



**Fisheries New Zealand**

Tini a Tangaroa

## **Recreational harvest of southern bluefin tuna in New Zealand, 2018–19**

New Zealand Fisheries Assessment Report 2020/02

J.C. Holdsworth

ISSN 1179-5352 (online)

ISBN 978-1-99-001728-5 (online)

**January 2020**



Requests for further copies should be directed to:

Publications Logistics Officer  
Ministry for Primary Industries  
PO Box 2526  
WELLINGTON 6140

Email: [brand@mpi.govt.nz](mailto:brand@mpi.govt.nz)

Telephone: 0800 00 83 33

Facsimile: 04-894 0300

This publication is also available on the Ministry for Primary Industries websites at:

<http://www.mpi.govt.nz/news-and-resources/publications>

<http://fs.fish.govt.nz> go to Document library/Research reports

**© Crown Copyright – Fisheries New Zealand**

## Table of Contents

EXECUTIVE SUMMARY.....	1
1. INTRODUCTION.....	2
1.1. Objectives.....	2
1.2. Overview .....	2
1.3. Description of the recreational fishery .....	3
2. DATA SOURCES AND METHODS .....	3
2.1. The on-site survey .....	3
2.2. Sport fishing club records.....	4
2.3. Expanded survey catch at Waihou Bay .....	4
2.4. Amateur fishing charter boat records .....	5
2.5. Section 111 landings .....	5
2.6. Allowance for unaccounted catch .....	5
2.7. Biological data.....	5
3. RESULTS.....	6
3.1. Landed catch from the on-site survey .....	6
3.2. Sport fishing club records and other sources.....	7
3.3. Amateur fishing charter boat records .....	7
3.4. Section 111 landings .....	7
3.5. Otoliths collected.....	7
3.6. 2017–18 recreational harvest estimate for southern bluefin tuna .....	8
4. DISCUSSION .....	8
5. ACKNOWLEDGMENTS.....	9
6. REFERENCES .....	10



## EXECUTIVE SUMMARY

**Holdsworth J.C. (2020) Recreational harvest of southern bluefin tuna in New Zealand, 2018–19.**

*New Zealand Fisheries Assessment Report 2020/02. 16 p.*

This report describes the New Zealand recreational catch of southern bluefin tuna in the 2018–19 fishing year. The species code for southern bluefin tuna (*Thunnus maccoyii*) in the New Zealand commercial fishery is STN. In this report we use the internationally recognised abbreviation for southern bluefin tuna SBT.

There are two distinct recreational fisheries for southern bluefin tuna (SBT) in New Zealand at present. One off the west coast of the South Island from January to July and a new fishery off the east coast of the North Island mainly in June and July.

The North Island catch is predominantly taken by trailer boats launching from Waihou Bay in the eastern Bay of Plenty. In 2019 an on-site (creel) survey at the Waihou Bay boat ramp collected detailed catch and effort information from returning fishers. The Waihou Bay Sport Fishing Club provided accurate weights of individual fish and assisted with collection of SBT heads for otolith extraction. Catch records were obtained from 12 other North Island sportfishing clubs.

An adaptive sampling strategy was used to target survey effort at Waihou Bay on days when fishing effort was above a threshold. Trailer counts at 11:00 am each day during the survey period were used to estimate fishing effort. The survey intercepted 537 boat crews with 118 landed SBT. The total landed catch, estimated using average catch from surveyed boats and trailer counts of non-surveyed boats, was 192 SBT (with a CV of 0.075). A further 34 SBT were recorded by other sport fishing clubs. The average SBT weight from North Island club records in 2018–19 was 72.3 kg (sd 21.77 kg).

Anecdotal information from the South Island fishery estimates that 67 SBT were landed by amateur fishers on private boats in 2018–19. In addition, there is logbook data of recreational catch from charter boats recording 27 SBT from the South Island. Harvest reported as recreational catch taken from commercial vessels under section 111 of the Fisheries Act 1996 is also included in harvest estimates. An allowance of 15% to 30% was made for unaccounted catch by recreational fishers who were not interviewed or did not have their catch reported elsewhere.

The total landed catch from the on-site survey and other available data sources is 349 SBT in 2018–19. Allowing an additional 15% to 30% for unaccounted landed catch gives a range of 401 to 454 SBT and a point estimate of 428 SBT.

The mean weight for SBT recorded by North Island fishing clubs was 72.27 kg and the overall estimated mean weight for SBT retained in the South Island was 33.7 kg. The total amateur harvest weight for SBT in the 2018–19 October fishing year is estimated to be 25.9 t and the estimated range is 24.4 t to 27.5 t.

# 1. INTRODUCTION

## 1.1. Objectives

Overall objectives:

1. To improve the estimates of the recreational catch and size composition of southern bluefin tuna (*Thunnus maccoyii*) in New Zealand fisheries waters.

Specific objectives:

1. To design an on-site survey to estimate amateur harvest of southern bluefin tuna in the eastern Bay of Plenty.
2. To estimate the amateur southern bluefin tuna harvest for the 2018–19 southern bluefin tuna fishing year using the method developed in Specific Objective 1, data from the amateur charter vessels, section 111 landings and sport fishing club records.
3. To characterise the biological and temporal nature of the marine amateur harvest of southern bluefin tuna.
4. To collect otoliths from southern bluefin tuna caught by recreational fishing vessels fishing in the eastern Bay of Plenty.

## 1.2. Overview

Southern bluefin tuna (*Thunnus maccoyii*) is a single stock, primarily distributed between 30° S and 45° S, with one confirmed spawning area in the Indian Ocean between Java and Western Australia (Farley & Davis 1998; Patterson et al. 2008). Initial growth is rapid with juveniles reaching 50 cm at one year old. Southern bluefin tuna up to 5 years old undertake annual cyclical migrations in which they generally spend austral summers in the Great Australian Bight and move east as far as New Zealand or west into the Indian Ocean as far as South Africa during the winter (Basson & Farley 2014; Bestley et al. 2010). Fish older than five years disperse widely across the southern oceans from the western Atlantic across the Indian Ocean to the Tasman Sea. They can live to 30 years old and reach a maximum size of about 190 cm fork length and 140 kg by 20 years old. Most southern bluefin tuna (SBT) are mature by 12 years of age (Gunn et al. 2008).

Large Japanese surface longline vessels were attracted to New Zealand waters during the 1960s to catch southern bluefin tuna. During the 1970s and 1980s some of the fleet, along with vessels from Korea, took up licences to fish part of the year in New Zealand waters. The New Zealand domestic surface longline fishery expanded rapidly during the 1990s, targeting swordfish, bigeye and southern bluefin tuna (Ministry for Primary Industries 2017).

New Zealand is a founding member of the Commission for Conservation of Southern Bluefin Tuna (CCSBT), an intergovernmental organisation responsible for the conservation and management of SBT. Member countries receive an allocation from the global total allowable catch and must report all sources of SBT fishing mortality each year. This includes recreational catch.

The most recent stock assessment, completed in 2017, indicates that several years of strong recruitment are reaching maturity and that spawning stock biomass is increasing and is likely to continue to increase (Anon 2017).

The SBT catch limit for New Zealand was 420 tonnes (t) in the early 1990s. On introduction to the QMS in 2004 the Total Allowable Commercial Catch (TACC) was set at 413 t, with a recreational allowance of 4 t, a customary allowance at 1 t and other sources of fishing related mortality at 2 t. There have been a number of TAC increases following allocation decisions by the CCSBT.

In 2012 the Total Allowable Catch (TAC) was set at 830 t, with a TACC of 817 t, a recreational allowance of 8 t, a customary allowance at 1 t and other sources of fishing related mortality at 4 t. In 2018 an in-season adjustment increased the TAC by 88 t as a result of the revised national allocation following an update of the stock assessment by CCSBT and operation of the agreed management procedure. As a result, the available Annual Catch Entitlement for commercial fishers was increased to 1046 t, the recreational allowance was set at 20 t, the customary allowance was set at 2 t and other sources of fishing related mortality was set at 20 t. The TACC and allowances were retained when the TAC was set from 1 October 2018.

### 1.3. Description of the recreational fishery

There has been a small recreational fishery on the west coast of the South Island mainly from Fiordland over summer since the 1970s. The Fiordland Game Fishing Club was formed and was a member of the New Zealand Sport Fishing Council until the late 1980s. Most of the SBT were less than 30 kg and caught on 10 kg line (Marquand 1978). A recreational fishery for Pacific bluefin tuna (*Thunnus orientalis*) developed in 2005 off the west coast of the South Island with charter boats fishing from Greymouth and Hokitika. Occasionally southern bluefin tuna were caught in this fishery during August and September.

An east coast North Island recreational fishery rapidly emerged in June and July 2017. Social media posts by commercial fishers, along with good catch rates and favourable weather attracted hundreds of anglers to the eastern Bay of Plenty at short notice. Most fishers towed trailer boats and launched at Waihou Bay. Fish were caught by trolling lures using the same tackle as the summer billfish fishery. Members of the Waihou Bay Sport Fishing Club operated a weigh station adjacent to the boat ramp, weighing and recording most of the catch. In addition, some fish were taken back to home clubs and weighed there.

NZSFC clubs recorded 266 southern bluefin tuna kept and landed in 2017 with a further 13 released from the east coast recreational fishery, mostly during late June and July 2017. Most of the North Island tuna landed were over 60 kg and the average weight was over 72 kg. The total landed weight of SBT recorded by clubs in 2017 was 19.4 tonnes. Over 90% of the North Island catch was landed at the Waihou Bay boat ramp.

In the South Island fishery six charter vessels recorded a recreational landed catch in 2017 of 47 SBT with an estimated weight of 1.9 t. Therefore, the average weight of these fish was 40.6 kg. South Island sport fishing clubs recorded a further eight SBT in 2017. It is not known if these fish were taken on charter boats, but anecdotal reports suggest that there are a number of private boats active in this fishery when the weather is suitable.

This report describes the recreational catch in the 2018–19 New Zealand fishing year (October 2018 to September 2019).

## 2. DATA SOURCES AND METHODS

### 2.1. The on-site survey

A major component of this survey was to collect information from fishers as they returned to the Waihou Bay boat ramp using on-site interviews. The survey design was proposed in the tender response document and discussed with members of the Waihou Bay Sport Fishing Club and Bruce Hartill (NIWA). A presentation on the survey design was made to a joint meeting of the Marine Amateur Fisheries Working Group and Highly Migratory Species Working Group chaired by Fisheries New Zealand in May 2019. An important consideration was the uncertainty around when the fishing effort targeting SBT at Waihou Bay would occur. The remote location, weather conditions, and fishing success influences fisher interest and peak fishing periods.

The Waihou Bay on-site survey design was based around the following elements:

1. A survey period from 15 June to 11 August 2019 when SBT were most likely to be in the area;
2. Daily trailer counts at Waihou Bay at 11:00 am to estimate daily fishing effort for 44 days;
3. Initial estimate of 15 days of on-site interviews to determine fishing effort and catch;
4. A decision rule that if there are 10 or more boat trailers at noon for boats over 5 m long, this would become a survey day (criteria reviewed in July);
5. One primary interviewer with a backup person trained and able to fill in if needed;
6. Collection of vessel and angler details to match with club records of weighed fish to avoid double counting;
7. Record the number of fishers per boat, fishing method, hours fished, individual catch and length measurements of landed SBT;
8. Collection of heads, where possible, and extraction of otoliths;
9. Record any capture and fate of seabirds.

Data was collected on hard copy forms following the design used in 2018 (Holdsworth 2019). These included seabird interaction questions and a laminated show card of seabird species groupings. The boat ramp was very busy at times and most of the interviews occurred while the boat was being loaded onto the trailer. Generally only fish presented to the weigh station were measured.

Collection bins for heads were provided by the Waihou Bay Sport Fishing Club. Fish were measured and a head number issued to the fisher. Generally, the fish were processed on the boat and the head with label attached left in the bin. Heads were collected and taken to a private property for otolith removal.

## **2.2. Sport fishing club records**

New Zealand Sport Fishing Council clubs from Bay of Plenty, Gisborne and Northland provided detailed catch records from weigh stations with certified scales. Clubs weigh and record fish caught by affiliated club members and in most cases for non-members on request. Club records include details of date, species, boat and angler name, fish weight, and usually location of capture. If the fish is being weighed on behalf of another club this is identified as a “courtesy weigh”. Sport fishing clubs traditionally target yellowfin tuna and billfish over the summer months (December to May) and have used an austral fishing year from 1 July to 30 June. The recreational SBT fishery cuts across the end of this fishing year and the start of the next. However, information in this report is effectively the same as for the 2019 calendar year as no recreational catch was reported between 1 October and 31 December 2018 or after 30 September 2019.

All available club catch records are compiled into a spreadsheet and sorted by date, vessel, weight and angler and checked for fish that may have been entered by two clubs – the club that weighs the fish and the club that the angler belongs to. Landed fish that are recorded in the ramp survey are also matched with club records to ensure that these are not double counted.

## **2.3. Expanded survey catch at Waihou Bay**

The observed total catch includes the number of SBT intercepted by the on-site survey plus the number of non-survey SBT weighed by the Waihou Bay Sport Fishing Club. On busy days many of the boats came up the boat ramp after dark. The health and safety policy does not allow interviewers to work on the boat ramps in the dark. The club did weigh fish on request into the evening, though some boats with fish may have returned after the weigh station was closed. The observed catch will therefore be an underestimate of the total Waihou Bay landed catch.

The creel survey collected information on the number of boats intercepted and the number of SBT landed. Every day during the survey period the trailer count provided an estimate of number of boats fishing that day. Boat trip was used as the unit of fishing effort as it could be applied to both interview data and trailer counts. For survey days the mean landed catch per trip from survey interviews was



multiplied by the trailer count for that day. For non-survey days with trailers the overall survey CPUE (ratio of means) was multiplied by the trailer count for that day.

The variance associated with the landed catch on survey days was estimated by resampling catch per boat trip 1000 times with replacement from each survey day to assign catch to each boat in the trailer count for that day and summed across all survey days to give 1000 estimates of total catch on survey days.

The variance associated with landed catch on non-survey days was estimated by bootstrapping an estimate of CPUE from all survey days and multiplying this by the trailer count for non-survey days to give 1000 estimates of total catch on non-survey days.

The variance associated with total landed catch was estimated by adding the bootstrap estimates from survey days and non-survey days to generate an overall CV and 95% confidence intervals for total landed catch.

## **2.4. Amateur fishing charter boat records**

An extract of amateur fishing charter vessel (AFCV) records from events where southern bluefin and Pacific bluefin tuna were targeted or caught was obtained from Fisheries New Zealand. The AFCV database contains a number of errors, some of which are important for estimating SBT catch in the past. Three fish recorded as SBT were over 200 kg and caught off Hokitika or Greymouth prior to 2018. These were assumed to be Pacific bluefin. A review of the AFCV database was completed in 2019. This included providing code that would fix known errors and remove out of range entries so that there would be consistency in future data extracts.

## **2.5. Section 111 landings**

Southern bluefin tuna caught by commercial fishers using recreational fishing gear may be retained for personal use under an approval provided by Fisheries New Zealand under Section 111 of the Fisheries Act 1996. The weight of these fish must be recorded on the Catch Landing Return with destination code F. Fisheries New Zealand provided the number of records and sum of estimated weights for Section 111 landings.

## **2.6. Allowance for unaccounted catch**

There is anecdotal information that some recreational landed catch from the eastern Bay of Plenty is not recorded in club records or captured by the on-site survey. In 2018 a factor of 15% to 30% was added to the national SBT catch recorded by recreational fishers as an estimate of unaccounted catch.

For the 2018–19 project the Highly Migratory Species Working Group recommended adding 15% to 30% of landed catch to cover the likely range of unaccounted catch. The mid-point of these estimates was used as the point estimate for 2018–19.

## **2.7. Biological data**

Sport fishing club weigh stations are a good source of accurate size, date and location data. Southern bluefin tuna length information was collected in conjunction with heads taken for otolith extraction by the creel survey at Waihou Bay. We summarise the weight and length distributions of SBT sampled for otoliths. An identification guide for large tuna caught in New Zealand was produced and distributed to clubs to ensure Pacific bluefin and bigeye tuna were not being confused with SBT.

### 3. RESULTS

#### 3.1. Landed catch from the 2019 on-site survey

Blue Water Marine Research discussed and coordinated the lead up to the on-site survey with members of the Waihou Bay Sport Fishing Club. This included the development and distribution of the FishCare “Southern Bluefin Tuna Guide to Best Practice for Recreational Fishers”. Interviewers undertook a training day on 14 June.

The first survey day at Waihou Bay was the 15 June 2019 as there were 13 boat trailers at 11:00 am and radio conversations confirmed that these boats were targeting SBT. Two SBT were landed that day (Table 1). A few boats had been targeting SBT earlier in June and the Waihou Bay Sport Fishing Club weighed the first SBT on 12 June. Boats that returned to the ramp after dark or fished on days with fewer than 10 trailers at the 11:00 am trailer count were not interviewed.

A total of 852 trailers for offshore capable boats were counted over 58 days and 537 boat crews were intercepted and interviewed on the boat ramp. This coverage is 63% of effort from the Waihou Bay boat ramp based on trailer counts. Only one crew refused to answer the interview questions. A total of 196 landed SBT were observed at the ramp and/or club weigh station and 118 (60.2%) of these were from surveyed boats (Table 1). This year more fish were processed at sea or not weighed and recorded by the club. Matched records show that of the 118 fish intercepted at the ramp 24 (20.3%) were not recorded by Waihou Bay or other clubs.

The distribution of fishing effort per day shows that most fishing effort occurred in the last twelve days of June and there was a peak in catch on Saturday 29 June 2019 (Figure 1). Reports of good catch rates and several weather windows in late June attracted hundreds of fishers to Waihou Bay, with morning trailer counts exceeding 80 on four days (Figure 1). Eleven survey days were completed in the first 16 days of the survey and on 29 June two interviewers worked in tandem. Fishing continued through July at a lower level. The number of SBT caught per day follows the trend in fishing effort during June and became more inconsistent in July (Figure 1).

Southern bluefin tuna catch per boat trip from the survey interviews show a peak on 25 June 2019 followed by a gradual decline (Figure 2). There was another peak of 0.59 SBT per boat trip on 11 July but fishing either side of this was less successful.

The total number of SBT landed at Waihou Bay was estimated using survey CPUE and trailer counts to expand the survey data. This assumes that all fishers accurately reported their landed catch when interviewed and that boats that returned after dark or on non-survey days had the same average CPUE as surveyed boats. The expanded survey estimate of Waihou Bay landed catch is 192 SBT (CV 0.075). The distribution of bootstrap harvest estimates from the expanded survey data is shown in Figure 3. In addition, twelve SBT were landed at Waihou Bay in the week before the survey started and are included with other sport fishing club catch.

The onsite survey collected information on the number of SBT landed per trip and the number of unsuccessful trips. In 2019, 74% of crews interviewed at Waihou Bay landed no SBT and of those that caught fish, 81% landed one fish per trip, 17% landed two fish, while 2% landed three fish per trip (Figure 4). One boat caught four fish in a day and they tagged and released two and one of the landed fish had an electronic archival tag that had been in the fish for 8 years. Four years of data has been recovered from this tag and details of movement and depth profiles will be passed on by CSIRO when available. All metrics show that the Waihou Bay catch and CPUE was better than in 2018, but not as good as 2017.

In 2019 75% of trailer boat trips targeting SBT from Waihou Bay had two or three fishers on board and 23% had four to six fishers (Figure 5). This is similar to 2018.

### 3.2. Sport fishing club records and other sources

A total of 174 SBT were recorded landed by North Island sport fishing clubs in 2018–19. Most of these fish were caught in the last week of June in the eastern Bay of Plenty. This is true for other clubs as well as for Waihou Bay. The main exceptions were two fish weighed by the Gisborne Tatapouri Sports Fishing Club, a 79.6 kg fish caught on 23 January 2019 and 156.8 kg SBT caught on 29 August 2019 while fishing for swordfish.

In 2019 the average weight of SBT from North Island sport fishing clubs was 72.2 kg (sd 21.77). This compares to an average weight in 2018 of 78.3 kg (sd 19.13). In 2019 the proportion of SBT in the 40 and 60 kg size classes were higher while the proportion in the 70 and 80 kg size classes were lower than in 2018 (Figure 6).

There is limited information about the South Island fishery which has operated out of Fiordland since the 1970s. The Fiordland Sport Fishing Club recorded 18 to 36 SBT per year in the late 1970s. Most of these were caught in February during the NZSFC Nationals tournament. The club disbanded around 1990. Reports from members of other South Island fishing clubs in 2019 indicate that a few dedicated fishers target SBT out of the Fiords and occasionally Jackson Bay. Information from people active in the fishery is that immature fish of 20 to 30 kg were being caught mainly in January with limited success in February and March 2019. The anecdotal catch estimate over this period was 25 SBT. Larger fish turn up in April, May and June. An estimate of 30 fish were landed over Easter 2019 in the 22 kg to 50 kg weight range. The weather in May and June was “terrible with lots of wind and rain” and 12 fish over 75 kg, with two close to 100 kg, were reported from the South island.

### 3.3. Amateur fishing charter boat records

An extract of amateur fishing charter vessel (AFCV) records from events where bluefin tuna were targeted or caught was provided by Fisheries New Zealand. This database allows free text entries for species codes or names so all southern bluefin tuna and Pacific bluefin tuna data was requested. A total of 42 SBT were reported in 2018–19, from 63 fishing events which targeted or landed SBT, between February and August 2019. Eighteen of these events were off the eastern North Island with 15 SBT retained and five released on those charter trips. AFCV data from previous years is shown in Table 2. There were no fishing events targeting or catching SBT reported by AFCVs in 2013–14.

There is a requirement for skippers to record the estimated weight of retained SBT. The mean weight for fish reported by charter vessels off the west coast of the South Island (FMA 5) in 2019 was 22.3 kg. The average estimated weight of SBT caught off the east coast of the North Island in 2019 was 81.3 kg.

### 3.4. Section 111 landings

Southern bluefin tuna caught by commercial fishers and retained as recreational catch under Section 111 of the Fisheries Act is recorded on Catch Effort Landing Returns (CELRs). In the 2018–19 fishing year the reported s 111 landings were 454 kg. The highest annual weight of s 111 catch reported over the last 5 years was 1038 kg in 2016–17 (Table 3).

### 3.5. Otoliths collected

A total of 80 otolith sets were extracted from southern bluefin tuna intercepted during the creel survey at Waihou Bay in 2019. The weight of these fish ranged from 23.2 kg to 136.8 kg with a mode at 80 to 90 kg (Figure 7). The fork length of these fish ranged from 100.5 to 188 cm with a mode at 160 to 165 cm (Figure 8). Measurements were made with a tape measure over the curve of the body while fish were hanging at the weigh station. Calipers were supplied for measuring straight line lengths but they were awkward to use on the weigh station.

### 3.6. 2018–19 recreational harvest estimate for southern bluefin tuna

The total landed catch from the on-site survey and other available data sources is 349 SBT in 2018–19. Allowing an additional 15% to 30% for unaccounted catch gives a range of 401 to 454 SBT and a point estimate of 428 SBT (Table 4).

The mean weight for SBT recorded by North Island fishing clubs of 72.27 kg was multiplied by the estimate of North Island landed catch and the estimated number of SBT landed in the South Island was multiplied by the overall estimated mean weight of 33.72 kg. The reported weight of SBT retained under Section 111 was added to the recreational harvest estimates. The total harvest weight for recreational SBT in the 2018–19 October fishing year is estimated to be 25.9 t and the estimated range calculated using the range in unaccounted catch is 24.4 t to 27.5 t (Table 4).

## 4. DISCUSSION

This is the second dedicated project to estimate the recreational harvest of southern bluefin tuna in New Zealand. Since the 1970s the recreational catch has been taken mostly on the west coast of the South Island by a small number of fishers and total landings were assumed to be relatively small. Charter vessels taking recreational fishers on fishing trips have been required since 2010 to report the number and weight of SBT caught. However, prior to 2017 the annual charter boat catch was fewer than 40 fish per year.

The North Island fishery developed rapidly in 2017 after reports of high catch rates of large SBT within range of recreational fishers off Cape Runaway. Private fishers with trailer boats remain the main participants in this fishery though there were more launches and charter boats participating in 2019. Fishing clubs keep good catch records including accurate weights for club members and non-members. However, there is increased awareness about the need to chill SBT quickly after capture and more fish are being processed at sea. The proportion of fish presented to club weigh stations is still high but declining. In 2018 fisher interviews recorded 9.6% of SBT that were not weighed and in 2019 the survey recorded 20.3% SBT landed but not weighed. In both years a small number of fishers chose to say they had not caught SBT when they had. The reason for these “soft refusals” is not clear.

The on-site survey at the Waihou Bay boat ramp in 2019 interviewed fishers from 537 boat trips landing 118 SBT. An adaptive sampling strategy was used to target survey effort on days when fishing effort was above a pre-determined level (Moore et al. 2015). The 18 survey days proposed in the survey design were all used. The expanded survey harvest weight represents 66% of the estimated total weight of the national landed recreational catch in 2018–19. Estimates of catch from fisher reports in the South Island make up 15% of total landed catch.

Again this year, many fishers were willing to leave tuna heads with labels attached for otolith extraction, but getting accurate straight-line fork lengths from whole fish was difficult.

The main fishing method used was trolling lures (97% of trips interviewed). There were no seabirds reported caught or tangled by any of the crews interviewed at Waihou Bay. There were no Pacific bluefin tuna recorded in the North Island fishery when fishers were targeting SBT.

There is limited information from the South Island fishery. The best fishing is early in the year when juveniles are caught, but the number of fishers is relatively small. Fishing effort increases over Easter but is sporadic and weather dependant in May and June.

## **5. ACKNOWLEDGMENTS**

Many thanks to Christine Elmiger and the Waihou Bay Sport Fishing Club for their assistance in the planning and implementation of this project. Thanks to the New Zealand Sport Fishing Council and affiliated clubs for their cooperation and for providing weigh station records. Particular thanks to survey interviewers Bill Beckett and Nicola Hayes for communications and data submission. Many thanks to Jim and Sally Kemp for collecting and cataloguing the otoliths. This project was reviewed by the Highly Migratory Species Working Group chaired by Dr John Annala. Fisheries New Zealand provided funding through Project SEA2018-40.

## 6. REFERENCES

- Anon. (2017). Report of the Twenty-second Meeting of the Scientific Committee, 28 August–2 September 2017, Yogyakarta, Indonesia.
- Basson, M.; Farley, J.H. (2014). A standardised abundance index from commercial spotting data of southern bluefin tuna (*Thunnus maccoyii*): random effects to the rescue. *PLoS ONE* 9(12): e116245. doi:10.1371/journal.pone.0116245
- Bestley, S.; Patterson, T.A.; Hindell, M.A.; Gunn, J.S. (2010). Predicting feeding success in a migratory predator: integrating telemetry, environment, and modelling techniques. *Ecology* 91: 2373–2384.
- Farley, J.H.; Davis, T.L.O. (1998). Reproductive dynamics of southern bluefin tuna, *Thunnus maccoyii*. *Fisheries Bulletin* 96: 223–236.
- Gunn, J.S.; Clear, N.P.; Carter, T.I.; Rees, A.J.; Stanley, C.A.; Farley, J.H.; Kalish, J.M. (2008). Age and growth in southern bluefin tuna, *Thunnus maccoyii* (Castelnau): direct estimation from otoliths, scales and vertebrae. *Fisheries Research* 92: 207–220.
- Holdsworth, J.C. (2019). Recreational harvest of southern bluefin tuna in New Zealand, 2017–18. *New Zealand Fisheries Assessment Report 2019/08*. 17 p.
- Marquand, D. (1978). Kiwis discover Fiordland game fish. *Modern Fishing*. September 1978 issue.
- Ministry for Primary Industries. (2017). Fisheries Assessment Plenary, November 2017: stock assessments and stock status. Compiled by the Fisheries Science Group, Ministry for Primary Industries, Wellington, New Zealand. 500 p.
- Moore, A.; Hall, K.; Khageswor, G.; Tracey, S.; Hansen, S.; Stobutzki, I.; Ward, P.; Andrews, J.; Nicol, S.; Brown, P. (2015). Developing robust and cost-effective methods for estimating the national recreational catch of Southern Bluefin Tuna in Australia. Canberra: Australian Bureau of Agricultural and Resource Economics and Sciences. ISBN 978-1-74323-275-0
- Patterson, T.A.; Evans, K.; Carter, T.I.; Gunn, J.S. (2008). Movement and behaviour of large southern bluefin tuna (*Thunnus maccoyii*) in the Australian region determined using pop-up satellite archival tags. *Fisheries Oceanography* 17:352–367.

**Table 1: Waihou Bay creel survey trailer counts, number of interviews and SBT landed by day. Total landed SBT including Waihou Bay Sport Fishing Club weigh station records and fish tagged and released by fishers using Waihou Bay boat ramp. Survey days in bold. There were no trailers to 11 August.**

	Trailer count	Survey interviews	Landed SBT survey	Landed SBT survey plus club	Tagged SBT
12/06/2019	3			4	
13/06/2019	9			6	
14/06/2019	23			2	
<b>15/06/2019</b>	<b>13</b>	<b>9</b>	<b>1</b>	<b>2</b>	
16/06/2019	2			0	
17/06/2019	0				
<b>18/06/2019</b>	<b>41</b>	<b>36</b>	<b>5</b>	<b>5</b>	
<b>19/06/2019</b>	<b>92</b>	<b>56</b>	<b>17</b>	<b>24</b>	
<b>20/06/2019</b>	<b>53</b>	<b>31</b>	<b>5</b>	<b>8</b>	
21/06/2019	0				
<b>22/06/2019</b>	<b>26</b>	<b>17</b>	<b>4</b>	<b>4</b>	
23/06/2019	14			5	
24/06/2019	17			2	
<b>25/06/2019</b>	<b>24</b>	<b>21</b>	<b>11</b>	<b>11</b>	
<b>26/06/2019</b>	<b>45</b>	<b>39</b>	<b>14</b>	<b>15</b>	<b>3</b>
<b>27/06/2019</b>	<b>81</b>	<b>49</b>	<b>17</b>	<b>20</b>	
<b>28/06/2019</b>	<b>101</b>	<b>54</b>	<b>13</b>	<b>22</b>	<b>1</b>
<b>29/06/2019</b>	<b>106</b>	<b>62</b>	<b>6</b>	<b>14</b>	
<b>30/06/2019</b>	<b>41</b>	<b>22</b>	<b>1</b>	<b>3</b>	
1/07/2019	2			1	
2/07/2019	0				
3/07/2019	0				
4/07/2019	0				
5/07/2019	2			0	
6/07/2019	3			0	
<b>7/07/2019</b>	<b>16</b>	<b>17</b>	<b>2</b>	<b>4</b>	
8/07/2019	0				
9/07/2019	11			0	
<b>10/07/2019</b>	<b>17</b>	<b>14</b>	<b>2</b>	<b>4</b>	
<b>11/07/2019</b>	<b>16</b>	<b>17</b>	<b>10</b>	<b>16</b>	
<b>12/07/2019</b>	<b>20</b>	<b>21</b>	<b>5</b>	<b>8</b>	
13/07/2019	1				
14/07/2019	0				
15/07/2019	0				
16/07/2019	0				
17/07/2019	0				
18/07/2019	0				
19/07/2019					
20/07/2019	1				
<b>21/07/2019</b>	<b>27</b>	<b>24</b>	<b>2</b>	<b>4</b>	
<b>22/07/2019</b>	<b>30</b>	<b>26</b>	<b>0</b>	<b>0</b>	
<b>23/07/2019</b>	<b>28</b>	<b>22</b>	<b>3</b>	<b>6</b>	
24/07/2019	11			5	
25/07/2019	3			0	
26/07/2019	0				
27/07/2019	0				
28/07/2019	3			1	
29/07/2019	3			0	
30/07/2019	2			0	
31/07/2019	0				
Total	852	537	118	196	4

**Table 2: Southern bluefin tuna effort and catch from amateur fishing charter vessel logbooks by year.**

	Days with SBT target	Number of SBT caught	Number of SBT retained	Estimated landed weight (kg)
2010–11	1	6	4	397
2011–12	4	6	4	131
2012–13	7	12	12	550
2013–14	0	0		
2014–15	16	6	2	95
2015–16	33	38	37	1 267
2016–17	53	54	52	2 274
2017–18	37	12	12	597
2018–19	63	47	42	1 821
Total	214	181	165	7 132

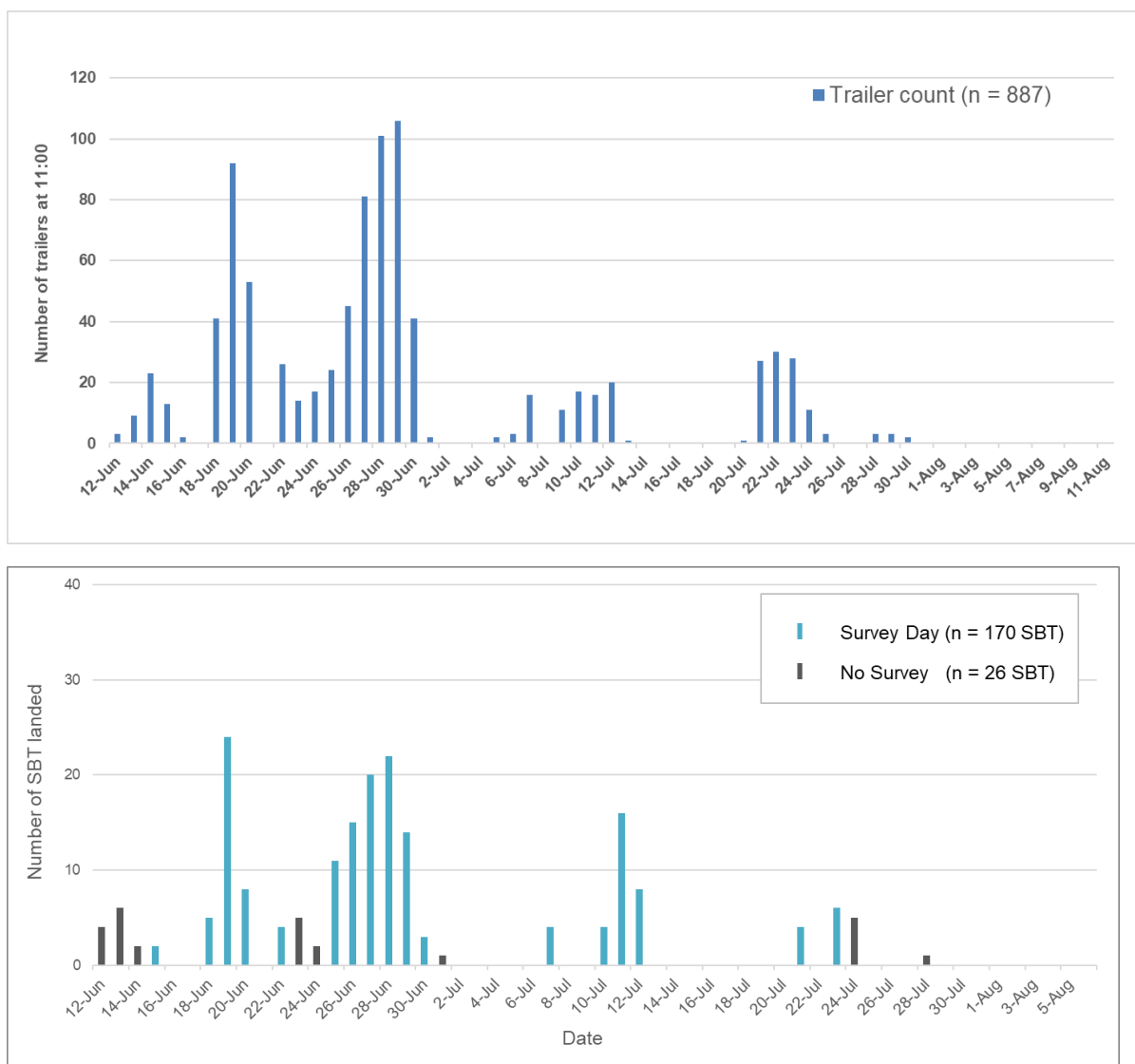
**Table 3: Recreational catch retained by fishers on commercial vessels under a Section 111 approval.**

October Fishing Year	2014–15	2015–16	2016–17	2017–18	2018–19
Greenweight kg	672	661	1 038	507	454

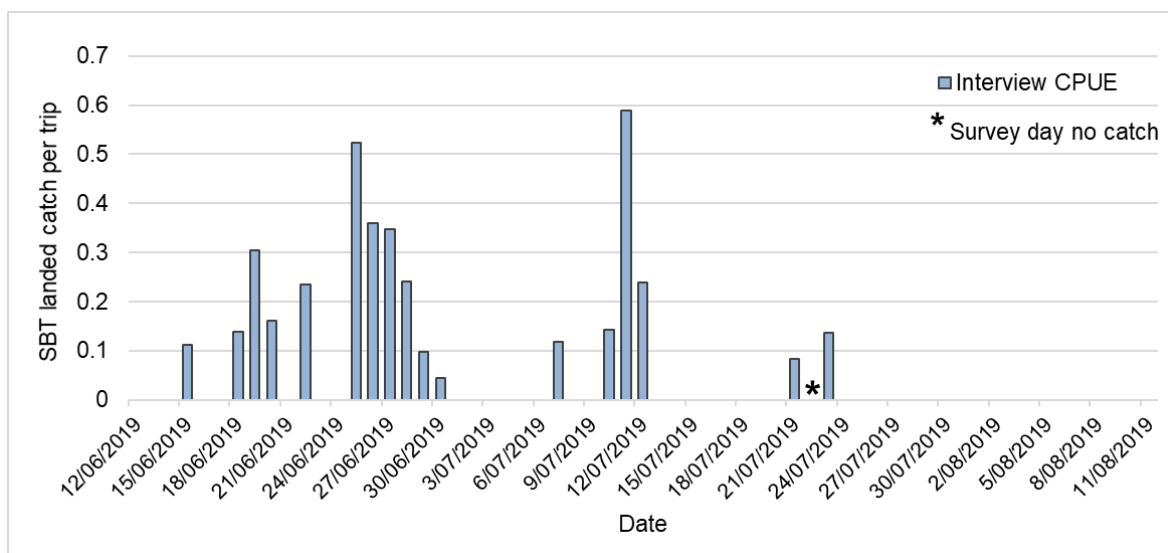
**Table 4: 2018–19 recreational harvest estimates from available sources with an allowance for unaccounted catch of 22.5% and range of 15% to 30%.**

Source	Harvest #	Mean wt (kg)	Harvest wt (t)
<b>North Island</b>			
Waihau Bay Survey	192 CV 0.075	72.27	13.88
Other club catch N Island	34	72.27	2.46
AFCV records N Island	15	81.30	1.22
<b>South Island</b>			
S Island early	25	22.3	0.56
S Island Easter	30	35.0	1.05
S Island late	12	80.0	0.96
AFCV records S Island	27	22.3	0.60
<b>National</b>			
s 111	14		0.45
<b>Total</b>	349		21.17
Plus unaccounted catch			
Low estimate 15%	401		24.4
High estimate 30%	454		27.5
<b>Point estimate 22.5%</b>	428		25.9

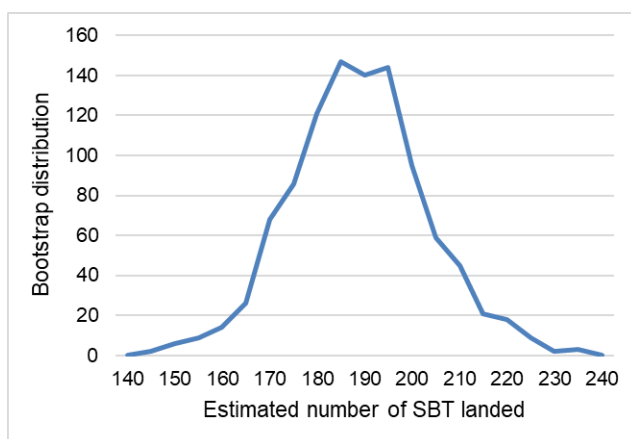




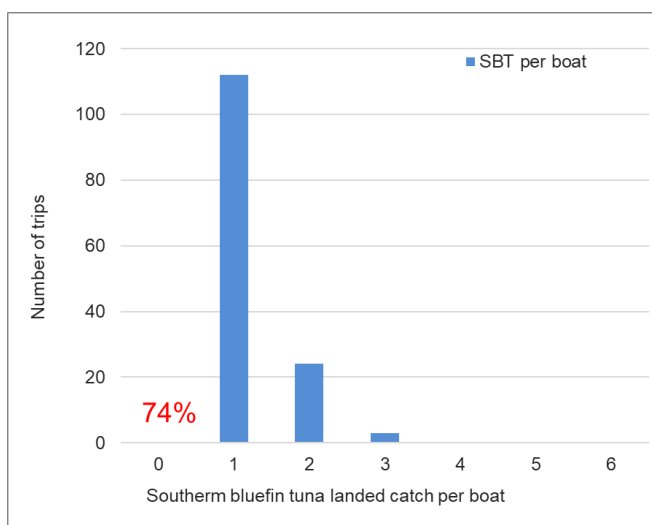
**Figure 1: Waihou Bay trailer counts in 2019 by day (top) and number of landed SBT captured in survey interviews plus club weigh station observations on survey days and non-survey days at Waihou Bay (bottom).**



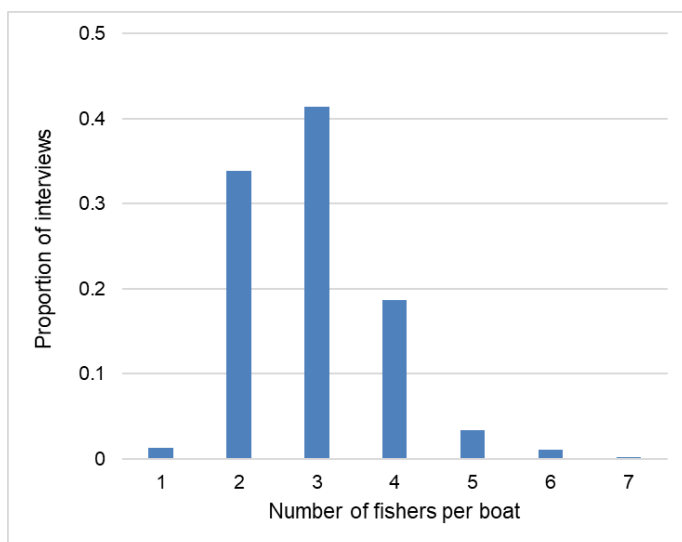
**Figure 2: The catch rate of SBT per boat trip from the Waihou Bay on-site survey.**



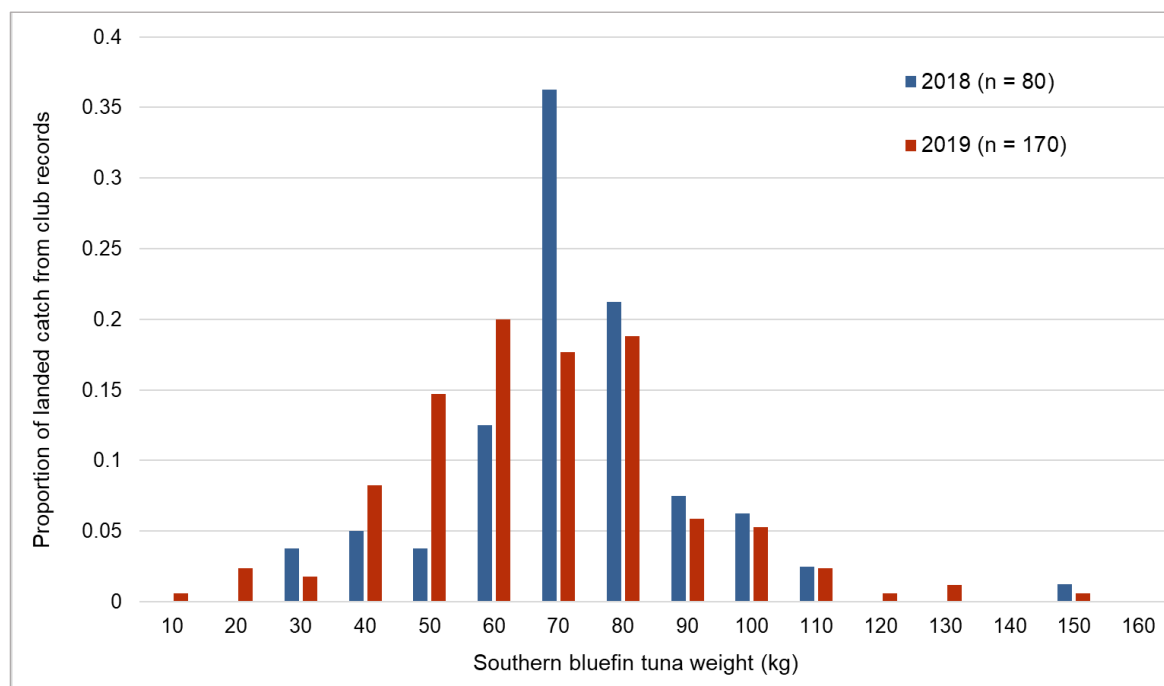
**Figure 3: The bootstrap distribution of expanded survey harvest from Waihou Bay.**



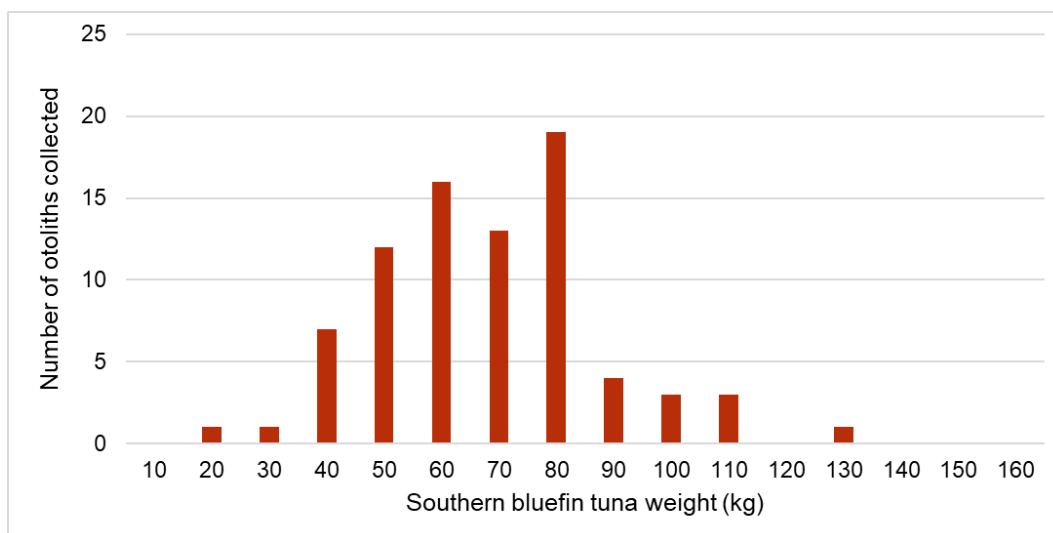
**Figure 4: The number of SBT landed per boat trip in 2019 from on-site survey data.**



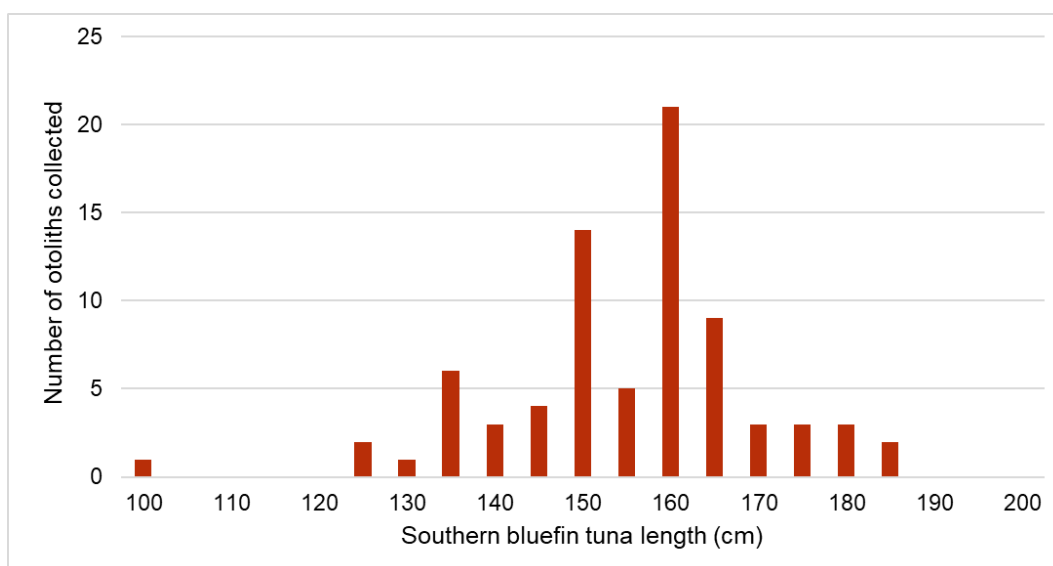
**Figure 5: The number of fishers per boat as a proportion of all onsite survey interviews in 2019.**



**Figure 6: The weight distribution of SBT weighed by North Island sport fishing clubs in 2018 and 2019.**



**Figure 7: Weight distribution of southern bluefin tuna caught in the recreational fishery from Waihou Bay which had otoliths removed in 2019.**



**Figure 8: Length distribution of southern bluefin tuna caught in the recreational fishery from Waihou Bay which had otoliths removed in 2019.**