

**CCBST-ESC/0709/SBT Fisheries/New Zealand**

**Annual Review of National SBT Fisheries for the  
Scientific Committee**

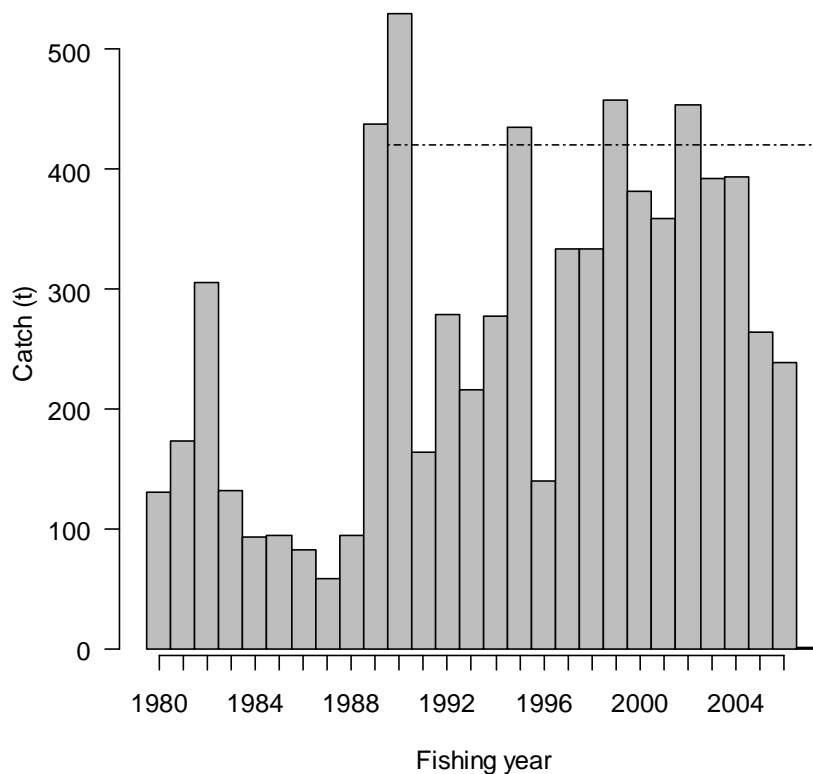
**New Zealand**

**2007**

# 1 Introduction

Historically both adult and juvenile southern bluefin tuna (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 – with several tonnes taken in pole and line and troll fisheries. From the late 1970s and early 1980s, a concerted effort to develop a domestic fishery to service the Japanese market was undertaken. By 1982 the handline fishery was established with the catch frozen onboard a former Japanese longline vessel. The handline fishery continued, albeit at a reduced level, following the record 1982 season (305 tonnes landed) into the early 1990s when longlining became the dominant fishing method for SBT.

The New Zealand SBT fishery has been constrained by a national catch limit of 420 tonnes per year (New Zealand fishing year – 1 October to 30 September) since 1989. During this time New Zealand has exceeded its quota on a few occasions and when the catch limit has been exceeded, the subsequent year's catch limit has been reduced to adjust for the over-catch (Figure 1; Table 1).



**Figure 1: Catches of southern bluefin tuna (tonnes whole weight) by New Zealand fishing year (1 October to 30 September). Annual total catch is from Licensed Fish Receiver returns for 1998/99 to 2000/01, and from Monthly Harvest Returns from permit holders since 2001/02. The dashed horizontal line refers to the limit of 420 t that has been in place since 1989.**

All but a few tonnes of the domestic SBT catch is now taken by longline, and SBT catches are chiefly off the southwest coast of the South Island (WCSI) and off the east coast of the North Island (ECNI) from April to July. Longlining off the WCSI is almost entirely targeted at SBT, yielding higher catch rates of SBT than off the ECNI. The fleet operating off the southwest

coast is primarily composed of the larger –60° freezer vessels of the charter fleet. The generally heavier weather conditions off the WCSI compared to the ECNI means that few of the smaller domestic owned and operated vessels operate in this area.

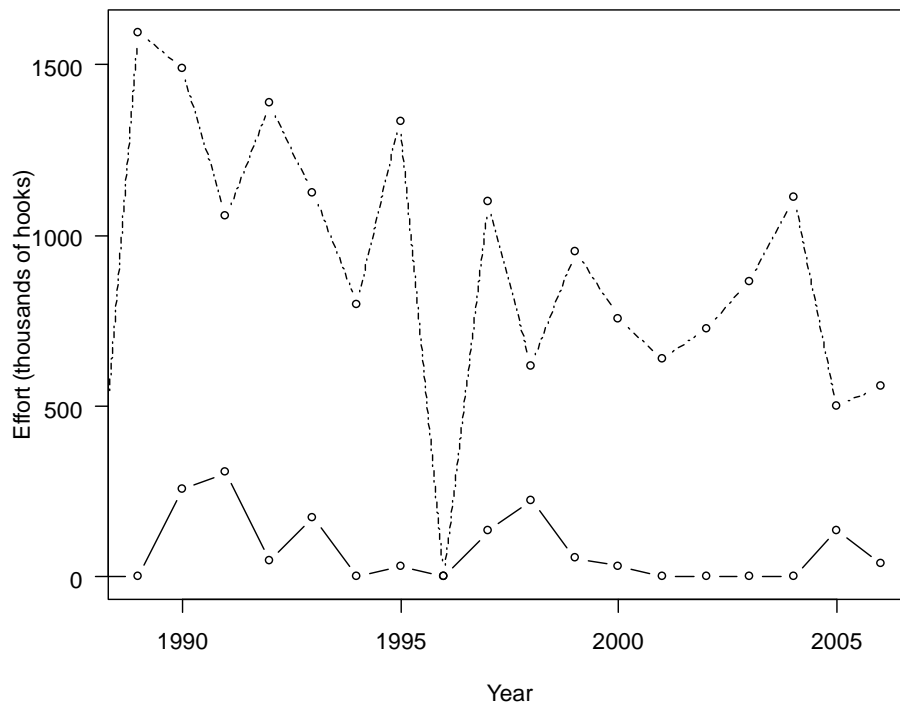
The longline fishery off the ECNI is dominated by smaller domestically owned and operated “ice boats” that are typically at sea for only a few days, and includes landings of SBT both as a target and as a bycatch of bigeye target sets.

SBT was introduced into the Quota Management System (QMS) effective 1 October 2004 with a Total Allowable Commercial Catch (TACC) of 413 t, the remainder of New Zealand’s TAC of 420 t being allocated to recreational (four tonnes) and customary fishers (one tonne), and other sources of fishing-related mortality (two tonnes). The introduction to the QMS has seen a change from the “Olympic” race for fish seen in previous years. This introduction has been associated with a consolidation of the fleet.

The most recent fishing season (2005/06) resulted in the lowest NZ catch in 10 years (238 t). This is attributed to two main factors: the absence of new recruitment into the NZ longline fishery leading to decreased vulnerable biomass (as illustrated in the continued period of low CPUE in the charter fleet); and the decline in longline effort from the domestic fleet and charter fleets.

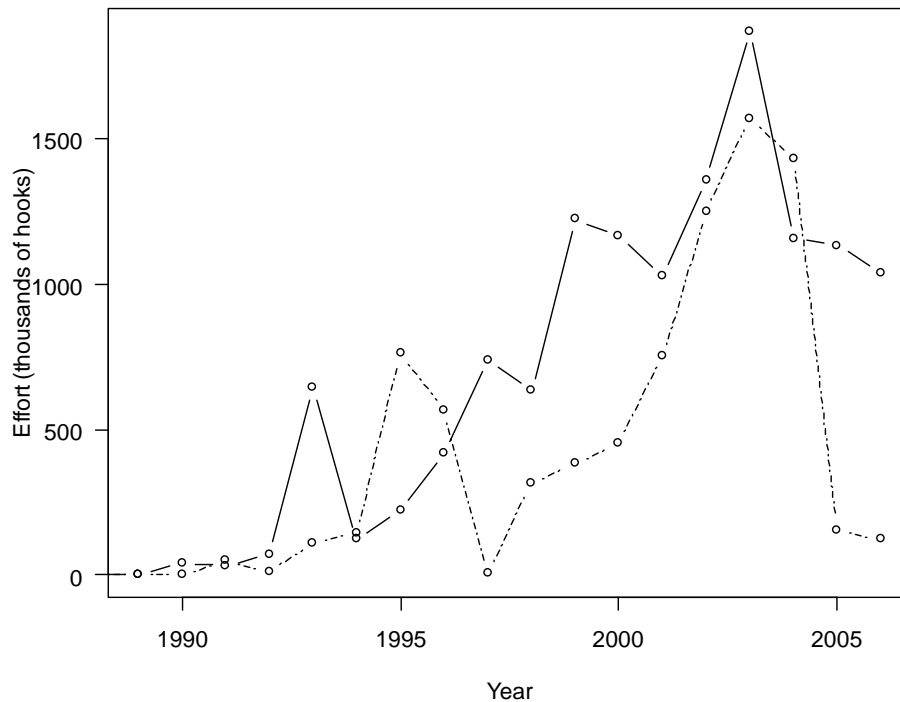
## 2 Catch and Effort

Catches for the charter fleet by calendar year and CCSBT region are provided in Table 2 and effort is provided in Figure 2 and Table 3. Most catch and effort occurs in region 6 which covers the west coast of the South Island (WCSI) fishing grounds. Over the period 2001-2004 there was no targeting of SBT (and no catches of SBT) by the charter fleet in region 5 which covers the east coasts North Island (ECNI) fishing grounds. In 2005, the two charter vessels did fish for SBT in the later part of the season in region 5 and experienced higher catch rates than they had in region 6.



**Figure 2: Effort (thousands of hooks) for the charter fleet in Region 5 (solid line – east coast North Island) and Region 6 (dashed line – west coast South Island). Note that this includes some non-SBT target effort in region 5 and that no charter vessels fished in 1996.**

Catches for the domestic fleet by calendar year and CCSBT region are provided in Table 4 and SBT target effort is provided in Table 5. There is a significant longline fishery that operates outside the SBT fishing season. It is important to separate these data out to better understand the New Zealand SBT fishery. For catches, the importance of the two regions has varied since 1995. While target effort increased dramatically in both regions from 1995 to 2003, it has decreased since then, particularly in region 6.

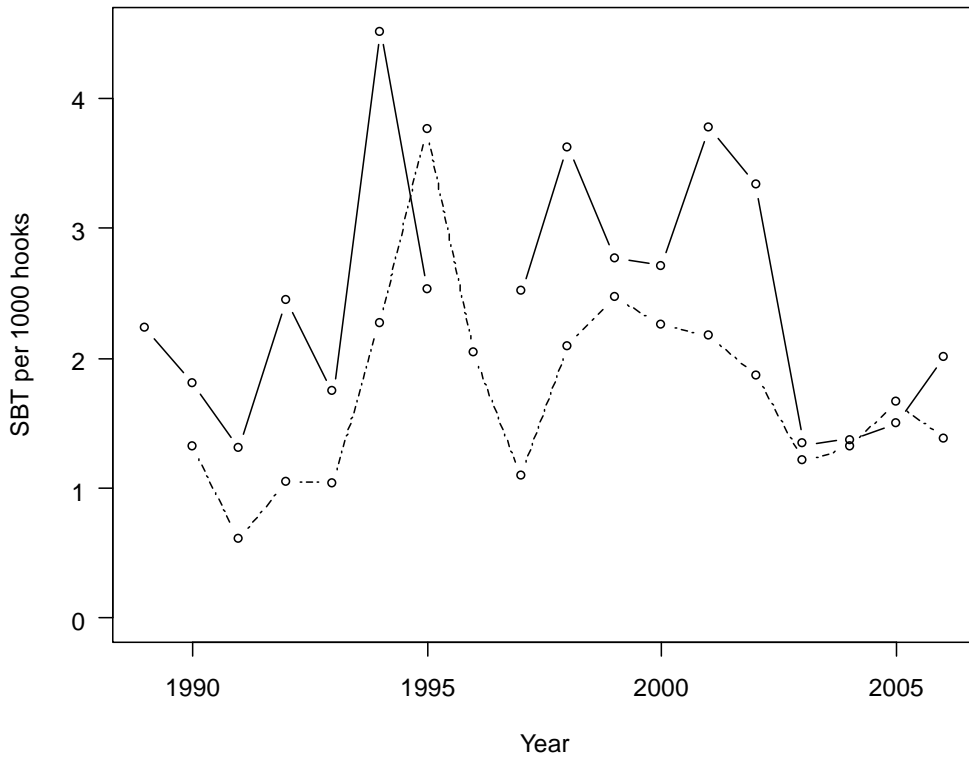


**Figure 3: Target effort (hooks from sets that either targeted or caught SBT – thousands of hooks) by the domestic fleet for Region 5 (solid line – east coast North Island) and Region 6 (dashed line – west coast South Island).**

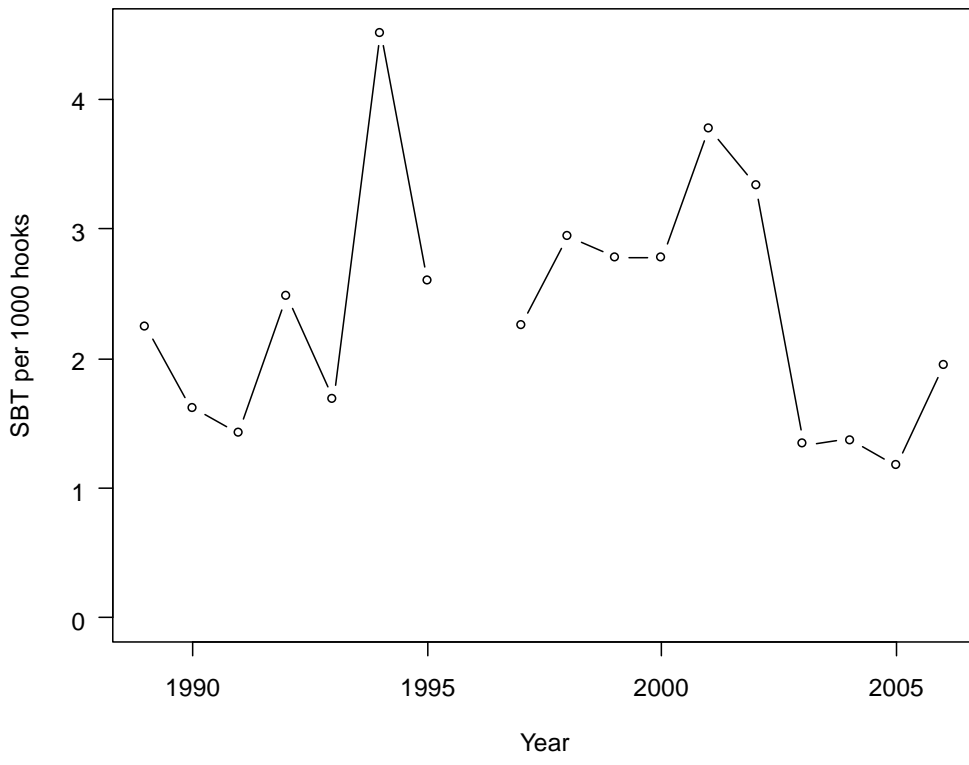
### 3 Nominal CPUE

Nominal CPUE was calculated by fleet, year, and CCSBT region. For the domestic fleet, CPUE was calculated for effort from sets that either caught or targeted SBT (referred to as target effort). It is noted that due to the large changes in the structure of the domestic fleet and the nature of the “Olympic system” which the NZ fishery operated under prior to 2004, the trends in the CPUE for the domestic fishery are not thought to provide reliable information on trends in vulnerable biomass. Notwithstanding this, with a reduced fleet now operating in this fishery we will continue to assess the utility of developing a CPUE series for this fleet.

Nominal CPUE by fleet across all regions based on targeted longline effort is provided in Figure 4. Charter CPUE averaged around 3 SBT per 1000 hooks over 1997-2002. Associated with the lack of new recruitment (Section 4), CPUE declined dramatically in 2003 and has stayed at these historically low levels until a slight increase in 2006 for the charter fleet. Figure 5 indicates that this increase occurred in the core area of their fishery (e.g. region 6) and may be due to the appearance of some small recruits.



**Figure 4: Catch per unit effort (number of SBT per thousand 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 southern bluefin tuna.**



**Figure 5: Catch per unit effort (number of SBT per thousand hooks) from the charter fleet in Region 6 (west coast South Island).**

## 4 Size composition

For length and proportional ageing<sup>1</sup>, we consider data collected from 1989 to 2007. The data collected in 2007 is preliminary, but does represent over half the catch from the charter fleet and over 10% of the catch from the domestic fleet. Direct ageing has been undertaken, but the data are not presented here as we are still working on how best to assign these ages to cohorts (see report from SC 10 for discussion of the issue).

### 4.1.1 Size composition data

As noted at SC10 and SC11, there has been a very clear reduction in the range of sizes of SBT taken in the New Zealand fishery since 2001 and new data suggest that this has continued in 2007 (Figure 6). There is evidence of the growth (progression of modes) over this period, but there is little evidence of recruitment of smaller fish to the New Zealand fishery except for a scattering of smaller fish during the last two years.

Due to lower levels of observer coverage in the domestic fishery, size composition data are not as well estimated for that fleet. Nevertheless, size composition data for the domestic fleet (based on observer reports) are provided in Figure 7 and show similar patterns to that observed in the charter fishery.

An examination of the proportion of the charter fleet catch under a given size since 1989 (Table 6; Figure 8) indicates that fish under 140 cm generally represent over 25% of the catch from the charter fleet, but have been 10% or less since 2004. Overall, the proportions do fluctuate in a way consistent with periods of above and below average recruitment (e.g. two to three year cycles).

### 4.1.2 Proportional ageing data

The lack of small fish reflected in the length data corresponds to a series of weak (or absent) cohorts in the proportional ageing data (Figure 9). The data suggests at least four consecutive extremely weak year classes during 1999 to 2002. While there is a scattering of 2 and 3 year old fish in 2006 (Figure 9) and 2007 (from length data in Figure 7), the abundance of these juveniles is still much weaker than seen historically (e.g. see relative abundance of three year olds in 2001).

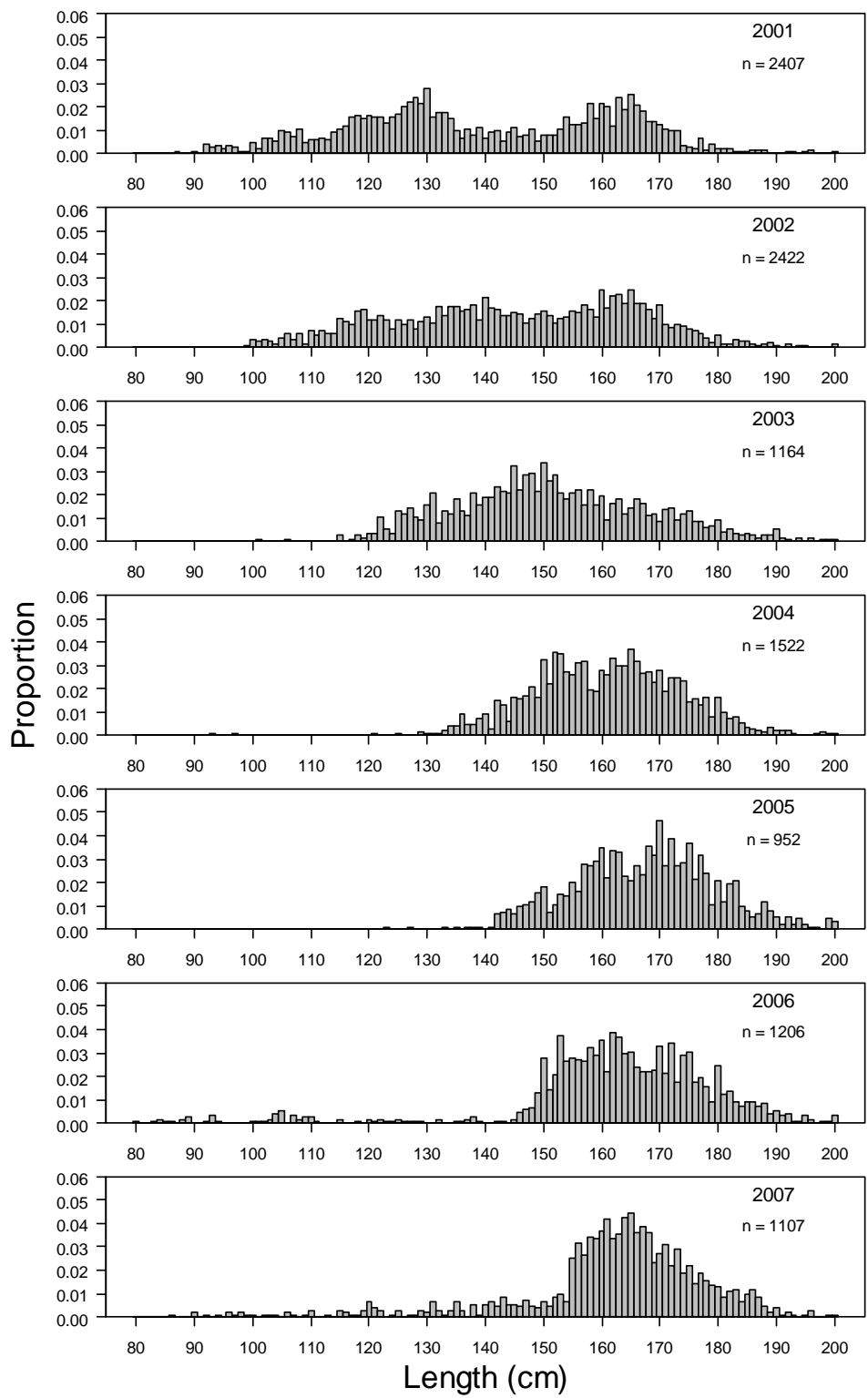
### 4.1.3 Direct ageing data

At SC10 New Zealand provided proportions at age determined from direct ageing of fish caught by the Charter fleet for the years 2001 to 2004. It was noted that there were technical difficulties associated with assigning ages to fish taken in the middle of the year. These difficulties were particularly important for the younger fish in the samples and did not have a great impact on older fish (e.g. over 10 years). It was noted that the direct ageing showed considerably fewer 'plus group' fish than were estimated from proportional ageing.

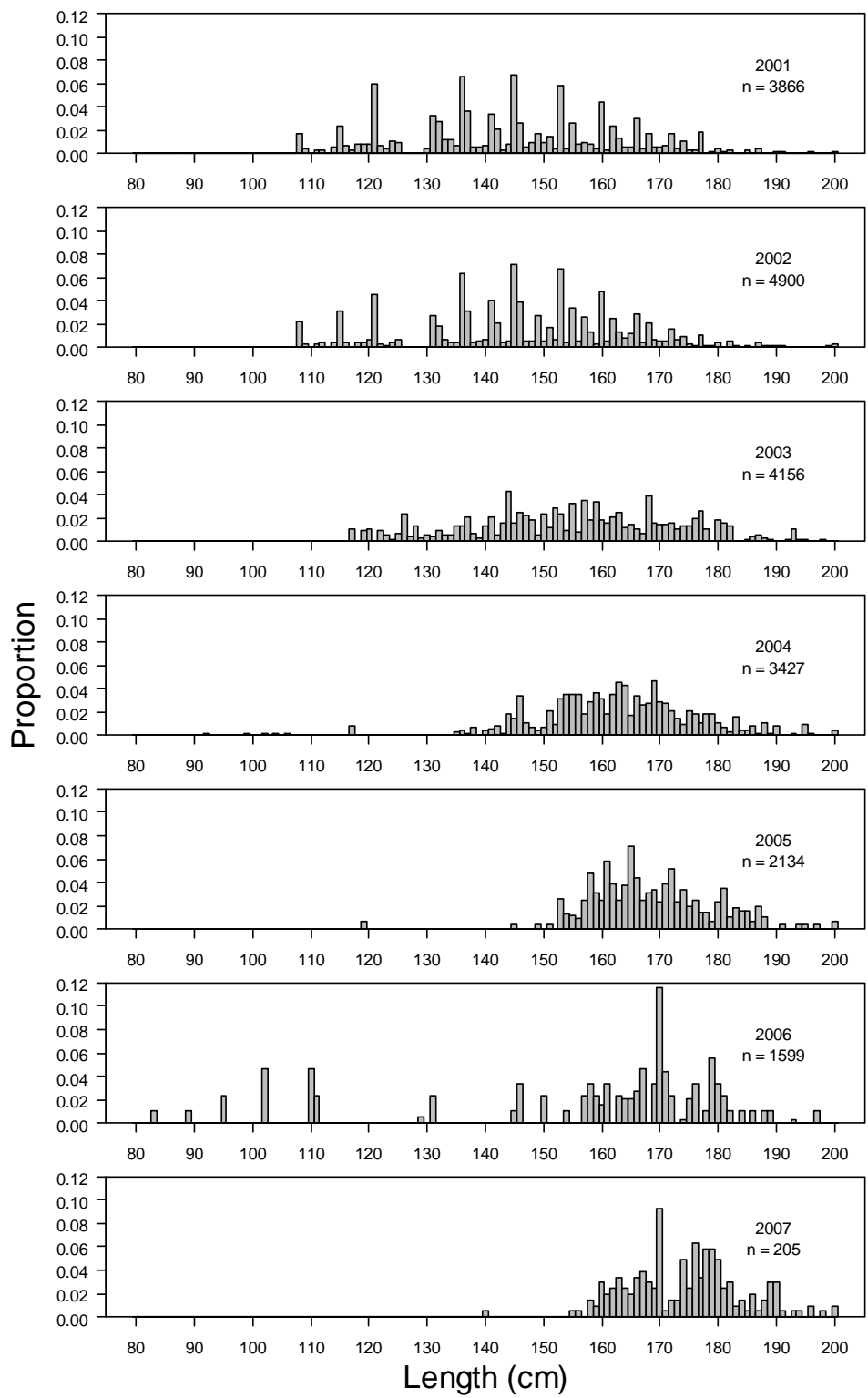
It has not been possible to resolve these issues over the past year. In ageing future samples, efforts will be made to collect detailed measurements for otoliths to allow statistical modelling of these data to refine age estimates. This work should be available for discussion at SC13.

---

<sup>1</sup> An approach where the length composition is converted to an age distribution based on assumed length bins. This analysis was based on the SC2001 growth curve and is now undertaken by the Secretariat.



**Figure 6: Proportion at length for the charter fleet for 2001 to 2007. Note the data for 2007 are preliminary and restricted to the two vessels (out of four) that finished fishing prior to the report being submitted.**



**Figure 7: Proportion at length for the domestic fleet for 2001 to 2005. Note the data for 2007 are preliminary and based on observed trips that were completed prior to the report being submitted. Samples sizes are the number of fish caught rather than number sampled.**



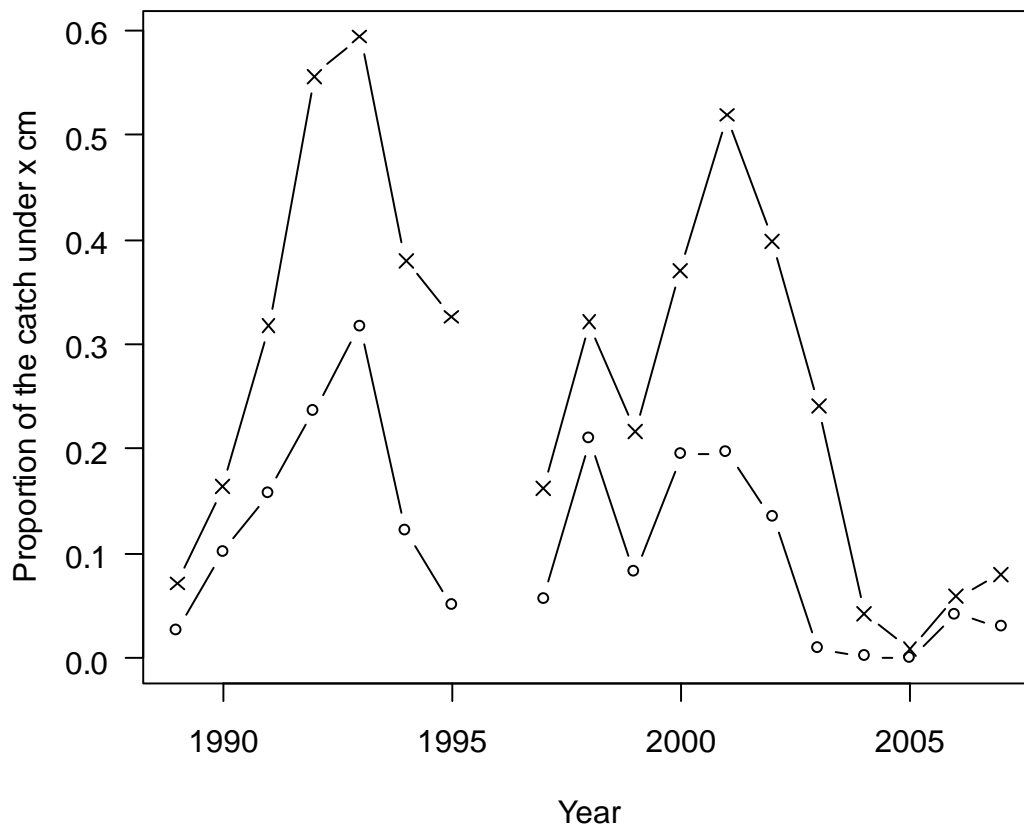


Figure 8: Proportion of the catch from the charter fleet under 120 cm (o) and 140 cm (x) for 1989 to 2006.

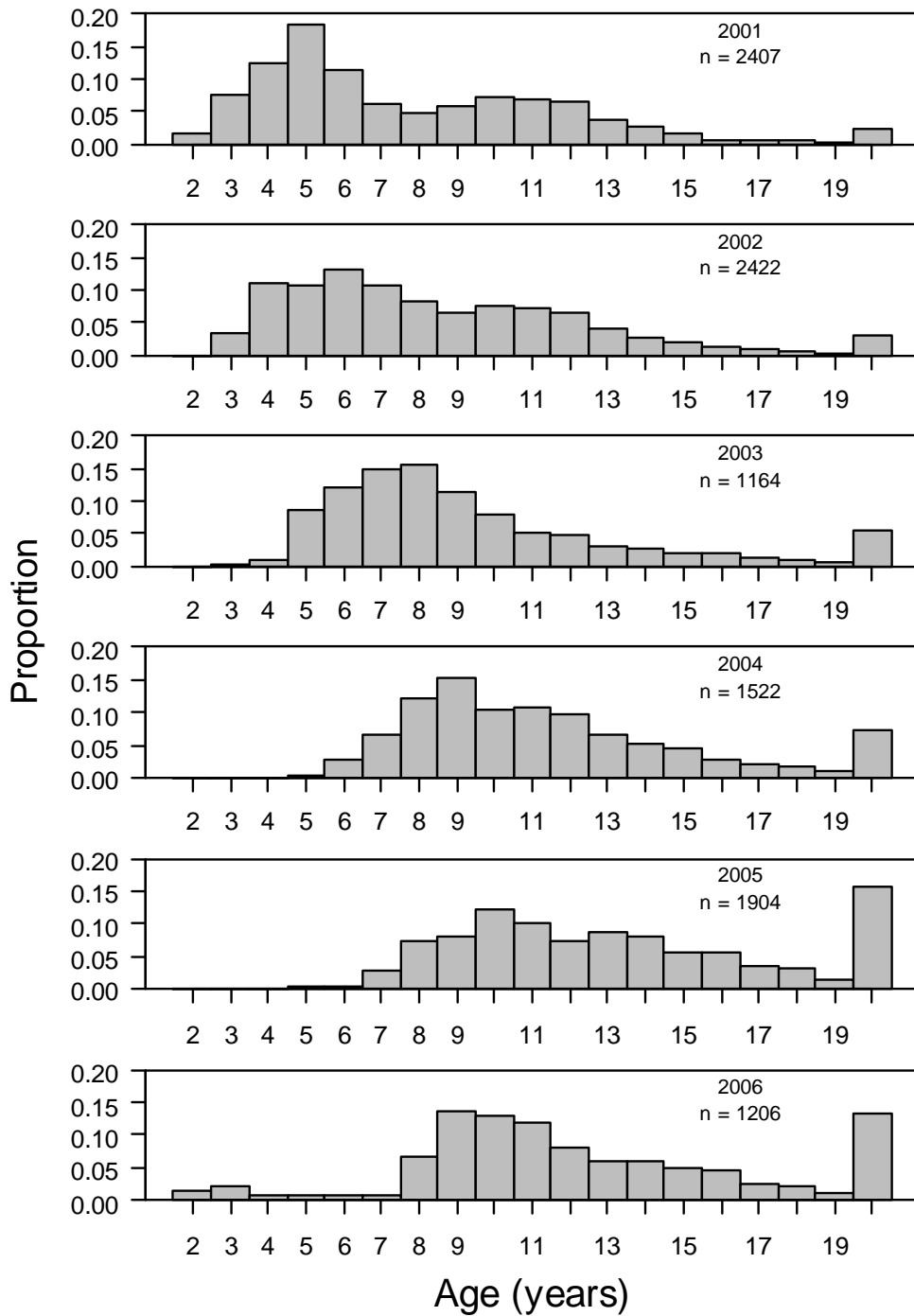
## 5 Fleet size and distribution

The number of vessels fishing by surface longline peaked in 2002 and has since declined to only 56 vessels in 2006. We expect that it will have declined even further in 2007 (Table 7). In 2005 and 2006 only two charter vessels fished for SBT in New Zealand fisheries waters, which is less than recent years.

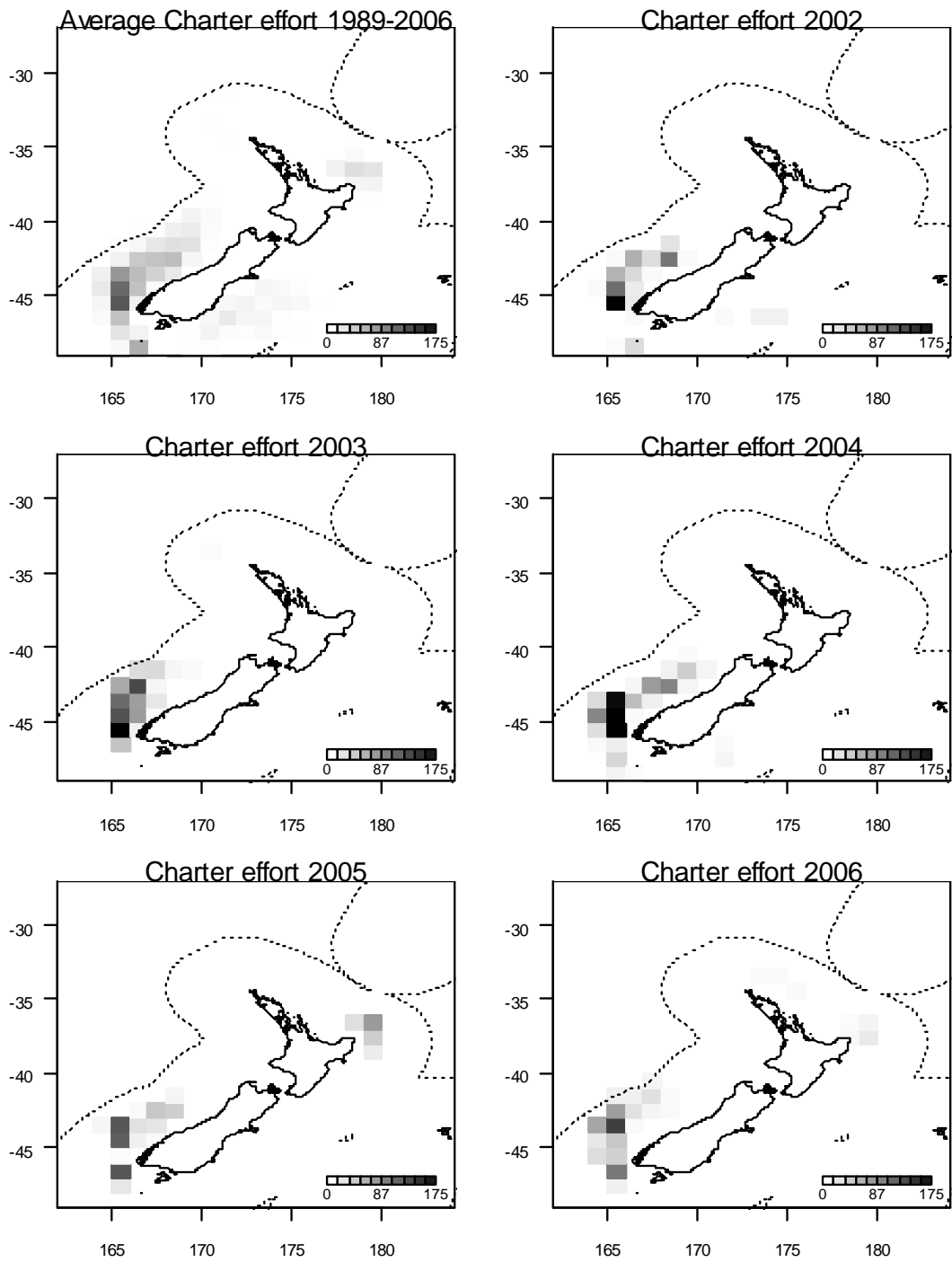
The spatial distribution of fishing effort and SBT catches from the charter fleet are provided in Figures 10 and 11. Most of the charter catch and effort occurs off the WCSI, though there was some effort off the ECNI in 2005 and 2006.

The spatial distribution of target fishing effort and SBT catches from the domestic fleet are provided in Figures 12 and 13. While most target effort occurs off the ECNI, a substantial domestic fishery operated off the WCSI – mostly due to one large domestic vessel that has not fished in recent years.

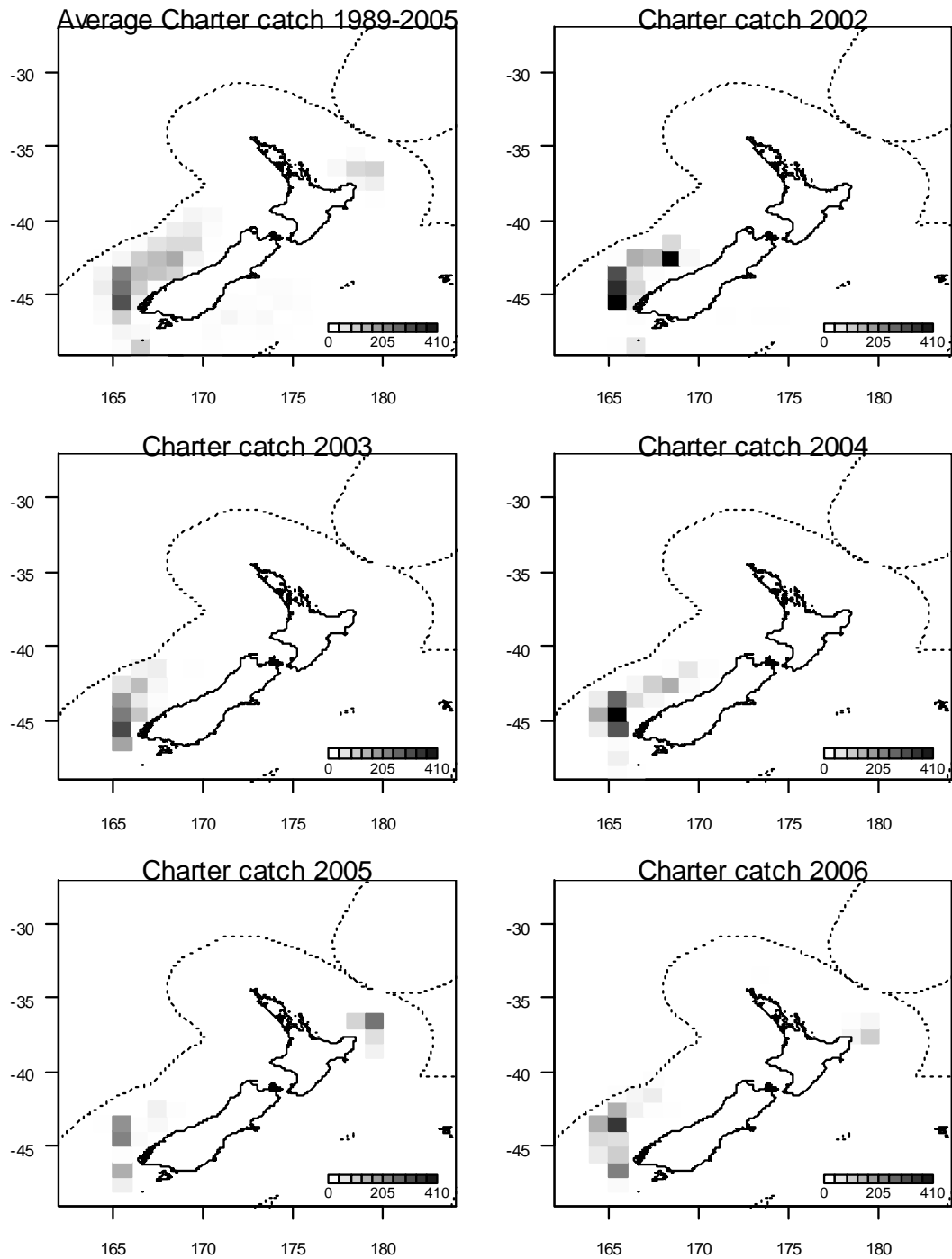
The distribution of catches is similar to that of target effort, though proportionally more catch (compared to effort) was taken in the WCSI fishery compared to the ECNI fishery prior to 2005.



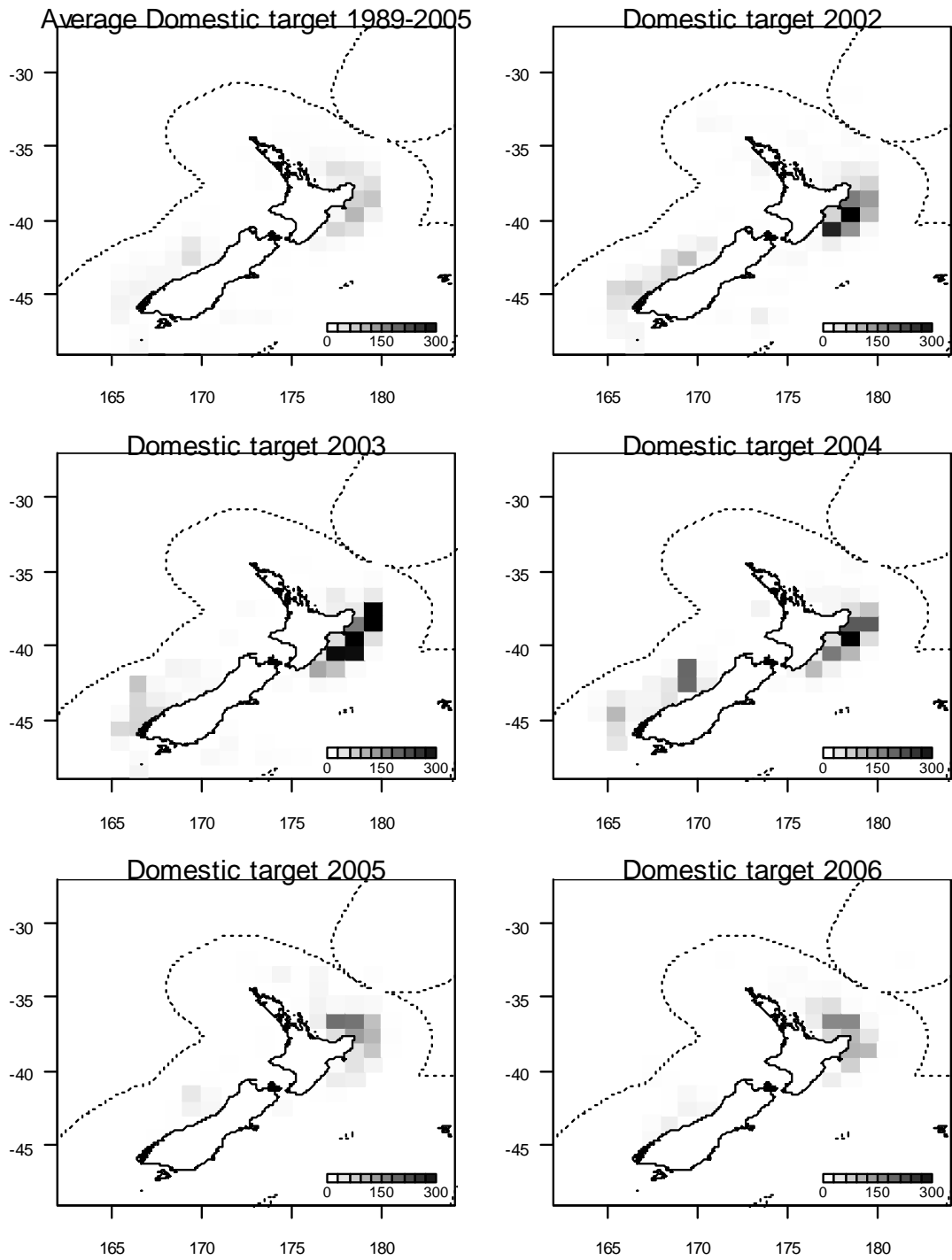
**Figure 9: Proportion at age for the charter fleet for 2001 to 2006 based on cohort slicing using the SC(2001) growth curve.**



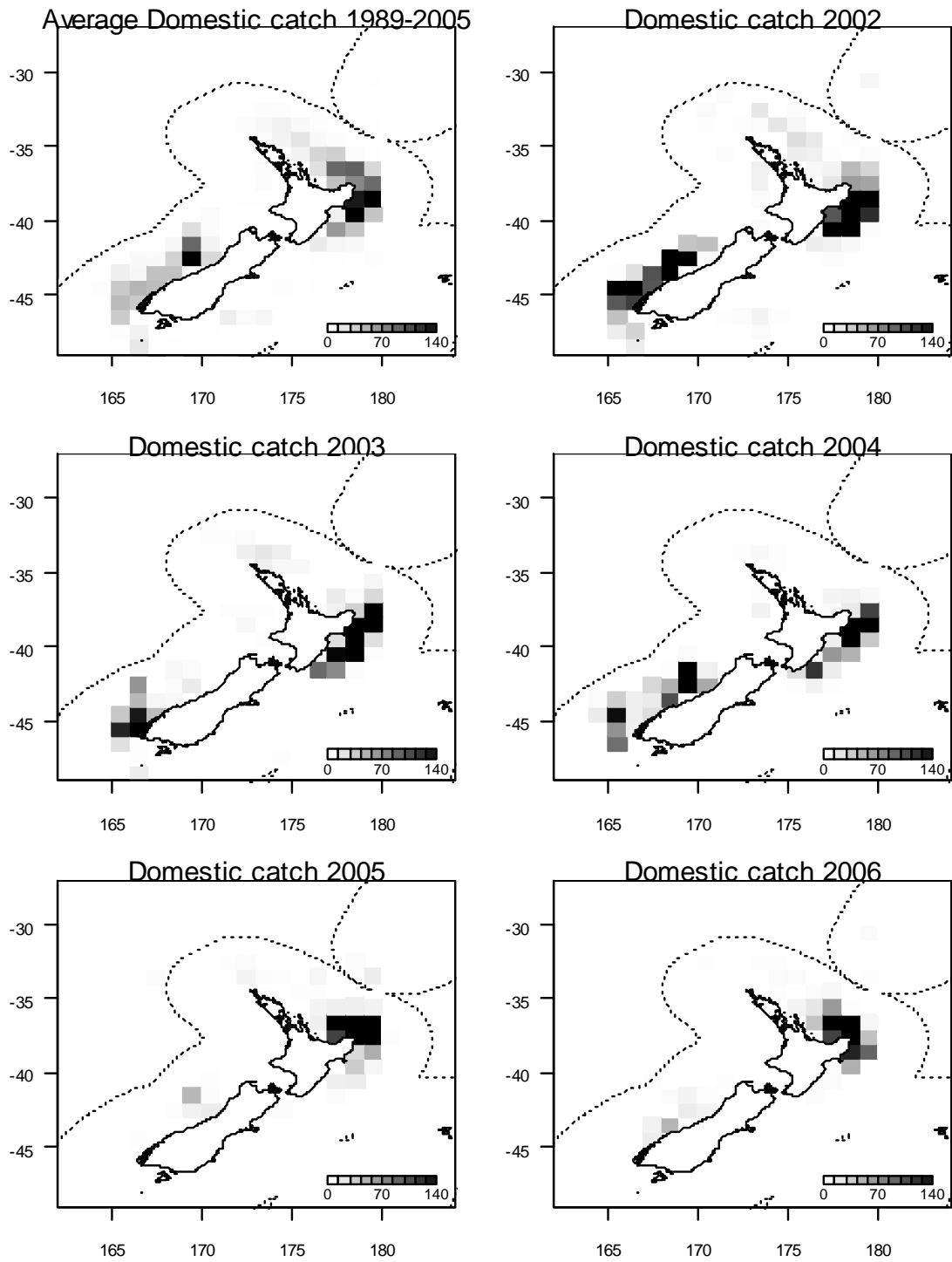
**Figure 10: Distribution of longline effort (thousands of hooks per 1 degree square) for the charter fleet: average for the time series (1989-2006), and annually for 2002 to 2006. The darkest grey scale is the 90th percentile in 2004.**



**Figure 11: Distribution of longline catches (number of fish per 1 degree square) for the charter fleet: average for the time series (1989-2006), and annually for 2002 to 2006. The darkest grey scale is the 90th percentile in 2002.**



**Figure 12: Distribution of longline effort (thousands of hooks per 1 degree square) for the domestic fleet that was targeted at southern bluefin tuna: average for the time series (1989-2006), and annually for 2002 to 2006. The darkest grey scale is the 90th percentile in 2003.**



**Figure 13: Distribution of longline catches (number of fish per 1 degree square) for the domestic fleet: average for the time series (1989-2006), and annually for 2002 to 2006. The darkest grey scale is the 90th percentile in 2002.**

## **6 Other relevant information**

### **6.1.1 Scientific observer programme**

New Zealand has a Scientific Observer Programme (SOP) that covers both domestic and charter longline vessels. All trips on charter vessels are covered by at least one observer, while the target coverage level for the domestic fleet is 10% of the effort to reflect 10% of the catch.

In 2005 and 2006, observers were deployed on two charter vessels and nine domestic vessel. This involved 10 and 16 observers in each year.

Coverage is measured in two ways, proportion of catch (in numbers of fish) observed (Table 8) and proportion of hooks observed (Table 9). In terms of catches, over 98% of the catch was observed (and measured) in the charter fleet in 2005 and 2006. For the domestic fleet, 9% of the catch was observed in 2005, but only 4% in 2006. In terms of effort, 89% of hooks were observed on the Charter vessels in 2005, and 94% in 2006. For the domestic fleet 12% of the effort was observed in 2005 and 9% in 2006.

Because only one observer is present on the vessel, and the observer takes breaks during the long hauling process, it is not possible to observe all hooks on the charter vessels. The observer accurately reports the portions of the haul that are not observed. The proportion of the catch observed is higher than hooks observed, because some unobserved catches are recorded (and sometimes measured) as they are available to the observer after their break. Unobserved catches which are measured are noted.

### **6.1.2 Otolith collection**

Observers onboard the charter vessels collect otoliths from as many SBT caught as possible. Due to the smaller size of the domestic vessels and the different processing practices, it is not feasible to collect otoliths from the domestic fleet at this time.

In 2004, 1153 otoliths were collected from SBT, but only 432 and 444 were collected in 2005 and 2006 respectively. The lower number is because only two charter vessels fished in 2005 and 2006 compared to 2004. A sub-sample of the otoliths from 2004 and 2005 have been aged, but there are currently concerns regarding the interpretation of these otoliths.

### **6.1.3 Estimation of non-retained catches**

As required for the CCSBT data exchange, estimates of non-retained catches of SBT from the New Zealand charter fleet for the years 1989-2006 were provided to the Commission (Table 10). The totals are based on observer estimates of discards scaled to total effort. The discards were not split by month and 5x5 square at this stage, but we intend to do this in the future. There was no auxiliary information on the size structure of the discards, so it is assumed that they are representative of the retained catch. Discards have been separated into categories alive and dead based on the annual proportions of alive/dead discards reported by observers.

Estimates for the domestic fleet were also provided for the years 1992-2006 based on observer records (Table 11). These are preliminary, but are not expected to vary greatly. There is still some minor work required to ensure that the most appropriate estimates of total effort are used in the scaling.

Since 2004, fishers have also been required to report discards on their catch effort returns, providing another method to estimate non-retained catches (Table 12). The estimates are higher for 2006, reflecting better reporting of discards of live SBT.

#### **6.1.4 Non-commercial catches**

Since 1 October 2004 New Zealand has allowed five tonnes for non-commercial catches under its national allocation. Due to the locations and seasons during which SBT are now found in New Zealand waters (e.g. winter months and areas with little recreational fishing), it is unlikely that this allowance has been approached.

There have been some reports of bycatch of SBT in the recently developed sport fishery for Pacific bluefin (*Thunnus orientalis*) off the west coast of the South Island. Generally, the SBT are only taken early in the season (July) with the catch being almost entirely Pacific bluefin by August – September when most effort occurs. The overall tonnage of SBT retained is thought to be low and many of the SBT have been tagged and released.

In order to better estimate the level of recreational catch in relation to the allowance made under our National allocation, New Zealand will be monitoring this fishery during the current season.

#### **6.1.5 Tagging of southern bluefin tuna**

New Zealand has participated in two electronic tagging programmes in relation to SBT. The first is the Global Spatial Dynamics Programme (GSDP) to electronically tag juvenile SBT throughout the range of the stock. The second is deployment of pop-off tags (PSATs) on large SBT which is being done in collaboration with Australia. New Zealand had hoped to tag 50 SBT per year (2004-2006) as part of the GSDP and 25 large SBT as part of the pop-off tagging project.

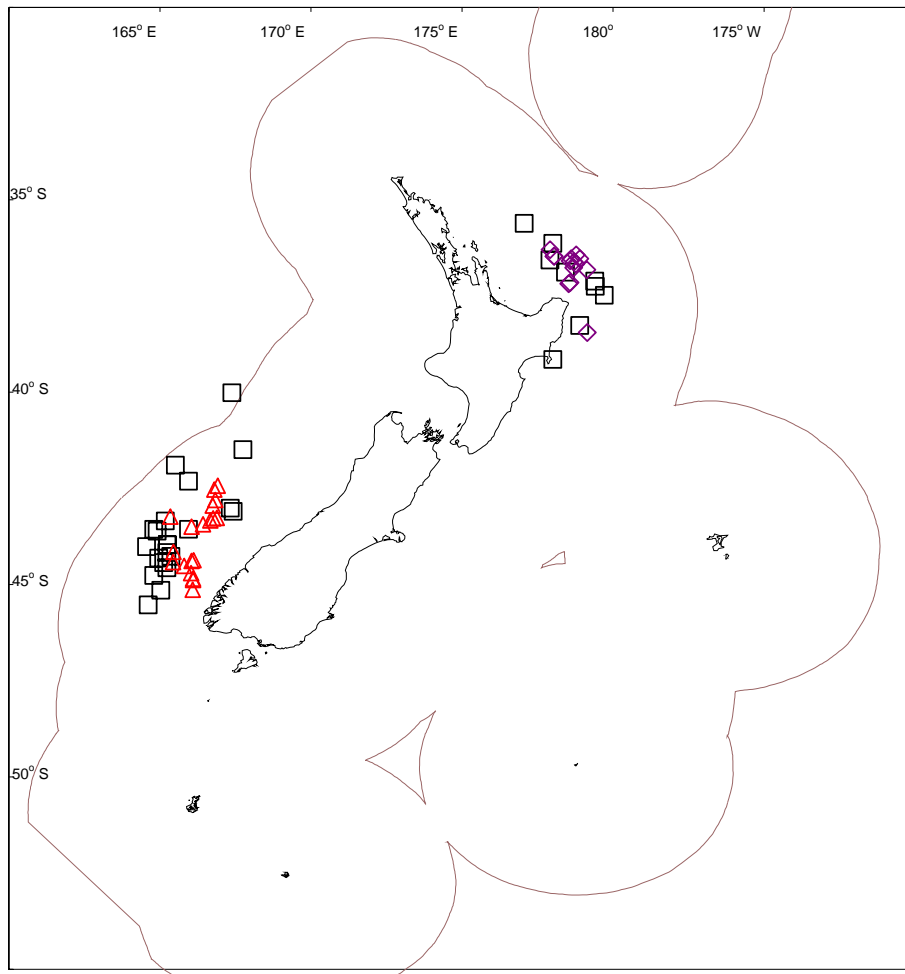
For the GSDP, in 2004 and 2005, the near complete absence of juvenile SBT made it impossible to reach the target of tagging 50 juvenile SBT each. In fact only two SBT were tagged during 2005, one with an archival tag and another with a conventional (spaghetti) tag adding to the six tagged in 2004. The scattering of small fish in the fishery (see Figure 6 and 7) in 2006 allowed for more success and 30 SBT were tagged throughout the fishery (Figure 14). In order to deploy the already purchased tags, the programme was extended to cover 2007 and the remaining 19 tags were deployed using Charter vessels.

Due to the poor state of the NZ fishery, it has been difficult to obtain larger bluefin for tagging, however, during 2007, 14 PSATs have been deployed from domestic vessels as of 20<sup>th</sup> July (Figure 14).

## **7 Acknowledgements**

MFish acknowledge Lynda Griggs, the data entry staff at NIWA, and the Scientific Observer Programme for ensuring that length data for the 2007 season was available for inclusion in this report, and Bob Kennedy for his continued assistance to New Zealand and the preparation of their data.





**Figure 14: Release locations of tagged SBT during 2006 and 2007 (up to 20 July 2007): 30 tagged with Mk-9s in 2006 (black boxes), 19 tagged with MK-9s in 2007 (red triangles), and 14 tagged with PSATs (purple diamonds).**

**Table 1: Recent catches of southern bluefin tuna in New Zealand fisheries waters (tonnes whole weight) by Calendar year and New Zealand fishing year (1 October to 30 September).**

<b>Year</b>	<b>Calendar year catches</b>	<b>Fishing year catches</b>
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

**Table 2: Catch (t) for the charter fleet by year and CCSBT region.**

<b>Calendar Year</b>	<b>Region 5</b>	<b>Region 6</b>	<b>Other*</b>
1989	0	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	0	234.1	
1995	1.6	228.7	0.2
1996	0.0	0.0	
1997	52.3	186.2	
1998	83.9	117.3	
1999	9.8	190.7	
2000	2.5	132.5	
2001	0.0	139.3	
2002	0.0	148.4	
2003	0.0	82.1	
2004	0.0	126.4	
2005	34.4	53.0	
2006	9.9	95.0	

\*Most often erroneous position data

**Table 3: Effort (thousands of hooks) for the charter fleet by year and CCSBT region.**

<b>Calendar Year</b>	<b>Region 5</b>	<b>Region 6</b>	<b>Other*</b>
1989	9.7	1596.0	32.3
1990	310.8	1490.6	0.0
1991	344.6	1062.6	0.0
1992	103.8	1386.8	3.0
1993	174.1	1125.7	101.4
1994	30.4	799.1	8.5
1995	46.0	1335.7	15.0
1996	0.0	0.0	0.0
1997	135.2	1098.7	0.0
1998	247.2	616.0	0.0
1999	93.7	955.1	2.5
2000	64.1	757.9	6.0
2001	0.0	639.4	0.0
2002	12.0	726.4	0.0
2003	80.2	866.6	6.4
2004	51.5	1113.5	0.0
2005	137.0	498.9	0.0
2006	39.2	560.4	0.0

\*Most often erroneous position data

**Table 4: Catches for the domestic fleet by year and CCSBT region.**

<b>Calendar Year</b>	<b>Region 5</b>	<b>Region 6</b>	<b>Other*</b>
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	0.0
1990	6.9	278.7	2.0
1991	0.9	37.8	0.1
1992	6.2	53.2	0.0
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	0.0
2005	165.2	11.6	0.3
2006	122.8	10.2	0.0

\* Includes erroneous position data and data without positions

**Table 5: Effort (thousands of target<sup>#</sup> hooks) for the domestic fleet by year and CCSBT region.**

Calendar Year	Region 5	Region 6	Other*
1989	0.0	0.0	0.0
1990	41.7	0.0	0.0
1991	31.5	49.2	0.0
1992	71.7	12.1	0.0
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	1038.7	122.9	0.9

\* Includes erroneous position data and data without position data

<sup>#</sup> Effort for sets that either targeted or caught southern bluefin tuna

**Table 6: Proportion of the catch from the charter fleet under 110, 120, 130, and 140 cm for 1989 to 2006.**

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	0.052	0.059
2007	0.017	0.030	0.051	0.080

**Table 7: Number of vessels catching southern bluefin tuna in New Zealand fisheries waters (tonnes whole weight) by Calendar year and New Zealand fishing year (1 October to 30 September).**

<b>Year</b>	<b>Calendar year vessel numbers</b>	<b>Fishing year vessel numbers</b>
2001	132	132
2002	151	155
2003	132	132
2004	99	101
2005	57	58
2006	56	57

**Table 8: Observer coverage in terms of catch (proportion of numbers observed) for the charter (NZC) and domestic (NZD) fleets for 2005 and 2006.**

<b>Calendar year</b>	<b>NZC</b>	<b>NZD</b>
2005	0.98	0.09
2006	1.00	0.04

**Table 9: Observer coverage in terms of effort (proportion of hooks observed) for the charter (NZC) and domestic (NZD) fleets for 2005 and 2006.**

<b>Calendar year</b>	<b>NZC</b>	<b>NZD</b>
2005	0.89	0.12
2006	0.94	0.09

**Table 10: Estimated number of non-retained SBT (separated by life status - alive and dead) for the charter fleet based on observer records.**

<b>Year</b>	<b>Alive</b>	<b>Dead</b>	<b>Total</b>
1989	0	0	0
1990	0	0	0
1991	0	0	0
1992	0	0	
1993	55	13	68
1994	40	13	53
1995	4	9	13
1996	NA	NA	NA
1997	0	38	38
1998	0	20	20
1999	18	15	33
2000	0	4	4
2001	3	4	6
2002	2	3	5
2003	0	2	2
2004	0	2	2
2005	0	0	0
2006	2	2	5

**Table 11: Estimated number of non-retained SBT (separated by life status - alive and dead) for the domestic fleet based on observer records.**

<b>Year</b>	<b>Alive</b>	<b>Dead</b>	<b>Total</b>
1989			
1990			
1991			
1992	0	0	0
1993			
1994	0	0	0
1995	10	20	30
1996	25	6	31
1997	0	4	4
1998	0	0	0
1999	0	0	0
2000	0	0	0
2001	8	10	18
2002	24	30	53
2003	0	0	0
2004	0	7	7
2005	33	8	42
2006	16	0	16

**Table 12: Estimated number of non-retained SBT (separated by life status - alive and dead) for the domestic fleet based on fisher reporting.**

<b>Year</b>	<b>Alive</b>	<b>Dead</b>	<b>Total</b>
2005	19	5	24
2006	48	0	48