$</p>				
<p>Q.44 <i>Food costs within [AREA BEING SURVEYED]</i></p>	<p>\$</p>				
<p>Q.45 <i>Liquor costs within [AREA BEING SURVEYED]</i></p>	<p>\$</p>				
<p>Q.46 <i>Cost of charter or your share of private boat expenses</i></p>	<p>\$</p>				
<p>Q.47a <i>Bait</i></p>	<p>\$</p>				
<p>Q.47b <i>Fishing tackle (for example lures, hooks, etc)</i></p>	<p>\$</p>				

Q.48a Thinking now about ***the last three years***, how much have you spent on purchasing fishing equipment such as rods and reels for game fishing?

WRITE AMOUNT IN COLUMN Q.48a BELOW:

	Q.48a Purchase Expenses	Q.48b Maintenance	Q.48c Proportion on Marlin Fishing	Q.48d Proportion Expenses within area
Rods	\$ _____	\$ _____	_____ %	_____ %

Q.48b How much do you estimate that you have spent maintaining your game fishing gear in ***the last year***? **WRITE AMOUNT IN COLUMN Q.48b ABOVE.**

Q.48c What proportion of these maintenance and purchase expenses would you say was spent on Marlin fishing? **WRITE AMOUNT IN COLUMN Q.48c ABOVE.**

Q.48d What proportion of these expenses were spent in [AREA BEING SURVEYED]? **WRITE AMOUNT IN COLUMN Q.48d ABOVE:**

Q.49 Do you have any other expenses associated with billfishing which we haven't covered? (for example, books, communications, wages, etc.) Please specify: _____	\$
---	----------

REFER TO Q3. IF THE VESSEL IS PRIVATELY OWNED — ASK NEXT QUESTION OTHERWISE SKIP TO Q80:

Q.50 Do you own the vessel used for this fishing trip?	Yes	1	CONTINUE
	No	1	SKIP TO Q.80

IF YES, ASK :

Q.51 Approximately how much have you spent in ***the last three years*** to purchase the following equipment? **WRITE AMOUNT IN COLUMN Q.51 BELOW.**

	Q.51 Purchase Expenses	Q.52 Maintenance	Q.53 Proportion on Marlin Fishing	Q.54 Proportion Expenses within area
a. Boat	\$ _____	\$ _____	_____ %	_____ %
b. Berth	\$ _____	\$ _____	_____ %	_____ %
c. Electronics	\$ _____	\$ _____	_____ %	_____ %
d. Tow Vehicle	\$ _____	\$ _____	_____ %	_____ %

Q.52 How much would you estimate you have spent maintaining these items in ***the last year***. **WRITE AMOUNT IN COLUMN Q.52 ABOVE.**

Q.53 What proportion of these purchases and maintenance expenses would you say was spent on Marlin fishing? **WRITE AMOUNT IN COLUMN Q.53 ABOVE.**

Q.54 What proportion of these expenses were spent in [AREA BEING SURVEYED]? **WRITE AMOUNT IN COLUMN Q.54 ABOVE**

Q.55

In the next question, we would like you to consider a hypothetical situation. This is not related to the actual management of the fishery, now or in the future. Instead we are trying to establish the value of billfishing to you. Please answer as if the following situation was real.

Suppose the NZ marlin fishery could disappear overnight and it was widely agreed that the fishery would vanish unless the Marine Research Foundation took effective action. Would you be willing to pay an extra fee for each day you go marlin fishing, to help pay for the preservation of this fishery?

What is the maximum amount shown on this showcard you would be prepared to pay:

SHOW RESPONDENT SHOWCARD

- Nothing 1
- \$10 per day 2
- \$20 per day 3
- \$40 per day 4
- \$60 per day 5
- \$80 per day 6
- \$100 per day 8
- More than \$120 per day 7
- How much more than \$120 per day 9
- (Write in amount) \$ _____

DEMOGRAPHICS.

<p>C.1 <i>To ensure we have a cross section of anglers, please tell me which of the following categories would your own personal <u>gross</u> income fall into? Please include all sources of income and tell me the total before tax.</i></p> <p>FOR OVERSEAS VISITORS, ASK IF THEY ARE ABLE TO ASSESS THEIR INCOME IN NZ DOLLARS. READ OUT:</p> <p style="text-align: right;"> Less than \$10,000 per year 1 \$10,001 to \$20,000 2 \$20,002 to \$30,000 3 \$30,001 to \$40,000 4 \$40,001 to \$60,000 5 \$60,001 to \$80,000 6 Over \$80,000 per year 7 </p>							
<p>C.2 <i>Please tell me what age group you are in?</i></p> <p>READ OUT</p> <p style="text-align: right;"> Under 15 years 15 – 19 years 1 20 – 25 years 2 26 – 30 years 3 31 – 35 years 4 36 – 40 years 5 41 to 50 years 6 51 to 60 years 7 Over 60 years 8 </p>							
<p>C.3 Record sex of respondent</p> <p style="text-align: right;"> Male 1 Female 2 </p>							
<p>C.4 <i>In order to classify where you normally reside, can you please give me the first five digits of your telephone number, including STD code?</i></p>	<table border="1" style="width: 100%;"> <tr> <td style="width: 10%; text-align: center;">0</td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> <td style="width: 10%;"></td> </tr> </table>	0					
0							
<p>C.5 <i>How many years have you been fishing for marlin or other billfish?</i></p> <p style="text-align: right;">Write in number of years</p>	<table border="1" style="width: 100%;"> <tr> <td style="width: 50%;"></td> <td style="width: 50%;"></td> </tr> </table>						
<p>C.6 <i>Thinking about the last couple of years, on average, how many days billfishing would you do a year?</i></p> <p style="text-align: right;">Write in average number of bill fishing days per year</p>	<table border="1" style="width: 100%;"> <tr> <td style="width: 50%;"></td> <td style="width: 50%;"></td> </tr> </table>						

C.7	<p>READ OUT OR SHOW OPTIONS</p> <p><i>What is your occupation please?</i></p> <p>Home maker (not otherwise employed) 01</p> <p>Retired/Superannuitant 02</p> <p>Social Welfare Beneficiary/Unemployed 03</p> <p>Student 04</p> <p>Clerical or sales employee 05</p> <p>Semi-skilled worker 06</p> <p>Technical or skilled worker 07</p> <p>Business Manager/Executive 08</p> <p>Business proprietor or Self-employed 09</p> <p>Teacher/Nurse/Police/Other trained service worker 10</p> <p>Professional or Senior Govt Official 11</p> <p>Labourer, Manual, Agricultural or Domestic worker 12</p> <p>Farm owner or Farm Manager 13</p> <p>Other 98</p> <p>(please write in) _____</p> <p>Don't Know/Refused 99</p>	
C.8	<p><i>Had you heard of the New Zealand Marine Research Foundation before now?</i></p> <p>Yes 1</p> <p>No 2</p>	
	<p>PLEASE INDICATE THAT YOU HAVE SOME INFORMATION/PAMPHLETS ABOUT THE FOUNDATION IF THEY ARE INTERESTED.</p>	
C.9	<p>AREA BEING SURVEYED. RECORD AREA YOU ARE SURVEYING</p> <p>Northland 1</p> <p>Bay of Plenty 2</p> <p>Auckland 3</p> <p>Gisborne 4</p> <p>West Coast 5</p>	

On behalf of the NZ Marine Research Foundation, I would like to thank you for your participation in this survey.

APPENDIX 2

DATA ANALYSIS AND SCALING METHODOLOGY

DATA ANALYSIS AND SCALING METHODOLOGY

Overview

Expenditure data from the sample of 577 respondents was scaled up to estimate the total expenditure in the 2000-2001 billfish season.

The steps in the weighting or scaling process are described below:

- a. Each fishing trip is selected with probability proportional to the length of the current trip in days (d_i). The corresponding inverse probability weight is $\frac{1}{d_i}$.
This excludes the component for the boat days sampling fraction.
- b. For each stratum h , and using the above weight, calculate the weighted total number of billfish caught by all anglers on this trip and recorded in club records (denoted b_h).
- c. Calculate the boat day sampling fraction for each stratum as $\frac{b_h}{B_h}$ where B_h is the total number of billfish caught in stratum h according to club records.
- d. The probability of selection for each respondent i is proportional to the number of days they spend billfishing during the year (denoted D_i), and inversely proportional to the number of anglers on their current fishing trip (denoted a_i). Combining this knowledge with the appropriate boat day sampling fraction yields the ultimate probability of selection for each respondent: $\frac{b_h D_i}{B_h a_i}$. The corresponding inverse probability weight is $\frac{B_h a_i}{b_h D_i}$.
- e. Now we can easily estimate total expenditure as the weighted sum of expenditure items across all respondents (once these items have been appropriately scaled to reflect annual expenditure). Summing just across a particular group of respondents gives an estimate of the total expenditure for that group in the population.

The following strata were used in calculating the weights or scaling factors:

- Northland Charter Boats
- Northland Private Boats
- Western BOP Charter Boats*
- Western BOP Private Boats
- Eastern BOP Charter Boats
- Eastern BOP Private Boats
- Other Private Boats*

The above strata with an asterisk (*) had small sample sizes, and their sampling fraction was taken as the mean of the sampling fractions for the other strata.

Detailed Description of Analytical Methods

Anglers were weighted by the inverse of their probability of selection³ (number of anglers on this trip / number of days fishing on this trip = $Q6/Q5=awt$). Questions relating to angler expenditure were split into seven expenditure groups or categories. Each category was then weighted appropriately to estimate angler expenditure on billfishing per year. Summaries of the method used to estimate expenditure in each of seven categories follow below:

CATEGORY ONE: Travel and Accommodation Spend Outside the Area Surveyed

- only applies to visitors to the area (Q16)
- calculated on a per trip basis

out_travel = sum of all travel costs (excl. own car) outside the area surveyed (Q21, Q23, Q24, Q25, Q26)

out_accom = sum of accommodation, food and liquor costs outside the area surveyed (Q27, Q28, Q29)

out_other = other costs relating to trip outside the area surveyed (Q30)

out_trav_accom = sum of above three costs

$cost1 = out_trav_accom \times awt \times (number\ of\ days\ bf\ per\ year\ (C6) / number\ of\ days\ bf\ this\ trip(Q5))$

CATEGORY TWO: Travel and Accommodation Spend Within the Area Surveyed

- calculated on a per trip basis

in_travel = sum of all travel costs (excl. own car) within the area surveyed (Q40, Q41, Q42)

in_accom = sum of accommodation, food and liquor costs within the area surveyed (Q43, Q44, Q45)

in_other = sum of other costs relating to trip within the area surveyed (Q46, Q47a, Q47b)

in_trav_accom = sum of above three costs

$cost2 = in_trav_accom \times awt \times (number\ of\ days\ bf\ per\ year\ (C6) / number\ of\ days\ bf\ this\ trip(Q5))$

CATEGORY THREE: Costs Associated with Using Own Car

- calculated on a per trip basis
- only applies to those who used their own car (Q31)
- covers both within and outside region
- the \$/km rates for Q33 have been estimated as:
 - Small Car: 50c/km
 - Medium Car: 60c/km
 - Large Car: 80c/km

car = cost associated with using own car = km travelled (Q32) X \$/km cost (3 levels depending upon size of car (Q33))

$cost3 = car \times awt \times (number\ of\ days\ bf\ per\ year\ (C6) / number\ of\ days\ bf\ this\ trip(Q5))$

³ These probabilities of selection ignore the sampling fraction for selecting boat days, which was calculated later using separate data from club records on billfish catch numbers.

CATEGORY FOUR: Spend on Fishing Equipment

- calculated on a per angler year basis – initial figures are on a yearly or three yearly basis but were converted to a yearly basis then divided by the number of angler days per year (C6)
- covers both within and outside region but can be split

equip = spend on fishing equipment this year

= (purchase expenses of fishing equipment over the past three years divided by three (Q48a)) + (maintenance of fishing equipment over the past year (Q48b))

equipBF = portion of above spend attributable to billfishing (using Q48c)

equipIN = the portion of spend attributable to billfishing spent within the region (using Q48d)

equipOUT = the portion of spend attributable to billfishing spend outside the region (using Q48d)

cost4 = awt X equipIN

cost5 = awt X equipOUT

CATEGORY FIVE: Other Billfishing Expenses

- need information on what the expenses were for
- need to know what time period was covered

othBFexp = (Q49)

cost6=awt X othBFexp

CATEGORY SIX: Vessel Related Expenses

- only applies to those with their own vessel (Q50)
- calculated on a per angler year basis – initial figures are on a yearly or three yearly basis but were converted to a yearly basis then divided by the number of angler days per year (C6)
- covers both within and outside region but can be split
- calculated in the same manner as Category Four but for the following variables:
 - costs associated with the boat (Q51)
 - costs associated with the berth (Q52)
 - costs associated with the electronics (Q53)
 - costs associated with the tow vehicle (Q54)

cost7=awt X vesselIN

cost8=awt X vesselOUT

CATEGORY SEVEN: Willingness to Pay

- calculated on a per angler day basis

cost9=awt X number of days bf per year (C6) X WTP

Calculation of Fraction of Boat Days Sampled

It was assumed that the survey consisted of a random sample of boat days within each stratum. The sampling fraction for each stratum is required to calculate expenditure estimates, and was derived by combining survey data with billfish catch totals from club records.

The total reported catch per boat day was estimated from survey data. The catch from each respondent's boat was divided by how many days their trip lasted for, to give the catch per boat day. This was summed over each stratum, and multiplied by the overall proportion of billfish caught that were recorded in club records, to give the total recorded catch per boat day.

Total numbers of billfish caught were also calculated from club records. The sampling fraction was calculated as the ratio of these two totals. (The sampled catch in one stratum (Private/Other) was too small for accurate estimation of the sampling fraction, so this was estimated at 5% - similar to the values for the other strata.)

The yearly mean cost for each activity relating to billfishing per respondent was then multiplied by the inverse of the sampling fraction to inflate the figures to the population.

Annual Billfishing Days In New Zealand

The survey did not collect the number of days spent billfishing in New Zealand per annum. We did collect the number of billfishing days in the current trip, and the number of days spent billfishing per annum worldwide. To take account of overseas visitors not spending all of their annual billfishing days in New Zealand, the analysis was repeated with the number of days billfishing per annum replaced with the length of the current billfishing trip for overseas visitors. This reduced the estimated expenditure by overseas visitors. The true figure will probably lie between the two results. Note that both sets of results use the number of days spent billfishing worldwide per annum for NZ residents.

Imputing Billfish Data

Prior to analysis, missing values in the data need to be imputed with sensible values. This part of Appendix 2 outlines the imputation processes used.

The following variables were imputed using the mean of the variable over an appropriate group of similar respondents:

- Q6 Number of anglers on this boat trip (three missing values)
- Q5 Number of days fishing for marlin on this trip (one missing value)
- Q33 Size of car (three missing values)
- Q32 Number of km travelled in total in own car (six missing values)
- Q13 Number billfish caught by all anglers on board (five missing values)
- Q51-Q54 Vessel Related Expenses (nine missing values for purchase expense where the respondent claimed to own the vessel). In all cases all related expenses and share of expenses had been coded as zero. It was thus assumed that the expenses occurred 3+ years before.
- Q23 Amount spent on Cruise Ship fares outside the area (one missing value). Of all the other values (576) all but one are zero. For this reason it is probably safe to impute a value of zero.
- C6 Number of Days Billfishing Per Year (20 missing or zero values for this variable) Note that this assumes that the Number of Days Billfishing Per Year only recorded days billfishing in New Zealand.
- Q27, Q28, Q29, Q30 – Other costs outside the area (18 missing values)
- Q31 Used own car. All missing values for overseas visitors imputed as 'no'.
- Q41 Rental Care Fares Within the Area (18 missing values)
- Q40 Train Travel Within the Area. Of the non-missing data only two out of over 500 respondents paid anything for train travel within the area. Thus for the 102 respondents who did not record spend on train travel it is probably safe to impute a value of 0.
- Q42 Other Means of Travel Within the Area (13 missing values)

More complicated imputation of various forms was carried out on the following variables:

- Q12 Number of billfish personally caught
 - 46 missing values
 - In the 34 cases where the number of billfish caught by all anglers was zero a value of zero was imputed.
 - In the remaining 12 cases the number of billfish caught by all anglers was divided by the number of anglers and after rounding *down* to a whole number (assuming the respondent was more likely to give his/her catch if s/he out fished the other anglers but not so otherwise!) the result was attributed to the respondent.
- Q14 Number of billfish caught and not recorded in club records
 - 49 missing values
 - In the 35 cases where the number of billfish caught by all anglers was zero a value of zero was imputed.
 - For the remaining 14 cases the value needed to be imputed. The probability of a billfish not being recorded on club records was found to be approximately 8% so the Binomial Distribution was used to randomly impute the number of billfish not recorded given the number of billfish caught.
- Q50 Own Vessel

- 196 missing values
- All but five of these had chartered the boat and were thus not vessel owners.
- Of the remaining five, two paid a share of the vessel cost relating to the fishing indicating that they were did not actually own the vessel.
- For the three remaining missing values one can only assume that since this question (along with any relating to vessel ownership) was not answered the respondents were not owners of the vessel. In all cases there were three or four anglers in total on board and thus it would not be unlikely that they were not the owners.
- Thus in all cases it appears that the respondent did not in fact own the vessel and so Q51 to Q54 can similarly be considered to be zero.
- Q48a-Q48d Fishing Equipment Related Expenses
 - There are a number of missing values related to these variables. Firstly one can probably safely assume that if the purchase expense is zero then all other variables relating to that expense should be set to zero.
 - Also, if the respondent is an overseas visitor then any missing values were set to zero.
 - There are six cases with missing values for all of Q48a-Q48d. With no other obvious means of imputing these values and no other information the means for all non-overseas billfishers have been used.
 - There are two missing values for Q48b alone. The values were imputed using the values for Q48a and the estimated ratio of Q48a:Q48b among non-overseas billfishers.
 - There are five missing values for Q48c. These were imputed again using the means among non-overseas billfishers.
 - For the six missing values for Q48d the mean for either local or non-local billfishers was imputed as appropriate.
- Q21, Q24, Q25 and Q26 – Travel Outside the Area
 - Among those from outside the area there were 26 observations with at least one missing value among these variables.
 - Initially all missing values were set to zero where the respondent used their own car.
 - For those four cases with a considerable spend on Rental Cars and missing values elsewhere these missing values were set to zero.
 - Similarly, in the single case of a high spend on train fares the rental car spend was set to zero.
 - In the two cases of respondents using a private vessel to reach the area the spend on airfares was set to zero.
 - For the three cases of respondents using a chartered vessel the share of vessel costs was imputed to be zero.
 - For the two overseas visitors with missing values the spend on airfares was set at the mean airfare spend for overseas visitors.
 - For the remaining missing values the means of the appropriate group were used for imputation.
 - Note that there remain eight overseas visitors who have a reported spend of \$0 on airfares and a further four overseas visitors who also classify themselves as locals (and were thus not asked this question). For the first group the spend on airfares is assumed to be zero.
- Q43, Q44, Q45 Food and Accommodation Costs Within the Area
 - There are 16, 8 and 10 missing values respectively.
 - The missing values were replaced by the mean daily spend X number of days billfishing.

- Q46, Q47a, Q47b Fishing Related Expenses During Trip
 - There are 8, 10 and 14 missing values respectively.
 - Q46 was replaced by the mean daily spend X number of days billfishing for either a private or charter trip.
 - Q47a and Q47b were replaced with the mean for either a private or charter trip.

APPENDIX 3

MULTIPLIER ANALYSIS AND THE BILLFISH FISHERY

MULTIPLIER ANALYSIS AND THE BILLFISH FISHERY

Expenditure Effects

The economic contribution of a business activity does not mean that the economy is better off by the full amount of the measured contribution. This would only be true if all of the resources involved in supplying the needs of that activity would otherwise lie idle.

With regard to billfishing, in any region there are two distinct groups of fishers:

- Fishers who come from outside the region.
- Fishers who reside inside the region.

Expenditure by fishers who come into a region to fish is analogous to exports from the region. This is referred to as a 'trade creation' effect. Expenditure by the latter group largely represents a shift in the spending of local consumers - towards billfishing and away from other (discretionary) goods and services. This is referred to as a 'trade diversion' effect.

Another source of 'trade creation' also needs to be considered. This is expenditure that is retained in the local economy that could otherwise go elsewhere (analogous to 'import substitution'). If billfishers are unable to fish in their home region, where would they otherwise fish? On the basis of known historic fishing patterns for the fishery, it is unlikely that a billfish fisher will substitute fishing in one region for another region as there is a strong correlation between the performance of the fishery in both regions. Therefore, for the purposes of our analysis, we have assumed that this possible source of 'trade creation' is negligible.

Economic 'Flow-On' Effects

Each dollar spent on the output of one industry leads to output increases in other industries. For example, a billfish charter operator requires a range of inputs such as fuel, bait, maintenance, communication services etc in providing billfish-related services. Part of the operator's income is used to cover the cost of these items. Another part covers the cost of the boat and berth (spread over their useful lives) and there is a large portion for wages and salaries. The supplying industries such as fuel, fish bait and electrical supplies require inputs for their activities, pay wages and salaries and so on.

The direct expenditures of billfish fishers on billfish fishing activities is referred to as the direct effect.

The impacts on the supplying industries is referred to as the upstream or indirect production effects and is calculated as the ratio of the direct plus indirect effect to the direct effect.

The effect brought about by the initial payment of wages and salaries is generally known as the downstream or induced consumption effect, as wages and salaries are used to purchase household consumption goods. Their production and sale requires inputs from other industries and so on as before. This effect can also be measured by a multiplier.

The total multiplier is defined as the direct, plus indirect production, plus induced consumption effects, divided by the direct effect.

Multipliers that measure indirect production effects are referred to as Type IB multipliers whilst those which also include the induced consumption effects are referred to as Type II multipliers. Each type of multiplier is usually calculated for three different measures of economic activity: gross output, value added and employment

Multipliers need to be cautiously interpreted and carefully applied. When applied to gross output they lead to double counting. For example, the value of food and drink supplied at a cafe is counted as part of the gross output of both the Food and Beverage industry and the Restaurant industry. If one's aim is to measure overall business activity this double counting may be useful, but from the perspective of economic contribution and wealth creation it is value-added which is of interest.

Calculation of Multipliers

Before the economic multipliers for billfish could be determined the expenditure data needed to be adjusted. The following steps were involved:

Expenditure was divided into that which took place within a given region and that which occurred outside the given region. The latter group is of no further interest for the multiplier analysis as we do not know in which other regions that expenditure took place.

Expenditure in the former group is then sorted into industry of supply.

As multipliers are industry based, and thus apply to prices faced by producers, the expenditure data is converted from purchasers' prices to producers' prices by removing excise taxes and GST, and by reallocating wholesale and retail trade margins to the retail and wholesale trade industry.

With respect to capital expenditure, expenditure on second-hand goods is removed, as is expenditure on capital goods which are imported directly as finished goods

Region and industry specific multipliers are then weighted by the industry composition of expenditure valued at producers' prices. This produces multipliers for billfishing in each of the relevant regions⁴. There are separate multipliers for gross output, value-added and employment.

Multipliers for the indirect production effect can be calculated from standard input-output tables produced by Statistics New Zealand. For a given increment in final demand (exports, government consumption etc), the direct and indirect pattern of production needed to support it can be calculated.

Consumption induced multipliers are more complicated to determine as they require some assumptions about the links between the Production Account and the Income & Outlay Account. In particular a link between private consumption (mostly household spending) and income from wages and profits needs to be established. Typically this is accomplished by treating inputs of labour as an intermediate input

⁴ The multipliers used in this report were supplied by Butcher Partners.

and then treating private consumption as the industry which produces labour. Enhancements to this approach include allowances for the distribution of operating surpluses to households and for leakage of household savings. This is the essence of the approach used by Butcher Partners whose estimates have been used to calculate regional indirect production and induced consumption multipliers.

There are still some limitations to multiplier analysis which need to be considered as follows. The multiplier analysis in this report:

- assumes that all factors of production are in excess supply,
- does not allow for price changes (such as if a factor is in limited supply) which may lead producers to change inputs thereby altering their production structure,
- assumes that average relationships hold at the margin, for example, if an industry requires a workforce of 1000 people to generate annual sales of \$100m, then an extra \$5m of sales is assumed to require an extra 50 staff.

The multipliers that have been calculated for billfishing are shown in Table 15.