Fisheries New Zealand
Tini a Tangaroa

Annual Report of the New Zealand Southern Bluefin Tuna Fishery

New Zealand

Prepared for the 23rd Meeting of the Extended Committee Meeting (ESC23) of the Commission for the Conservation of Southern Bluefin Tuna (CCSBT)

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1 Introduction

1.1 BACKGROUND

This review report provides scientific information on the New Zealand southern bluefin tuna (**SBT**) fishery for 2017 and the most recent fishing year, which is from 1 October 2016 to 30 September 2017.

1.2 SUMMARY OF HISTORICAL DEVELOPMENTS IN THE FISHERY

Historically, juvenile and adult SBT were distributed around New Zealand. During the 1960s and 1970s, juvenile SBT were encountered on both the east and west coasts of the North Island, and the west coast of the South Island during summer months. Domestically, several tonnes were taken in pole and line and troll fisheries.

In the early 1980s, a concerted effort to develop a domestic SBT fishery was undertaken to service the Japanese market. By 1982, a handline fishery was established with the catch frozen on board a former Japanese longline vessel. Following the high catches of the 1982 season (305 tonnes landed), the handline fishery continued into the late 1980s, albeit at a reduced level (below 100 tonnes until 1989). Around this time, longlining became the dominant fishing method for SBT, and remains so until this day.

In 1989, New Zealand implemented a national catch limit of 420 tonnes per year, which remained until 2008/09. In 2009, the 16th Commission Meeting of the Commission for the Conservation of Southern Bluefin Tuna (**CCSBT**) agreed to reduce the global total allowable catch (**TAC**) by 20% and apply revised national allocations for 2010 and 2011. New Zealand's national catch limit has increased over the years to 1,000 tonnes in 2014/15, where it remained for the 2016/17 fishing season. On the few occasions when the New Zealand allocation has been exceeded, the domestic catch limit has been reduced in the following year by an equivalent amount (**Table 1** and **Figure 1**).

Since 1 October 2004, SBT has been managed under the quota management system. The introduction to the quota management system saw a change from the "Olympic" race for fish, to fishing spread throughout the season, and was associated with a consolidation of the fleet.

1.3 OVERVIEW OF THE MOST RECENT FISHING SEASON

For the 2016/17 fishing year, within New Zealand's national allocation of 1,000 tonnes, there were the following allowances: a total allowable commercial catch (**TACC**), which is the commercial allowance, of 971 tonnes; a recreational allowance of eight tonnes; a customary non-commercial allowance of one tonne; and an allowance for other sources of fishing-related mortality of 20 tonnes.

For the 2016/17 fishing year, commercial removals of SBT were 913.9 tonnes (**Table 1**). Given no foreign charter vessels fished in New Zealand in 2016 or 2017, the entire commercial catch was taken by the domestic fleet. Discard mortality was estimated at 4.8 tonnes, recreational removals were estimated at 24.3 tonnes, and there were no customary removals reported.

2 Catch and effort

Total catch for the New Zealand fishery is provided in **Table 1**, whilst catch and effort by fleet and region are provided in **Table 2, Table 3, Table 4,** and **Table 5, Figure 2** and **Figure 3.**

2.1 TRENDS BY GEAR TYPE

Prior to the early 1990s, small vessels handlining and trolling dominated the domestic SBT fishery. Since 1991, surface longlining has been the predominant method, whilst handlining and trolling have made up around 4% of the vessel days combined. Since 2008, there has only been a handful of days handling and trolling for SBT. This represents a major change from the 1980s when most fishing was by handline.

2.2 TRENDS BY AREA AND SEASON

Total SBT catch has steadily increased since the early 1990s, with 2016 reaching a record high of 950.8 tonnes, dropping to 913.3 tonnes in 2017 (**Table 1**). Total effort also saw an increasing trend, peaking around 2003 before declining back to similar levels as the 1990s (**Table 3** and **Table 5**). Catch data shows most SBT are caught off the west coast of the South Island (CCSBT Region 6) and the east coast of the North Island (CCSBT Region 5) from April to July.

For the foreign charter fleet, catch fluctuated around 200 tonnes since the early 1990s (**Table 2**). Effort gradually declined from the early 1990s to 2016, when, due to changes in legislation, the vessels left the fishery (**Table 3** and **Figure 2**). Catch and effort predominantly occurred in Region 6, with under 10% of total charter catch and effort occurring in Region 5.

For the domestic fleet, catch remained below 300 tonnes up until 2012 when it began increasing, peaking in 2016 at 950.8 tonnes (**Table 4**). Effort increased dramatically in both regions from 1994 to 2003, which was followed by a decline to a low level in 2007 and 2008, particularly in Region 6 (**Table 5** and **Figure 3**). This decline is associated with a substantial decrease in the number of vessels in the surface longline fleet (**Table 6**), and the removal from the fleet of a domestically-owned freezer vessel that fished in Region 6. Since 2008, domestic vessels have increased effort in Region 6. This increased effort has been reflected in increased catch in Region 6, which reached 429 tonnes in 2017, almost equalling catch in Region 5 (483.2 tonnes) (**Table 4).**

Total effort in the fishery was around 25% less than levels seen prior to the exit of the foreign charter fleet. A longline fishery targeting other highly migratory species also operates outside the SBT fishing season, and this data has been included as “Other”.

3 Nominal CPUE

3.1 TRENDS BY FLEET

For the domestic fleet, CPUE was calculated for effort from sets that either caught or targeted SBT. Due to the large changes in the structure of the domestic fleet and the nature of the “Olympic system” under which the New Zealand fishery operated prior to 2004, the trends in the CPUE for the domestic fishery may not provide reliable information on trends in vulnerable biomass, although the CPUE does exhibit similar trends to that of the charter fleet.

From 2005 to 2016, the domestic fleets operating in both Regions 5 and Region 6 have experienced an increase in CPUE, from around one fish to almost 14 fish per 1,000 hooks, reducing marginally to nearer 13 fish per 1,000 hooks in 2017 (**Figure 4**).

From 2008 to 2015, the charter fleet also experienced an increase in CPUE, from around one fish per 1,000 hooks to around seven fish per 1,000 hooks, peaking in 2010 at nearer eight fish per 1,000 hooks (**Figure 4**).

3.2 TRENDS BY AREA AND SEASON

Associated with the lack of new recruitment (Section 4), CPUE declined dramatically for both charter and domestic fleets in 2003 and remained at these low levels (about one fish per 1,000 hooks) for four to five years (**Figure 4**).

CPUE was calculated for the charter fleet in Region 6 for fish thought to be of spawning age (SBT greater than 10 years of age). This was done based on both the proportional ageing of observer lengths and on the smaller dataset of SBT that were directly aged. The series are compared and agree closely with each other. CPUE of SBT greater than 10 years has varied around one fish per 1,000 hooks, with a historical low of near-zero fish in 2003 and the highest level of just over two fish in 2015 (**Figure 5**).

4 Size composition

Length frequency distributions for the foreign charter and domestic fleets by year are provided in **Figure 6** and **Figure 7**. Proportion of catch under 120 and 140 centimetres for the foreign charter and domestic fleets are provided in **Figure 8** and **Figure 9**. Length frequency distributions for the foreign charter and domestic fleet for each 10 year period are provided in **Figure 10** and **Figure 11**. For the foreign charter fleet, length frequency distributions for each 10 centimetre interval are provided in **Table 9**, and proportion-at-age distributions, determined from direct aging, are provided in **Figure 12** (which includes 2016 information from the domestic fishery). Proportion-at-length information from the catch documentation scheme is provided in **Figure 13** and **Figure 14**.

4.1 TRENDS BY FLEET

Direct ageing showed considerably fewer "plus group" fish than were estimated from the size frequency data (see New Zealand's country report 2010 for comparison). Direct ageing data have also been used to calculate the annual catch rates for SBT that are greater than 10 years of age (spawning age fish) (**Figure 5**).

Historically, observer coverage was low in the domestic fishery, therefore size composition data are not as well estimated for this fleet. Nevertheless, size composition data for the domestic fleet (based on observer reports) show similar patterns to that observed in the charter fleet (**Figure 6** and **Figure 7**). These distributions are now better described by data from the catch documentation system, which provides a complete census of fish lengths for the fishery since 2011 (**Figure 13** and **Figure 14**).

An examination of the proportion of the domestic fleet catch under a given size since 1990 indicates that fish under 140 centimetres have varied from less than around 20% from 2003 to 2008 to over 60% in 2016 and 2017 (**Figure 9**).

4.2 TRENDS BY AREA AND SEASON

There was a reduction in the range of sizes of SBT taken in the New Zealand fishery in the 2000s **(Figure 10** and **Figure 11**). There is evidence of growth (progression of modes) over this period, but little evidence of recruitment of smaller fish to the New Zealand fishery (**Figure 8** and **Figure 9**). However, more recent data show a change, with smaller recruits appearing in the fishery (**Figure 6,** and **Figure 7**).
An examination of the proportion of the charter fleet catch under a given size since 1989 indicates that fish under 140 centimetres have varied from less than 10% from 2001 to 2004 to over 60% in 2010 (**Table 9** and **Figure 8**). In 2013 this had dropped to less than 30% as a result of growth (progression of the main length mode). Overall, the frequencies fluctuate in a manner consistent with periods of above and below average recruitment (for example, two to three year cycles).

5 Fleet size and distribution

Maps of historical catch and effort by gear type for the fishery are provided in **Figure 15, Figure 16, Figure 17,** and **Figure 18.** The number of vessels catching SBT in New Zealand fisheries waters by year are provided in **Table 6.**

5.1 TRENDS BY SEASON

Up until 1991, foreign charter vessels dominated the New Zealand SBT fishery. In 1991, the first domestic longline vessel began fishing for SBT, and then throughout the 1990s and early 2000s the domestic fleet expanded. Since around the time that SBT was introduced into the quota management system, the number of vessels operating in the New Zealand fishery has been declining, with 32 vessels operating in the fishery during the 2016/17 fishing year (**Table 6**).

5.2 TRENDS BY AREA

Historically, the charter fleet, which was primarily composed of the larger -60° freezer vessels, dominated the west coast South Island (Region 6) fishery, however, in 2016, changes in legislation resulted in the charter vessels leaving the fishery (**Figure 15** and **Figure 16**).

The domestic fleet is primarily composed of smaller vessels, which operate mainly in the longline fishery off east coast North Island (Region 5), however, in recent years, domestic vessels have increased effort off west coast South Island (Region 6) replacing some of the effort previously made by the foreign charter fleet (**Figure 17** and **Figure 18**). The domestic vessels are typically at sea for only a few days, and land SBT both as a target and as a bycatch of bigeye target sets.

6 Research and monitoring to improve estimates of attributable catch

6.1 RELEASES AND/OR DISCARDS

6.1.1 Current status

Southern bluefin tuna is listed on Schedule 6 of the Fisheries Act 1996, which enables a fish to be returned to the sea or other waters in accordance with the following requirement:

> 'A person who is a New Zealand national fishing against New Zealand's national allocation of southern bluefin tuna may return any southern bluefin tuna to the waters from which it was taken if—
>
> a) that southern bluefin tuna is likely to survive on return; and
> b) the return takes place as soon as practicable after the southern bluefin tuna is taken.

Under the Fisheries Act 1996, dead southern bluefin tuna can only be discarded when authorised by an observer, and are required to be reported against annual catch entitlement (counted within the TACC). These SBT include those with shark or orca inflicted damage.

The Resolution on Reporting of all Sources of Mortality of Southern Bluefin Tuna requires that members report the fate of discards. New Zealand does not currently have a moribund category when reporting fate of captures. Moribund fish are included in the 'dead' category, reflecting the domestic requirements that only discarded fish that are 'likely to survive' can be considered 'alive'.

Estimates of non-retained catches are required for the CCSBT Data Exchange, and have been provided to the Commission for the charter and domestic fleets from 1989 to 2017 (**Table 12** and **Table 13**). Estimates of dead discards and live releases have been scaled from observed discards and releases to total effort, assuming a similar rate on unobserved vessels. Noting that discarding dead SBT would not be in compliance with regulations, and this may therefore overestimate total dead discards.

Since 2004, fishers have also been required to report discards on their catch effort returns, providing another method to estimate non-retained catches. Specific provisions also exist under the Fisheries Act 1996 that provide for the live release of SBT where they are considered likely to survive. Such releases are also recorded on catch effort returns.

6.1.2 Research

There is currently no research in this area.

6.1.3 Monitoring

Monitoring of compliance with these requirements is conducted by aerial flights checking for activity on decks of vessels, at-sea inspections, self-reporting, and observer coverage.

23% of catch and 21% of effort was observed during the 2017 calendar year (**Table 14** and **Table 16**), whist there have been seven aerial flights during the 2016/17 and 2017/18 fishing years combined, that reported longline fishing activity within or around SBT target areas.

Discrepancy analysis between observer data and information reported by commercial fishers is currently done on a case by case basis when necessary. Fisheries Officers also conduct observer briefings prior to trips and/or observer debriefs subsequent to trips, in accordance with priorities and/or risk assessments. Routine debrief documentation is completed by the observer programme where no formal debrief is carried out by a Fisheries Officer.

Digital monitoring has the potential allow for increased visibility of vessel movements, processing practices, discards and expedited access to fishing reports. The ability to receive electronic fishing, processing and disposal reports within a 24 hour period has the potential to allow for the early identification of any discrepancies between reports and highlight areas of attention to be addressed by Fishery Officers.

The digital monitoring cameras should also make it easier to detect discharges of damaged or small SBT.

6.2 RECREATIONAL FISHING

Reporting of recreational SBT catch is provided in **Table 18** and **Table 19**,

6.2.1 Current status

A recreational allowance for SBT was introduced when SBT entered into New Zealand's Quota Management System on 1 October 2004. In the past, New Zealand has based its national catch reporting and carry-forward calculations on the full recreational allowance even though estimates of actual recreational catch were consistently well below the levels set under that allowance.

Prior to 2007, recreational catches of SBT are likely to have been rare because of the locations and seasons during which SBT are found in New Zealand waters (generally winter months and areas with little recreational fishing). SBT are occasionally taken as bycatch by recreational fishers when targeting Pacific bluefin tuna while fishing out of Greymouth or Westport, on the West Coast South Island. There is also a small SBT recreational fishery out of Fiordland, in Milford Sound, and also on the West Coast of the South Island.

In 2015, compulsory returns from amateur charter vessels documented that ten SBT were caught, with an estimated total weight of 1,050 kilograms. Only five of the ten SBT caught were retained. In 2016, 37 SBT were reported to be caught, with an estimated total weight of 1,127 kilograms and 36 of them were retained. Records provided by New Zealand sport fishing clubs reported one SBT landed in 2015, and seven SBT landed in 2016 by recreational fishers.

Recreational catches have been recorded in the months from January to September, and SBT has become a more targeted species for recreational fishers on both coasts of New Zealand. In 2017 on the east coast on the North Island a mixture of factors, including favourable weather conditions, proximity of fish, and increased recreational interest in SBT, resulted in higher levels of catch than previously seen in the recreational fishery. Following this increase, an estimate of recreational catch was generated from sport fishing club records showing 266 SBT were landed, with an estimated total weight of 19.4 tonnes and 13 were fish released alive. Additionally, there were 47 SBT reported by amateur charter vessel logbooks. Records from amateur charter vessel operators, sport fishing clubs, provisions for unreported catch, and an estimate of additional catch in August and September, resulted in a total estimate of SBT recreational catch for 2017 of 24.3 tonnes.

6.2.2 Research

A formal reporting regime for the recreational sector applies only to a proportion of the sector (recreational fishing from amateur charter vessels and commercial vessels). Other information sources are required to achieve an overall estimate of recreational catch which can be particularly challenging

for species such as SBT which are not caught frequently enough to result in reliable estimates of catch from national multi-species diary surveys. Fisheries New Zealand analyses data obtained from recreational fishing clubs and amateur charter vessels and has more recently directed research to monitor SBT catch at the boat ramp.

The New Zealand gamefish tagging programme:
The New Zealand gamefish tagging programme is a cooperative project between Fisheries New Zealand, the New Zealand Sport Fishing Council, its affiliated clubs, and anglers. The New Zealand Gamefish Tagging Programme was introduced as a multi species gamefish tagging programme to study the seasonal and short-term movements of gamefish species of importance to New Zealand fisheries. Recaptures from the programme provide information on distance and direction of movement, time at liberty, and in some circumstances the average migration rate of the fish involved.

The most recent report, a Synthesis of New Zealand gamefish tagging data, 1975 to 2014 can be found here: https://www.mpi.govt.nz/dmsdocument/12135/loggedIn

Most southern bluefin tuna tagged under this programme are less than 30 kilograms and are tagged off the west coast of the South Island. Recaptures of SBT have been recorded in South Australia and Hokitika. Since the recent development of a recreational SBT fishery off the east coast North Island, where larger southern bluefin tuna have been landed (averaging 72 kilograms in 2017), the New Zealand Sport Fishing Council is encouraging tag and release of SBT as this fishery develops. SBT tagged and released are not counted against the recreational allowance.

Estimates of the recreational catch and size composition of SBT:
Following the rapid development of a recreational fishery off the east coast of the North Island in 2017, there is reasonable uncertainty about the likely level of recreational SBT catch going forward. Therefore, Fisheries New Zealand has approved an additional research project for 2018, with the overall objective to improve estimates of the recreational catch and size composition of SBT in New Zealand fisheries waters.

Specific objectives of this research include designing and implementing an on-site creel survey to estimate recreational harvest of SBT in the eastern Bay of Plenty, where the majority of SBT recreational catch occurred in 2017. Analysis will then be conducted to estimate the recreational SBT harvest for the 2018 fishing year using a variety of inputs. These include; 2018 creel survey results, data from amateur charter vessel records, Section 111 landing reports and New Zealand sport fishing club records. This will enable researchers to characterise the biological and temporal nature of the recreational harvest of SBT in New Zealand.

Additionally, otoliths from SBT caught on recreational vessels fishing in the eastern Bay of Plenty will be part of New Zealand's otolith collection for the CCSBT.

National Panel Survey of Marine Recreational Fishers:
Nationwide panel surveys are conducted to generate harvest estimates of recreational catch in New Zealand waters. Features of the survey include; meshblock-based face-to-face recruitment, a frequent and adaptable contact regime with a SMS texting option, and a structured questionnaire administered by telephone to record fishing details.

The most recent survey conducted included over 7,000 marine fishers who reported their fishing activity throughout the New Zealand fishing year from 1 October 2011 to 30 September 2012. The survey includes information on recreational harvest of highly migratory species, such as skipjack tuna and albacore tuna, but did not capture any information on SBT. A current panel survey is being conducted from 1 October 2017 to 30 September 2018, which will provide an update on recreational harvest estimates in New Zealand, including highly migratory species.

The results from the survey can be viewed here: https://www.mpi.govt.nz/dmsdocument/4719/loggedIn

6.2.3 Monitoring

Fisheries New Zealand monitors recreational catch of southern bluefin tuna in a variety of ways. This includes; amateur charter vessel records, reporting of recreational activity from commercial vessels, New Zealand sport fishing club records, the New Zealand gamefish tagging programme, management measures and social media. Further information on the different ways New Zealand monitors SBT recreational catch are outlined below:

Amateur charter vessel records:
Amateur charter vessel records are an important source of information when estimating recreational catch of SBT. Anyone in New Zealand who takes someone fishing where payment is made for the vessel and guide services, is required to be registered as an amateur-fishing charter vessel operator under the Fisheries Act 1996. Fish caught on these types of fishing trips are not entitled to be sold or traded, and the catch is regarded as recreational catch.

Compulsory reporting for recreational charter vessel operators was introduced in November 2010 under the Fisheries (Amateur Fishing) Regulations 2013. This requires amateur charter vessel operators to report catch to Fisheries New Zealand on a number of shared species of interest, this includes compulsory reporting for southern bluefin tuna and Pacific bluefin tuna.

In 2015 amateur charter vessel records showed that 10 SBT were caught, for an estimated weight of 1,050 kilograms, of which only five were retained. In 2016, 37 SBT were caught, for an estimated weight of 1,127 kilograms and 36 of them were retained. While in 2017 a total of 47 SBT were recorded and retained. (**Table 18)**

New Zealand sport fishing club records:
The New Zealand Sport Fishing Council has 57 affiliated clubs across New Zealand. Sport fishing club records provide an important source of information on tagging, landings and weights of highly migratory species caught by recreational fishers in New Zealand waters. Records of SBT landings from various sport fishing clubs are provided to Fisheries New Zealand.

Information captured through surveys and analysis of recreational sport fishing clubs in 2017 suggests that the majority of trips targeting southern bluefin tuna resulted in a single capture – only 15 % of trips landed three or more southern bluefin tuna. Feedback from stakeholders has also indicated that the average recreational vessel targeting southern bluefin tuna will carry three fishers.

In 2015, one SBT was recorded to be landed by sport fishing club records and seven SBT in 2016. In 2017 sport fishing club records reported 266 SBT were landed, with an estimated total weight of 19.4 tonnes and 13 were fish that were released alive. (**Table 19**)

Section 111 reporting:
Section 111 of the Fisheries Act 1996 stipulates that all fish that is on board, landed from, or transhipped from, any registered commercial fishing vessel or fish carrier is deemed to have been taken or possessed for the purpose of sale. However, commercial fishers can apply for an exemption to this provision that allows fish to be retained for recreational consumption subject to conditions requiring the use of recreational gear. Data on this type of recreational catch is captured as part of commercial reporting requirements.

Management measures:
In 2018, Fisheries New Zealand is holding public consultation which includes a review on the national recreational allowance for SBT. Feedback from this consultation round will provide additional information on the future level of recreational effort in this fishery.

The consultation will also discuss future management constraints for New Zealand's SBT recreational fishery.

Social media:
Social media; including Facebook and Instagram, provides a platform for New Zealand's commercial and recreational fishers alike to share information on SBT. Noted in the past year, fishers have been seen to share information through "fishing forums" on SBT landings and locations, as well as sharing

information about where SBT are located in New Zealand waters. A number of New Zealand's sport fishing clubs also share information on social media. Information from social media has also been used to supplement information received through official channels, and can provide insight into the behaviour of the recreational sector.

6.3 OTHER SOURCES (E.G. CUSTOMARY, TRADITIONAL AND/OR ARTISANAL FISHING)

6.3.1 Current status

One of the allowances under the New Zealand quota management is made to allow for the customary take of species. This customary allowance provides for catches of southern bluefin tuna that are governed by customary fishing regulations. There is no evidence to date that catches of southern bluefin tuna are made in this way. Most, if not all, non-commercial catches are taken subject to general provisions for amateur fishing (rather than under the customary fishing regulations). Based on these factors, Fisheries New Zealand has kept a nominal one tonne allocation for customary fishing.

6.3.2 Research

Fisheries New Zealand recognises that some of the constraints proposed to the recreational management of southern bluefin tuna may create an incentive to increase the use of customary fishing provisions and is seeking feedback from stakeholders on this potential shift in effort. As part of the wider consultation on total allowable catch setting, Fisheries New Zealand has been engaged with local iwi (i.e. tribal) forums around New Zealand to encourage interest in the ongoing management of southern bluefin tuna.

6.3.3 Monitoring

Fisheries New Zealand monitors customary permits however no permits have been used to take southern bluefin tuna to date.

7 Development and implementation of scientific observer programme

New Zealand's Observer Programme covers both domestic and foreign charter longline vessels. In 2016 and 2017, no foreign charter vessels targeting SBT fished in New Zealand's Exclusive Economic Zone, and increased coverage of the domestic fleet was attained. The target coverage level for fisheries targeting SBT is 10% of catch and effort, as specified in the CCSBT Scientific Observer Program Standards. Coverage is measured in two ways, proportion of catch (in numbers of fish) observed and proportion of hooks observed where relevant effort is hooks from sets that either targeted or caught SBT (unraised).

7.1 OBSERVER TRAINING

Overview of training programme provided to scientific observers:
Fisheries New Zealand's Observer Services Unit is responsible for the recruitment and training of Fisheries Observers. The recruitment process include a half day assessment centre, online physiological testing, drug and alcohol testing, a criminal record check, seafarers medical, and referee checks. Successfully shortlisted candidates then undergo a comprehensive 3 week training course which covers a mixture of New Zealand Qualification Authority (NZQA) unit standards, Fisheries New Zealand task specific units, other relevant government agency training modules, and industry representation. Candidates are assessed throughout the training course against the NZQA unit standards. Candidates must complete the entire 3 week course and pass a written exam at the end. Those that successfully pass the training course are deployed on at least one training trip at sea with an experience observer to train and mentor the new observers. Regular audits are undertaken by the trainer to ensure competency is obtained. Training trips last between 3-7 weeks depending on the

vessel type and fishery deployed to. Additional SBT specific training is provided during briefing for relevant fishery deployments.

The 3 week observer training course covers:

- State Services Code of conduct
- Maritime New Zealand training
- Data collection and report writing
- Safety at sea modules, including firefighting, emergency evacuations, communications, first aid
- Overview of NZ's Quota Management System
- Common parts of a vessel
- Commercial fishing methods
- Information display systems
- Catch quantification and species identification
- Biological sampling
- Protected species interaction and monitoring
- Computer training
- Vessel monitoring and compliance
- A day in the life of an observer role play

Number of observers trained:
There are over 100 observers in the Fisheries New Zealand's Observer programme. 100% of observers deployed by Fisheries New Zealand have successfully completed full training. 30-40 observers were recruited and trained in 2017.

Summary of qualifications / training and years of experience of the observers deployed in SBT fisheries during the past year:
There is no specific qualification required to be considered for recruitment for a Fisheries Observer. We look for people who can display:

- Good data collection and report writing skills
- Are reliable, independent, mature and adaptable
- Are willing to work irregular hours under a range of conditions

Preference is for people with tertiary qualifications, a clear interest in the marine environment, and have experience living at sea.

7.2 SCIENTIFIC OBSERVER PROGRAMME DESIGN AND COVERAGE

The fisheries observer programme is managed and coordinated by Fisheries New Zealand's Observer Services Unit. Fishing industry quota holders are levied or direct charged for observer coverage. Observer coverage for the incoming year is determined by consultation with industry and the requirements of the Observer Services Unit cliental, which include Fisheries Management teams, and the Department of Conservation. The Observer Services Unit reports on a financial year, which is from 1 July to 30 June. Observer deployment is managed by a small team of shore based staff in Wellington New Zealand. Observers are deployed throughout New Zealand to cover vessels operating within New Zealand's Exclusive Economic Zone and in international waters as appropriate.

Which fleets, fleet components, or fishery components were covered by the programme:

In relation to CCSBT, Fisheries New Zealand observers were deployed to the surface longline targeting southern bluefin tuna, bigeye tuna, and swordfish.

How vessels were selected to carry observers within the above fleets or components:

Observer placements are priorities based on: vessel level of effort and catch, new entrants to the fishery, length of time since previous observation, and compliance risk assessment.

How was observer coverage stratified: By fleets, fisheries components, vessel types, vessel sizes, vessel ages, fishing areas and seasons.

The New Zealand domestic SBT fishery currently consists of a largely uniform fleet of smaller longline vessels. New Zealand has previously stratified its observer coverage reporting based on domestic vs foreign charter vessels however this stratification is no longer relevant with the exit of the large foreign vessels from the fishery.

Details of observer coverage of the above fleets, including:

In 2016, 23% of the domestic catch and 19% of the domestic effort was observed, and in 2017, 21 % of the domestic catch and 20% of the domestic effort was observed (**Table 14** and **Table 16**).

During the 2017 calendar year, for those vessels targeting SBT, there were 444 sea days and 164 shore days.

7.3 OBSERVER DATA COLLECTED

List of observer data collected against the agreed range of data set out in Attachment 1.

Effort data: Amount of effort observed (vessel days, sets, hooks, etc), by area and season and % observed out of total by area and seasons
See **Table 15** and **Table 16**

Catch data: Amount of catch observed of SBT and other species (if collected), by area and season, and % observed out of total estimated SBT catch by area and seasons
See **Table 13** and **Table 14**

Length frequency data: Number of fish measured per species, by area and season.
See **Table 11**

Biological data: Type and quantity of other biological data or samples (otoliths, sex, maturity, Gonosomatic index, etc) collected per species.
See **Table 11**

7.4 TAG RETURN MONITORING

Six dart tags were recaptured during observed trips in 2015, none in 2016 and two in 2017. One of the tags was collected in region 6 while the other came from Region 5.

7.5 PROBLEMS EXPERIENCED

There were no problems experienced.

8 Other relevant information

New Zealand is progressing a Digital Monitoring Programme, which will require vessels to electronically report, use geospatial position reporting, and implement electronic monitoring.

9 Acknowledgements

Fisheries New Zealand acknowledges Terese Kendrick and John Holdsworth for assistance with various parts of this report. Also, we thank Colin Millar for his assistance to New Zealand in the preparation of the data.

10 Appendix – Tables

Table 1: Commercial catches of SBT in New Zealand fisheries waters (tonnes, whole weight) by calendar year and New Zealand fishing year (1 October to 30 September).

Year	Calendar year catches	Fishing year catches
1980	130.0	130.0
1981	173.0	173.0
1982	305.0	305.0
1983	132.0	132.0
1984	93.0	93.0
1985	94.0	94.0
1986	82.0	82.0
1987	59.0	59.0
1988	94.0	94.0
1989	437.2	437.1
1990	529.2	529.3
1991	164.5	164.5
1992	279.2	279.2
1993	216.6	216.3
1994	277.0	277.2
1995	436.4	434.7
1996	139.3	140.4
1997	333.7	333.4
1998	337.1	333.0
1999	460.6	457.5
2000	380.3	381.7
2001	358.5	359.2
2002	450.3	453.6
2003	389.6	391.7
2004	393.3	394.0
2005	264.4	264.0
2006	238.2	238.2
2007	382.6	383.1
2008	319.0	318.8
2009	418.5	417.3
2010	500.8	500.0
2011	547.1	547.2
2012	775.5	775.4
2013	756.4	758.2
2014	825.6	825.8
2015	922.3	922.2
2016	950.8	949.6
2017	913.3	913.9

Table 2: Catch (tonnes) for the charter fleet by year and CCSBT region. Based on raised catches. (No charter vessels fished in 1996 nor in 2016, 2017.)

Calendar Year	Region 5	Region 6	Other*
1989		296.3	0.3
1990	66.7	174.9	
1991	23.0	102.6	
1992	4.8	214.5	0.5
1993	20.2	120.5	9.5
1994		234.1	
1995	1.6	228.7	0.2
1996			
1997	52.3	186.2	
1998	83.9	117.3	
1999	9.8	190.7	
2000	2.5	132.5	
2001		139.3	
2002		148.4	
2003		82.1	
2004		126.4	
2005	34.4	53.0	
2006	9.9	95.3	
2007	53.0	161.0	
2008		200.0	
2009	17.0	201.2	
2010		207.8	
2011		199.1	
2012		240.1	0.1
2013		183.9	
2014		223.9	
2015		256.8	
2016			
2017			

*Most often erroneous position data

Table 3: Effort (1,000s of hooks) for the charter fleet by year and CCSBT region based on raised hooks. Note that this includes some non-SBT target effort in Region 5. (No charter vessels fished in 1996 nor in 2016.)

Calendar Year	Region 5	Region 6	Other*
1989		1596	3.5
1990	259	1490.6	
1991	306	1056.5	
1992	47.6	1386.8	3
1993	174.1	1125.7	101.4
1994		799.1	
1995	27.1	1198.7	13.5
1996			
1997	135.2	1098.7	
1998	225	616	
1999	57.2	955.1	
2000	30.3	757.9	
2001		639.4	
2002		726.4	
2003	3	866.6	
2004		1113.5	
2005	137	498.9	
2006	39.4	562.5	
2007	271.6	1136.1	
2008		568.3	
2009	66.8	731.0	
2010		484.9	
2011		495.9	
2012		548.4	3.4
2013	13.2	450.8	
2014		655.8	
2015		625.9	
2016			
2017			

*Most often erroneous position data

Table 4: Catch (tonnes) for the domestic fleet by year and CCSBT region based on raised catches.

Calendar Year	Region 5	Region 6	Other*
1980			130.0
1981			173.0
1982			305.0
1983			132.0
1984			93.0
1985			94.0
1986			82.0
1987			59.0
1988			94.0
1989	0.1	140.5	
1990	6.9	278.7	2.0
1991	0.9	37.8	0.1
1992	6.2	53.2	
1993	49.4	16.3	0.8
1994	6.5	35.6	0.8
1995	15.0	184.9	6.1
1996	34.2	103.8	1.3
1997	57.9	36.2	1.1
1998	83.4	52.2	0.4
1999	194.7	64.8	0.6
2000	184.0	60.9	0.4
2001	113.1	105.7	0.4
2002	135.7	162.9	3.2
2003	216.7	89.7	0.1
2004	101.0	165.9	
2005	165.2	11.6	0.3
2006	122.8	10.2	
2007	162.5	2.1	
2008	80.5	38.1	
2009	133.5	66.7	0.2
2010	204.8	88.2	
2011	237.2	110.8	
2012	249.1	285.8	
2013	344.1	227.2	
2014	334.0	267.6	
2015	406.1	259.3	0.1
2016	563.5	386.3	1.1
2017	483.2	429	1.1

* Includes erroneous position data and data without positions.

Table 5: Effort (1,000s hooks that caught or targeted SBT) for the domestic fleet by year and CCSBT region based on raised hooks.

Calendar Year	Region 5	Region 6	Other*
1989			
1990	41.7		
1991	31.5	49.2	
1992	71.7	12.1	
1993	644.0	108.1	7.7
1994	122.6	143.3	5.8
1995	221.5	760.4	26.7
1996	417.9	564.3	11.5
1997	736.4	8.9	17.3
1998	633.6	314.5	1.2
1999	1221.4	382.9	5.5
2000	1164.0	454.4	8.5
2001	1027.6	751.5	1.9
2002	1358.6	1246.8	13.5
2003	1868.7	1569.1	4.3
2004	1154.1	1431.9	1.2
2005	1133.0	153.6	2.4
2006	1036.4	122.4	0.9
2007	681.2	19.0	
2008	527.8	94.0	
2009	733.9	165.4	1.3
2010	1116.7	294.3	
2011	955.7	197.8	
2012	858.9	629.3	
2013	905.3	565.0	1.2
2014	595.0	540.2	
2015	716.0	524.1	0.7
2016	883.8	565.9	12.6
2017	866.1	590.2	7.9

* Includes erroneous position data and data without positions.

Table 6: Number of vessels catching SBT in New Zealand fisheries waters by calendar year and New Zealand fishing year (1 October to 30 September).

Year	Calendar year vessel numbers	Fishing year vessel numbers
2001	132	132
2002	151	155
2003	132	132
2004	99	101
2005	57	58
2006	56	57
2007	44	45
2008	35	36
2009	40	39
2010	44	42
2011	42	42
2012	43	44
2013	39	39
2014	37	38
2015	34	33
2016	32	32
2017	32	32

Table 7: CPUE (number of fish per 1,000 target hooks) for the foreign charter fleet by year and Region, based on raised catches and effort.

Calendar Year	Region 5	Region 6	Other*
1989		2.24	1
1990	2.98	1.61	
1991	0.91	1.43	
1992	1.32	2.48	2.52
1993	1.72	1.69	2.35
1994		4.51	
1995	0.65	2.60	0.24
1996			
1997	4.68	2.25	
1998	5.48	2.94	
1999	2.50	2.78	
2000	1.04	2.78	
2001		3.77	
2002		3.33	
2003	0.00	1.34	
2004		1.37	
2005	2.65	1.18	
2006	2.91	1.95	
2007	1.93	1.70	
2008		4.88	
2009	2.42	4.55	
2010		7.80	
2011		6.39	
2012		7.33	0.29
2013	0.08	6.49	
2014		6.10	
2015		6.74	
2016	NA	NA	NA
2017	NA	NA	NA

Table 8: CPUE (number of fish per 1,000 target hooks) for the domestic fleet by year and Region, based on raised catches and effort.

Calendar Year	Region 5	Region 6	Other*
1989			
1990	1.32		
1991	0.40	0.74	
1992	1.00	1.35	
1993	0.9	1.83	1.60
1994	0.69	3.62	2.38
1995	0.72	4.63	4.26
1996	1.17	2.68	2.37
1997	1.11	1.52	0.52
1998	2.22	1.82	7.00
1999	2.58	2.13	1.70
2000	2.37	1.99	0.75
2001	1.84	2.63	3.63
2002	1.55	2.20	3.53
2003	1.54	0.82	0.52
2004	1.16	1.46	0.0
2005	1.79	0.70	1.43
2006	1.44	0.88	0.0
2007	2.65	0.43	
2008	1.84	5.99	
2009	2.50	7.85	2.50
2010	2.75	7.29	
2011	3.98	11.12	
2012	4.84	9.78	
2013	6.15	8.11	2.00
2014	8.93	10.14	
2015	9.35	10.19	1.67
2016	12.34	16.48	1.83
2017	10.74	17.43	1.46

Table 9: Frequency of catch from the charter fleet under 110, 120, 130, and 140 centimeters (cm) for 1989 to 2016. (No charter vessels in 1996, 2016, or 2017.)

Year	< 110 cm	< 120 cm	< 130 cm	< 140 cm
1989	0.006	0.026	0.045	0.071
1990	0.041	0.101	0.131	0.164
1991	0.114	0.158	0.274	0.317
1992	0.052	0.237	0.392	0.556
1993	0.217	0.316	0.472	0.594
1994	0.028	0.122	0.229	0.380
1995	0.019	0.05	0.161	0.326
1996	NA	NA	NA	NA
1997	0.038	0.057	0.098	0.162
1998	0.094	0.209	0.247	0.321
1999	0.033	0.082	0.157	0.216
2000	0.067	0.194	0.279	0.370
2001	0.093	0.196	0.378	0.519
2002	0.037	0.135	0.245	0.398
2003	0.002	0.009	0.094	0.241
2004	0.001	0.001	0.004	0.042
2005	0.000	0.000	0.002	0.008
2006	0.035	0.041	0.051	0.059
2007	0.042	0.058	0.087	0.109
2008	0.080	0.181	0.230	0.289
2009	0.033	0.196	0.384	0.485
2010	0.062	0.106	0.366	0.633
2011	0.035	0.073	0.135	0.403
2012	0.062	0.142	0.212	0.328
2013	0.039	0.089	0.175	0.258
2014	0.050	0.177	0.321	0.438
2015	0.044	0.077	0.159	0.284
2016	NA	NA	NA	NA
2017	NA	NA	NA	NA

Table 10: Number of otoliths collected and aged by observers from the charter and domestic fleet catch for the years 2000 – 2016. (At the time of submitting this report, 2017 information was not yet available.)

	Charter fleet		Domestic fleet	
Year	Otoliths	Number aged	Otoliths	Number aged
2000	149	0		
2001	777	198		
2002	1199	197		
2003	838	197		
2004	1141	196	120	23
2005	417	252	3	3
2006	443	249		
2007	714	254		
2008	745	253		
2009	1066	268		
2010	875	258		
2011	604	270		
2012	1252	255		
2013	1019	252		
2014	1241	257		
2015	1231	254		
2016			111	89
2017			121	Pending

Table 11: Biological specimens taken by observers

				LF #s	Sexed	Head	Viscera	Stomach Log	Otoliths	Tail	Anal fin	Entire Specimen	White Muscle	Photo	Gill raker	Stomach contents
NZ	2016	SLL	5	1,607	1,443	0	3	1197	0	0	0	1	528	128	0	0
			6	2,394	2,045	1	5	1919	111	169	0	0	724	24	0	0
NZ	2017	SLL	5	2,003	1,806	0	0	1696	54	10	12	0	452	30	1	0
			6	2,051	1,416	0	0	1731	67	0	0	0	701	23	19	13

Table 12: Number of releases and discards observed and the estimated total number of discards (separated by life status[1] - alive and dead) based on observer coverage and the life status of the observed discards for the charter fleet. Note that numbers are rounded to the nearest whole fish. (No charter vessels fishing in 1996, 2016, or 2017.)

	Observed numbers		Scaled estimate		
Year	Alive	Dead	Alive (released)	Dead	Total
1989	0	0	0	0	0
1990	0	0	0	0	0
1991	0	0	0	0	0
1992	0	0	0	0	
1993	18	4	55	13	68
1994	27	9	40	13	53
1995	2	3	4	9	13
1996	0	0			
1997	0	23	0	38	38
1998	0	20	0	20	20
1999	18	15	18	15	33
2000	0	3	0	4	4
2001	3	3	3	4	6
2002	2	3	2	3	5
2003	0	2	0	2	2
2004	0	2	0	2	2
2005	0	0	0	0	0
2006	2	2	2	2	5
2007	2	1	4	2	5
2008	0	0	0	0	0
2009	5	0	6	0	6
2010	10	2	12	3	15
2011	10	0	14	0	14
2012	36	0	43	0	43
2013	64	4	82	5	87
2014	65	0	78	0	78
2015	16	0	20	0	20
2016	**No charter vessels fishing in New Zealand waters this year**				
2017	**No charter vessels fishing in New Zealand waters this year**				

[1] The Resolution on Reporting all Sources of Mortality of Southern Bluefin Tuna requires that members report the fate of discards. New Zealand does not currently use the moribund category when reporting fate of captures. Moribund fish are included within the "dead" category reflecting the domestic requirement that only discarded fish which are "likely to survive" can be considered "alive".

Table 13: Actual number of releases and discards observed and the estimated total number of discards (separated by life status - alive and dead) based on observer coverage and the life status of the observed discards for the domestic fleet. Note that numbers are rounded to the nearest whole fish.

	Observed numbers		Scaled estimate		
Year	Alive	Dead	Alive (released)	Dead*	Total
1989	0	0			
1990	0	0			
1991	0	0			
1992	0	0	0	0	0
1993	0	0			
1994	0	0	0	0	0
1995	1	3	10	20	30
1996	4	1	25	6	31
1997	0	1	0	4	4
1998	0	0	0	0	0
1999	0	0	0	0	0
2000	0	0	0	0	0
2001	2	3	8	10	18
2002	2	2	24	30	53
2003	0	0	0	0	0
2004	0	1	0	7	7
2005	4	1	33	8	42
2006	1	0	16	0	16
2007	1	1	8	8	15
2008	2	0	13	0	13
2009	1	1	12	12	24
2010	24	2	282	25	307
2011	37	7	442	84	526
2012	61	5	745	65	810
2013	50	0	1180	0	1180
2014	48	19	697	276	973
2015	62	15	910	214	1124
2016	534	66	2770	342	3113
2017	193	31	974	158	1132

*Dead discards can only occur when authorised by observers, so the scaled estimates should be treated with caution. These SBT included those with shark or orca-inflicted damage.

Table 14: Observer coverage in terms of catch (proportion of individual SBT observed) for the domestic surface longline fleet fleet for 2016 and 2017 calendar years.

Country/ Fishing Entity	Calendar Year	Fishery		CCSBT statistical area	Total SBT catch numbers	Observed SBT catch numbers	Observer coverage (%)
		Gear Code	Fleet Code				
NZ	2016	SLL	NZD	5	11,362	1,962	17%
				6	9,382	2,787	30%
NZ	2017	SLL	NZD	5	9,357	2,181	23%
				6	9,953	2,195	22%

Table 15: Observer coverage in terms of estimated catch (proportion of total estimated weight) for the domestic surface longline fleet for 2016 and 2017 calendar years.

Country/ Fishing Entity	Calendar Year	Fishery		CCSBT statistical area	Total SBT Catch (kgs)	Observed SBT Catch (kgs)	Observer coverage (%)
		Gear Code	Fleet Code				
NZ	2016	SLL	NZD	5	467,802	80,901	17%
				6	320,054	101,288	32%
NZ	2017	SLL	NZD	5	402,862	106,786	27%
				6	356,652	92,240	26%

Table 16: Observer coverage in terms of effort (proportion of hooks observed) for the domestic fleet for 2016 and 2017 calendar years.

Country/ Fishing Entity	Calendar year	Fishery		CCSBT statistical area	Total Effort (no. of hooks)	Observed Effort (no. of hooks)	Observer coverage (%)
		Gear code	Fleet code				
NZ	2016	SLL	NZD	5	854,222	138,694	16%
				6	539,330	129,930	24%
NZ	2017	SLL	NZD	5	836,054	149,174	18%
				6	564,695	127,997	23%

Table 17: Observer coverage in terms of days for the domestic fleet for 2016 and 2017 calendar year

Country/ Fishing Entity	Calendar Year	Fishery		CCSBT statistical area	Total Effort (vessel days)	Total Effort (vessel days)	Observer coverage (%)
		Gear Code	Fleet Code				
NZ	2016	SLL	NZD	5	973	135	14%
				6	465	115	25%
NZ	2017	SLL	NZD	5	929	153	17%
				6	507	117	23%

Table 18: Number of landed SBT recorded through amateur charter vessel reporting for 2012-2017 calendar years.

Calendar year	2012	2013	2014	2015	2016	2017
Amateur charter vessel reporting SBT landed (number)	4	12	0	5	36	47

Table 19: Number of landed SBT reported through New Zealand sport fishing clubs 2012-2017 calendar years.

Calendar year	2012	2013	2014	2015	2016	2017
New Zealand sport fishing clubs landed SBT (number)	0	0	2	1	7	266

11 Appendix – Figures

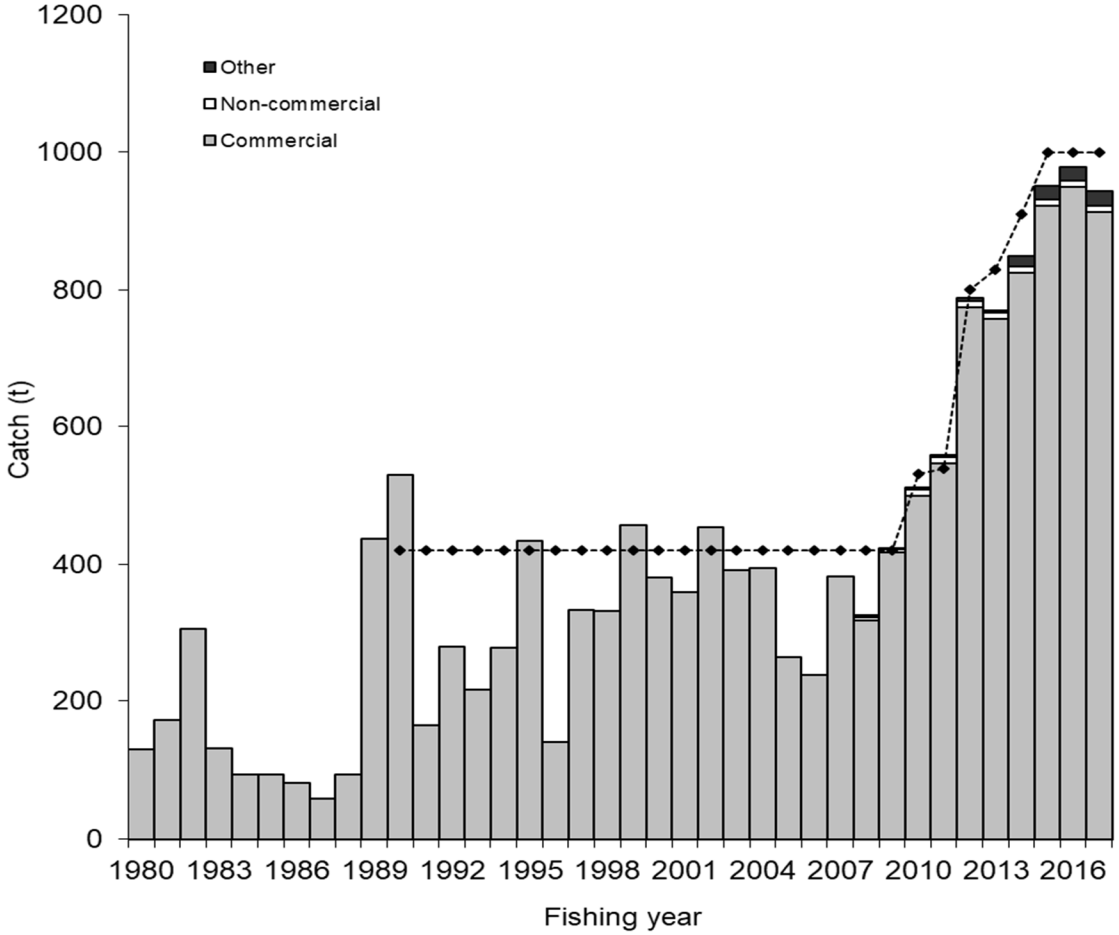

Figure 1: Commercial catches of SBT (tonnes, whole weight) by New Zealand fishing year. From 1998/99 to 2000/01, commercial catch information is from Licensed Fish Receivers, and from 2001/02, commercial catch information is from Monthly Harvest Returns from permit holders. The dashed horizontal line refers to the catch limit for New Zealand. From the 2007/08 fishing year, estimates of non-commercial catch and discard mortality (included as 'other') are provided.

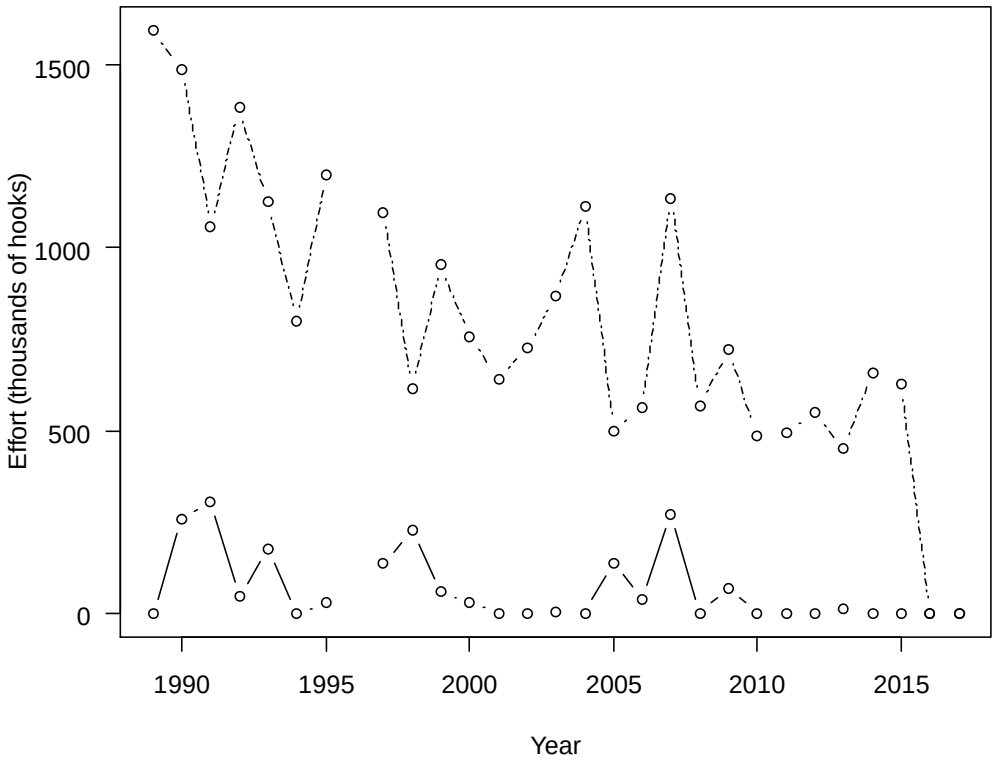

Figure 2: Effort (1,000s of hooks) for the charter fleet in Region 5 (solid line) and Region 6 (dashed line). Note that this includes some non-SBT target effort in Region 5 and that no charter vessels fished in 1996, 2016, or 2017.

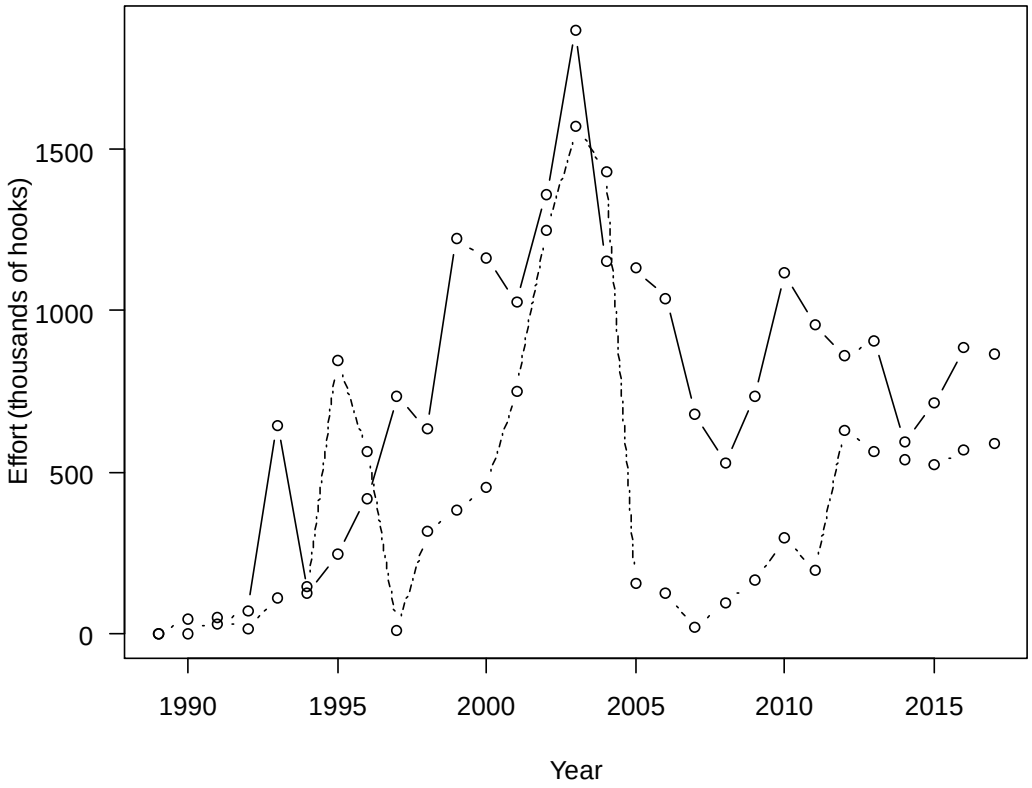

Figure 3: Target effort (1,000s of hooks, hooks from sets that either targeted or caught SBT) by the domestic fleet for Region 5 (solid line) and Region 6 (dashed line).

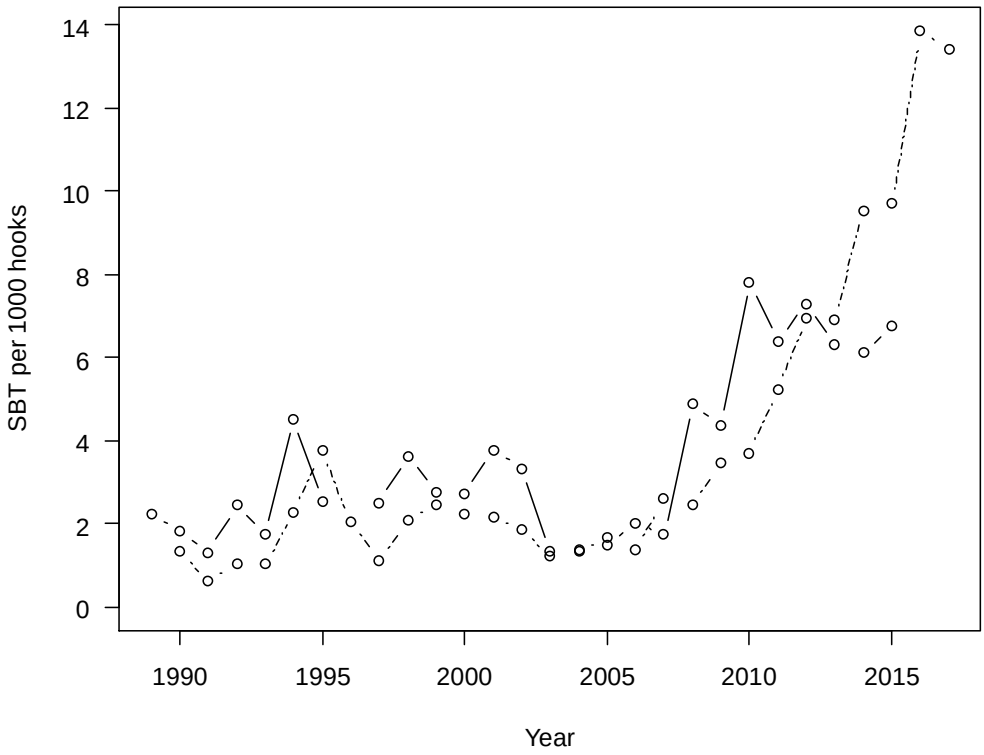

Figure 4: CPUE (number of SBT per 1,000 hooks) by calendar year for the charter (solid line) and domestic (dashed line) longline fleets based only on effort from sets that either targeted or caught SBT. Note that no charter vessels fished in 1996, 2016, or 2017.

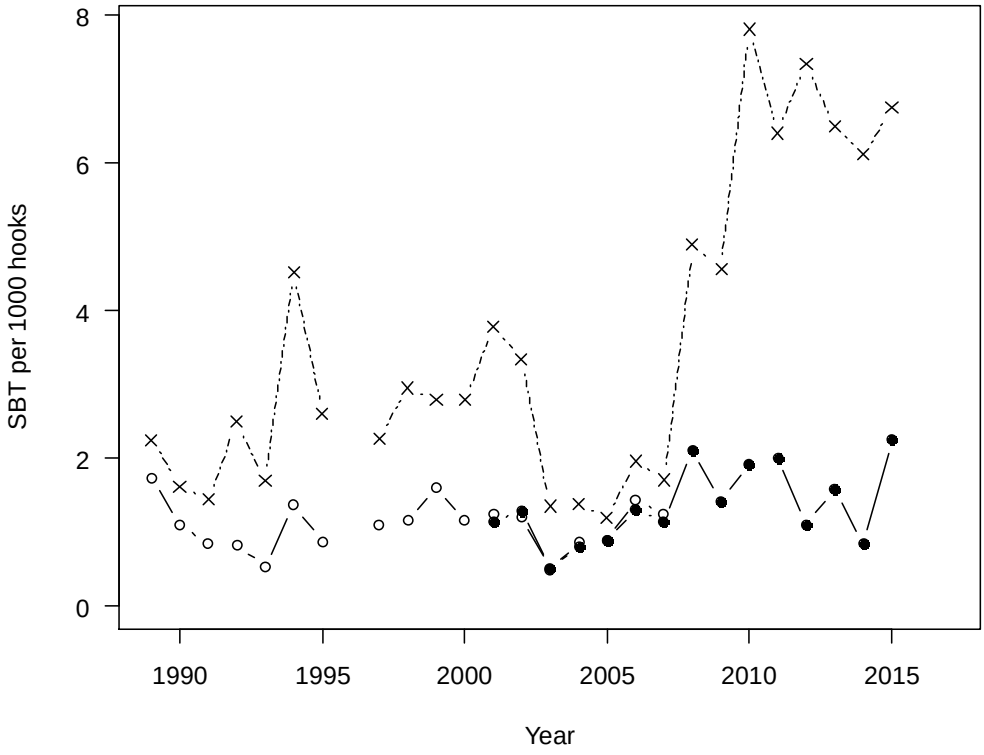

Figure 5: CPUE (number of SBT per 1,000 hooks) from the charter fleet in Region 6 (west coast South Island) for all southern bluefin tuna (dashed line) and for fish greater than 10 years of age based on proportional ageing data (solid line, open symbols) and based on direct ageing data (solid line, solid symbols).

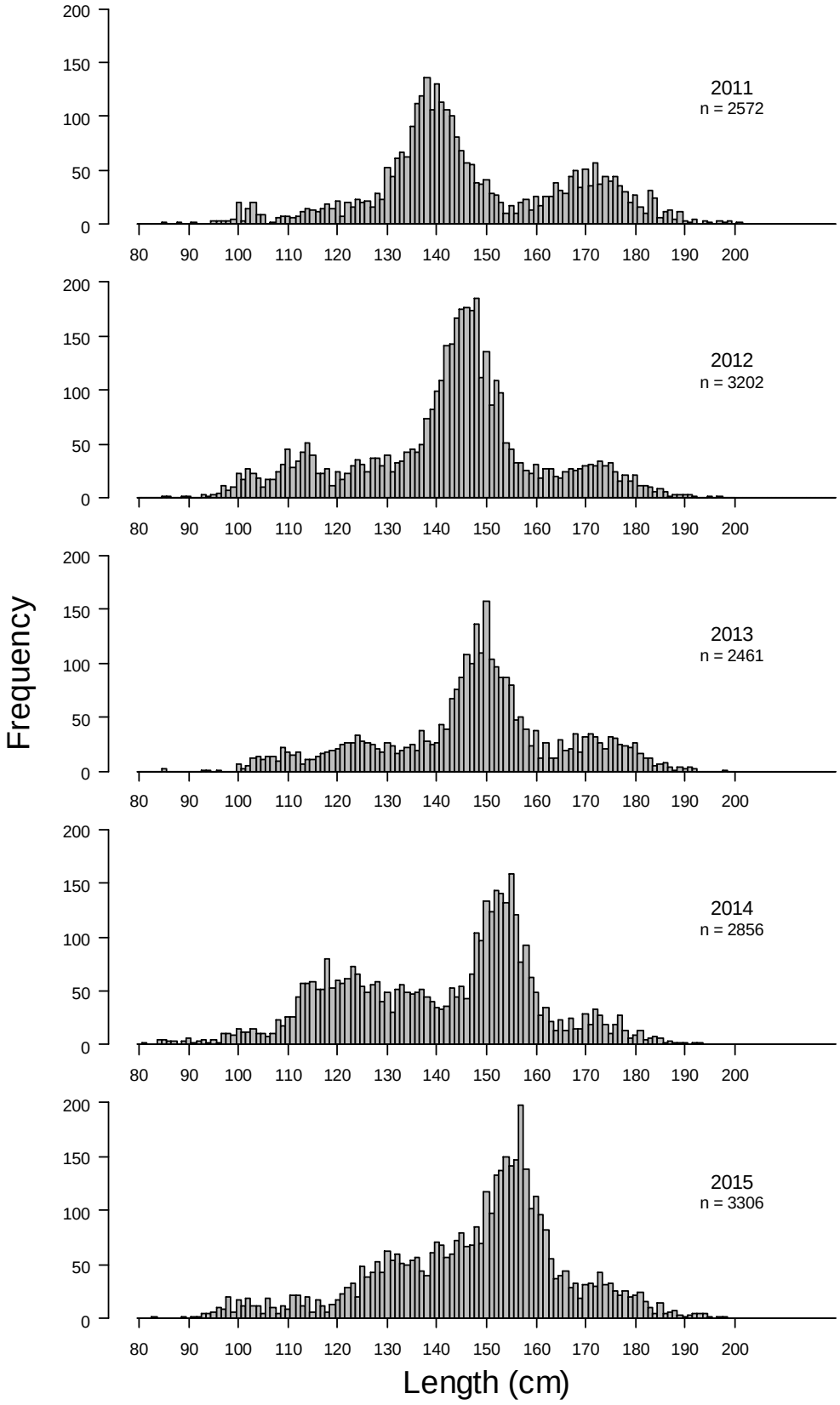

Figure 6: Length frequency of SBT catch (raised) by the charter fleet for the most recent five calendar years (no charter vessels fished in 2016 or 2017).

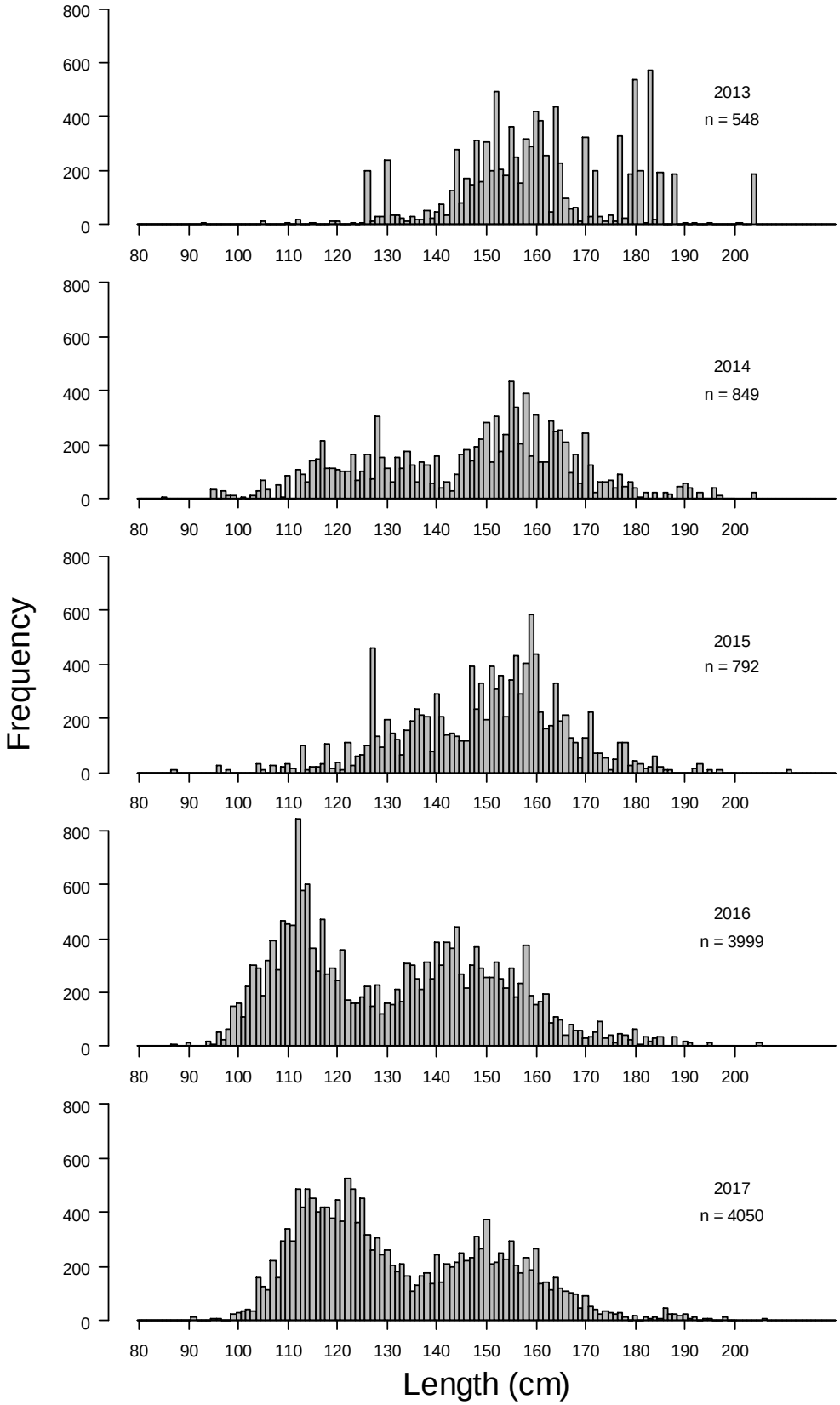

Figure 7: Length frequency of SBT catch by the domestic fleet for the five most recent calendar years.

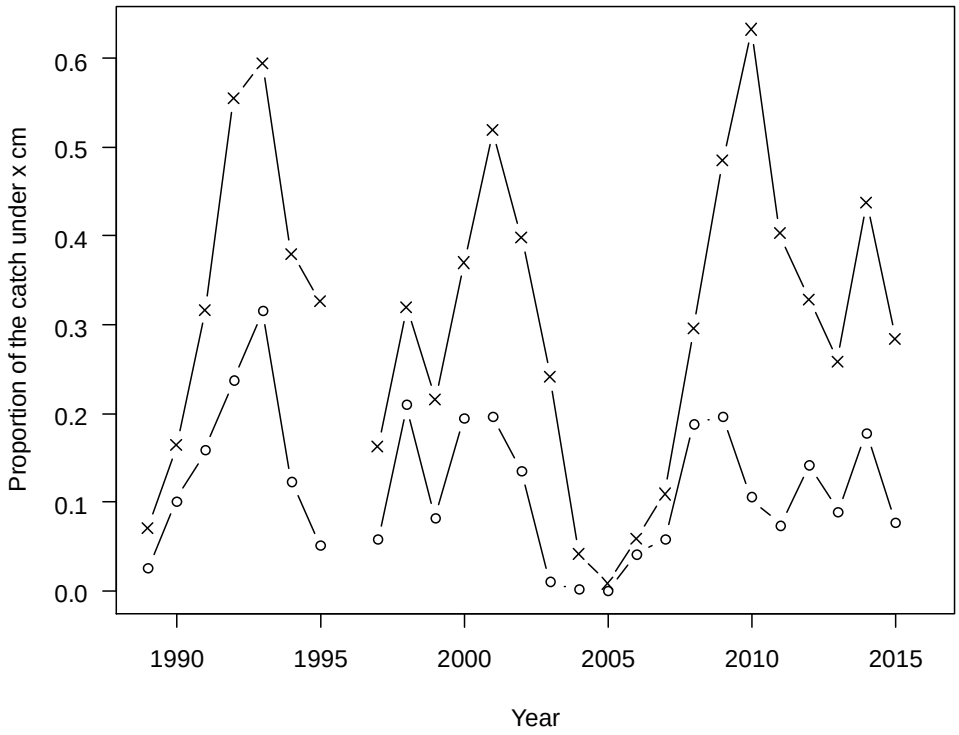

Figure 8: Proportion of the catch from the charter fleet under 120 cm (o) and 140 cm (x) since 1989 (no charter vessels fishing in 1996, 2016 or 2017).

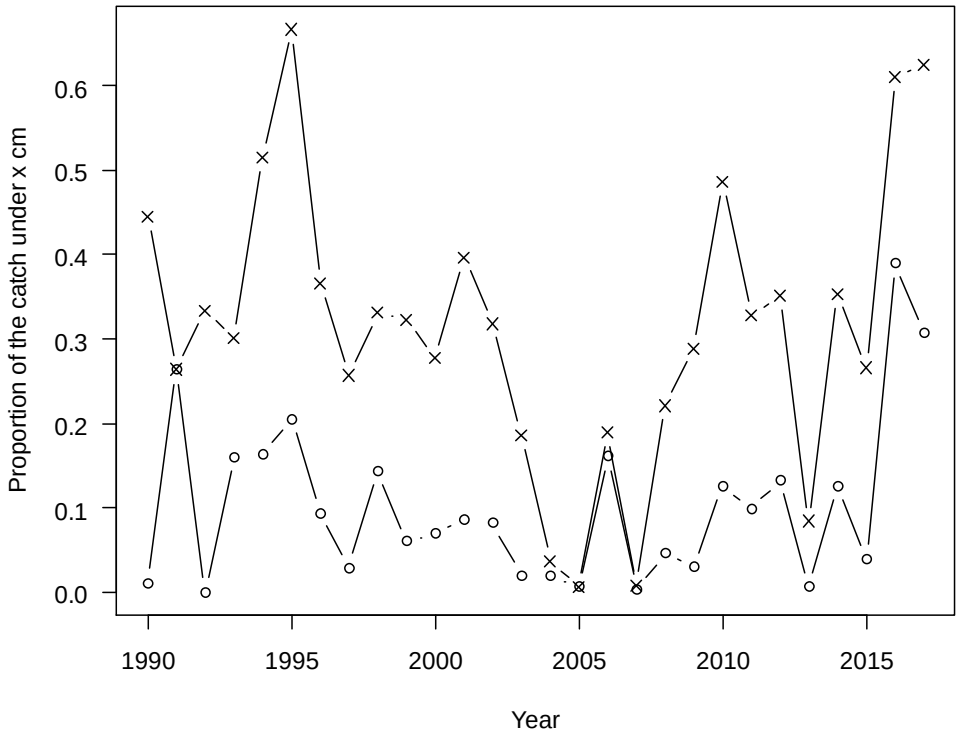

Figure 9: Proportion of the catch from the domestic fleet under 120 cm (o) and 140 cm (x) for 1989 to 2017.

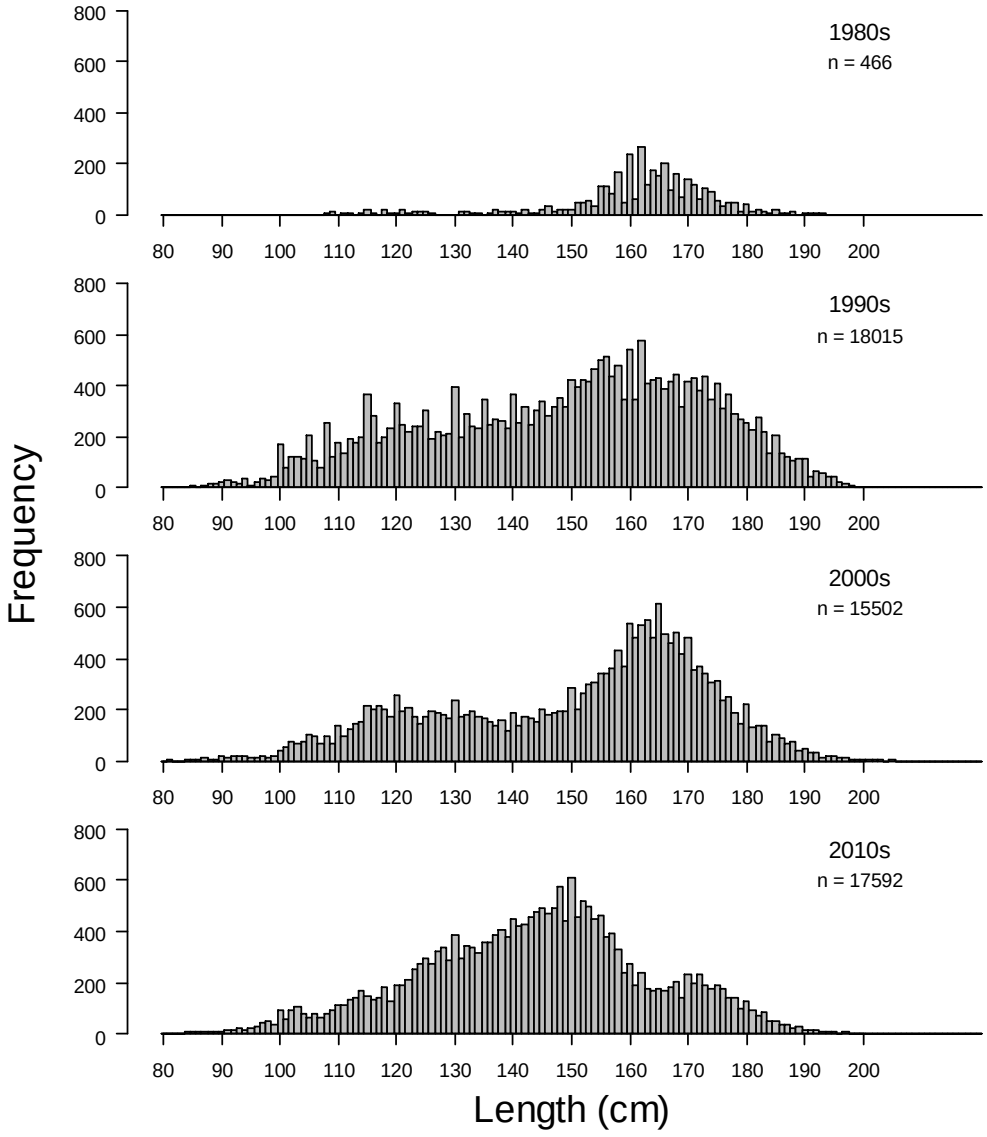

Figure 10: Length frequencies (raised) for the charter fleet in the 10 year periods 1990-99, 2000-09, and 2010-present. (No charter vessel fished in 2016 or 2017.) n= is the number of fish measured

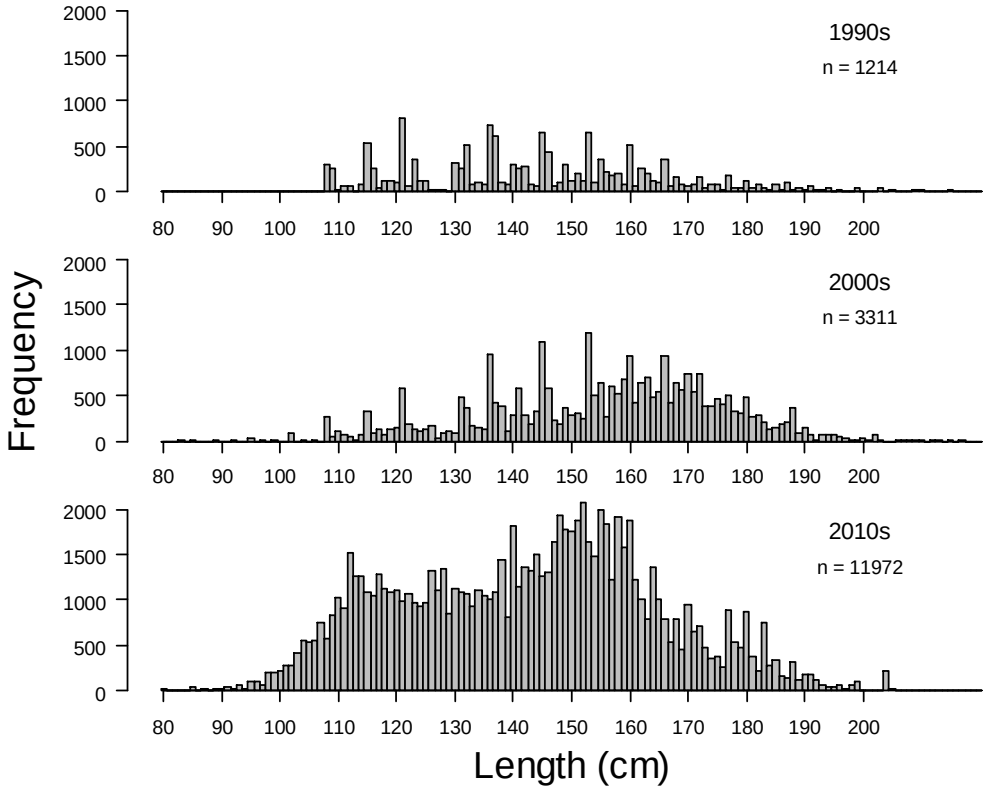

Figure 11: Length frequencies (raised) for the domestic fleet in the 10 year periods 1990-99, 2000-09, and 2010-present. (No charter vessel fished in 2016 or 2017.) n= is the number of fish measured

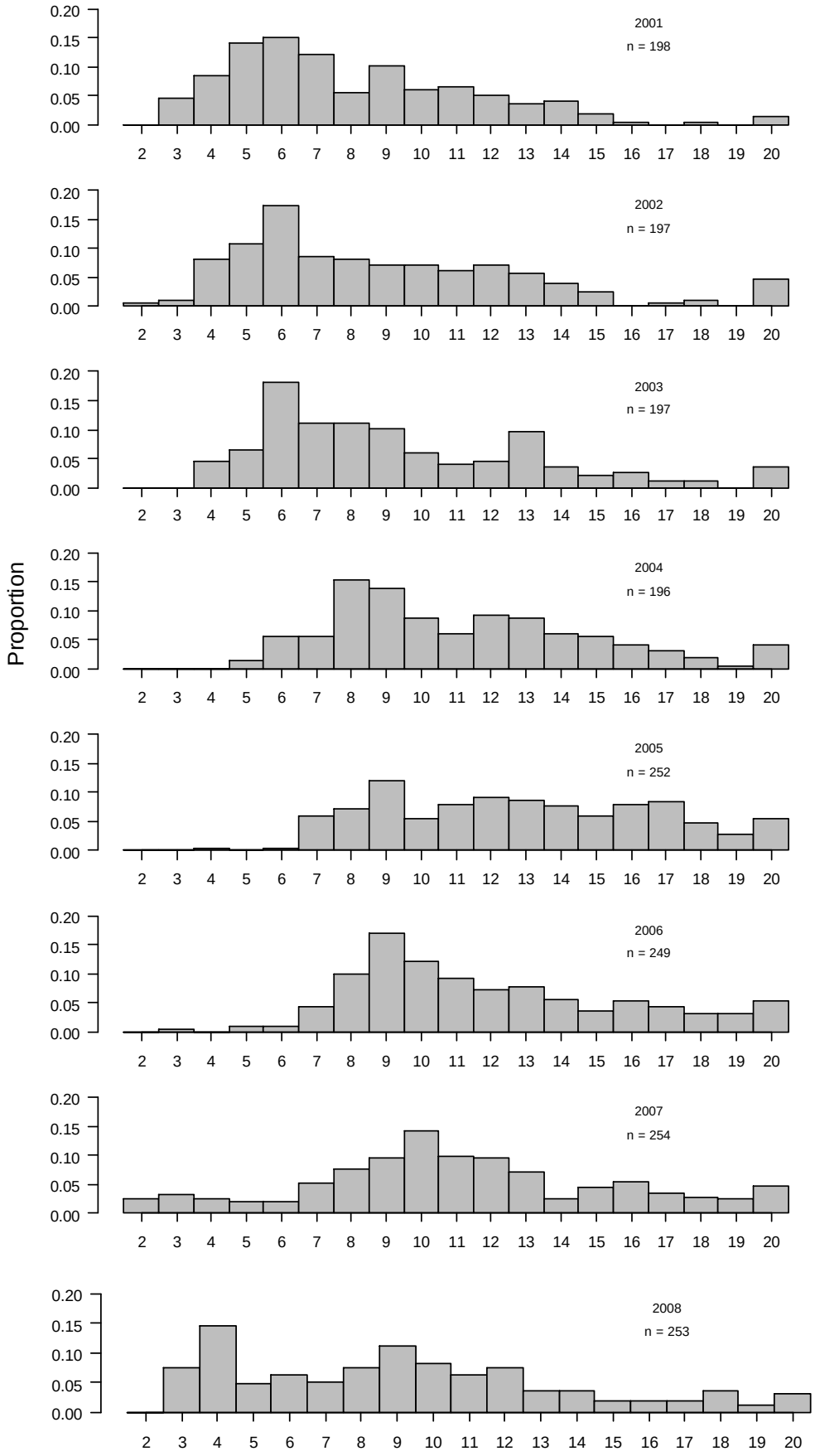

Figure 12: Proportion-at-age for the charter fleet for 2001 to 2017 based on direct ageing. Age 20 is a plus group.

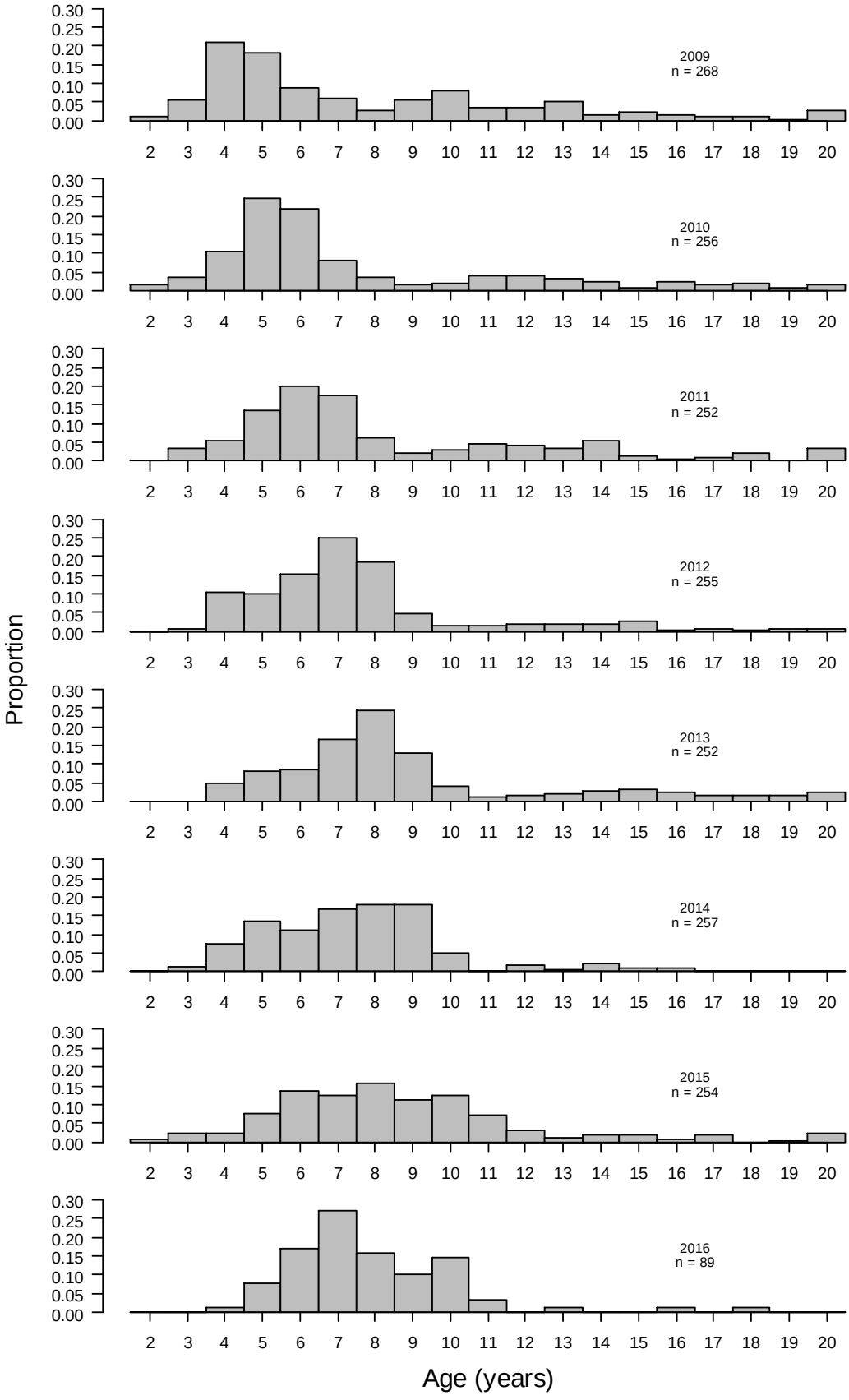

Figure 12 (continued): Proportion-at-age for the charter fleet for 2001 to 2015 based on direct ageing. The data for 2016 is age-frequency of SBT catch by the domestic fleet. Age 20 is a plus group.

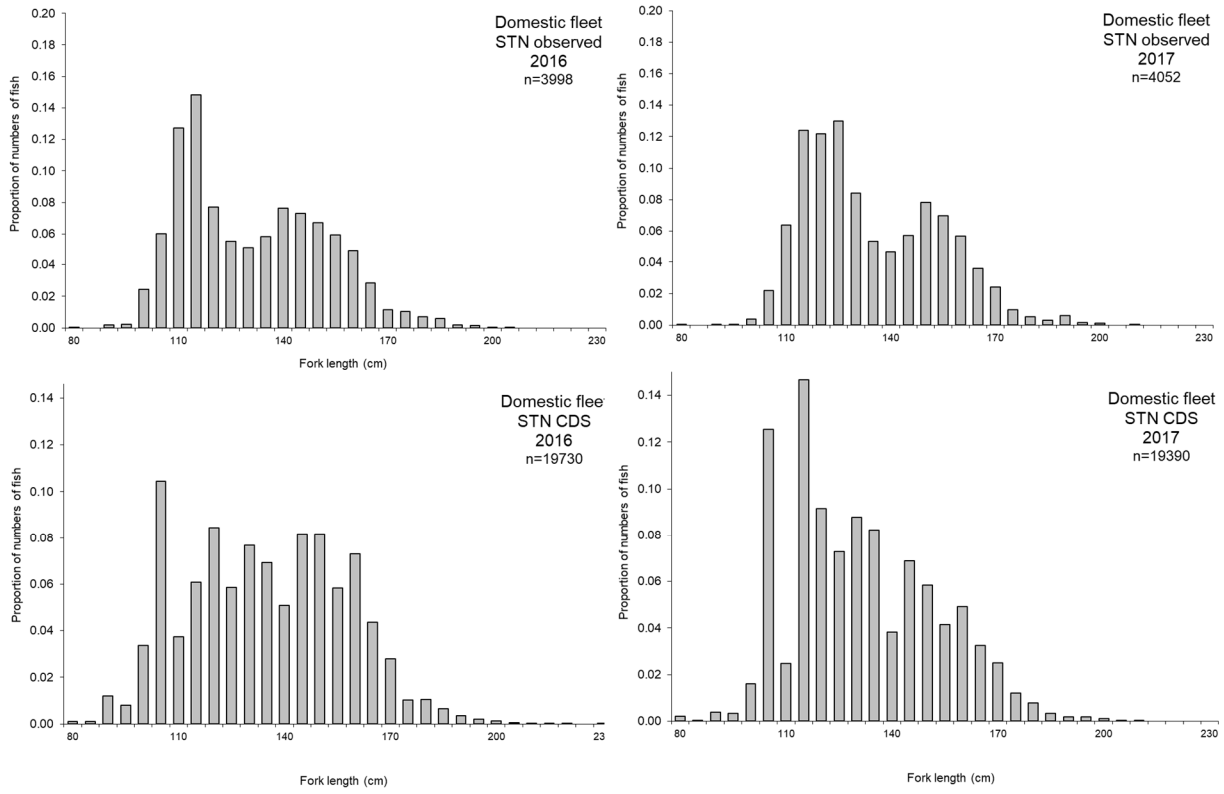

Figure 13: Proportion-at-length for SBT catches from 2016, and 2017 for the domestic fleet measured by observers, and reported on CDS forms.

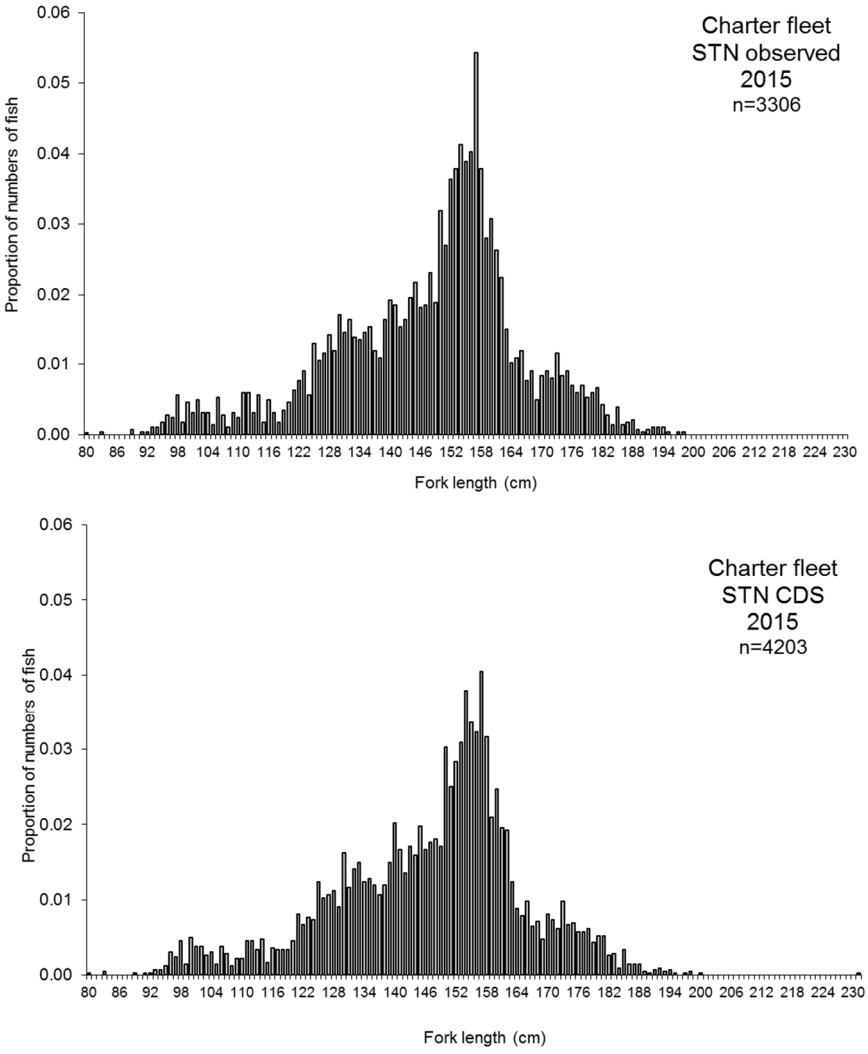

Figure 14: Proportion-at-length for the SBT catches from 2015 for the charter fleet measured by observers, and reported on CDS forms.

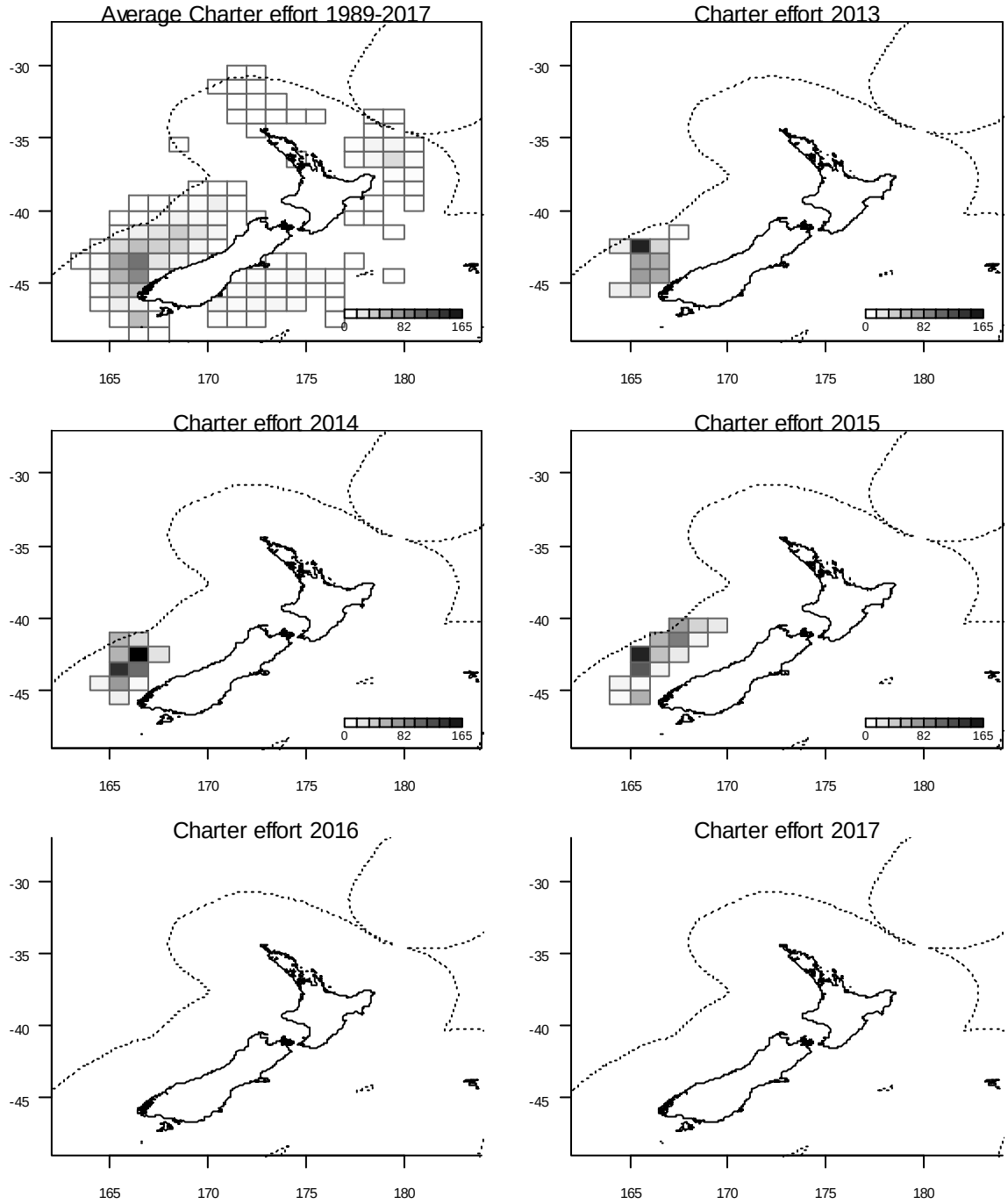

Figure 15: Distribution of longline effort (1,000s of hooks per one degree square) for the charter fleet: average for the time series (1989 to 2017), and annually for 2013 to 2017. (No charter vessels fished in 2016 or 2017.)

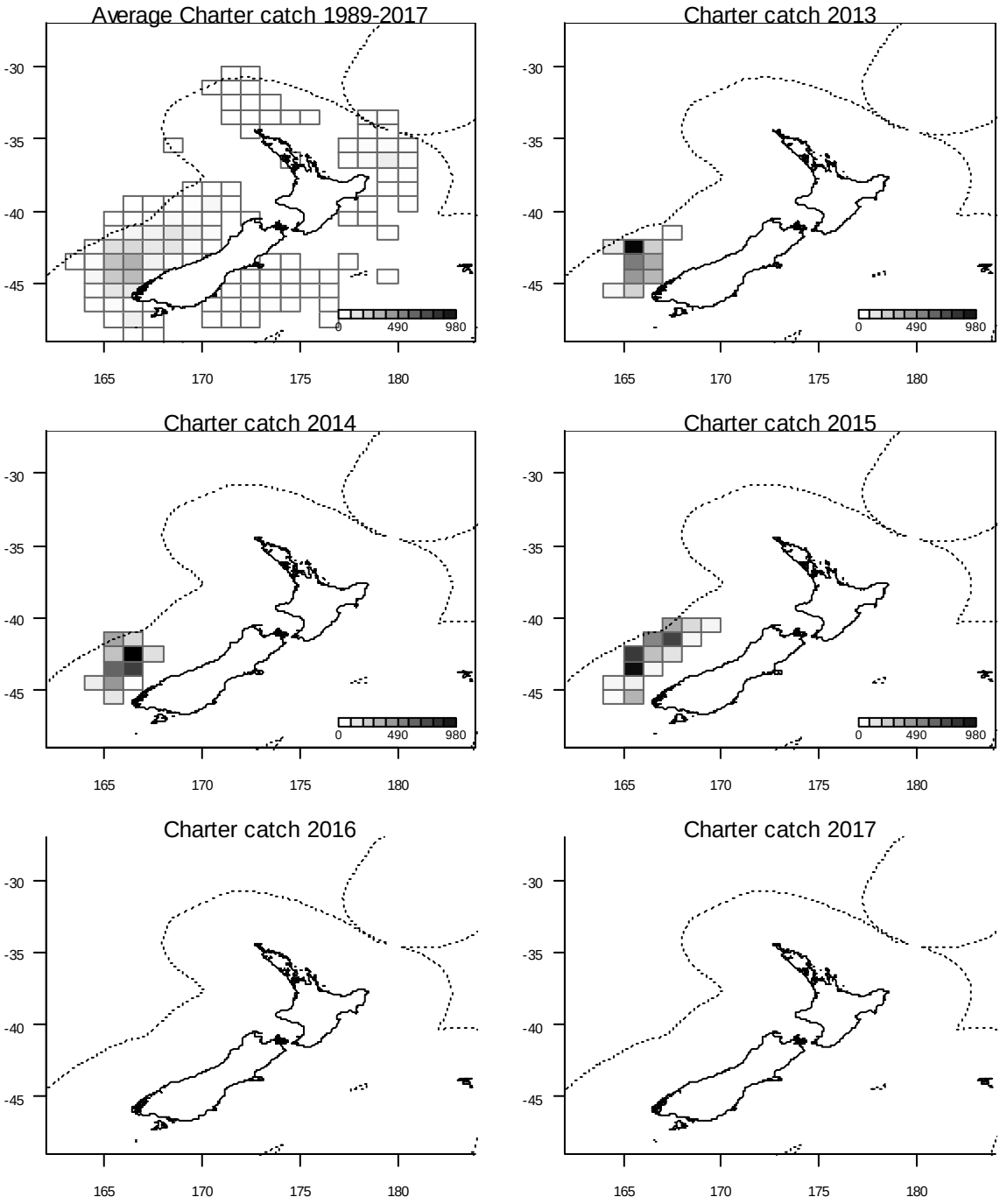

Figure 16: Distribution of longline catches (number of fish per one degree square) for the charter fleet: average for the time series (1989 to 2017), and annually for 2013 to 2017. (No charter vessels fishing in 2016 or 2017.)

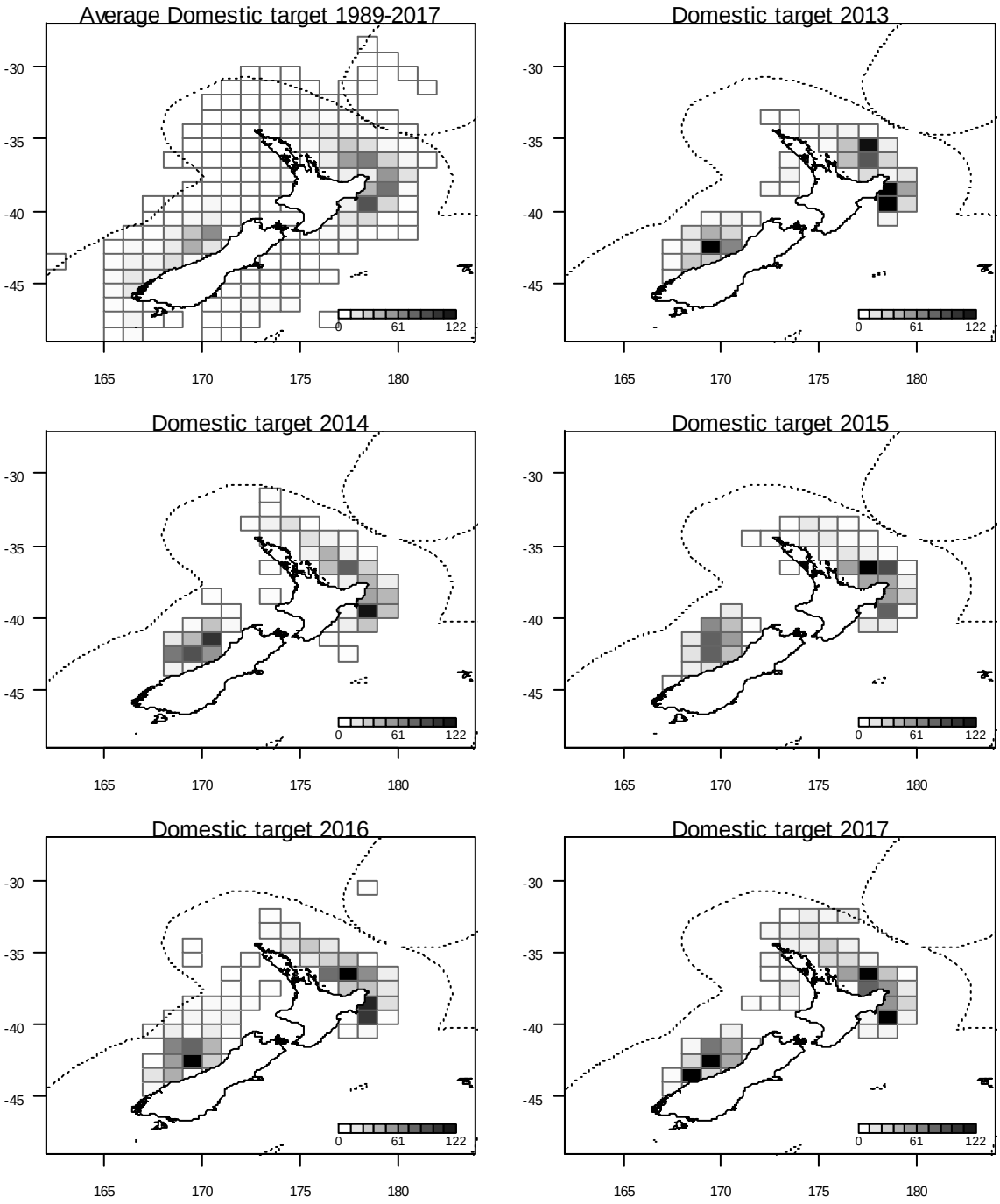

Figure 17: Distribution of longline effort (1,000s of hooks per one degree square) for the domestic fleet that was targeted at SBT: average for the time series (1989 to 2017), and annually for 2013 to 2017.

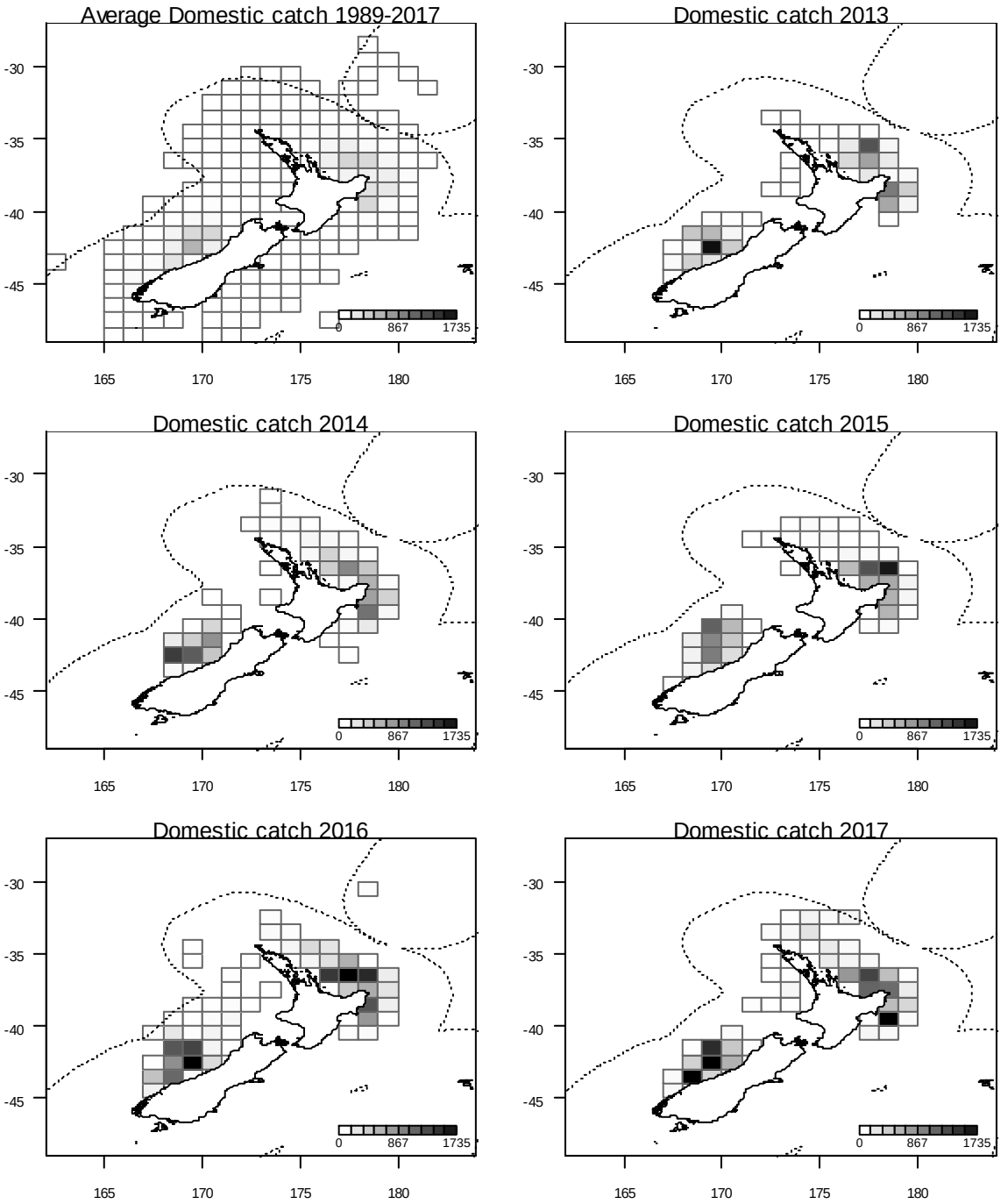

Figure 18: Distribution of longline catches (number of fish per one degree square) for the domestic fleet: average for the time series (1989 to 2017), and annually for 2013 to 2017.