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Fish bycatch in New Zealand tuna longline fisheries 2006–07 to 2009–10

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EXECUTIVE SUMMARY

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We used Observer Programme data to assess the species composition of the New Zealand tuna longline fisheries, and to estimate the catch per unit effort (CPUE) and the number of fish caught by observed vessels during the 2006–07 to 2009−10 fishing years. Data were summarised by fishing fleet (foreign charter vessels and New Zealand domestic vessels), and geographical area (north and south). For the main non-target species, we used observer data to estimate the proportions of fish that were alive and dead on recovery, and the proportions that were retained and discarded. The size distribution, sex composition, and maturity composition of blue, porbeagle, and mako sharks and Ray's bream were determined.

The total number of hooks set by longline vessels fishing in the New Zealand Exclusive Economic Zone (EEZ) and adjacent waters has declined from a maximum of 27 million in 1980–81 to less than 4 million in the mid-1990s when foreign licensed vessels ceased fishing in New Zealand. The domestic fishing fleet has been the dominant fleet in the fishery since 1993–94 and the number of hooks set by this fleet increased rapidly in the late 1990s to a peak of almost 10 million in 2001–02. Effort of the domestic fleet has dropped substantially from 2002–03 onwards, and the total effort dropped to 3.7 million hooks set in 2004–05. Fishing effort remained at 3.7 million hooks in 2005–06 and 2006–07 and then dropped to 2.2 million hooks in 2007–08 but has increased since that time to around 3 million hooks in 2008–09 and 2009–10. Australian flagged vessels began fishing in New Zealand waters for the first time near the end of the 2005–06 fishing year and this continued into the 2006–07 fishing year.

Observer coverage on charter vessels continues to be high averaging 78% of hooks observed over the past four fishing years. Domestic coverage has increased over the last four fishing years, although was always below 10%.

In 2006−07 to 2009–10, 111 074 fish and invertebrates from at least 62 species or species groups were observed. Most species were rarely observed, with only 37 species (or species groups) exceeding 100 observations between 1988–89 and 2009–10. The most commonly observed species over all years were blue shark, albacore tuna, and Ray's bream, these three making up nearly 70% of the catch by numbers. Blue shark and Ray's bream were the most abundant and second most abundant species in each of the four fishing years 2006–07 to 2009−10. Other important non-target species were albacore, lancetfish, bigscale pomfret, dealfish, porbeagle shark, swordfish, moonfish, mako shark, deepwater dogfish, sunfish, and oilfish. The catch composition varied with fleet and area fished.

Fishing effort and observed catches were stratified by fleet (Charter and Domestic) and area (North and South) for estimating CPUE and numbers caught. For most species there were large differences in CPUE between fleets and between areas. CPUE could be reliably determined only for the Charter fleet, and in 2006−07 to 2009−10 there were differences in temporal and spatial fishing patterns compared with previous years. There was a very large increase in CPUE for southern bluefin tuna in the South in the most recent three years. There was a periodic increase in CPUE for Ray's bream, and bigscale pomfret in the mid-2000s. Mako shark CPUE appears to have increased in the most recent years although the data are patchy. Similar trends were observed for butterfly tuna, oilfish, and dealfish. Deepwater dogfish CPUE in the South, while lower than the mid-1990s, remains relatively high. The Australian fleet had high CPUE for bigeye tuna and swordfish for the two years that they fished in New Zealand. Reported and estimated catches are presented and compared.

Length frequency data combined with length-at-maturity information indicated that most blue, porbeagle, and mako sharks caught in New Zealand fishery waters were immature. Greater proportions of mature male blue sharks were found in the North while few were mature in the South. Most female Ray's bream were probably mature in 2006–07 to 2009−10.

In 2006–07 to 2009–10, most blue, mako, porbeagle, and school sharks, deepwater dogfish, moonfish, Ray's bream, bigscale pomfret, escolar, oilfish, and rudderfish were alive when recovered. Most of the albacore, swordfish, butterfly tuna, dealfish and lancetfish were landed dead. Few yellowfin tuna and striped marlin were caught and most were alive. These proportions differed by fleet and area.

Most blue, porbeagle, mako, and school sharks were processed in some way, either being finned or retained for their flesh, but there were significant fleet differences. Most albacore, swordfish, yellowfin tuna, moonfish and Ray's bream were retained. Overall most butterfly tuna were retained, with fleet and year differences. Charter vessels kept most of their butterfly tuna. Over the four year period, most bigscale pomfret were discarded, with large variation from year to year. Charter vessels discarded escolar, oilfish and rudderfish while Domestic vessels retained the majority of these three species. Almost all deepwater dogfish, dealfish, and lancetfish were discarded. All except three striped marlin were returned to the sea.

Few conclusions could be drawn from the CPUE and catch data from the Domestic fleet due to low observer coverage rates that are not spatially and temporally representative of fishing effort, especially in southern New Zealand waters. We recommend that observer coverage of the Domestic fleet be increased and efforts made to ensure that the coverage is representative of the spatial and temporal distribution of the fishing effort in order to better quantify the catch.

1. INTRODUCTION

The New Zealand longline fishery is undertaken by about 42 New Zealand flagged vessels targeting bigeye and southern bluefin tuna as well as swordfish and a small foreign charter fleet (4 vessels) targeting southern bluefin tuna. The Ministry for Primary Industries (formerly Ministry of Fisheries) is responsible for managing all New Zealand fisheries, including target and non-target fish species. To fulfil this responsibility it is necessary to obtain regular estimates of the catch and catch rates of non-target fish species taken as bycatch during normal fishing operations. Estimates of target and non-target discard quantities are also required. These quantities provide an estimate of the level of removals from the population.

New Zealand has an obligation to provide estimates of the numbers of non-target fish species taken in the tuna longline fishery as part of its contribution to the Ecological Species Working Group under the Convention for the Conservation of Southern Bluefin Tuna (CCSBT), and to the Western and Central Pacific Fisheries Commission (WCPFC).

New Zealand developed a National Plan of Action (NPOA) on sharks, as part of a the Food and Agriculture Organisation of the United Nations (FAO) initiated Plan of Action for the Conservation and Management of Sharks (IPOA–Sharks), to improve the assessment and management of shark fisheries worldwide. New Zealand's NPOA was approved in 2008 (Anon. 2008), and is currently under review. Information on the shark bycatch from New Zealand tuna longline fisheries is crucial input into this.

Tuna longline fishing is often considered a highly specific, environmentally sound fishing technique compared with other methods (e.g., trawling and pelagic driftnet fishing). However, for some target species, areas, and seasons, bycatch levels can be high (Ayers et al. 2004, Griggs et al. 2007). In the New Zealand Exclusive Economic Zone (EEZ) and adjacent waters more than 70 non-target fish species have been recorded by scientific observers in the bigeye and southern bluefin tuna fisheries, although most species were rarely observed, with only 36 species (or species groups) exceeding 100 observations between 1988–89 and 2004–05 (Griggs et al. 2007). The most commonly observed species over all years (1988–89 and 2005–06) were blue shark (*Prionace glauca*), albacore tuna (*Thunnus alalunga*), and Ray's bream (*Brama brama*), these three making up 75% of the catch by numbers.

Concerns have been raised about the numbers of non-target fish species, especially sharks, swordfish, and marlins, taken as bycatch in the tuna longline fishery. Oceanic sharks are an important bycatch throughout the Pacific Ocean, and the demand for shark fins in Asia has led to an increase in their catch over the last few decades (Bonfil 1994, Hayes 1996, Stevens 2000). Oceanic sharks generally have low reproductive rates, long life spans, and possibly slow growth, and they segregate by size and sex. These features make them vulnerable to overfishing (Fogarty et al. 1989, Compagno 1990, Hoenig & Gruber 1990). To date, the only assessments of shark bycatch on tuna longlines in temperate South Pacific waters have been in the Australian Fisheries Zone (Stevens 1992, Stevens & Wayte 1999), and NIWA's previous studies in New Zealand waters (Francis et al. 1999, 2000, 2001, 2004, Ayers et al. 2004, Griggs et al. 2007, 2008). Bailey et al. (1996) reviewed bycatch and discards in Western Pacific tuna fisheries.

Billfish species are commonly caught in longline fisheries targeting tunas. The species caught in tuna longline fisheries vary with area and fishery. Bailey et al. (1996) reported that blue marlin were the most common bycatch species in the western tropical Pacific longline fishery while in Australia short-billed spearfish predominate. In New Zealand, swordfish are commonly caught, and striped marlin (*Kajikia audax*) are occasionally taken; other marlins are rarely caught (Francis et al. 2004). Only swordfish can be retained by domestic fishers; the other billfish species, with a few exceptions, must be returned to the water alive or dead. Commercial fishers view the practice of dumping dead marlin as a waste of a valuable resource of no benefit to any fishing sector or to the resource, and they have sought a change in regulations to allow them to retain dead marlin, especially striped marlin which

have high commercial value. Recreational fishers, on the other hand are concerned about any potential impact on the recreational striped marlin fishery from increased domestic tuna longline activity, especially fishing effort which might target striped marlin. Both commercial and recreational sector groups have requested information on the number of marlin caught and on the discard rate before changes to the current regulations are considered.

Under 10% of the domestic tuna longline fishing effort in the New Zealand fishery has been observed, and this is the only independent source of information on the scale of bycatch and discarding in the fishery.

In 2003 a new Tuna Longlining Catch Effort Return (TLCER) form was introduced, and fishers were required to record discarded fish. In October 2004, several tuna and longline-caught bycatch species were introduced into the Quota Management System (QMS), namely southern bluefin tuna, Pacific bluefin tuna, bigeye tuna, swordfish, blue shark, porbeagle shark, mako shark, moonfish, and Ray's bream.

NIWA has reported the results of previous Ministry of Fisheries projects that investigated the bycatch of the New Zealand tuna longline fleet (Francis et al. 1999, 2000, 2004, Ayers et al. 2004, Griggs et al. 2007, 2008). The present study updates and extends those previous analyses for four more years which extend the time series to 22 years.

This report addresses the objective: To estimate the catches, catch rates, and discards of non-target fish in tuna longline fisheries data from the Observer Programme and commercial fishing returns for the 2006–07 to 2009–10 fishing years, and to describe bycatch trends in tuna longline fisheries using data from this project and the results of previous similar projects. It was funded by Ministry of Fisheries project HMS200901.

2. METHODS

2.1 Data sources and data treatment

Tuna longline vessels submit information on their fish catch to the Ministry for Primary Industries (MPI), (formerly Ministry of Fisheries) on Tuna Longline Catch Effort Return (TLCER) forms, with a small amount also reported on Catch Effort Landing Returns (CELRs). These returns underestimate bycatch because much of it is discarded at sea and not recorded (Francis et al. 2000). A new TLCER form was introduced in 2003 with a section for reporting of discards.

More reliable data on the amount of bycatch are available from the MPI Observer Programme, in which observers on board commercial vessels identify and count all of the bycatch during the time they are observing. Observers also record whether fish are alive or dead on recovery, their subsequent fate, and lengths, weights, and sex of individual fish. Observer data can therefore provide a good independent source of information on the scale of bycatch and discarding in the fishery. We used observer data to determine which non-target fish species are caught, and to estimate unstandardised catch per unit effort (CPUE), the total number of fish caught, the proportion of the catch alive and dead on recovery, and the proportion of fish processed and discarded.

New Zealand tuna longline fishery data for the 2006–07 to 2009–10 fishing years were obtained from two sources: commercial fishing records and observer data.

Data recorded by observers on tuna longline vessels were extracted from the centralised observer database (*cod*). One trip was excluded from analysis because it was primarily for albacore tagging and not representative of normal fishing practice.

Groomed commercial longline data from TLCER and CELR forms were extracted from the database *tuna*. Further grooming was carried out before analysis as follows.

- Data was checked to ensure that there were no records with missing hook number or very low hook numbers (less than 100).
- Records with no set position (latitude and longitude) were compared with sets on adjacent days for that vessel and assigned to area North or South (see below) as appropriate.

TLCER data corresponding to the albacore tagging trip were excluded. No other sets were deleted from the 2006–07 to 2009–10 dataset, but some positions were corrected. Two records lacking latitude and longitude were assigned area North and one was changed from South to North.

The earlier commercial data and observer data (1989–90 to 2005–06) were those used by Francis et al. (1999, 2000, 2004), Ayers et al. (2004), and Griggs et al. (2007, 2008).

Data were stratified by fishing year, fleet, and area for analysis. Three fleets have routinely fished in New Zealand waters: foreign licensed vessels (mainly Japanese but also some Korean), foreign vessels chartered by New Zealand companies, and New Zealand domestic owner-operated vessels. Foreign licensed vessels have not fished in New Zealand waters since 1995. Foreign licensed and chartered vessels have been grouped together for analysis because they fished similar areas with similar gear (Francis et al. 2004, Ayers et al. 2004, Griggs et al. 2007, 2008), and this grouping is used to present a time series of trends in fishing effort. One large New Zealand domestic vessel fished with this fleet in the same area and with the same methods up until 2004 and was included in this group. Australian charter vessels began fishing in New Zealand and fished only during 2005–06 and 2006–07 and were treated as a separate fleet due to differences in their fishing methods and area fished.

From 2006–07 to 2009–10, there were no foreign licensed vessels. "Charter" refers to the Japanese charter fleet only, and Australian vessels are shown separately as "Australian". New Zealand domestic vessels are referred to as "Domestic". The names "Charter" and "Domestic" are retained for continuity with the historical description of these fleets.

Two geographic areas are used, "North" and "South". The North area is defined as sets that began north of latitude 39.5° S on the west coast and north of 43.75° S on the east coast, these being the same boundaries as used previously by Ayers et al. (2004). The South area has previously been subdivided into south-west and south-east areas (Ayers et al. 2004), but no sets were made in the south-east area during 2006–07 to 2009−10, so this separation was not made. Sets outside the New Zealand EEZ in the North region were included.

As with previous years (Francis et al. 2004, Ayers et al. 2004, Griggs et al. 2007, 2008), some species were grouped together. "Deepwater dogfish" included those recorded as DWD (species unknown), Owston's dogfish (*Centroscymnus owstoni*), Portuguese dogfish (*Centroscymnus coelolepis*), longnose velvet dogfish (*Centroselachus crepidater*), Plunket's shark (*Proscymnodon plunketi*), leafscale gulper shark (*Centrophorus squamosus*), seal shark (*Dalatias licha*), velvet dogfish (*Zameus squamulosus*), cookie-cutter shark (*Isistius brasiliensis*), spiny dogfish (*Squalus acanthias*), shovelnose dogfish (*Deania calcea*), Baxters lantern dogfish (*Etmopterus granulosus*), and white tail dogfish (*Scymnodalatias albicauda*). Shortnose and longnose lancetfish, *Alepisaurus ferox* and *A. brevirostris*, were combined.
Deepwater dogfish and lancetfish were usually cut off the lines and observers often did not have the opportunity to identify them to the species level. Hapuku and bass (*Polyprion oxygeneios* and *P. americanus*) were combined as they were often not separated to the species level for reporting.

2.2 Estimation of catch per unit effort and total numbers

CPUE was expressed as the number of fish observed caught per 1000 hooks set. The basic unit of sampling was an individual set; a set *i* has information on the number of fish caught (c_i) and the

amount of effort expended (u_i the number of hooks). All hooks on a set may not be observed. In the calculation of CPUE we used the estimated number of observed hooks; this estimate was derived from the proportion of the haul observed (based on the haul duration and the time recorded as unobserved in the observer events logs) multiplied by the number of hooks set.

For the main catch species, CPUE values ($\hat{y}$) were calculated for each stratum (fishing year, fleet and area) in 2006–07 to 2009–10 by use of a ratio of means estimator (see Bradford 2002, Ayers et al. 2004):

$$\hat{y} = \frac{\sum_{i=1}^{n} c_i / n}{\sum_{i=1}^{n} u_i / n} = \frac{\sum_{i=1}^{n} c_i}{\sum_{i=1}^{n} u_i}$$

where n is the number of observed sets.

Ayers et al. (2004) compared the use of two analytical and one bootstrap variance estimators and found that the difference was negligible. These authors reported estimates of variance based on the sample means, which have better statistical properties (Thompson 1992):

$$\hat{\text{var}}(\hat{y}) = \frac{1}{\mu_u^2}\left(\frac{N-n}{N}\right)\frac{s_{\hat{y}}^2}{n}$$

where $s_{\hat{y}}^2 = \frac{1}{n-1}\sum_{i=1}^{n}(c_i - \hat{y}u_i)^2$

and μ_u is the population mean of the effort variable. There has been some indication that the estimator $\hat{\text{var}}(\hat{y})$ is correlated with the mean of the effort variable ($\bar{u}$). An adjusted estimator,

$$\tilde{\text{var}}(\hat{y}) = \left(\frac{\mu_u}{\bar{u}}\right)^2 \hat{\text{var}}(\hat{y})$$

has been suggested to alleviate this problem (Thompson 1992). This was used in the present study to provide analytical estimates of confidence intervals.

The total number of each species caught in each stratum was estimated by scaling up the CPUE to the total number of hooks set (N): thus, $\hat{T} = N\hat{y}$. These numbers were then summed across strata to give total annual catch estimates. The estimated variance of these totals was given by $\hat{\text{var}}(\hat{T}) = N^2\,\tilde{\text{var}}(\hat{y})$.

CPUE values and catch estimates are provided for 2006–07 to 2009–10 and added to the time series for 1988–89 to 2005–06 (Francis et al. 2004, Ayers et al. 2004, Griggs et al. 2007, 2008). Catch numbers estimated from observer data were compared with catch numbers reported by commercial fishers on their TLCERs.

2.3 Status of fish on recovery and subsequent treatment

The status of the fish at time of recovery (i.e., retrieval to the side of the vessel) and the subsequent treatment (i.e., whether processed or discarded), were analysed from observer data for 2006–07 to 2009–10 for each of the main non-target species. Fish status was recorded as alive, dead, killed by crew, or unobserved. Fish recorded as killed by crew were treated as alive on recovery. Fish treatment was recorded as retained, finned, discarded, lost, or unobserved. Retained and finned fish were grouped as fish that were processed in some way, whereas the discarded and lost fish were categorised as not processed.

2.4 Length frequency analysis

Observer length data were extracted for blue, mako, and porbeagle sharks, Ray's bream, and striped marlin, and length frequency distributions were summarised by sex and area.

3. RESULTS

3.1 Fishing effort and observer coverage

The New Zealand tuna longline fishery was dominated by the foreign licensed fleet during the 1980s (Francis et al. 2004). Most effort came from Japanese vessels, but Korean vessels were also involved. The total number of hooks set declined from a maximum of 27 million in 1980–81 to less than 4 million in the mid-1990s when the foreign licensed vessels ceased fishing in New Zealand (Figure 1).

Chartered Japanese vessels fished in New Zealand waters mainly from 1986 onwards and the effort of this group (with the effort by one large New Zealand vessel included) peaked at 2.2 million hooks during 1990–91. During the past 15 years Charter effort has been lower, averaging 1.1 million hooks annually. The Philippine fleet fished under charter arrangements in 2002–03 only, setting almost 1 million hooks. In 2005–06 a fleet of Australian vessels began fishing in New Zealand waters under charter arrangements, contributing 16 550 hooks (0.45% of the total set in that year). This effort only occurred at the end of the 2005–06 fishing year, but they continued into the 2006-07 fishing year setting 72 160 hooks (1.9% of the total set).

The Domestic fleet has increased its effort since 1991–92 and has been the dominant fleet in the fishery since 1993–94 (Table 1, Figure 1). Domestic effort peaked at almost 10 million hooks set in 2001–02, producing a second peak for the fishery as a whole of almost 11 million total hooks. Domestic and total effort have dropped substantially since then. The introduction of pelagic species into the QMS in October 2004 resulted in a change in fishing practices and a reduction in the number of Domestic boats in the fishery, but Domestic effort had been declining since 2002–03. In 2003–04, 7.4 million hooks were set, 5.9 million of them (80%) by the Domestic fleet, in 2004–05, this dropped further to 3.7 million hooks, of which 3.1 million (84%) were set by the Domestic fleet. In the 2005–06 fishing year, effort was almost the same as the previous year, with 3.7 million hooks set, of which 3.1 million were set by the Domestic fleet (Table 1).

Total fishing effort remained at 3.7 million hooks in 2006–07, with a lower contribution of 2.3 million hooks set by the domestic fleet. In 2007–08, total effort dropped to an all-time low of 2.2 million hooks, of which 1.7 million hooks were set by the domestic fleet. Effort then increased to around 3 million in 2008–09 and 2009–10, with the domestic fleet contributing 2.3 and 2.5 million hooks respectively (Table 1, Figure 1).

The number of observed trips and sets, observed hooks and reported hooks by fleet and the percentage of reported hooks on CELR forms are shown in Table 1. Use of CELR forms for reporting longline fishing has ceased. The last use of CELR forms on longline vessels was in 2005–06.

Observed hooks as a percentage of those set by the fishery are shown in Table 2, and by fleet and area in Figure 2, for all years. Observer coverage on charter vessels continues to be high, at 45−81% over the most recent four fishing years. Domestic coverage has increased over the last four fishing years to between 6 and 9%, and appears to be more spatially representative than in previous years.

The percentages of hooks observed per set during 2006–07 to 2009–10 are shown in Table 3. Most Domestic sets were fully observed, but this was not possible on Charter vessels where hauls often exceeded 12 hours and observers needed to take breaks. Most sets on Charter vessels were in the range 80–99% observed.

Number of reported sets and hooks and the percentages observed are shown for North and South areas by fleet and fishing year in Table 4.

Fishing positions of reported and observed sets in 2006–07 to 2009–10 are shown in Figure 3. In previous years, the Domestic fleet fished mainly in the North and the Foreign and Charter vessels fished predominantly in the South (Ayers et al. 2004, Francis et al. 2004, Griggs et al. 2007, 2008). In 2005–06 and 2006–07 the Australian vessels fished only in the North area, targeting bigeye tuna and swordfish with most sets in the Kermadec Fisheries Management Area (not shown).

This trend continued during 2006–07 for the Domestic vessels and Japanese Charter vessels, and then changed during the next three years, particularly for the Charter vessels. In 2006–07 Japanese vessels fished an extensive range of the West Coast of the South Island (WCSI) and then moved north in July and fished near East Cape. They targeted southern bluefin tuna and fished from March until August (Figure 4), with one vessel making three sets targeting bigeye tuna. In 2007–08, 2008–09, and 2009–10 fishing was confined to a smaller part of the southern WCSI west of Fiordland (Figure 3) and the fishing season was much shorter than in previous years (Figure 4). Japanese Charter vessels typically spend about 3–3 ½ months fishing in New Zealand waters, making the 2006–07 season (over 4 months) a long one and the others short, especially 2009–10 (1 ½ months). In 2008–09, there was some fishing near East Cape, with one vessel making two sets for bigeye tuna and the others continuing to fish for southern bluefin tuna.

Domestic vessels fished all year round, for a variety of target species, including bigeye tuna, southern bluefin tuna, swordfish, Pacific bluefin tuna, albacore, and yellowfin tuna. They fished mainly in the North, with very few sets in the South in 2006–07 and 2007–08, and then increased fishing effort in 2008–09 and 2009–10 in the South in a fairly concentrated area off central WCSI where they targeted southern bluefin tuna (Figure 3).

A comparison of commercial and observed sets, by latitude and longitude, for the past 10 years is shown in Figures 5 and 6. Observer coverage of the Charter fleet represented the spatial distribution of the fishery well in 2006–07 to 2009–10 (Figures 3, 5, and 6). Coverage of the Domestic fleet was better than in previous years, although a bit sparse. There was no coverage of the Domestic effort in the South in 2007–08. Observed sets in the North were concentrated south of East Cape and North Cape in 2006–07, and better distributed in the next three years. Observer coverage of the Charter fleet represented the spatial and temporal distribution of the fishery well but Domestic coverage did not adequately represent effort in many months (Figures 4 and 7).

3.2 Species composition

During 2006–07 to 2009–10, 111 074 fish and invertebrates from at least 50 species were observed (Appendix 1). Non-fish bycatch (seabirds, marine mammals, and turtles) were excluded from this analysis. The most commonly observed species since 1988–89 were blue shark, albacore tuna, and Ray's bream, which constituted nearly 70% of the catch by numbers (Appendix 1). Most species were rarely observed, with only 37 species (or species groups) exceeding 100 recorded fish since 1988–89.

Observed catches by fleet and area in 2006–07 to 2009–10 are shown in Table 5. These data provide a useful within-stratum comparison of relative species abundance, but should not be compared among strata because of the different numbers of observed hooks in each stratum.

In the four year period 2006–07 to 2009–10 blue shark was the most abundant species in the observed catches, followed by Ray's bream (Appendix 1). These two species were also the two most abundant species observed in each of the four fishing years (Table 5). The next most abundant species varied from year to year, but over the four year period combined these were southern bluefin tuna, albacore,

lancetfish, bigscale pomfret, dealfish, porbeagle shark, swordfish, moonfish, mako shark, deepwater dogfish, bigeye tuna, sunfish, and oilfish. Observed catches of escolar, butterfly tuna, pelagic stingray, school shark, and rudderfish were next highest, but had in earlier years been in the top 15 most abundant species, and were comparatively less frequent, (Ayers et al. 2004, Francis et al. 2004, Griggs et al. 2007, 2008).

Most (99.3%) of the deepwater dogfish identified to species were Owston's dogfish (*Centroscymnus owstoni*). There were 177 unidentified fish observed in 2006–07 to 2009–10. Most of these were cut off the line at the side of the vessel or lost and not seen by the observer.

The catch varied with area and fleet. The Charter fishing in the South caught mainly blue shark, Ray's bream and southern bluefin tuna, with smaller amounts of deepwater dogfish, bigscale pomfret, dealfish, and porbeagle shark. The Charter fleet fishing in the North in 2006–07 and 2008–09 caught mainly blue shark and albacore. The Domestic fleet caught mainly blue shark and albacore, followed by lancetfish and swordfish in the North. Domestic vessels observed in the South in 2008–09 and 2009–10 caught mainly blue shark catches, followed by southern bluefin tuna and Ray's bream. The most abundant species caught by the Australian vessels fishing in the far north were swordfish (their main target species), lancetfish, blue shark, bigeye tuna (the other species targeted), and albacore (Table 5).

3.3 Catch per unit effort

CPUE estimates were calculated for each fleet and area stratum in which eight or more sets were observed and at least 2% of the hooks were observed. The number of hooks and sets used in the CPUE calculations are shown in Table 4. CPUE estimates were calculated by species for each fleet and area in 2006–07 to 2009–10 and added to the time series for 1988–89 to 2005–06 (Griggs et al. 2008) and these are shown in Figure 8.

The CPUE results from the Domestic fleet should be interpreted with caution due to the lower observer coverage of this fleet. CPUE estimates for the Charter fleet can be considered reliable from 1992–93 onwards (Griggs et al. 2007).

Charter vessels fished in the North area in two of the four fishing years. In the South area the fishing area differed spatially and temporally from previous years. This makes trends more difficult to determine.

Some trends of the Charter fleet during 2006−07 to 2009–10:

- Some increase in CPUE of blue, mako, and porbeagle sharks in 2006−07 in the North
- CPUE of blue, mako and porbeagle sharks continued to be similar in the South to previous years
- Decrease of CPUE for deepwater dogfish in the South
- There was a huge increase in southern bluefin tuna in the South to the highest level ever observed
- A very high CPUE for bigeye tuna in 2006−07, and swordfish in 2005−06 and 2006−07 for the Australian fleet in the North
- An increase in CPUE of butterfly tuna in the North
- Yellowfin tuna CPUE has remained very low
- Ray's bream and bigscale pomfret reached their highest CPUE in the South in 2006−07, then declined after that
- Some increase for moonfish in 2006−07 in the North, then lower in 2008−09
- Increase in CPUE of oilfish in the North
- Increase in CPUE of dealfish in the South.

Over the full time-series the following trends were apparent:

- After a peak in 1994–95, blue shark CPUE in the North dropped before rising slightly since 2006−07
- CPUE of mako sharks was higher in the North than the South
- Porbeagle CPUE was higher in the South than the North, but porbeagle CPUE has been very low for the past nine years in the South, and there has been a recent increase in the North
- CPUE of school sharks was higher in the South than the North and much higher in the South for deepwater dogfish
- CPUE of southern bluefin tuna was higher in the South than the North in most years since the late 1990s, apart from a reversal in the mid 2000s, then in 2007−08 it increased sharply and reached the highest level yet in 2009−10
- Catch rates of albacore, bigeye tuna, yellowfin tuna, swordfish, moonfish, oilfish, escolar, and lancetfish were greatest in the North
- Yellowfin CPUE has remained very low
- Greatest catch rates of albacore, yellowfin tuna, swordfish, striped marlin, and lancetfish were usually made by the Domestic fleet in the North area
- CPUE of Ray's bream, bigscale pomfret, and dealfish were highest in the South and for the Charter fleet
- CPUE of Ray's bream and bigscale pomfret increased to a peak in 2004–05, and remained high
- Butterfly tuna CPUE has decreased in the South and increased in the North over recent years
- Escolar is mainly caught by charter vessels, with variable CPUE that was high in some years.

3.4 Total numbers of fish caught

The reported and estimated numbers of fish caught in 2006–07 to 2009–10 were added to the time series generated previously for 1988–89 to 2005–06 (Griggs et al. 2008) and these are shown in Figure 9.

CELR data were not included because either fish number or fish weight is reported, so the data for fish numbers are incomplete. This will cause a negative bias, especially in years when a high proportion of the catch was reported on CELR forms (see Table 1). CELR forms have not been used since 2005–06, so the numbers will not be affected by this during 2006–07 to 2009–10.

Reported catches of blue, mako, and porbeagle sharks increased slowly during 2006–07 to 2009–10, while deepwater dogfish catches decreased.
Southern bluefin tuna catches increased slightly, while albacore catches were relatively low and yellowfin tuna catches have declined consistently through the 2000s. Reported catches of butterfly tuna were below estimated catches for the past six years suggesting that they may be under-reported. Swordfish catches were lower in 2006–07 than in 2005–06, but then increased to a higher catch in 2009–10. Catches of Ray's bream and bigscale pomfret were high in 2006–07, this being a peak for bigscale pomfret, and then catches of both species fell over the next three years. Catches of oilfish, escolar, and rudderfish have been relatively low over the last six years. Reported dealfish catches increased to the highest level yet in 2009–10 but were well below estimated catches during the 1900s. Reported catches of lancetfish were below estimated catches suggesting they were under-reported.

Reported catches of each species caught in 2006–07 to 2009–10 are shown in Appendix 2.

3.5 Length-frequency distributions

Observed length frequency distributions by area and sex of blue, porbeagle, and mako sharks, and Ray's bream are shown in Figures 10–13 for fish measured in 2006–07 to 2009–10. Striped marlin distributions are not presented as only two were measured in the four year time period.

Length frequency distributions of blue sharks showed differences in size composition between North and South areas (Figure 10). There were more female blue sharks (59.5% over the four year period) caught than males, with a higher proportion of females in the South (77.5% over the four years) than the North (40.5 %). Based on the length-frequency distributions and approximate mean lengths at maturity of 192.5 cm fork length for males and 180 cm for females (Francis & Duffy 2005), most blue sharks were immature (91.1% of males and 92.9% of females, overall). Greater proportions of mature male blue sharks were found in the North (12.1% mature in the North and 1.1% in the south), while more similar proportions of mature females were found in the North and South (4.5% and 8.4% respectively).

The proportion of porbeagles caught in the South was less than the North, unlike other years, and the fish were smaller than seen previously (Francis et al. 2004, Ayers et al. 2004, Griggs et al. 2007, 2008). In this four year period there is a mode at about 75–100 cm each year in both sexes and few larger fish (Figure 11), while in previous years there had been a bimodal distribution with a dominant mode between 110–140 cm (Francis et al. 2004, Ayers et al. 2004). This larger mode has been less predominant in the previous five years, 2002–03 to 2005–06 (Griggs et al. 2007, 2008). Based on length-frequencies and mean lengths at maturity of 145 cm FL for males and 175 cm fork length for females (Francis & Duffy 2005), most porbeagle sharks were immature (86.4% of males and 97.4% of females, overall). Sex ratios between male and female porbeagle sharks were similar.

Few mako sharks were observed in the South. The distributions were roughly bimodal with a wide size range and no discernible difference between males and females (Figure 12). There were more females (60.9% over the four year period) than males. Assuming a mean length at maturity of 182.5 cm FL for males and 280 cm fork length for females (Francis & Duffy 2005), most mako sharks were immature (85.1% of males and 100.0% of females, overall).

The distributions of Ray's bream for each year in the North and South regions are shown in Figure 13. Ray's bream are usually kept whole and not sexed, but in 2006–07 and 2009–10 fish were further processed and the fish were sexed, and distributions are shown for 2006–07 and 2009–10 by region and sex. There are differences in the North/South distributions, with South fish being larger, but the distributions for males and females are similar (Figure 10). Female Ray's bream mature at about 43 cm (Francis et al. 2004), and most females were probably mature (78.7% over the four year period).

It is not known whether observers are distinguishing Ray's bream from Southern Ray's bream (*Brama australis*) and it is possible that there are two species with different distributions.

3.6 Status of fish on recovery and discards

The percentages of the main non-target species recorded alive or dead, by year, fleet, and area, are shown in Table 6. The top 15 most abundant species in 2006–07 to 2009–10 (combined) are included in this table, along with school shark, rudderfish, yellowfin tuna and striped marlin, which have been included in previous bycatch reports (Ayers et al. 2004, Francis et al. 2004, Griggs et al. 2007, 2008).

In 2006–07 to 2009–10, most sharks were landed alive, with the percentage alive highest for blue sharks and deepwater dogfish, and lowest for porbeagle sharks. Percentage alive varied with fleet and area, and tended to be lower in the North than in the South.

Most of the albacore, swordfish and butterfly tuna were landed dead. There were large fleet differences for these three species. Most of those landed by the Charter fleet were landed alive while most of those landed by the Domestic and Australian fleets were dead (Table 6), as seen previously (Griggs et al. 2008). Few yellowfin tuna and striped marlin were caught and most were alive.

Most moonfish, Ray's bream, bigscale pomfret, escolar, oilfish, and rudderfish were alive when recovered, as seen previously (Ayers et al. 2004, Francis et al. 2004, Griggs et al. 2007, 2008). Most

dealfish and lancetfish were recovered dead, with variation between years for both species, and also between fleets for lancetfish, where a greater proportion landed by the Domestic and Australian fleets were dead (Table 6).

The proportions of each species retained and discarded are shown in Table 7. Overall, most blue, mako, porbeagle, and school sharks were processed in some way, while almost all deepwater dogfish were discarded, but there were significant fleet differences. Charter vessels finned most of their blue sharks and porbeagle sharks, and retained most of their mako sharks for further processing. This is similar to previous years (Griggs et al. 2007, 2008) except that fewer porbeagles were retained for their flesh. Domestic vessels discarded more than half of their catch of these three species, while some vessels finned them, and not many were retained for further processing. These patterns have been observed before (Griggs et al. 2007, 2008) and vary from vessel to vessel. Some vessels do not retain or fin any sharks, dead or alive. Most school sharks were retained for their flesh by both fleets but some were finned only. Australian vessels did not catch many sharks and discarded most of them.

Most albacore and swordfish were retained by all fleets. Charter vessels retained most of their butterfly tuna, while the proportion retained by the Domestic fleet varied from year to year. Over the four year period Domestic vessels discarded nearly half of their butterfly tuna. Yellowfin tuna was caught mostly by the Domestic fleet with some caught by Australian vessels, and most were retained. Australian vessels discarded eight striped marlin and Domestic vessels discarded 43. Three Striped marlin caught by the Domestic fleet were retained. These were recorded as caught within the EEZ and no explanations were available regarding retention of these fish.

Most moonfish and Ray's bream were retained by both the Charter and Domestic fleets. Domestic vessels retained more of the non-quota fish bycatch species than Charter vessels did. Bigscale pomfret was mostly discarded by the Charter fleet in 2006−07, mostly retained in 2007−08, and retained in lesser proportions in the next two years. Charter vessels discarded escolar, oilfish, and rudderfish while Domestic vessels retained the majority of these three species.
Dealfish and lancetfish were almost all discarded by Charter and Domestic vessels. Australian vessels did not catch many fish bycatch species, except lancetfish which they discarded, and escolar which they mostly retained.

Sunfish were not included in Tables 6 and 7, but were the 12th most abundant species in 2006–07 to 2009−10. Most (99.2 %) were landed alive, and most (98.0 %) were discarded by all fleets.

Life status of discarded fish is shown in Table 8. The majority of discarded sharks were alive when recovered and could be Sixth Schedule releases. Overall nearly half of the swordfish, one quarter of the moonfish and most of the Ray's bream discards were dead on recovery, and this varied between fleets. Non-QMS bycatch species are shown in Table 8 as well.

Discarding of some QMS species can be explained by damage, which applies to a few dead sharks only (0.1% blue sharks, 3.7% mako sharks and 5.2% porbeagle sharks), and a higher proportion of swordfish (75.0%), moonfish (100%) and Ray's bream (92.7%).

4. DISCUSSION

Major changes occurred in the New Zealand tuna longline fishery in recent years, including the introduction of a new TLCER form with better reporting of discarded species, introduction of several important target and non-target species into the QMS, and a decline in fishing effort since 2001−02, particularly for the Domestic fleet. A fleet of Australian vessels began fishing in New Zealand waters near the end of the 2005–06 fishing year and continued into the 2006–07 fishing year. Effort was consistent at 3.7 million hooks for three years, from 2004–05 to 2006–07, and then declined. Fishing seasons for the Charter vessels were shorter during 2007–08 to 2009–10, and this appears to reflect earlier high catch rates of southern bluefin tuna and the fleet reaching the fishing quota sooner. Effort

of the Domestic fleet declined in 2007–08 to the lowest level since 1993–94, and increased in the following two years.

The species most commonly observed on tuna longlines in 2006–07 to 2009–10 were blue shark, Ray's bream, and albacore tuna, as in previous years (Francis et al. 1999, 2000, 2004, Ayers et al. 2004, Griggs et al. 2007, 2008). Catch composition varied with area fished and fleet. The Australian fleet targeted bigeye tuna and swordfish and fished subtropical waters in the far north and this is reflected in their different catch composition. The Japanese Charter vessels fished together on the WCSI and the area they fished in was less extensive during 2007–08 to 2009–10 than in previous years. In 2006–07 and 2008–09 Charter vessels fished off the East Cape area at the end of their season.

Differences in CPUE trends in the Charter fleet in both the North and South regions may reflect different spatial representation or varying abundance of species in different areas.

We have not been able to adequately quantify changes in catch made by the Domestic fleet due to low and non-representative observer coverage of this fleet, which contributed most of the effort. However coverage has improved over recent years and appears to be more spatially representative of the fishing effort.

The biggest change in catch rates during 2006–07 to 2009–10 was a big increase for southern bluefin tuna by the Charter fleet fishing in the South. There were high catch rates for other southern species caught by this fleet, including Ray's bream, bigscale pomfret and dealfish. Catch rates were high for bigeye tuna and swordfish caught in the North by the Australian vessels.

Discard practices varied according to fleet and vessel, and may also vary with the presence of an observer on board. It is difficult to determine true practices in discarding of shark quota species in particular. When observers are on board, practices may change, and vessel personnel can sign 'Authority to Discard' forms provided by observers. Some vessels fin or retain sharks according to QMS requirements, while others discard them. Some domestic vessel skippers admit that they do not want to retain or fin any sharks, dead or alive, and that this is widespread throughout the domestic fishery (Observer Programme observers, pers. comm.). Some are opposed to finning. Some fishers also admit that they do not report discards of non-quota species (Observer Programme observers, pers. comm.), another practice claimed to be widespread, so many of the fish bycatch species can be considered to be under-reported.

The proportion of each species recovered alive varied with fleet and area, and tended to be lower in the North than in the South. There were large fleet differences for some species, especially albacore, swordfish and butterfly tuna, where more were landed dead than alive, and the proportion landed alive was much less for the Domestic vessels than the Charter vessels.

Quite a high proportion of QMS sharks (blue, porbeagle and mako sharks) were discarded, while QMS fish species (swordfish, moonfish and Rays bream) were mostly retained. Most sharks are recovered alive and most of the discards of blue, mako and porbeagle sharks could be Sixth Schedule releases, but quite a few of these quota species were discarded dead. Discard of some QMS can be explained by damage, which applies to a few dead sharks only, and the majority of swordfish, moonfish and Ray's bream.

Francis et al. (2004) suggested that it is unlikely that New Zealand's tuna longline fishery is having a serious impact on the stock of blue, mako and porbeagle sharks, and catch levels in recent years are unlikely to have made any changes to this, although adequate assessment of the wider stock has not been carried out. However, under-reporting of sharks (and other non-target species), and low Domestic observer coverage create considerable uncertainty about the true level of fishery removals from these stocks in New Zealand waters.

The goal of the NPOA is 'to ensure the conservation and management of sharks and their long-term sustainable use'. Part of the NPOA's plan of action is to strengthen existing research and monitoring programmes, which includes monitoring stock status and monitoring of wastage. The detailed information that observers record on catches, discards and landed states is critical for determining the impact of fishing on both QMS and non-QMS species. Continued review of observer allocation is important to ensure improvements in observer coverage (Anon 2008).

We recommend that observer coverage of the Domestic fleet be further increased and that efforts are made to ensure that the coverage is representative of the spatial and temporal distribution of the fishing effort and therefore the catch. While 90% of the total effort is made by the domestic fleet, less than 10% of the effort of the domestic fleet is observed, and this should be increased. The biggest shortfall is for the domestic vessels fishing in the north region in FMA1 and FMA2 for bigeye and southern bluefin tuna.

A suggested distribution of observer days is outlined in Appendix 3. This is based on 2005–06 to 2009–10 data with all four years combined. The fishery is divided into West Coast targeting southern bluefin tuna (W STN), East Coast targeting southern bluefin tuna (E STN), West Coast targeting bigeye tuna and/or swordfish (W BIG/SWO), East Coast targeting bigeye tuna and/or swordfish (E BIG/SWO). Other minor target species (albacore, Pacific Bluefin tuna, and yellowfin tuna) are included with BIG/SWO).

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Table 1: Number of tuna longline trips, sets and hooks observed, and number of hooks reported on TLCER and CELR forms by tuna longline vessels fishing in New Zealand. "Foreign and charter" vessels are predominantly Japanese, with some Korean effort in the 1980s, Philippine effort in 2002–03, Australian fleet in 2005–06 and 2006–07, and the effort of one large domestic vessel that fished with the Japanese charter fleet.

	Observed		Observed hooks			Set hooks			
Fishing year	Trips	Sets	Domestic	Foreign+ charter	Total	Domestic	Foreign+ charter	Total	% on CELR
1988–89	5	86	0	234 826	234 826	11 800	9 953 745	9 965 545	0.1
1989–90	6	154	0	447 239	447 239	117 562	8 553 288	8 670 850	1.3
1990–91	3	150	0	421 808	421 808	350 897	15 316 845	15 667 742	2.0
1991–92	8	192	19 525	508 629	528 154	544 658	10 362 346	10 907 004	1.9
1992–93	17	373	0	1 057 985	1 057 985	996 293	5 970 648	6 966 941	1.8
1993–94	9	246	2 418	693 262	695 680	1 798 970	1 763 343	3 562 313	11.2
1994–95	12	339	65 694	815 807	881 501	3 003 260	1 641 585	4 644 845	15.7
1995–96	5	147	162 922	0	162 922	3 048 663	258 203	3 306 866	21.2
1996–97	15	424	79 991	882 763	962 754	2 336 462	1 455 906	3 792 368	6.9
1997–98	15	438	70 835	989 566	1 060 401	2 943 762	1 277 666	4 221 428	4.6
1998–99	9	402	35 264	1 052 721	1 087 985	5 394 338	1 504 271	6 898 609	3.6
1999–00	13	274	38 458	659 923	698 381	7 143 042	1 150 085	8 293 127	2.9
2000–01	23	474	240 979	818 744	1059 723	8 907 172	943 018	9 850 190	1.3
2001–02	17	398	144 716	773 443	918 159	9 973 801	984 695	10 958 496	0.3
2002–03	9	610	0	1 887 816	1 887 816	8 650 712	2 216 292	10 867 004	0.2
2003–04	16	549	128 399	1 336 066	1 464 465	5 924 227	1 471 454	7 395 681	0.1
2004–05	14	343	150 574	562 825	713 399	3 091 477	642 074	3 733 551	0.6
2005–06	16	265	89 983	548 653	638 036	3 095 479	625 160	3 720 639	<0.1
2006–07	21	446	169 592	786 327	955 919	2 292 222	1 453 370	3 745 592	0.0
2007–08	18	226	141 489	254 208	395 697	1 664 974	568 285	2 233 259	0.0
2008–09	17	384	147 196	657 535	804 731	2 309 003	809 230	3 118 233	0.0
2009–10	21	325	179 700	387 285	571 994	2 507 977	478 558	2 986 535	0.0

Table 2: Percentage of hooks observed.

Fishing Year	Domestic	Foreign+ charter	Total
1988–89	0.0	2.4	2.4
1989–90	0.0	5.2	5.2
1990–91	0.0	2.8	2.7
1991–92	3.6	4.9	4.8
1992–93	0.0	17.7	15.2
1993–94	0.1	39.3	19.5
1994–95	2.2	49.7	19.0
1995–96	5.3	0.0	4.9
1996–97	3.4	60.6	25.4
1997–98	2.4	77.5	25.1
1998–99	0.7	70.0	15.8
1999–00	0.5	57.4	8.4
2000–01	2.7	86.8	10.8
2001–02	1.5	78.5	8.4
2002–03	0.0	85.2	17.4
2003–04	2.2	90.8	19.8
2004–05	4.9	87.7	19.0
2005–06	2.9	87.8	17.1
2006–07	7.4	54.1	25.5
2007–08	8.5	44.7	17.7
2008–09	6.4	81.3	25.8
2009–10	7.2	80.9	19.0
Total	2.5	23.1	12.2

Table 3: Percentage of hooks observed on observed sets in 2006–07 to 2009–10. Values are the numbers of sets in each category.

Fishing Year	% hooks observed	Number of sets		
		Domestic	Foreign+ charter	Total
2006–07	60–69		1	1
	70–79		10	10
	80–89		79	79
	90–99	3	162	165
	100	160	31	191
	Total	163	283	446
2007–08	60–69		3	3
	70–79		9	9
	80–89		31	31
	90–99		28	28
	100	143	12	155
	Total	143	83	226
2008–09	40–49		1	1
	50–59		4	4
	60–69		11	11
	70–79		67	67
	80–89		84	84
	90–99		64	64
	100	152	1	153
	Total	152	232	384
2009–10	10–19		1	1
	30–39		2	2
	50–59		2	2
	60–69		4	4
	70–79		59	59
	80–89	1	53	54
	90–99	1	18	19
	100	191	5	196
	Total	193	144	337

Table 4: Number of sets and hooks available for estimating CPUE and numbers of fish caught, by fishing year, fleet and area. Hook numbers are in thousands.

		Foreign and Charter fleet				Domestic fleet			
Fishing year	Area	Reported sets	% sets observed	Reported hooks	% hooks observed	Reported sets	% sets observed	Reported hooks	% hooks observed
1988–89	N	1 284	3.7	3 701	3.3	12	0.0	12	0.0
1989–90	N	1 294	6.0	3 752	6.0	265	0.0	117	0.0
1990–91	N	2 052	5.9	6 032	5.6	447	0.0	319	0.0
1991–92	N	1 550	5.4	4 500	5.4	691	0.0	540	0.0
1992–93	N	445	28.8	1 207	27.5	1 117	0.0	944	0.0
1993–94	N	49	65.3	137	63.4	1 978	0.0	1 649	0.0
1994–95	N	23	56.5	61	44.9	2 705	1.8	2 210	3.0
1995–96	N	0	–	0	–	3 154	2.1	2 775	2.3
1996–97	N	48	91.7	136	87.0	2 792	3.6	2 328	3.4
1997–98	N	123	76.4	328	73.9	3 267	2.4	2 930	2.4
1998–99	N	53	54.7	167	50.0	5 383	0.7	5 376	0.7
1999–00	N	46	54.3	134	50.5	6 547	0.0	7 087	0.0
2000–01	N	31	100.0	83	93.5	7 731	2.6	8 842	2.7
2001–02	N	4	100.0	12	97.9	8 196	1.5	9 683	1.5
2002–03	N	27	100.0	80	86.0	7 120	0.0	8 539	0.0
2003–04	N	16	100.0	52	79.6	4 722	2.1	5 487	2.2
2004–05	N	42	100.0	138	84.8	2 754	4.9	3 017	4.7
2005–06	N	18	100.0	50	82.1	2 769	2.3	2 992	2.6
2006–07	N	82	68.3	274	61.0	2 275	7.2	2 289	7.4
2007–08	N	0	–	0	–	1 675	8.5	1 572	9.0
2008–09	N	23	100.0	73	80.5	2 233	6.6	2 150	6.6
2009–10	N	0	–	0	–	2 454	6.7	2 307	6.9
1988–89	S	2 137	1.8	6 253	1.8	0	–	0	–
1989–90	S	1 628	4.7	4 801	4.6	2	0.0	<1	0.0
1990–91	S	3 127	0.9	9 285	0.9	23	0.0	31	0.0
1991–92	S	1 995	4.6	5 862	4.6	7	0.0	5	0.0
1992–93	S	1 563	15.7	4 763	15.2	29	0.0	53	0.0
1993–94	S	560	37.7	1 626	37.3	129	0.0	150	0.0
1994–95	S	540	51.1	1 580	49.9	798	0.0	793	0.0
1995–96	S	96	0.0	258	0.0	323	25.1	274	35.9
1996–97	S	457	61.1	1 320	57.9	14	0.0	9	0.0
1997–98	S	318	82.7	950	78.7	16	0.0	14	0.0
1998–99	S	436	77.1	1 338	72.5	34	0.0	19	0.0
1999–00	S	334	63.8	1 016	58.3	60	0.0	56	0.0
2000–01	S	277	87.0	860	86.2	79	0.0	65	0.0
2001–02	S	320	84.7	973	78.3	283	0.0	291	0.0
2002–03	S	348	100.0	1 134	92.7	150	0.0	137	0.0
2003–04	S	431	100.0	1 420	91.2	410	1.2	448	1.4
2004–05	S	157	100.0	504	88.4	107	7.5	97	7.9
2005–06	S	164	100.6	556	89.9	109	11.0	104	11.2
2006–07	S	321	59.5	1 107	53.1	3	0.0	3	0.0
2007–08	S	167	49.7	568	44.7	101	0.0	93	0.0
2008–09	S	216	96.8	736	81.3	160	3.1	159	3.9
2009–10	S	144	100.0	479	80.9	238	7.1	204	10.0

Table 4 *(continued)*: Philippine and Australian fleets.

		Philippine fleet			
Fishing year	Area	Reported sets	% sets observed	Reported hooks	% hooks observed
2002–03	N	241	96.7	1 002	76.6

		Australian fleet			
Fishing year	Area	Reported sets	% sets observed	Reported hooks	% hooks observed
2005–06	N	15	53.3	17	52.4
2006–07	N	79	45.6	72	42.9

Table 5: Numbers of the most common species observed during 2006–07 by fleet and area. Species are shown in descending order of total abundance. Also shown are the percentage of these species that were retained, and the percentage of the discarded fish that were dead on landing (n/a, none discarded).

	Charter		Domestic	Australia	Total	% of	%	discards
Species	North	South	North	North	number	catch	retained	% dead
Blue shark	2 734	5 541	3 999	132	12 406	30.8	67.5	5.3
Ray's bream	285	11 459	444	12	12 200	30.2	96.8	96.7
Albacore tuna	841	609	1 882	79	3 411	8.5	96.7	86.1
Southern bluefin tuna	398	1 133	315	0	1 846	4.6	94.0	5.0
Lancetfish	142	29	1 352	270	1 793	4.4	0.2	69.6
Big scale pomfret	4	1 612	3	0	1 619	4.0	1.3	18.0
Moonfish	493	123	180	20	816	2.0	93.0	25.0
Swordfish	93	22	355	326	796	2.0	94.7	40.7
Porbeagle shark	241	387	134	0	762	1.9	78.1	16.8
Mako shark	294	30	264	28	616	1.5	66.1	15.2
Dealfish	0	613	0	1	614	1.5	0.5	82.9
Deepwater dogfish	1	603	0	0	604	1.5	0.7	4.9
Bigeye tuna	8	0	414	80	502	1.2	95.4	66.7
Oilfish	348	4	37	1	390	1.0	7.9	9.2
Sunfish	43	32	192	13	280	0.7	3.9	1.5
Hoki	0	247	0	0	247	0.6	87.9	100.0
School shark	5	229	2	0	236	0.6	97.9	0.0
Butterfly tuna	91	34	83	1	209	0.5	71.3	93.1
Escolar	49	1	125	32	207	0.5	65.2	29.7
Pelagic stingray	8	1	126	43	178	0.4	0.0	8.2
Rudderfish	35	67	68	1	171	0.4	29.8	11.2
Thresher shark	21	54	16	4	95	0.2	36.8	13.5
Cubehead	0	42	5	0	47	0.1	12.8	65.9
Yellowfin tuna	0	0	28	18	46	0.1	80.4	0.0
Black barracouta	9	12	2	10	33	0.1	0.0	51.6
Striped marlin	0	0	12	8	20	0.0	10.0	41.2
Flathead pomfret	1	18	1	0	20	0.0	5.0	50.0
Hapuku bass	1	2	15	0	18	0.0	94.4	0.0
Dolphinfish	0	0	10	7	17	0.0	94.1	n/a
Skipjack tuna	0	1	13	2	16	0.0	87.5	100.0
Shark, unspecified	0	1	1	12	14	0.0	0.0	0.0
Pacific bluefin tuna	2	4	7	0	13	0.0	92.3	100.0
Snake mackerel	0	0	1	9	10	0.0	20.0	50.0
Wingfish	0	10	0	0	10	0.0	0.0	70.0
Hake	1	5	0	0	6	0.0	83.3	100.0
Bronze whaler shark	2	0	1	0	3	0.0	66.7	0.0
Kingfish	0	0	3	0	3	0.0	100.0	n/a
Seahorse	0	2	1	0	3	0.0	0.0	0.0
Shortbill spearfish	0	0	1	2	3	0.0	0.0	66.7
Bigeye thresher shark	2	0	0	0	2	0.0	100.0	n/a
Wahoo	0	0	1	1	2	0.0	50.0	n/a
Blue marlin	0	0	0	1	1	0.0	0.0	100.0
Fanfish	1	0	0	0	1	0.0	0.0	0.0
Sixgill shark	0	1	0	0	1	0.0	0.0	0.0
Hammerhead shark	0	0	0	1	1	0.0	100.0	n/a
Unicornfish	0	1	0	0	1	0.0	0.0	0.0

Table 5: (*continued*). 2006–07 continued.

	Charter		Domestic	Australia	Total	% of	%	discards
Species	North	South	North	North	number	catch	retained	% dead
Oceanic whitetip shark	0	0	0	1	1	0.0	0.0	n/a
Pipefish	0	0	1	0	1	0.0	100.0	n/a
Gemfish	0	0	1	0	1	0.0	100.0	n/a
Stingray	0	0	1	0	1	0.0	0.0	0.0
Unidentified fish	1	2	29	9	41	0.1	4.9	28.6
Total	6 154	22 931	10 125	1 124	40 334			

Table 5: (*continued*). 2007–08.

Species	Charter South	Domestic North	Total number	% of catch	% retained	discards % dead
Blue shark	2 747	5 656	8 403	42.0	69.8	4.8
Rays bream	3 975	152	4 127	20.6	96.9	90.4
Albacore tuna	170	1 771	1 941	9.7	96.1	97.6
Southern bluefin tuna	1 301	138	1 439	7.2	97.3	0.0
Porbeagle shark	49	488	537	2.7	40.6	22.3
Big scale pomfret	534	2	536	2.7	97.0	83.3
Swordfish	3	496	499	2.5	91.6	67.7
Lancetfish	0	464	464	2.3	1.1	49.9
Mako shark	16	305	321	1.6	68.2	7.7
Deepwater dogfish	250	0	250	1.3	0.4	8.1
Sunfish	10	218	228	1.1	3.1	0.5
Dealfish	192	0	192	1.0	0.0	81.9
Bigeye tuna	0	174	174	0.9	92.5	77.8
Pelagic stingray	4	135	139	0.7	1.4	3.7
Moonfish	41	97	138	0.7	100.0	n/a
Butterfly tuna	5	95	100	0.5	58.0	90.2
Escolar	0	86	86	0.4	79.1	57.1
Rudderfish	38	21	59	0.3	45.8	28.0
Dolphinfish	0	45	45	0.2	93.3	n/a
Oilfish	1	38	39	0.2	59.0	61.5
Yellowfin tuna	0	33	33	0.2	90.9	100.0
Flathead pomfret	31	0	31	0.2	3.2	10.0
Thresher shark	12	17	29	0.1	27.6	20.0
Cubehead	11	5	16	0.1	6.3	78.6
Bronze whaler shark	0	11	11	0.1	27.3	0.0
School shark	10	1	11	0.1	100.0	n/a
Galapagos shark	0	8	8	0.0	75.0	50.0
Shark, unspecified	0	8	8	0.0	0.0	0.0
Hoki	7	0	7	0.0	100.0	n/a
Pacific bluefin tuna	1	6	7	0.0	85.7	n/a
Barracouta	5	1	6	0.0	66.7	100.0
Hapuku bass	0	6	6	0.0	100.0	n/a
Skipjack tuna	0	6	6	0.0	100.0	n/a
Striped marlin	0	6	6	0.0	0.0	0.0
Wingfish	6	0	6	0.0	0.0	66.7
Bigeye thresher shark	0	5	5	0.0	0.0	60.0
Kingfish	0	4	4	0.0	50.0	50.0
Scissortail	3	0	3	0.0	0.0	33.3
Blue marlin	0	2	2	0.0	0.0	100.0
Hammerhead shark	0	2	2	0.0	50.0	0.0
Black barracouta	0	1	1	0.0	0.0	100.0
Oceanic whitetip shark	0	1	1	0.0	100.0	n/a
Ocean blue-eye	0	1	1	0.0	100.0	n/a
Sea perch	0	1	1	0.0	100.0	n/a
Shortbill spearfish	0	1	1	0.0	100.0	n/a
Scalloped dealfish	1	0	1	0.0	0.0	0.0
Unidentified fish	0	60	60	0.3	0.0	100.0
Total	9 423	10 567	19 930			

Table 5: (*continued*). 2008–09.

	Charter		Domestic		Total	% of	%	discards
Species	North	South	North	South	number	catch	retained	% dead
Blue shark	1 318	4 430	3 938	111	9 797	35.9	73.6	1.3
Rays bream	313	4 343	551	34	5 241	19.2	98.7	88.1
Southern bluefin tuna	131	2 981	242	100	3 454	12.6	98.9	4.5
Albacore tuna	474	131	1 990	3	2 598	9.5	98.2	96.0
Lancetfish	34	1	1 226	0	1 261	4.6	0.2	85.6
Dealfish	0	608	0	1	609	2.2	0.3	77.8
Porbeagle shark	79	178	254	5	516	1.9	68.9	3.8
Swordfish	37	6	417	1	461	1.7	97.4	0.0
Big scale pomfret	2	444	0	0	446	1.6	61.1	29.7
Deepwater dogfish	0	439	2	0	441	1.6	0.5	10.1
Mako shark	50	35	290	3	378	1.4	68.0	0.9
Bigeye tuna	12	0	361	0	373	1.4	99.2	n/a
Moonfish	73	34	201	0	308	1.1	99.0	50.0
Escolar	33	0	188	0	221	0.8	72.4	18.5
Oilfish	170	0	35	0	205	0.8	15.6	15.5
Sunfish	5	5	186	1	197	0.7	1.0	0.0
Butterfly tuna	32	64	94	0	190	0.7	74.2	83.7
Pelagic stingray	10	0	162	0	172	0.6	0.6	1.2
School shark	0	132	2	2	136	0.5	98.5	0.0
Rudderfish	7	55	20	0	82	0.3	20.7	27.9
Flathead pomfret	0	51	0	0	51	0.2	3.9	28.6
Dolphinfish	0	0	25	0	25	0.1	100.0	n/a
Thresher shark	3	10	8	0	21	0.1	33.3	7.7
Black barracouta	1	11	1	0	13	0.0	0.0	84.6
Skipjack tuna	0	0	12	0	12	0.0	100.0	n/a
Bigeye thresher shark	2	0	8	0	10	0.0	50.0	0.0
Hoki	0	10	0	0	10	0.0	60.0	100.0
Striped marlin	0	0	9	0	9	0.0	0.0	50.0
Pacific bluefin tuna	0	0	9	0	9	0.0	100.0	n/a
Yellowfin tuna	0	0	9	0	9	0.0	100.0	n/a
Hapuku bass	0	0	5	0	5	0.0	100.0	n/a
Barracouta	0	4	0	0	4	0.0	75.0	0.0
Kingfish	1	0	3	0	4	0.0	25.0	0.0
Blue marlin	0	0	2	0	2	0.0	0.0	50.0
Bronze whaler shark	1	0	1	0	2	0.0	50.0	0.0
Cubehead	0	0	2	0	2	0.0	0.0	100.0
Hammerhead shark	0	0	2	0	2	0.0	100.0	n/a
Broadnose seven gill shark	0	2	0	0	2	0.0	50.0	0.0
Fanfish	0	1	0	0	1	0.0	0.0	0.0
Hake	0	1	0	0	1	0.0	0.0	n/a
Pelagic stargazer	0	0	1	0	1	0.0	100.0	n/a
Shark, unspecified	0	1	0	0	1	0.0	0.0	0.0
Slender tuna	0	1	0	0	1	0.0	0.0	0.0
Wingfish	0	1	0	0	1	0.0	0.0	100.0
Unidentified fish	1	1	34	0	36	0.1	5.6	25.0
Total	2 789	13 980	10 290	261	27 320			

Table 5: (*continued*). 2009–10.

	Charter	Domestic		Total	% of	%	discards
Species	South	North	South	number	catch	retained	% dead
Blue shark	2 024	4 650	882	7 556	32.2	52.1	6.6
Rays bream	3 295	326	88	3 709	15.8	98.4	73.3
Southern bluefin tuna	3 244	211	179	3 634	15.5	98.4	9.8
Lancetfish	3	2 139	1	2 143	9.1	0.0	85.2
Albacore tuna	90	1 772	42	1 904	8.1	97.3	97.1
Dealfish	882	0	7	889	3.8	0.3	63.3
Swordfish	3	452	2	457	2.0	94.3	47.1
Moonfish	76	339	6	421	1.8	97.1	0.0
Porbeagle shark	72	328	20	420	1.8	51.7	32.0
Mako shark	11	343	7	361	1.5	21.6	16.5
Big scale pomfret	349	4	0	353	1.5	42.6	10.5
Deepwater dogfish	305	0	0	305	1.3	0.3	7.0
Sunfish	7	283	5	295	1.3	0.0	0.4
Bigeye tuna	0	191	0	191	0.8	96.3	n/a
Escolar	0	129	0	129	0.6	89.8	37.5
Butterfly tuna	15	100	3	118	0.5	76.3	80.8
Pelagic stingray	0	96	0	96	0.4	0.0	1.1
Oilfish	2	75	0	77	0.3	85.7	20.0
Rudderfish	39	20	2	61	0.3	38.3	29.4
Flathead pomfret	56	0	0	56	0.2	0.0	14.5
Dolphinfish	0	47	0	47	0.2	76.6	37.5
School shark	34	0	2	36	0.2	100.0	n/a
Striped marlin	0	24	0	24	0.1	4.3	31.6
Thresher shark	7	17	0	24	0.1	25.0	26.7
Cubehead	13	0	1	14	0.1	14.3	100.0
Kingfish	0	10	0	10	0.0	40.0	0.0
Yellowfin tuna	0	9	0	9	0.0	100.0	n/a
Hake	8	0	0	8	0.0	100.0	n/a
Hapuku bass	1	6	0	7	0.0	100.0	n/a
Pacific bluefin tuna	0	5	0	5	0.0	100.0	n/a
Black barracouta	0	4	0	4	0.0	0.0	75.0
Skipjack tuna	0	4	0	4	0.0	100.0	n/a
Shortbill spearfish	0	4	0	4	0.0	0.0	75.0
Gemfish	0	3	0	3	0.0	100.0	n/a
Bigeye thresher shark	0	2	0	2	0.0	0.0	0.0
Snipe eel	2	0	0	2	0.0	50.0	0.0
Slender tuna	2	0	0	2	0.0	0.0	50.0
Wingfish	2	0	0	2	0.0	50.0	0.0
Bronze whaler shark	0	1	0	1	0.0	100.0	n/a
Hammerhead shark	0	1	0	1	0.0	0.0	0.0
Hoki	0	0	1	1	0.0	100.0	n/a
Louvar	0	1	0	1	0.0	100.0	n/a
Marlin, unspecified	0	1	0	1	0.0	0.0	0.0
Scissortail	0	1	0	1	0.0	0.0	100.0
Broadnose seven gill shark	1	0	0	1	0.0	0.0	0.0
Shark, unspecified	0	1	0	1	0.0	0.0	0.0
Unidentified fish	2	30	8	40	0.2	2.6	0.0
Total	10 545	11 629	1 256	23 430			

Table 6: Percentage of main non-target species (including discards) that were alive or dead when observed during 2006–07 to 2009–10, by fishing year, fleet and region. Small sample sizes (number observed less than 20) omitted.
1. Sharks

Species	Year	Fleet	Area	% alive	% dead	Number
Blue shark	**2006–07**	Australia	North	95.4	4.6	131
		Charter	North	89.8	10.2	2 155
			South	93.4	6.6	5 025
		Domestic	North	87.9	12.1	3 991
		Total		**90.8**	**9.2**	**11 302**
	2007–08	Charter	South	89.2	10.8	2 560
		Domestic	North	88.6	11.4	5 599
		Total		**88.8**	**11.2**	**8 159**
	2008–09	Charter	North	94.5	5.5	1 317
			South	95.1	4.9	4 313
		Domestic	North	92.0	8.0	3 935
			South	94.9	5.1	98
		Total		**93.7**	**6.3**	**9 663**
	2009–10	Charter	South	95.6	4.4	2 004
		Domestic	North	85.7	14.3	2 853
			South	94.0	6.0	882
		Total		**90.5**	**9.5**	**5 739**
	Total all strata			**91.1**	**8.9**	**34 863**
Mako shark	**2006–07**	Australia	North	82.1	17.9	28
		Charter	North	83.0	17.0	276
			South	93.1	6.9	29
		Domestic	North	67.6	32.4	262
		Total		**76.6**	**23.4**	**595**
	2007–08	Domestic	North	63.8	36.2	304
		Total		**64.7**	**35.3**	**320**
	2008–09	Charter	North	88.6	11.4	44
			South	100.0	0.0	31
		Domestic	North	69.6	30.4	289
		Total		**74.4**	**25.6**	**367**
	2009–10	Domestic	North	76.1	23.9	330
		Total		**75.9**	**24.1**	**348**
	Total all strata			**73.6**	**26.4**	**1 630**

Table 6 (*continued*). Sharks (*continued*)

Species	Year	Fleet	Area	% alive	% dead	Number
Porbeagle shark	**2006–07**	Charter	North	60.5	39.5	223
			South	87.3	12.7	370
		Domestic	North	44.8	55.2	134
		Total		**71.3**	**28.7**	**727**
	2007–08	Charter	South	77.6	22.4	49
		Domestic	North	59.6	40.4	488
		Total		**61.3**	**38.7**	**537**
	2008–09	Charter	North	91.0	9.0	78
			South	85.4	14.6	158
		Domestic	North	57.9	42.1	254
		Total		**71.5**	**28.5**	**494**
	2009–10	Charter	South	82.4	17.6	68
		Domestic	North	40.4	59.6	322
			South	30.0	70.0	20
		Total		**46.8**	**53.2**	**410**
	Total all strata			**64.2**	**35.8**	**2 168**
School shark	**2006–07**	Charter	South	77.7	22.3	220
		Total		**77.4**	**22.6**	**226**
	2007–08	**Total**		**90.9**	**9.1**	**11**
	2008–09	Charter	South	69.6	30.4	112
		Total		**69.0**	**31.0**	**116**
	2009–10	Charter	South	65.5	34.5	29
		Total		**64.5**	**35.5**	**31**
	Total all strata			**74.2**	**25.8**	**384**
Deepwater dogfish	**2006–07**	Charter	South	95.1	4.9	556
		Total		**95.1**	**4.9**	**556**
	2007–08	Charter	South	92.0	8.0	249
		Total		**92.0**	**8.0**	**249**
	2008–09	Charter	South	90.2	9.8	437
		Total		**89.7**	**10.3**	**439**
	2009–10	Charter	South	93.0	7.0	301
		Total		**93.0**	**7.0**	**301**
	Total all strata			**92.7**	**7.3**	**1 545**

Table 6 (*continued*). 2. Tuna and billfish

Species	Year	Fleet	Area	% alive	% dead	Number
Albacore	**2006–07**	Australia	North	21.5	78.5	79
		Charter	North	61.2	38.8	784
			South	77.3	22.7	587
		Domestic	North	28.1	71.9	1 880
		Total		**44.4**	**55.6**	**3 330**
	2007–08	Charter	South	71.3	28.7	167
		Domestic	North	22.7	77.3	1 765
		Total		**26.9**	**73.1**	**1 932**
	2008–09	Charter	North	84.6	15.4	410
			South	79.5	20.5	112
		Domestic	North	33.7	66.3	1 986
		Total		**44.0**	**56.0**	**2 511**
	2009–10	Charter	South	82.1	17.9	78
		Domestic	North	28.8	71.2	1 766
			South	42.9	57.1	42
		Total		**31.3**	**68.7**	**1 886**
	Total all strata			**38.2**	**61.8**	**9 659**
Butterfly tuna	**2006–07**	Charter	North	31.4	68.6	86
			South	27.6	72.4	29
		Domestic	North	12.0	88.0	83
		Total		**22.6**	**77.4**	**199**
	2007–08	Domestic	North	6.3	93.7	95
		Total		**6.0**	**94.0**	**100**
	2008–09	Charter	North	75.9	24.1	29
			South	68.6	31.4	51
		Domestic	North	14.9	85.1	94
		Total		**40.8**	**59.2**	**174**
	2009–10	Domestic	North	13.0	87.0	100
		Total		**19.1**	**80.9**	**115**
	Total all strata			**24.5**	**75.5**	**588**
Yellowfin tuna	**2006–07**	Domestic	North	75.0	25.0	28
		Total		**78.3**	**21.7**	**46**
	2007–08	Domestic	North	75.8	24.2	33
		Total		**75.8**	**24.2**	**33**
	2008–09	**Total**		**88.9**	**11.1**	**9**
	2009–10	**Total**		**88.9**	**11.1**	**9**
	Total all strata			**79.4**	**20.6**	**97**

Table 6 (*continued*). Tuna and billfish (*continued*)

Species	Year	Fleet	Area	% alive	% dead	Number
Swordfish	**2006–07**	Australia	North	42.8	57.2	325
		Charter	North	58.9	41.1	90
			South	61.9	38.1	21
		Domestic	North	27.3	72.7	355
		Total		**38.2**	**61.8**	**791**
	2007–08	Domestic	North	25.1	74.9	495
		Total		**25.3**	**74.7**	**498**
	2008–09	Charter	North	97.0	3.0	33
		Domestic	North	26.0	74.0	416
		Total		**31.6**	**68.4**	**455**
	2009–10	Domestic	North	23.2	76.8	448
		Total		**23.7**	**76.3**	**452**
	Total all strata			**30.9**	**69.1**	**2 196**
Striped marlin	**2006–07**	**Total**		**65.0**	**35.0**	**20**
	2007–08	**Total**		**100.0**	**0.0**	**6**
	2008–09	**Total**		**50.0**	**50.0**	**8**
	2009–10	Domestic	North	72.7	27.3	22
		Total		**72.7**	**27.3**	**22**
	Total all strata			**69.6**	**30.4**	**56**

Table 6: (*continued*).
3. Teleosts

Species	Year	Fleet	Area	% alive	% dead	Number
Moonfish	**2006–07**	Australia	North	80.0	20.0	20
		Charter	North	85.2	14.8	472
			South	84.2	15.8	114
		Domestic	North	65.6	34.4	180
		Total		**80.4**	**19.6**	**786**
	2007–08	Charter	South	100.0	0.0	41
		Domestic	North	78.4	21.6	97
		Total		**84.8**	**15.2**	**138**
	2008–09	Charter	North	100.0	0.0	60
			South	100.0	0.0	30
		Domestic	North	72.6	27.4	201
		Total		**81.1**	**18.9**	**291**
	2009–10	Charter	South	98.6	1.4	69
		Domestic	North	71.5	28.5	333
		Total		**76.0**	**24.0**	**408**
	Total all strata			**79.8**	**20.2**	**1 623**
Ray's bream	**2006–07**	Charter	North	87.0	13.0	215
			South	96.0	4.0	10 350
		Domestic	North	65.8	34.2	442
		Total		**94.6**	**5.4**	**11 019**
	2007–08	Charter	South	95.7	4.3	3 680
		Domestic	North	70.2	29.8	151
		Total		**94.6**	**5.4**	**3 831**
	2008–09	Charter	North	90.1	9.9	313
			South	97.9	2.1	4 277
		Domestic	North	78.8	21.2	551
			South	94.1	5.9	34
		Total		**95.4**	**4.6**	**5 175**
	2009–10	Charter	South	96.3	3.7	3 259
		Domestic	North	85.6	14.4	264
			South	92.0	8.0	88
		Total		**95.5**	**4.5**	**3 611**
	Total all strata			**94.9**	**5.1**	**23 636**

Table 6 (*continued*). Teleosts (*continued*)

Species	Year	Fleet	Area	% alive	% dead	Number
Bigscale pomfret	**2006–07**	Charter	South	82.2	17.8	1 537
		Total		**82.2**	**17.8**	**1 544**
	2007–08	Charter	South	95.4	4.6	519
		Total		**95.0**	**5.0**	**521**
	2008–09	Charter	South	88.4	11.6	438
		Total		**88.2**	**11.8**	**440**
	2009–10	Charter	South	91.3	8.7	333
		Total		**90.5**	**9.5**	**337**
	Total all strata			**86.5**	**13.5**	**2 842**
Escolar	**2006–07**	Australia	North	59.4	40.6	32
		Charter	North	77.6	22.4	49
		Domestic	North	68.0	32.0	125
		Total		**69.1**	**30.9**	**207**
	2007–08	Domestic	North	60.5	39.5	86
		Total		**60.5**	**39.5**	**86**
	2008–09	Charter	North	97.0	3.0	33
		Domestic	North	80.1	19.9	186
		Total		**82.6**	**17.4**	**219**
	2009–10	Domestic	North	78.0	22.0	127
		Total		**78.0**	**22.0**	**127**
	Total all strata			**74.3**	**25.7**	**639**
Oilfish	**2006–07**	Charter	North	91.7	8.3	327
		Domestic	North	83.8	16.2	37
		Total		**90.8**	**9.2**	**369**
	2007–08	Domestic	North	65.8	34.2	38
		Total		**66.7**	**33.3**	**39**
	2008–09	Charter	North	85.3	14.7	170
		Domestic	North	80.0	20.0	35
		Total		**84.4**	**15.6**	**205**
	2009–10	Domestic	North	86.3	13.7	73
		Total		**86.7**	**13.3**	**75**
	Total all strata			**87.1**	**12.9**	**688**

Table 6 *(continued)*. Teleosts (*continued*)

Species	Year	Fleet	Area	% alive	% dead	Number
Rudderfish	**2006–07**	Charter	North	97.1	2.9	35
			South	85.0	15.0	60
		Domestic	North	61.8	38.2	68
		Total		**77.4**	**22.6**	**164**
	2007–08	Charter	South	83.3	16.7	36
		Domestic	North	75.0	25.0	20
		Total		**80.4**	**19.6**	**56**
	2008–09	Charter	South	72.2	27.8	54
		Domestic	North	90.0	10.0	20
		Total		**77.8**	**22.2**	**81**
	2009–10	Charter	South	73.7	26.3	38
		Domestic	North	80.0	20.0	20
		Total		**76.7**	**23.3**	**60**
	Total all strata			**77.8**	**22.2**	**361**
Dealfish	**2006–07**	Charter	South	18.7	81.3	461
		Total		**18.6**	**81.4**	**462**
	2007–08	Charter	South	24.9	75.1	177
		Total		**24.9**	**75.1**	**177**
	2008–09	Charter	South	26.1	73.9	605
		Total		**26.2**	**73.8**	**606**
	2009–10	Charter	South	49.4	50.6	874
		Total		**49.6**	**50.4**	**881**
	Total all strata			**34.1**	**65.9**	**2 126**
Lancetfish	**2006–07**	Australia	North	16.7	83.3	270
		Charter	North	59.2	40.8	142
			South	79.3	20.7	29
		Domestic	North	28.8	71.2	1 079
		Total		**30.5**	**69.5**	**1 520**
	2007–08	Domestic	North	49.6	50.4	450
		Total		**49.6**	**50.4**	**450**
	2008–09	Charter	North	76.5	23.5	34
		Domestic	North	12.9	87.1	1 200
		Total		**14.7**	**85.3**	**1 235**
	2009–10	Domestic	North	15.1	84.9	2 024
		Total		**15.2**	**84.8**	**2 028**
	Total all strata			**22.5**	**77.5**	**5 233**

Table 7: Percentage of main non-target species that were retained, or discarded or lost, when observed during 2006–07 to 2009–10, by fishing year and fleet. Small sample sizes (number observed less than 20) omitted.
1. Sharks

Species	Year	Fleet	% retained or finned	% discarded or lost	Number
Blue shark	**2006–07**	Australia	3.0	97.0	132
		Charter	85.1	14.9	8 272
		Domestic	33.2	66.8	3 994
		Total	**67.5**	**32.5**	**12 398**
	2007–08	Charter	91.8	8.2	2 638
		Domestic	59.5	40.5	5 650
		Total	**69.8**	**30.2**	**8 288**
	2008–09	Charter	87.5	12.5	5 723
		Domestic	54.0	46.0	4 049
		Total	**73.6**	**26.4**	**9 772**
	2009–10	Charter	91.7	8.3	2 023
		Domestic	37.6	62.4	5 531
		Total	**52.1**	**47.9**	**7 554**
	Total all strata		**66.5**	**33.5**	**38 012**
Mako shark	**2006–07**	Australia	17.9	82.1	28
		Charter	93.8	6.2	323
		Domestic	37.0	63.0	262
		Total	**66.1**	**33.9**	**613**
	2007–08	Domestic	66.6	33.4	305
		Total	**68.2**	**31.8**	**321**
	2008–09	Charter	100.0	0.0	85
		Domestic	58.7	41.3	293
		Total	**68.0**	**32.0**	**378**
	2009–10	Domestic	19.1	80.9	350
		Total	21.6	78.4	361
	Total all strata		**57.3**	**42.7**	**1 673**

Table 7 (*continued*). Sharks (*continued*)

Species	Year	Fleet	% retained or finned	% discarded or lost	Number
Porbeagle shark	**2006–07**	Charter	86.6	13.4	628
		Domestic	38.1	61.9	134
		Total	**78.1**	**21.9**	**762**
	2007–08	Charter	89.8	10.2	49
		Domestic	35.7	64.3	488
		Total	**40.6**	**59.4**	**537**
	2008–09	Charter	91.1	8.9	257
		Domestic	46.9	53.1	258
		Total	**68.9**	**31.1**	**515**
	2009–10	Charter	79.2	20.8	72
		Domestic	46.0	54.0	348
		Total	**51.7**	**48.3**	**420**
	Total all strata		62.0	38.0	2 234
School shark	**2006–07**	Charter	97.9	2.1	233
		Total	**97.9**	**2.1**	**235**
	2007–08	**Total**	**100.0**	**0.0**	**11**
	2008–09	Charter	99.2	0.8	132
		Total	**98.5**	**1.5**	**136**
	2009–10	Charter	100.0	0.0	34
		Total	**100.0**	**0.0**	**36**
	Total all strata		**98.3**	**1.7**	**418**
Deepwater dogfish	**2006–07**	Charter	0.7	99.3	603
		Total	**0.7**	**99.3**	**603**
	2007–08	Charter	0.4	99.6	250
		Total	**0.4**	**99.6**	**250**
	2008–09	Charter	0.2	99.8	436
		Total	**0.5**	**99.5**	**438**
	2009–10	Charter	0.3	99.7	305
		Total	**0.3**	**99.7**	**305**
	Total all strata		**0.5**	**99.5**	**1 596**

Table 7: (*continued*).
2. Tuna and billfish

Species	Year	Fleet	% retained	% discarded or lost	Number
Albacore	**2006–07**	Australia	92.4	7.6	79
		Charter	97.7	2.3	1 448
		Domestic	96.1	3.9	1 882
		Total	**96.7**	**3.3**	**3 409**
	2007–08	Charter	98.8	1.2	170
		Domestic	95.9	4.1	1 769
		Total	**96.1**	**3.9**	**1 939**
	2008–09	Charter	99.7	0.3	605
		Domestic	97.8	2.2	1 993
		Total	**98.2**	**1.8**	**2 598**
	2009–10	Charter	100.0	0.0	89
		Domestic	97.2	2.8	1 814
		Total	**97.3**	**2.7**	**1 903**
	Total all strata		**97.1**	**2.9**	**9 849**
Butterfly tuna	**2006–07**	Charter	98.4	1.6	125
		Domestic	31.3	68.7	83
		Total	**71.3**	**28.7**	**209**
	2007–08	Domestic	55.8	44.2	95
		Total	**58.0**	**42.0**	**100**
	2008–09	Charter	99.0	1.0	96
		Domestic	48.9	51.1	94
		Total	**74.2**	**25.8**	**190**
	2009–10	Charter	100.0	0.0	15
		Domestic	72.8	27.2	103
		Total	**76.3**	**23.7**	**118**
	Total all strata		**71.0**	**29.0**	**617**
Yellowfin tuna	**2006–07**	Domestic	78.6	21.4	28
		Total	**80.4**	**19.6**	**46**
	2007–08	Domestic	90.9	9.1	33
		Total	**90.9**	**9.1**	**33**
	2008–09	**Total**	**100.0**	**0.0**	**9**
	2009–10	**Total**	**100.0**	**0.0**	**9**
	Total all strata		**87.6**	**12.4**	**97**

Table 7 (*continued*). Tuna and billfish (*continued*)

Species	Year	Fleet	% retained	% discarded or lost	Number
Swordfish	**2006–07**	Australia	94.8	5.2	326
		Charter	99.1	0.9	115
		Domestic	93.2	6.8	355
		Total	**94.7**	**5.3**	**796**
	2007–08	Charter	100.0	0.0	3
		Domestic	91.5	8.5	496
		Total	**91.6**	**8.4**	**499**
	2008–09	Charter	100.0	0.0	43
		Domestic	97.1	2.9	418
		Total	**97.4**	**2.6**	**461**
	2009–10	Charter	100.0	0.0	3
		Domestic	94.3	5.7	454
		Total	**94.3**	**5.7**	**457**
	Total all strata		**94.5**	**5.5**	**2 213**
Striped marlin	**2006–07**	**Total**	**10.0**	**90.0**	**20**
	2007–08	**Total**	**0.0**	**100.0**	**6**
	2008–09	**Total**	**0.0**	**100.0**	**9**
	2009–10	Domestic	4.3	95.7	23
		Total	**4.3**	**95.7**	**23**
	Total all strata		**5.2**	**94.8**	**58**

Table 7: (*continued*).
3. Teleosts

Species	Year	Fleet	% retained	% discarded or lost	Number
Moonfish	**2006–07**	Australia	100.0	0.0	20
		Charter	91.6	8.4	616
		Domestic	97.2	2.8	180
		Total	**93.0**	**7.0**	**816**
	2007–08	Charter	100.0	0.0	41
		Domestic	100.0	0.0	96
		Total	**100.0**	**0.0**	**137**
	2008–09	Charter	100.0	0.0	107
		Domestic	98.5	1.5	201
		Total	**99.0**	**1.0**	**308**
	2009–10	Charter	100.0	0.0	76
		Domestic	96.5	3.5	345
		Total	**97.1**	**2.9**	**421**
	Total all strata		**95.7**	**4.3**	**1 682**
Ray's bream	**2006–07**	Charter	96.8	3.2	11 744
		Domestic	95.7	4.3	442
		Total	**96.8**	**3.2**	**12 198**
	2007–08	Charter	96.8	3.2	3 714
		Domestic	98.7	1.3	152
		Total	**96.9**	**3.1**	**3 866**
	2008–09	Charter	98.7	1.3	4 646
		Domestic	98.3	1.7	585
		Total	**98.7**	**1.3**	**5 231**
	2009–10	Charter	98.8	1.2	3 291
		Domestic	95.3	4.7	361
		Total	**98.4**	**1.6**	**3 652**
	Total all strata		**97.4**	**2.6**	**24 947**

Table 7 (*continued*). Teleosts (*continued*)

Species	Year	Fleet	% retained	% discarded or lost	Number
Bigscale pomfret	**2006–07**	Charter	1.2	98.8	1 615
		Total	**1.3**	**98.7**	**1 618**
	2007–08	Charter	97.0	3.0	529
		Total	**97.0**	**3.0**	**531**
	2008–09	Charter	61.1	38.9	445
		Total	**61.1**	**38.9**	**445**
	2009–10	Charter	42.0	58.0	348
		Total	**42.6**	**57.4**	**352**
	Total all strata		**32.5**	**67.5**	**2 946**
Escolar	**2006–07**	Australia	68.8	31.3	32
		Charter	0.0	100.0	50
		Domestic	90.4	9.6	125
		Total	**65.2**	**34.8**	**207**
	2007–08	Domestic	79.1	20.9	86
		Total	**79.1**	**20.9**	**86**
	2008–09	Charter	0.0	100.0	33
		Domestic	85.1	14.9	188
		Total	**72.4**	**27.6**	**221**
	2009–10	Domestic	89.8	10.2	128
		Total	**89.8**	**10.2**	**128**
	Total all strata		**74.5**	**25.5**	**642**
Oilfish	**2006–07**	Charter	0.0	100.0	352
		Domestic	83.8	16.2	37
		Total	**7.9**	**92.1**	**390**
	2007–08	Domestic	60.5	39.5	38
		Total	**59.0**	**41.0**	**39**
	2008–09	Charter	0.6	99.4	170
		Domestic	88.6	11.4	35
		Total	**15.6**	**84.4**	**205**
	2009–10	Domestic	88.0	12.0	75
		Total	**85.7**	**14.3**	**77**
	Total all strata		**21.4**	**78.6**	**711**

Table 7 (*continued*). Teleosts (*continued*)

Species	Year	Fleet	% retained	% discarded or lost	Number
Rudderfish	**2006–07**	Charter	2.0	98.0	102
		Domestic	72.1	27.9	68
		Total	**29.8**	**70.2**	**171**
	2007–08	Charter	42.1	57.9	38
		Domestic	52.4	47.6	21
		Total	**45.8**	**54.2**	**59**
	2008–09	Charter	0.0	100.0	62
		Domestic	85.0	15.0	20
		Total	**20.7**	**79.3**	**82**
	2009–10	Charter	10.5	89.5	38
		Domestic	86.4	13.6	22
		Total	**38.3**	**61.7**	**60**
	Total all strata		**31.7**	**68.3**	**372**
Dealfish	**2006–07**	Charter	0.5	99.5	613
		Total	**0.5**	**99.5**	**614**
	2007–08	Charter	0.0	100.0	192
		Total	**0.0**	**100.0**	**192**
	2008–09	Charter	0.3	99.7	608
		Total	**0.3**	**99.7**	**609**
	2009–10	Charter	0.3	99.7	882
		Total	**0.3**	**99.7**	**889**
	Total all strata		**0.3**	**99.7**	**2 304**
Lancetfish	**2006–07**	Australia	0.4	99.6	270
		Charter	0.6	99.4	171
		Domestic	0.1	99.9	1 320
		Total	**0.2**	**99.8**	**1 761**
	2007–08	Domestic	1.1	98.9	463
		Total	**1.1**	**98.9**	**463**
	2008–09	Charter	0.0	100.0	35
		Domestic	0.2	99.8	1 226
		Total	**0.2**	**99.8**	**1 261**
	2009–10	Domestic	0.0	100.0	2 137
		Total	**0.0**	**100.0**	**2 140**
	Total all strata		**0.2**	**99.8**	**5 625**

Table 8: Percentage of discarded main non-target species that were alive or dead when observed during 2006–07 to 2009–10, by fishing year, fleet and region. Small sample sizes (number observed less than 20) omitted.
1. Sharks

Species	Year	Fleet	% alive	% dead	Number
Blue shark	**2006–07**	Australia	98.1	1.9	104
		Charter	97.9	2.1	516
		Domestic	93.9	6.1	2 482
		Total	**94.7**	**5.3**	**3 102**
	2007–08	Charter	100.0	0.0	90
		Domestic	94.9	5.1	2 036
		Total	**95.2**	**4.8**	**2 126**
	2008–09	Charter	99.6	0.4	549
		Domestic	98.4	1.6	1 765
		Total	**98.7**	**1.3**	**2 314**
	2009–10	Charter	100.0	0.0	88
		Domestic	93.0	7.0	1 537
		Total	**93.4**	**6.6**	**1 625**
	Total all strata		**95.6**	**4.4**	**9 167**
Mako shark	**2006–07**	Domestic	83.0	17.0	147
		Total	**84.8**	**15.2**	**171**
	2007–08	Domestic	92.3	7.7	91
		Total	**92.3**	**7.7**	**91**
	2008–09	Domestic	99.1	0.9	113
		Total	**99.1**	**0.9**	**113**
	2009–10	Domestic	83.5	16.5	260
		Total	**83.5**	**16.5**	**260**
	Total all strata		**87.9**	**12.1**	**635**
Porbeagle shark	**2006–07**	Charter	97.1	2.9	70
		Domestic	70.9	29.1	79
		Total	**83.2**	**16.8**	**149**
	2007–08	Domestic	77.3	22.7	309
		Total	**77.7**	**22.3**	**314**
	2008–09	Charter	100.0	0.0	22
		Domestic	95.5	4.5	134
		Total	**96.2**	**3.8**	**156**
	2009–10	Charter	100.0	0.0	15
		Domestic	65.4	34.6	179
		Total	**68.0**	**32.0**	**194**
	Total all strata		**80.0**	**20.0**	**813**

Table 8 (*continued*). Sharks (*continued*)

Species	Year	Fleet	% alive	% dead	Number
School shark	**2006–07**	**Total**	**100.0**	**0.0**	**3**
	2007–08	**Total**	**100.0**	**0.0**	**1**
	Total all strata		**100.0**	**0.0**	**4**
Deepwater dogfish	**2006–07**	Charter	95.1	4.9	554
		Total	**95.1**	**4.9**	**554**
	2007–08	Charter	91.9	8.1	248
		Total	**91.9**	**8.1**	**248**
	2008–09	Charter	90.1	9.9	435
		Total	**89.9**	**10.1**	**436**
	2009–10	Charter	93.0	7.0	300
		Total	**93.0**	**7.0**	**300**
	Total all strata		**92.7**	**7.3**	**1 538**

Table 8 (*continued*)
2. Tuna and billfish

Species	Year	Fleet	% alive	% dead	Number
Albacore	**2006–07**	Charter	14.3	85.7	21
		Domestic	14.8	85.2	54
		Total	**14.7**	**85.3**	**75**
	2007–08	Domestic	2.5	97.5	40
		Total	**2.4**	**97.6**	**41**
	2008–09	Domestic	4.3	95.7	23
		Total	**4.0**	**96.0**	**25**
	2009–10	Domestic	2.9	97.1	35
		Total	**2.9**	**97.1**	**35**
	Total all strata		**8.0**	**92.0**	**176**
Butterfly tuna	**2006–07**	Domestic	7.1	92.9	56
		Total	**7.0**	**93.0**	**57**
	2007–08	Domestic	9.8	90.2	41
		Total	**9.8**	**90.2**	**41**
	2008–09	Domestic	16.7	83.3	48
		Total	**16.3**	**83.7**	**49**
	2009–10	Domestic	19.2	80.8	26
		Total	**19.2**	**80.8**	**26**
	Total all strata		**12.1**	**87.9**	**173**
Yellowfin tuna	**2006–07**	**Total**	**100.0**	**0.0**	**5**
	2007–08	**Total**	**0.0**	**100.0**	**2**
	Total all strata		**71.4**	**28.6**	**7**
Swordfish	**2006–07**	**Total**	**63.2**	**36.8**	**19**
	2007–08	**Domestic**	32.3	67.7	31
		Total	**32.3**	**67.7**	**31**
	2008–09	**Total**	**100.0**	**0.0**	**7**
	2009–10	**Total**	**52.9**	**47.1**	**17**
	Total all strata		**51.4**	**48.6**	**74**
Striped marlin	**2006–07**	**Total**	**44.4**	**55.6**	**9**
	2007–08	**Total**	**100.0**	**0.0**	**5**
	2008–09	**Total**	**50.0**	**50.0**	**8**
	2009–10	**Total**	**68.4**	**31.6**	**19**
	Total all strata		**63.4**	**36.6**	**41**

Table 8 (*continued*)
3. Teleosts

Species	Year	Fleet	% alive	% dead	Number
Moonfish	**2006–07**	Charter	76.7	23.3	43
		Total	**75.0**	**25.0**	**44**
	2008–09	**Total**	**50.0**	**50.0**	**2**
	2009–10	**Total**	**100.0**	**0.0**	**2**
	Total all strata		**75.0**	**25.0**	**48**
Ray's bream	**2006–07**	Charter	3.1	96.9	262
		Total	**3.3**	**96.7**	**275**
	2007–08	**Charter**	9.8	90.2	92
		Total	**9.6**	**90.4**	**94**
	2008–09	**Charter**	9.3	90.7	54
		Total	**11.9**	**88.1**	**59**
	2009–10	**Charter**	29.3	70.7	41
		Total	**26.7**	**73.3**	**45**
	Total all strata		**7.8**	**92.2**	**473**
Bigscale pomfret	**2006–07**	**Charter**	82.0	18.0	1 517
		Total	**82.0**	**18.0**	**1 518**
	2007–08	**Charter**	16.7	83.3	12
		Total	**16.7**	**83.3**	**12**
	2008–09	**Charter**	70.3	29.7	172
		Total	**70.3**	**29.7**	**172**
	2009–10	**Charter**	89.5	10.5	200
		Total	**89.5**	**10.5**	**200**
	Total all strata		**81.3**	**18.7**	**1 902**
Escolar	**2006–07**	Charter	77.6	22.4	49
		Domestic	33.3	66.7	6
		Total	**72.7**	**27.3**	**55**
	2007–08	**Total**	**42.9**	**57.1**	**14**
	2008–09	Charter	97.0	3.0	33
		Domestic	57.1	42.9	21
		Total	**81.5**	**18.5**	**54**
	2009–10	**Total**	**62.5**	**37.5**	**8**
	Total all strata		**72.5**	**27.5**	**131**

Table 8 (*continued*). Teleosts (*continued*)

Species	Year	Fleet	% alive	% dead	Number
Oilfish	**2006–07**	Charter	91.6	8.4	322
		Total	**91.0**	**9.0**	**324**
	2007–08	**Total**	**38.5**	**61.5**	**13**
	2008–09	Charter	84.2	15.8	158
		Total	**84.5**	**15.5**	**161**
	2009–10	**Total**	**80.0**	**20.0**	**5**
	Total all strata		**87.5**	**12.5**	**503**
Rudderfish	**2006–07**	Charter	90.8	9.2	87
		Total	**89.8**	**10.2**	**88**
	2007–08	Charter	70.0	30.0	20
		Total	**72.0**	**28.0**	**25**
	2008–09	Charter	72.4	27.6	58
		Total	**72.1**	**27.9**	**61**
	2009–10	Charter	70.6	29.4	34
		Total	**70.6**	**29.4**	**34**
	Total all strata		**79.3**	**20.7**	**208**
Dealfish	**2006–07**	Charter	17.1	82.9	427
		Total	**17.1**	**82.9**	**427**
	2007–08	Charter	18.1	81.9	160
		Total	**18.1**	**81.9**	**160**
	2008–09	Charter	22.1	77.9	552
		Total	**22.2**	**77.8**	**553**
	2009–10	Charter	36.7	63.3	679
		Total	**36.7**	**63.3**	**683**
	Total all strata		**26.1**	**73.9**	**1 823**
Lancetfish	**2006–07**	Charter	62.5	37.5	168
		Domestic	29.2	70.8	1 060
		Total	**33.7**	**66.3**	**1 228**
	2007–08	Domestic	50.1	49.9	439
		Total	**50.1**	**49.9**	**439**
	2008–09	Charter	76.5	23.5	34
		Domestic	12.7	87.3	1 192
		Total	**14.4**	**85.6**	**1 226**
	2009–10	Domestic	14.8	85.2	1 998
		Total	**14.8**	**85.2**	**2 001**
	Total all strata		**22.6**	**77.4**	**4 894**

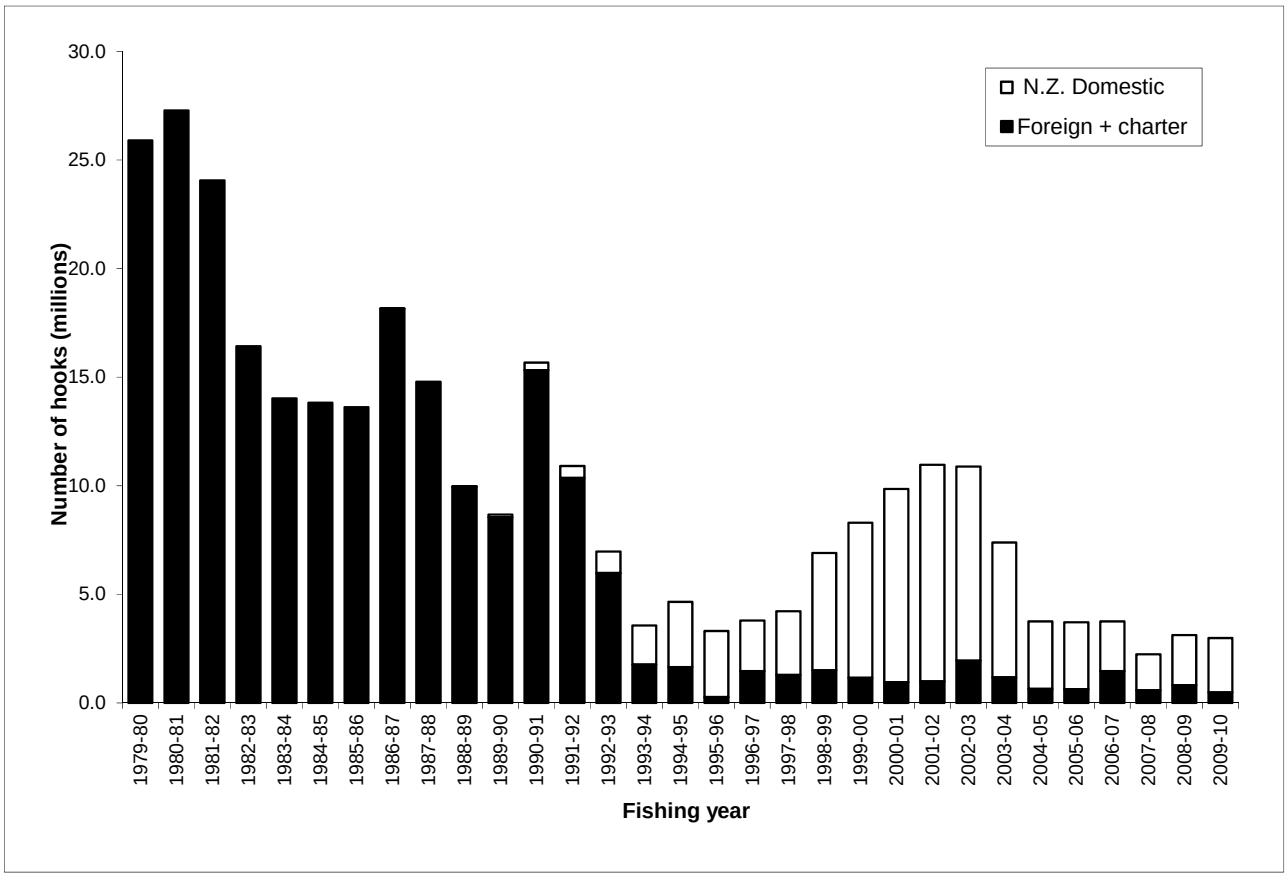


Figure 1: Number of hooks set by fishing year and fleet from 1979–80 to 2009–10. "Foreign + charter" includes Japanese foreign licensed and charter vessels, Korean foreign licensed vessels, Philippine charter vessels, Australian charter vessels, and one large New Zealand domestic vessel which fished with the charter fleet.

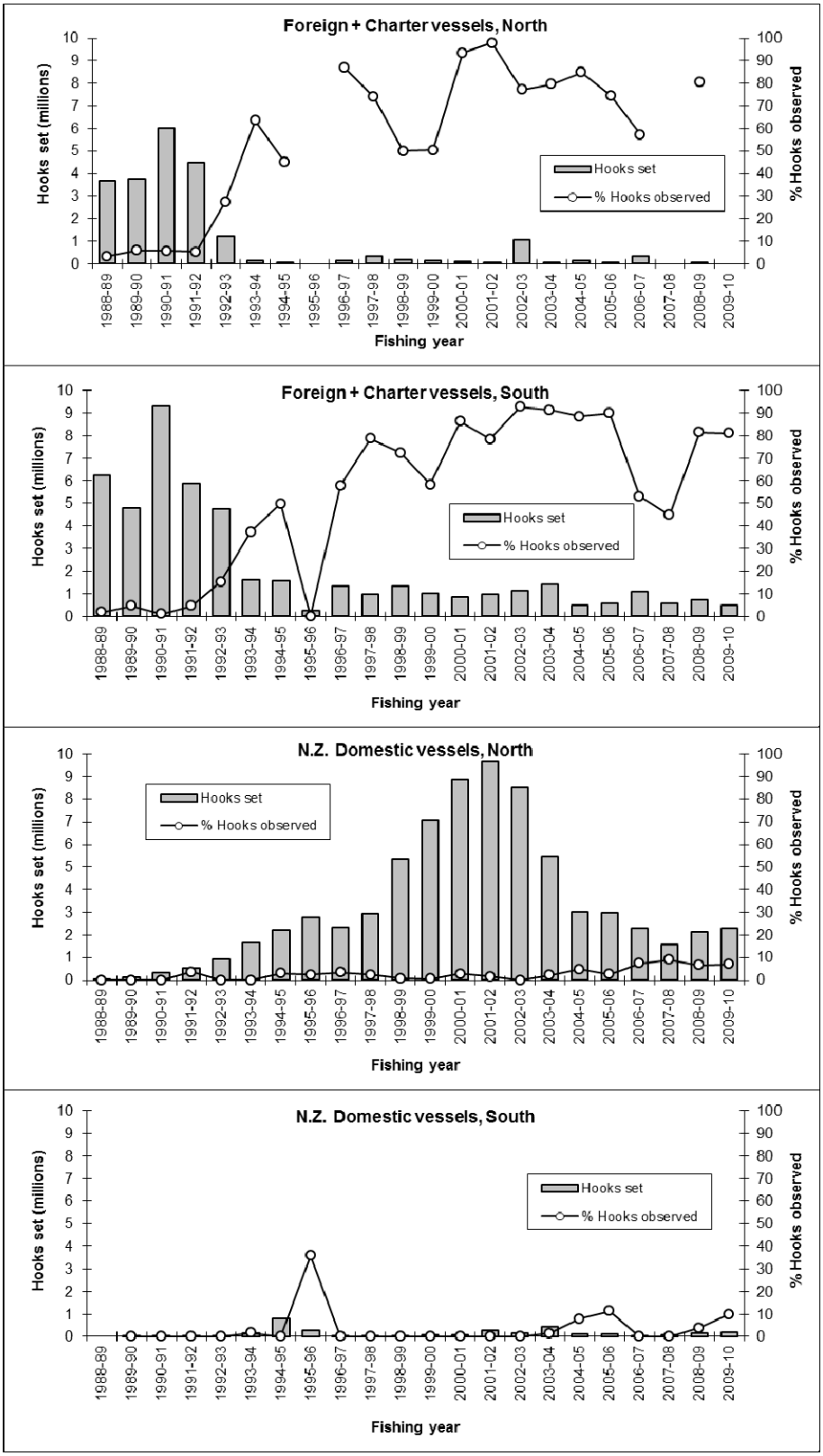


Figure 2: Numbers of hooks set, and percentage of hooks observed, by fleet, area and fishing year. "Foreign + charter" includes Japanese foreign licensed and charter vessels, Korean foreign licensed vessels, Philippine charter vessels, Australian charter vessels, and one large New Zealand domestic vessel which fished with the charter fleet.

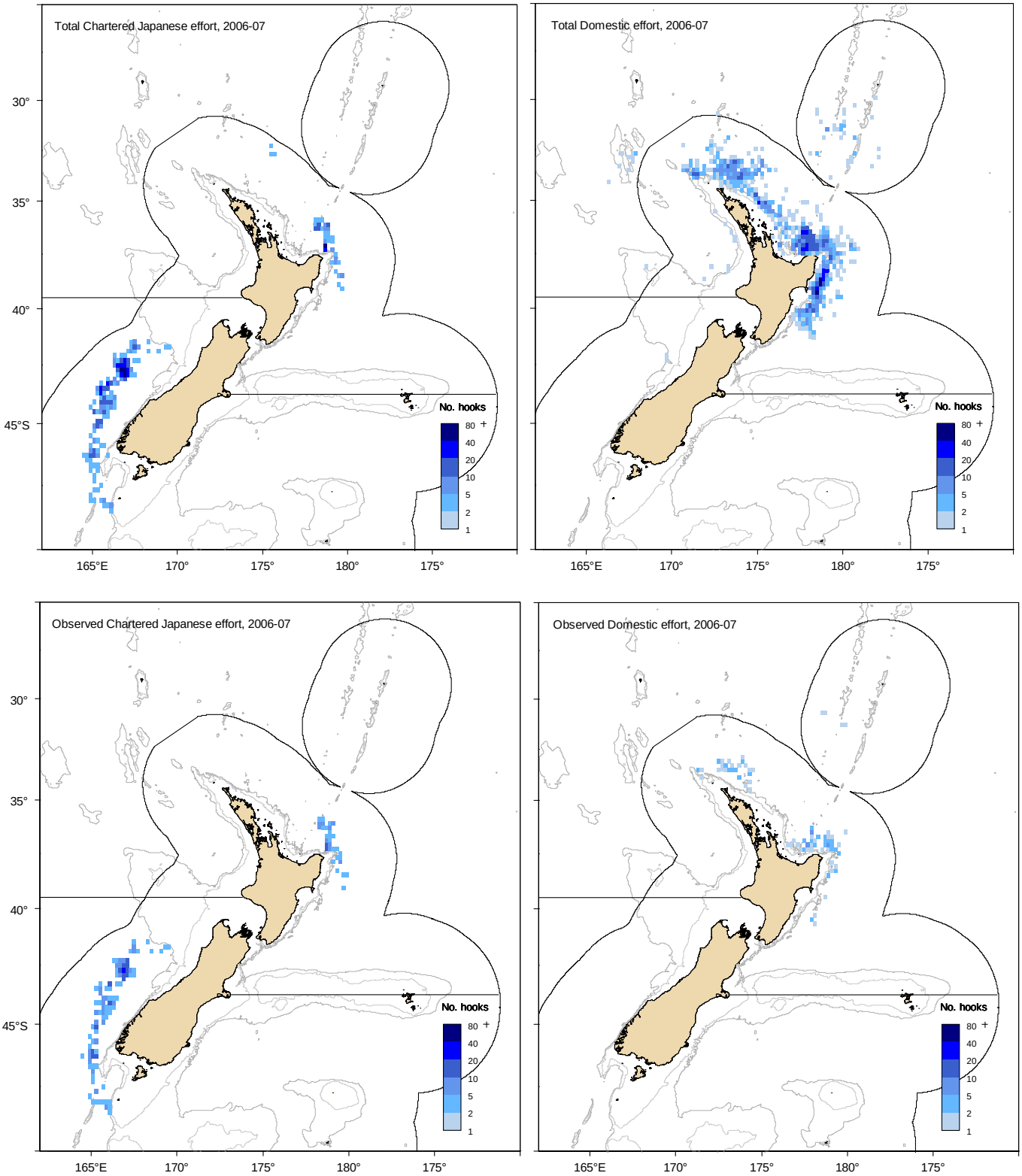


Figure 3: Numbers of hooks set (thousand), based on commercial returns (top), and observed (bottom), plotted at start positions for longlines set by chartered vessels (left), and domestic vessels (right) per 0.2° x 0.2° cell, in 2006–07.

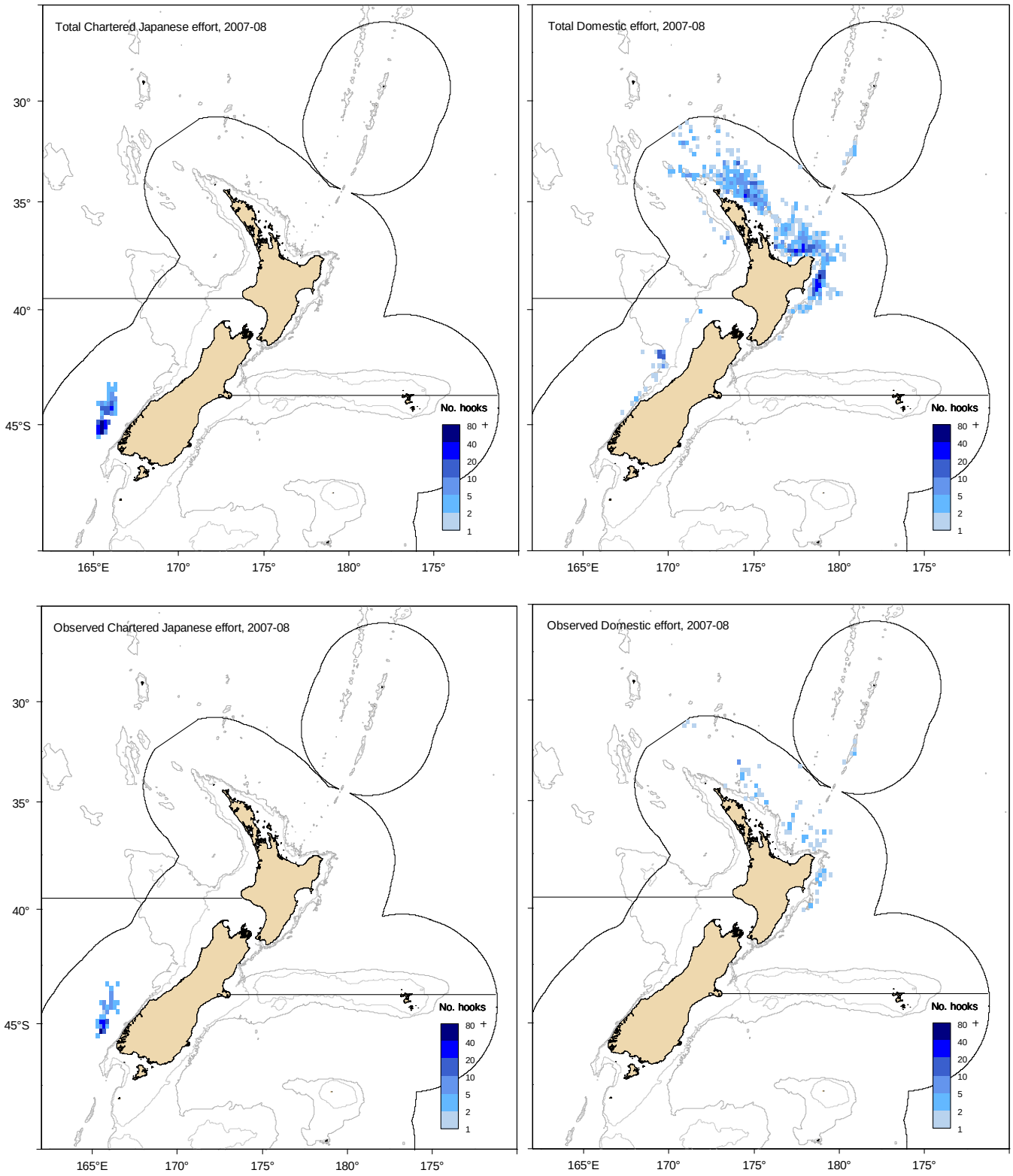


Figure 3: (continued). 2007–08.

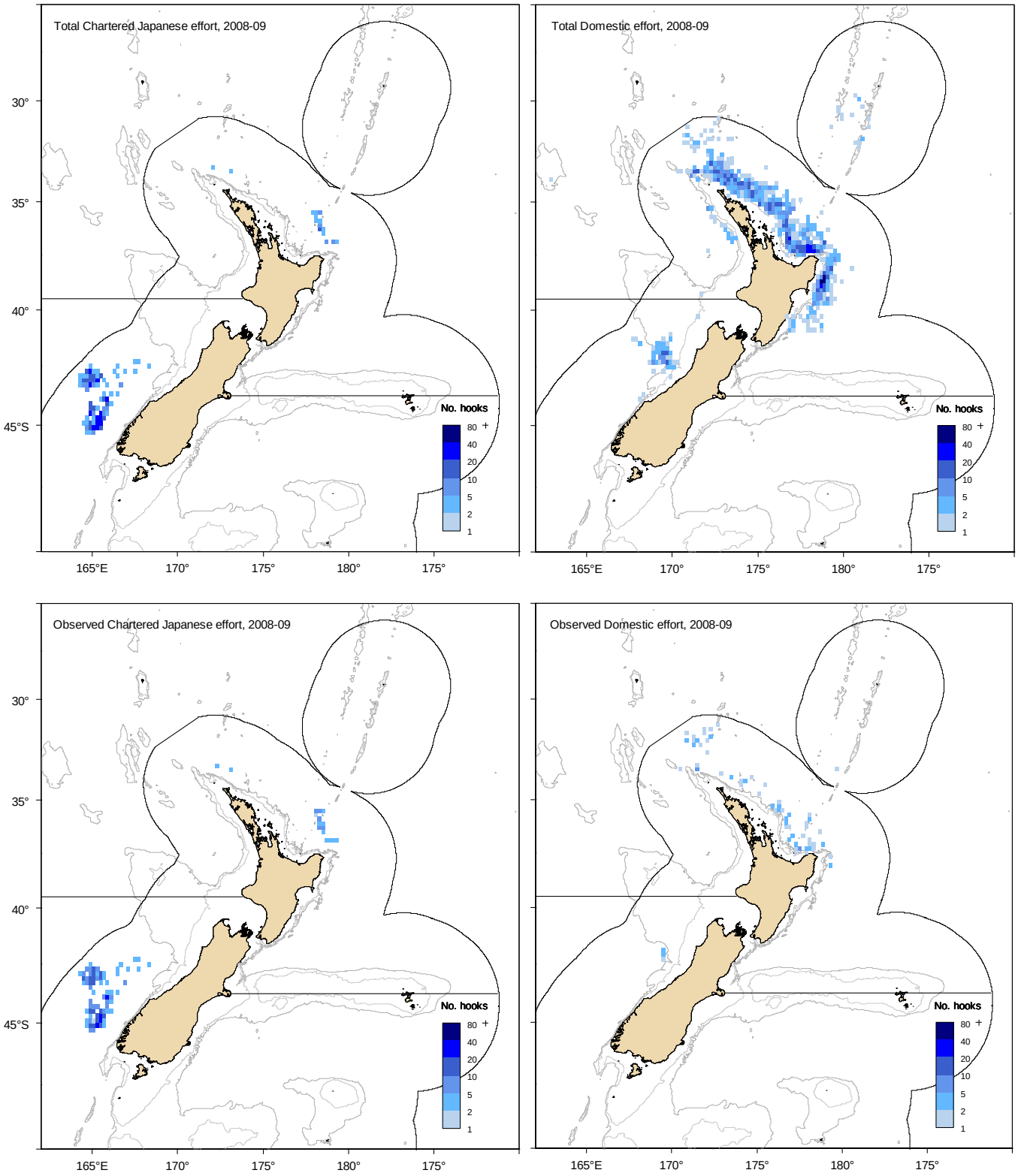


Figure 3: (continued). 2008–09.

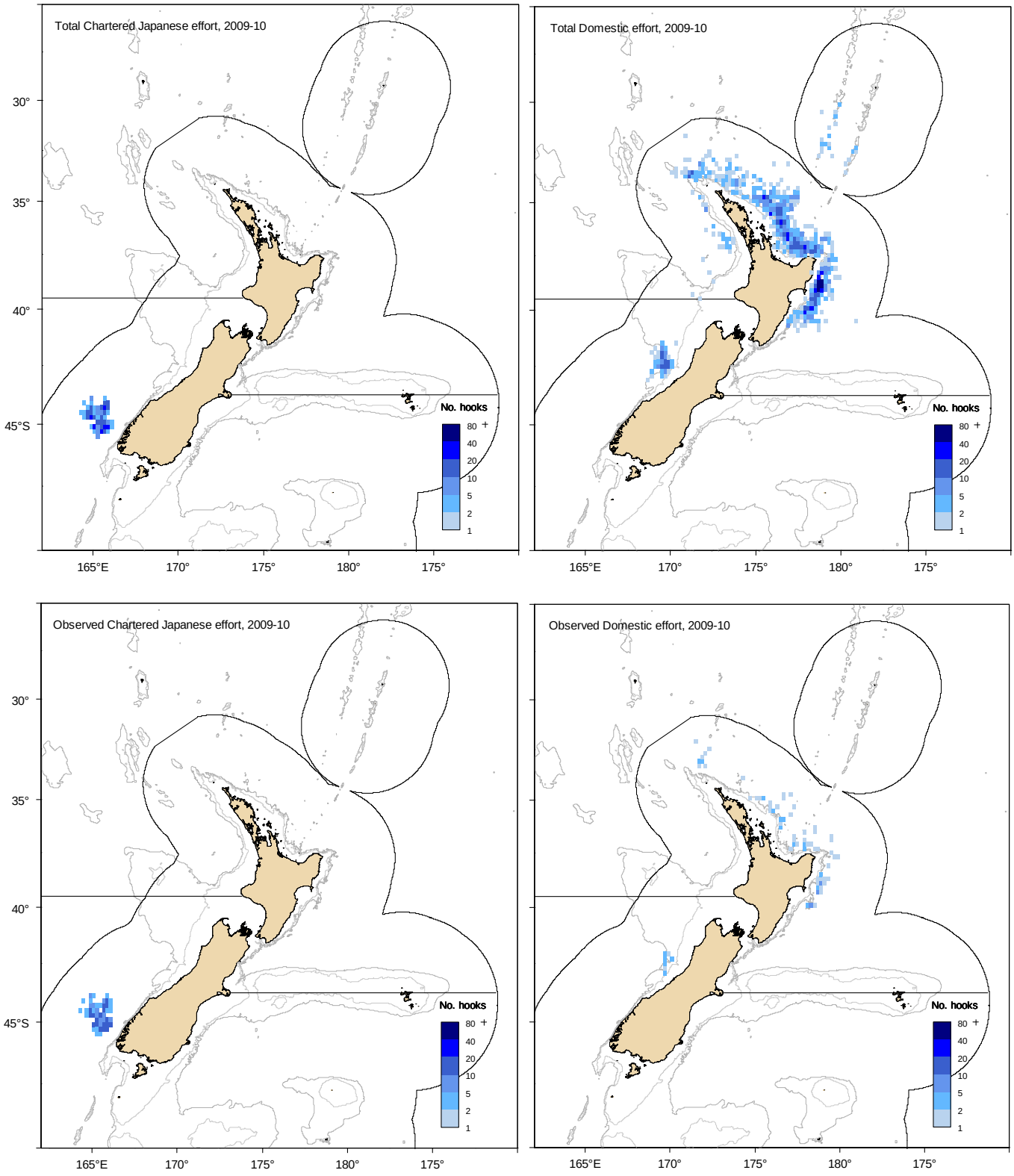


Figure 3: (continued). 2009–10.

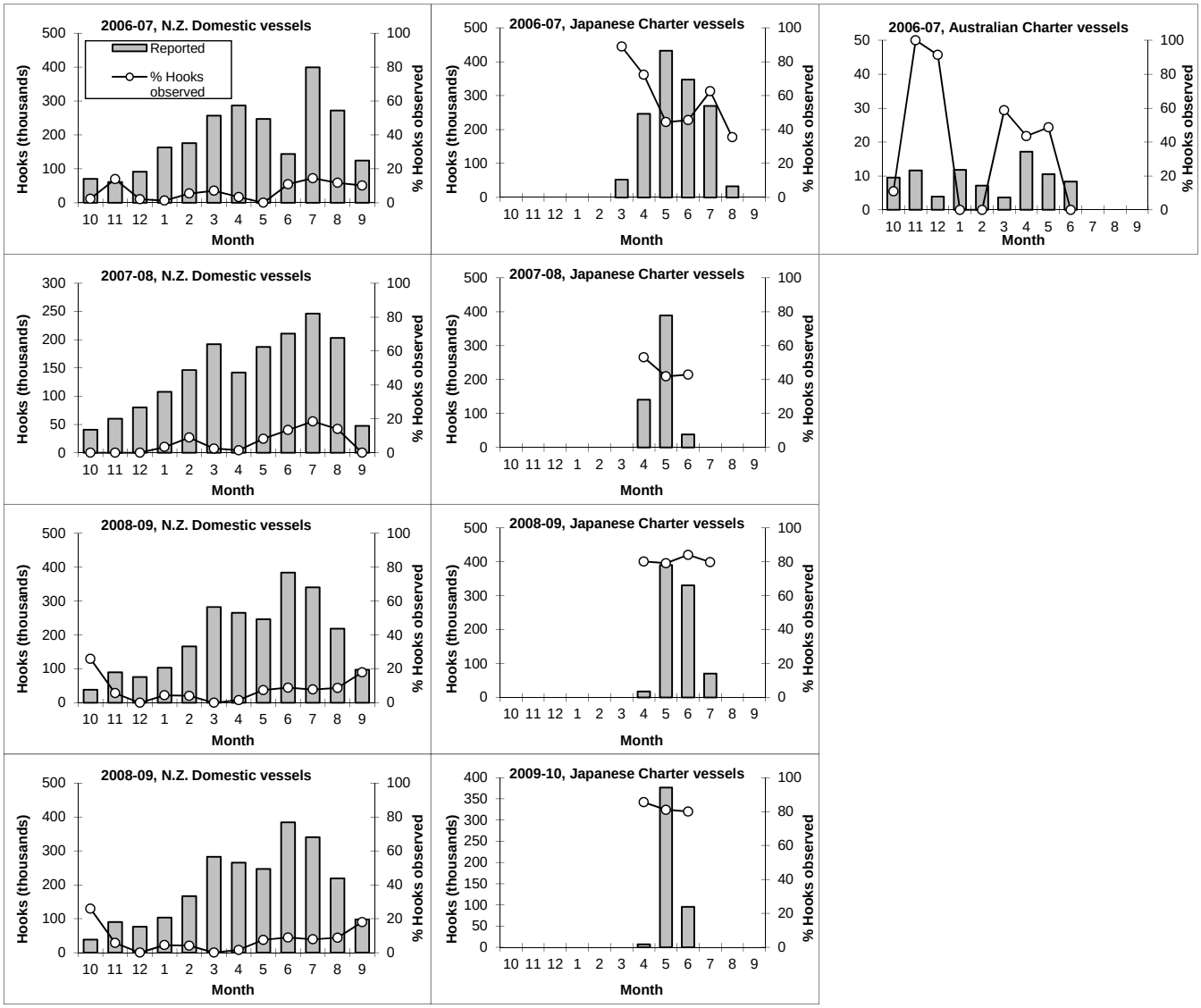


Figure 4: Monthly distribution of reported sets and the percentage observed in 2006–07 to 2009-10 by fleet and month. The percentage of hooks observed is shown on the right hand axes (white circles).

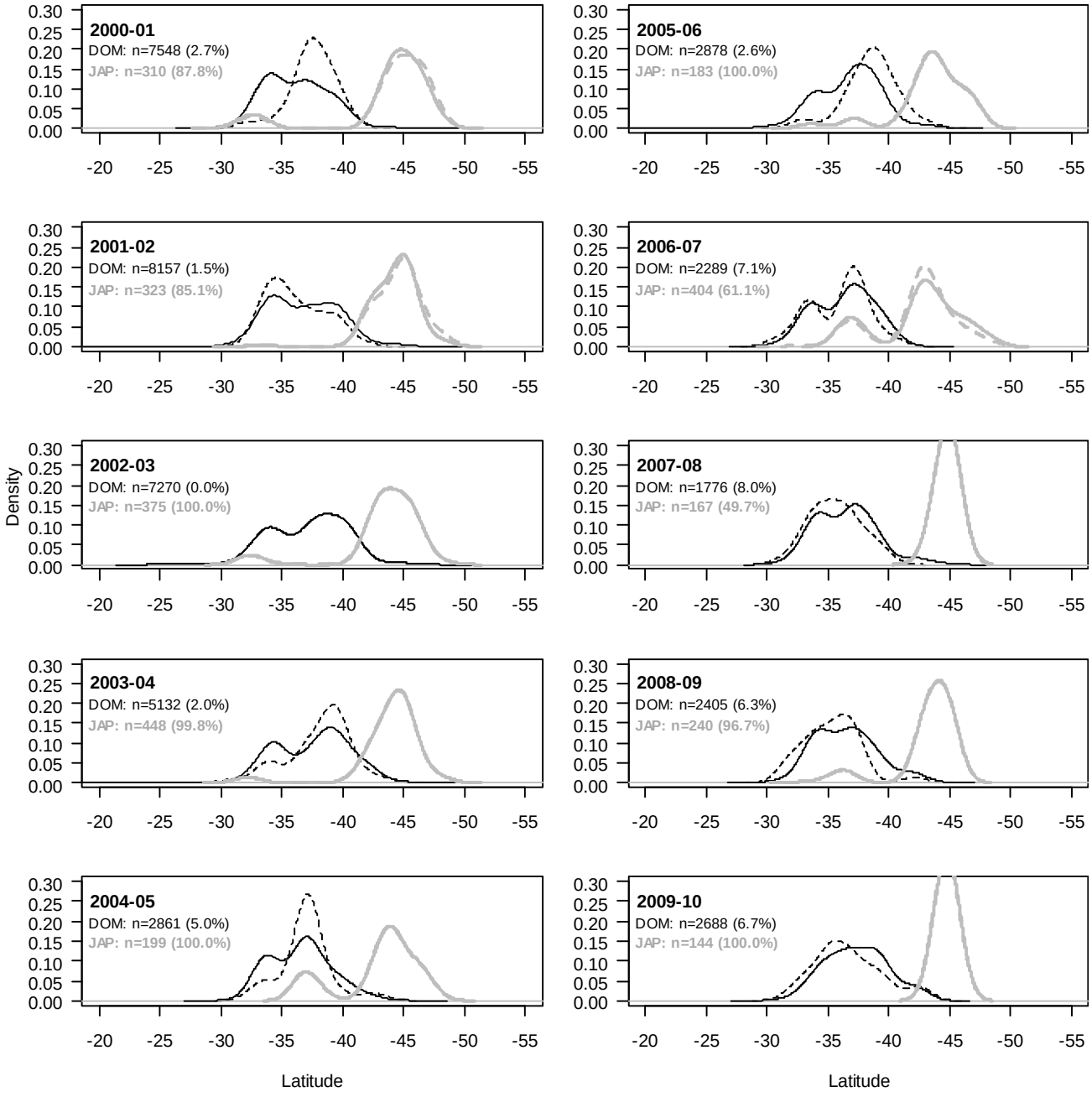


Figure 5: Comparison of commercial and observed numbers of sets, for domestic vessels (black lines) and chartered Japanese vessels (grey lines), 2000–01 to 2009–10, by start latitude positions, where solid lines represent commercial data and dashed lines represent observed data. The total number of sets by each fleet and the percentage observed is given for each fishing year. Note: there was no observed domestic effort in 2002–03.

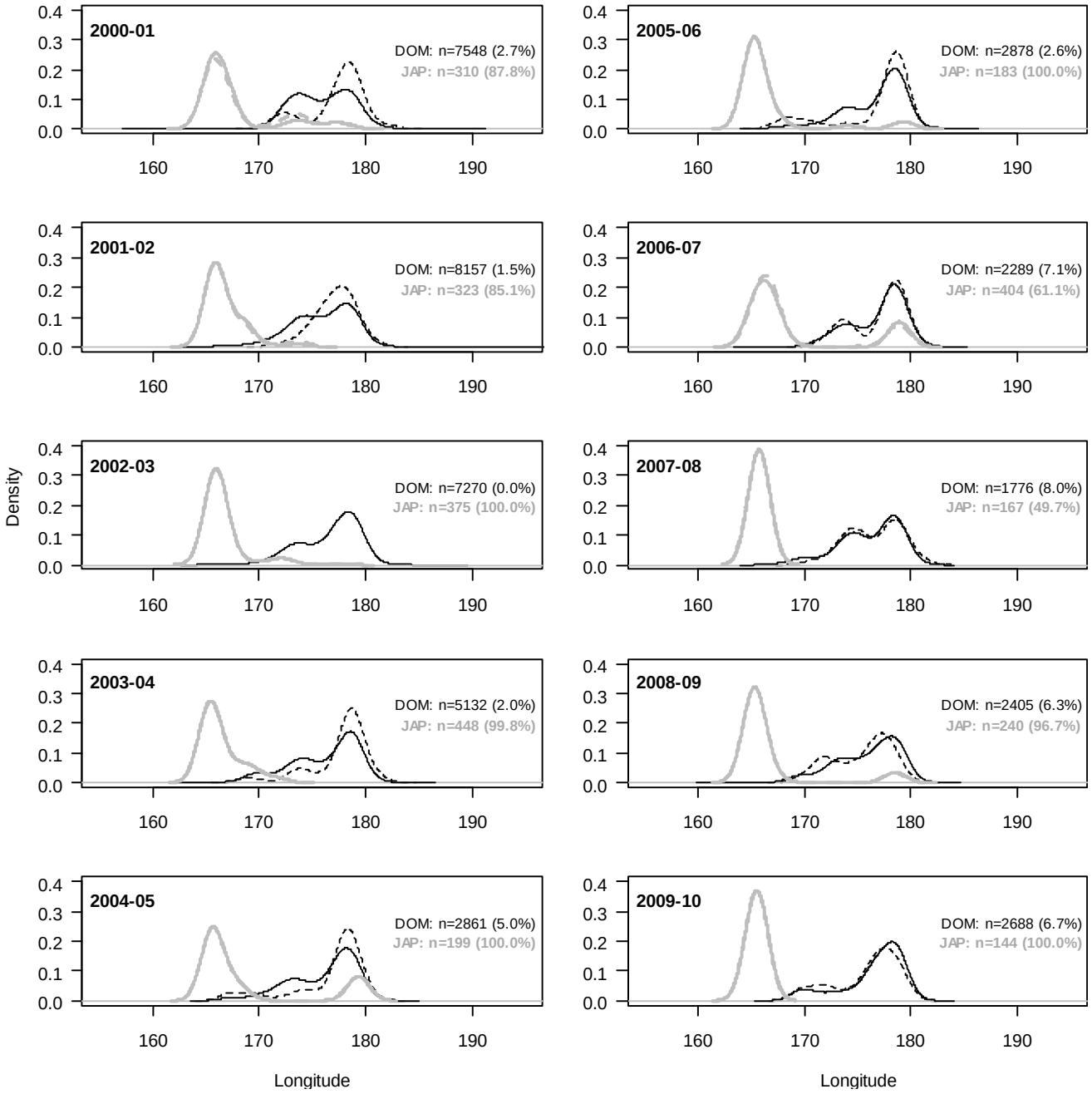


Figure 6: Comparison of commercial and observed numbers of sets, for domestic vessels (black lines) and chartered Japanese vessels (grey lines), 2000–01 to 2009–10, by start longitude positions, where solid lines represent commercial data and dashed lines represent observed data. The total number of sets by each fleet and the percentage observed is given for each fishing year. Note: there was no observed domestic effort in 2002–03.

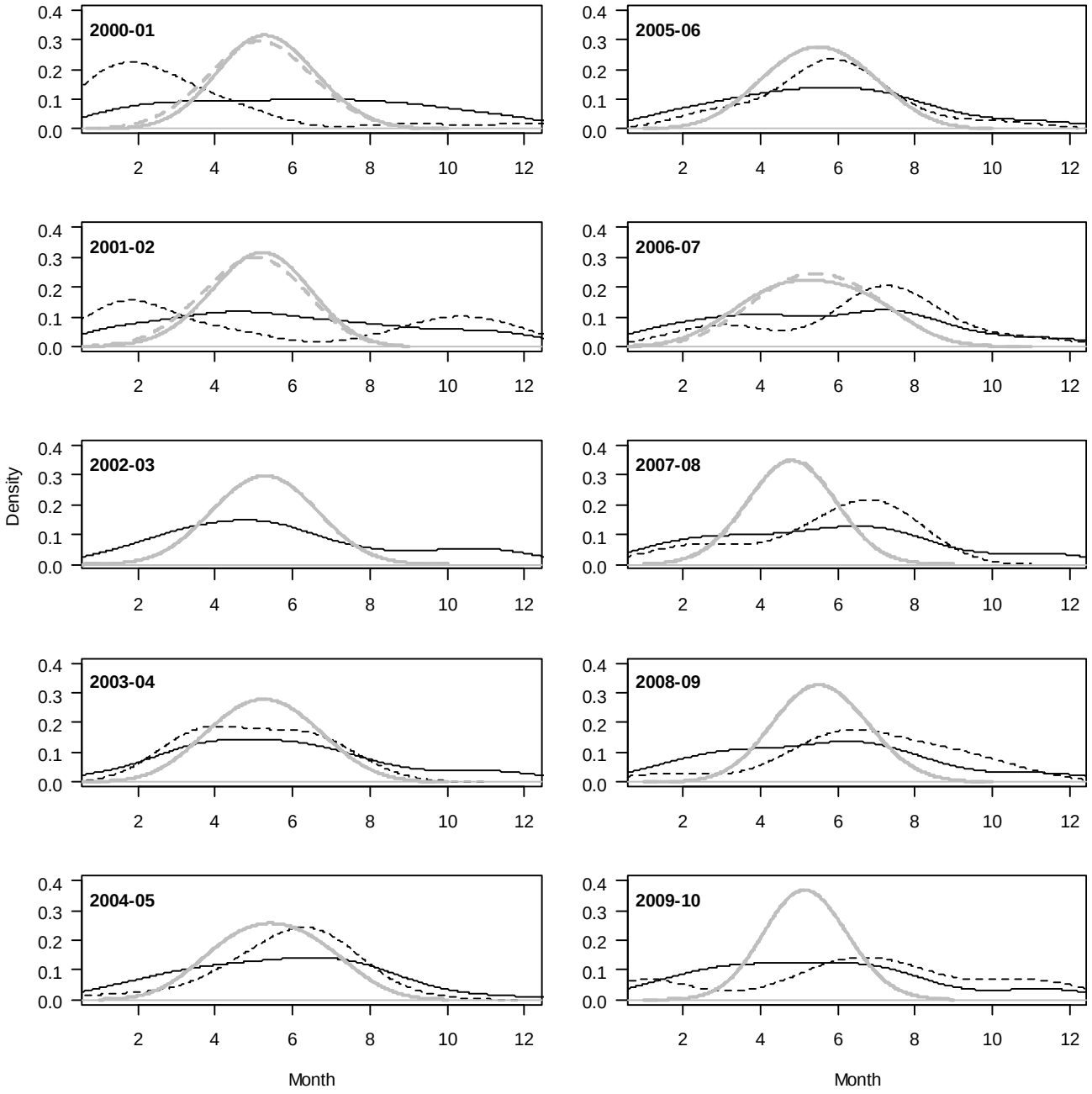


Figure 7: Comparison of commercial and observed numbers of sets, for domestic vessels (black lines) and chartered Japanese vessels (grey lines), 2000–01 to 2009–10, by month (2 is February, 12 is December), where solid lines represent commercial data and dashed lines represent observed data. Note: there was no observed domestic effort in 2002–03. One large domestic vessel was included with the Japanese fleet.

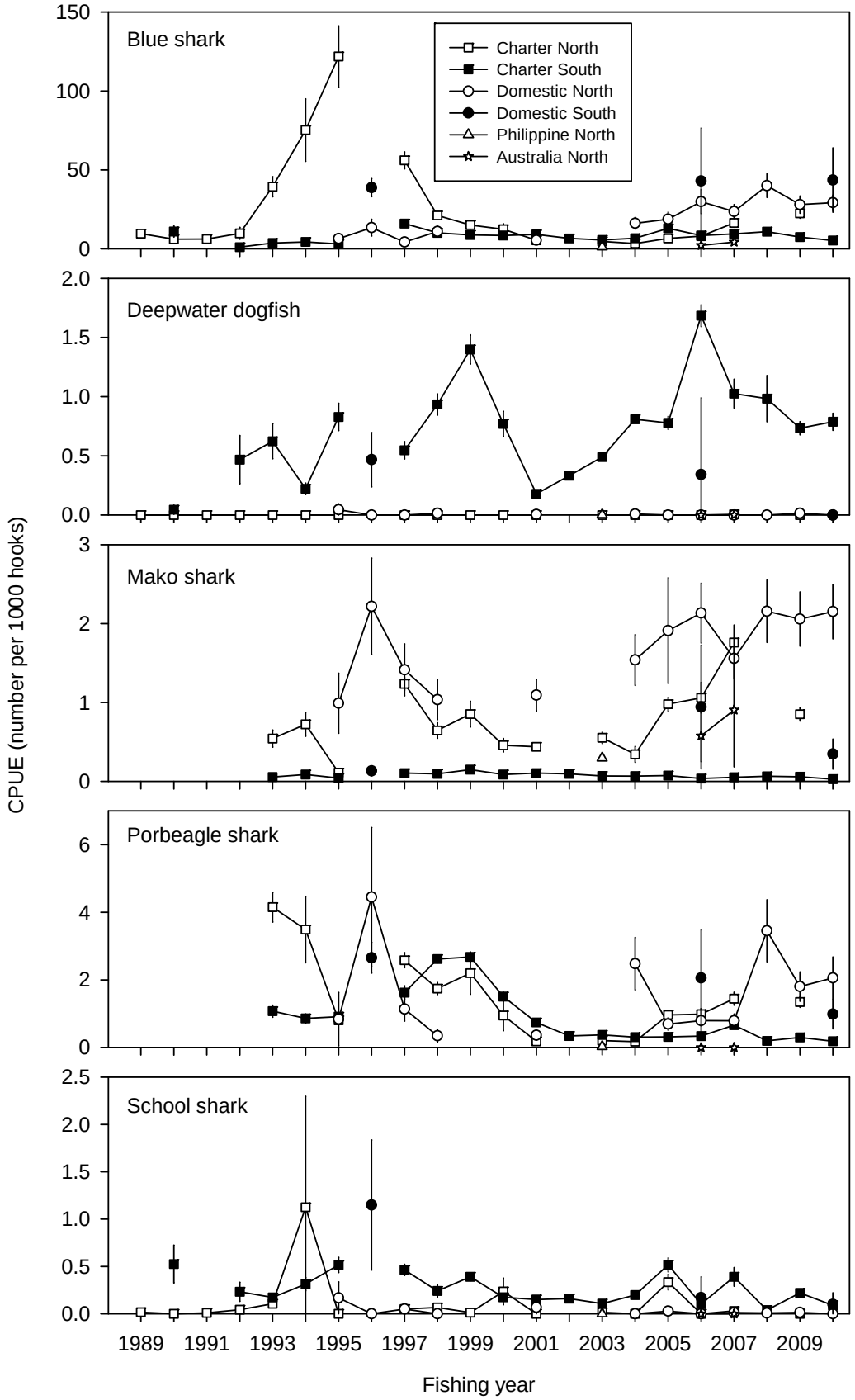


Figure 8: Annual variation in CPUE by fleet and area. Plotted values are the mean estimates with 95% confidence limits. Fishing year 1989 is October 1988 to September 1989. 1. Sharks.

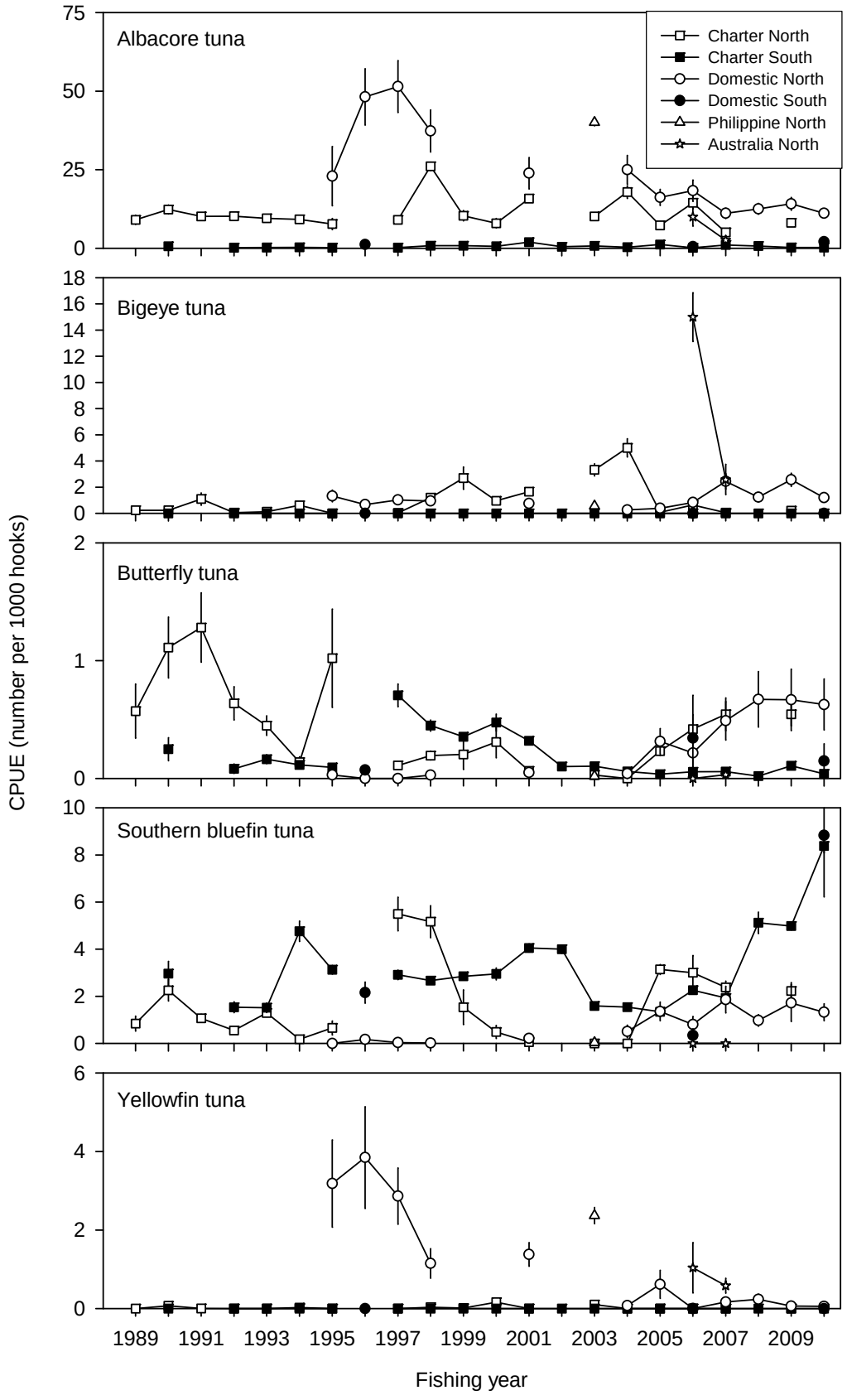


Figure 8: (continued). 2. Tunas.

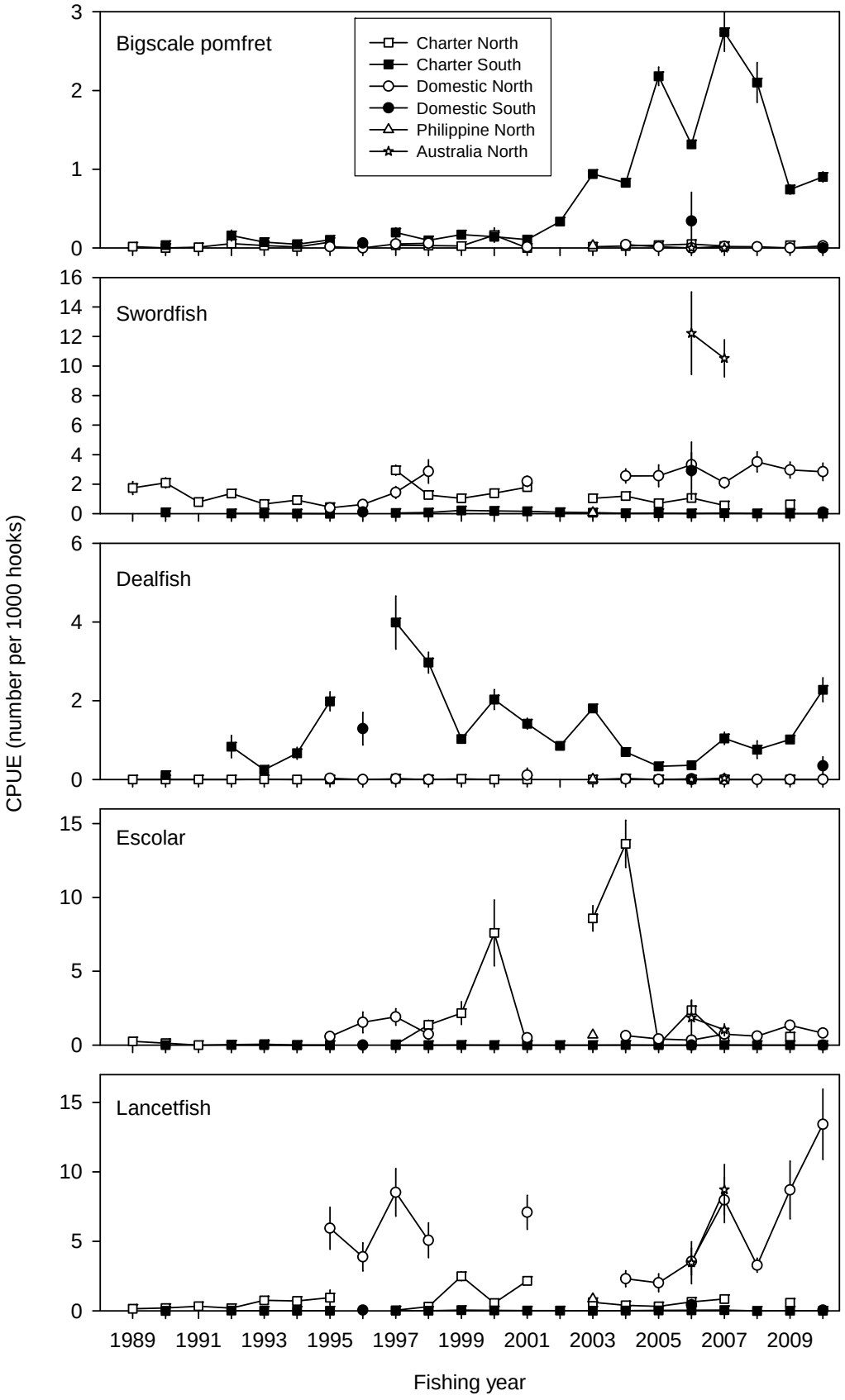


Figure 8: (continued). 3. Other species.

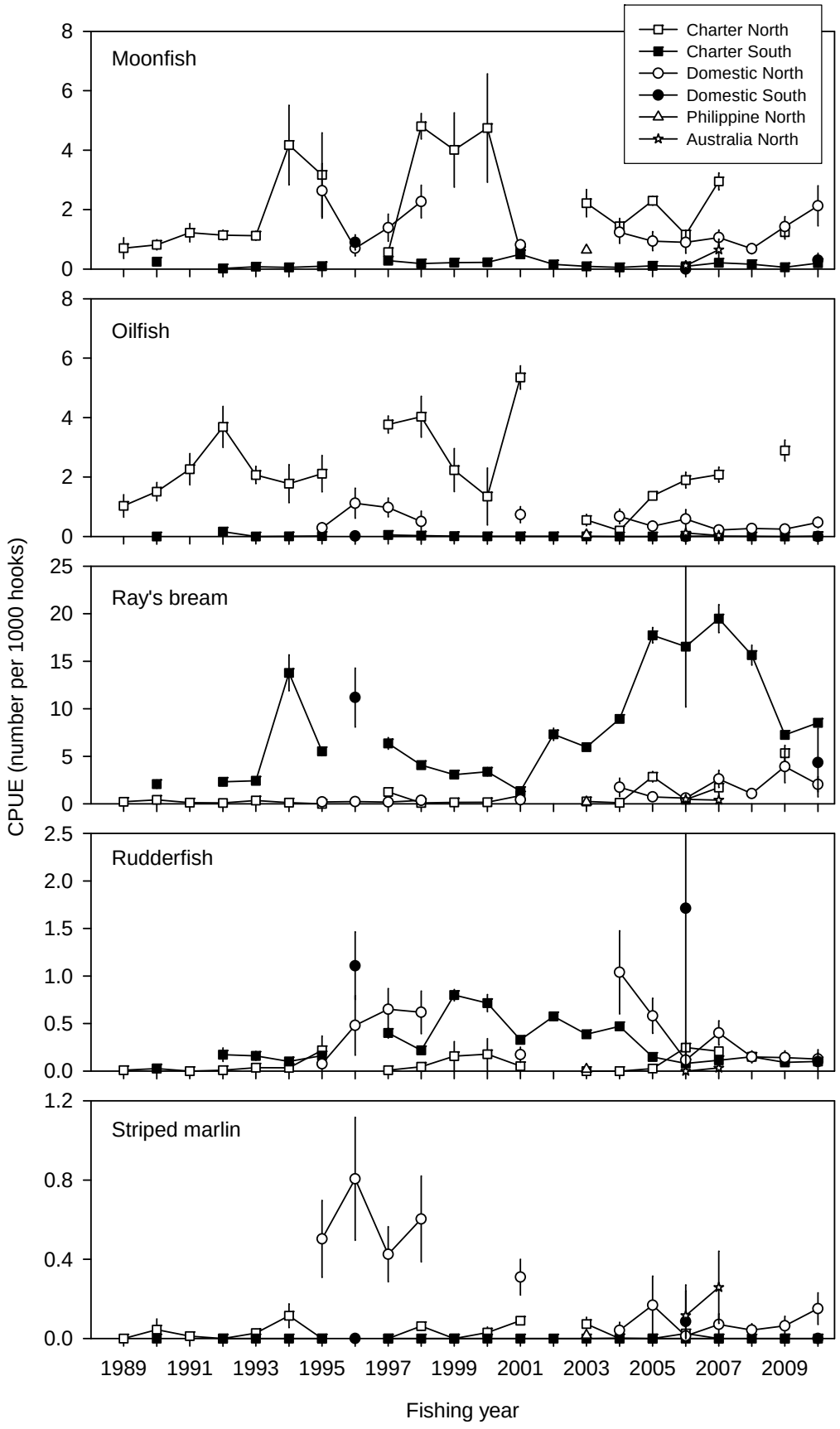


Figure 8: (continued). 3. Other species.

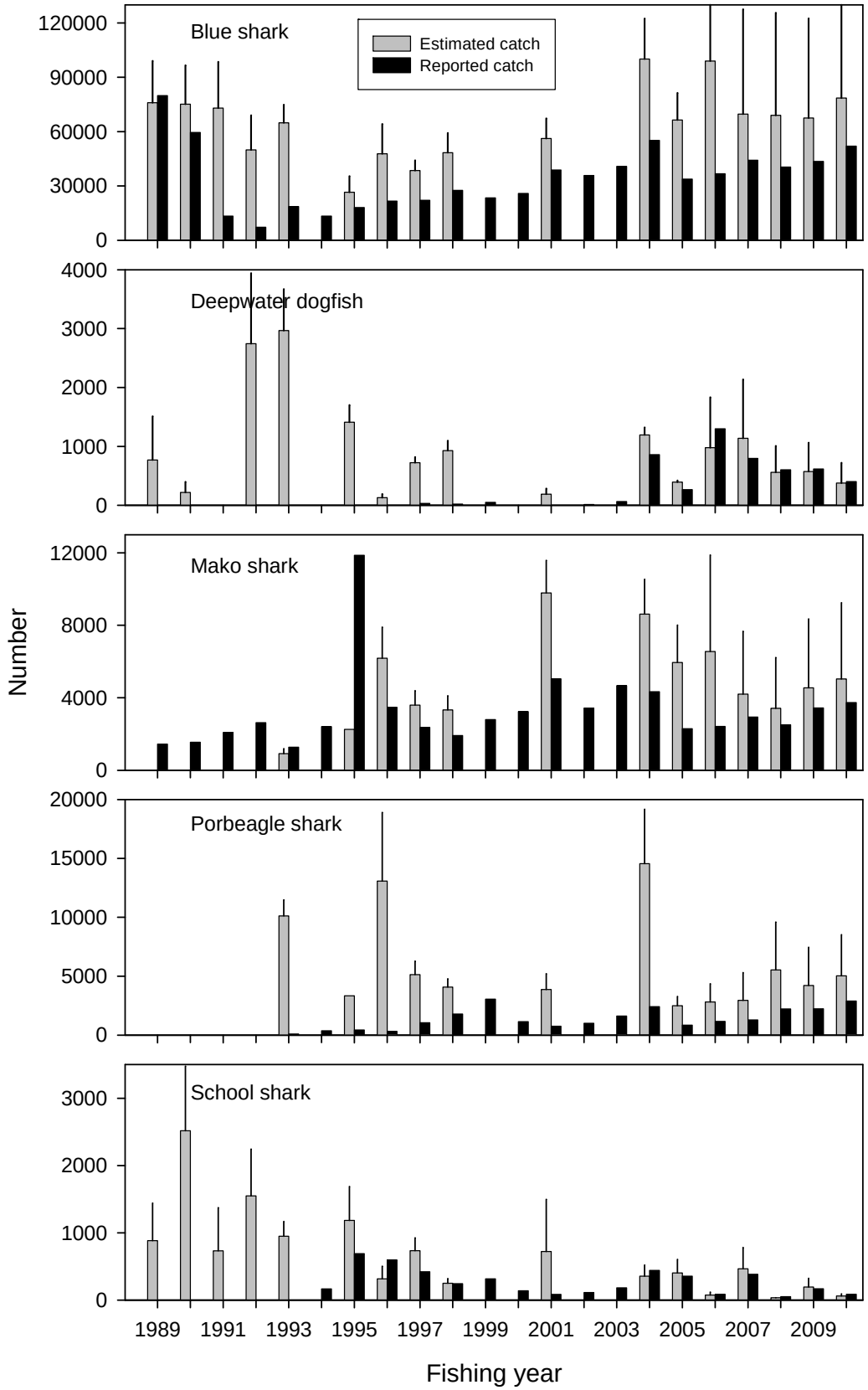


Figure 9: Observer-based estimates of scaled total numbers of fish caught, with 95 % confidence limits, and numbers reported caught on TLCER forms. Fishing year 1989 is October 1988 to September 1989. 1. Sharks.

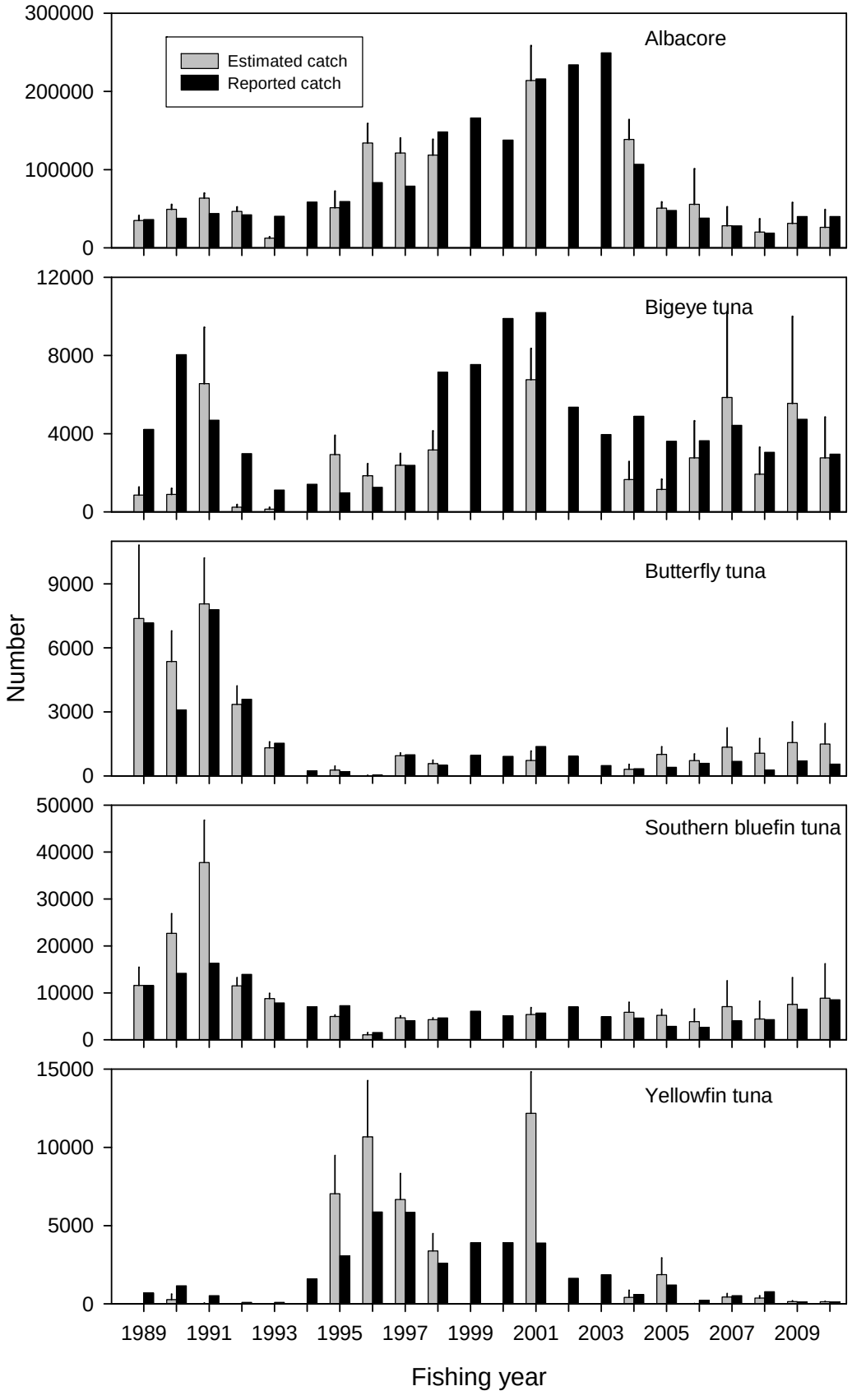


Figure 9: (continued). 2. Tunas.

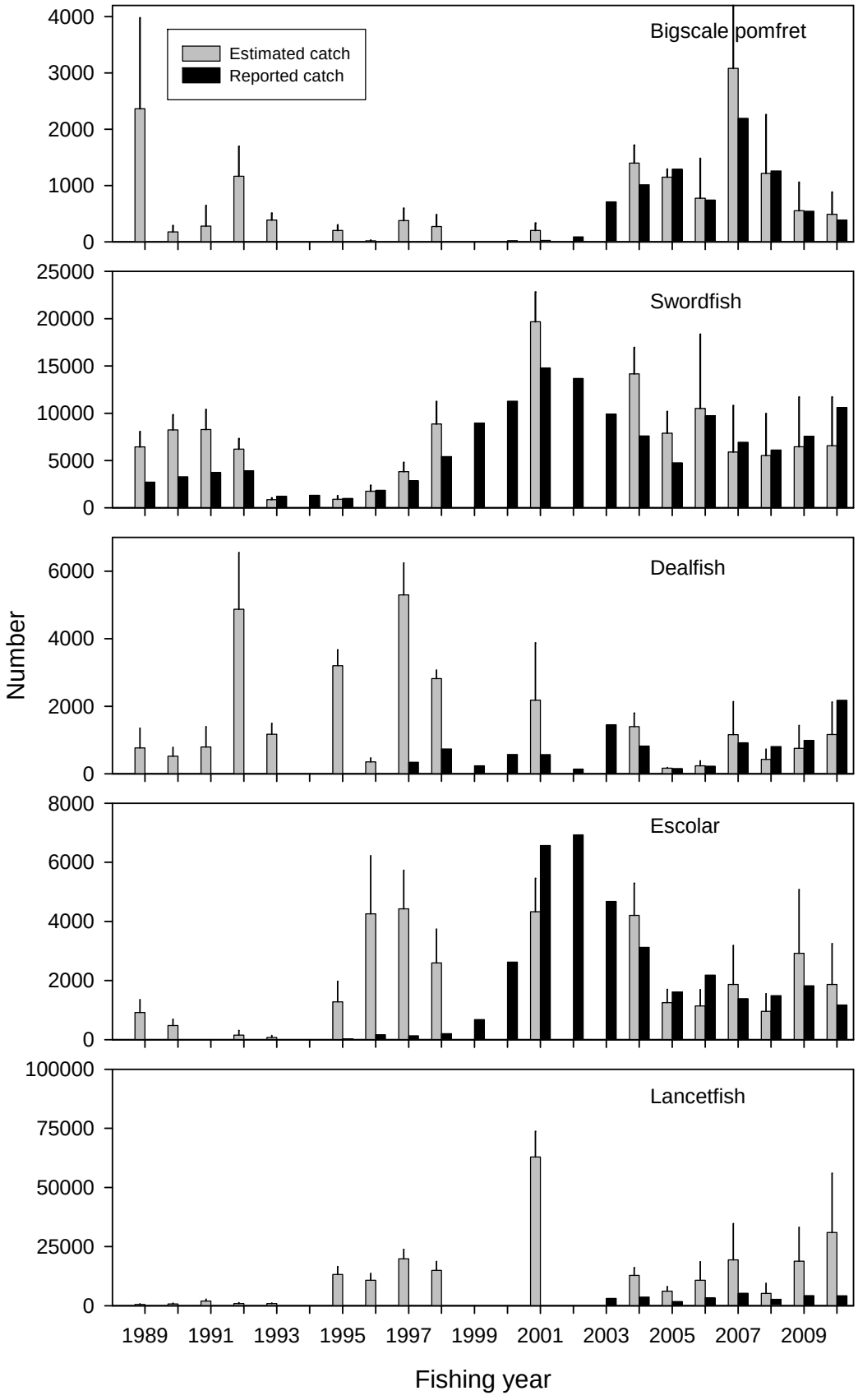


Figure 9: (continued). 3. Other species.

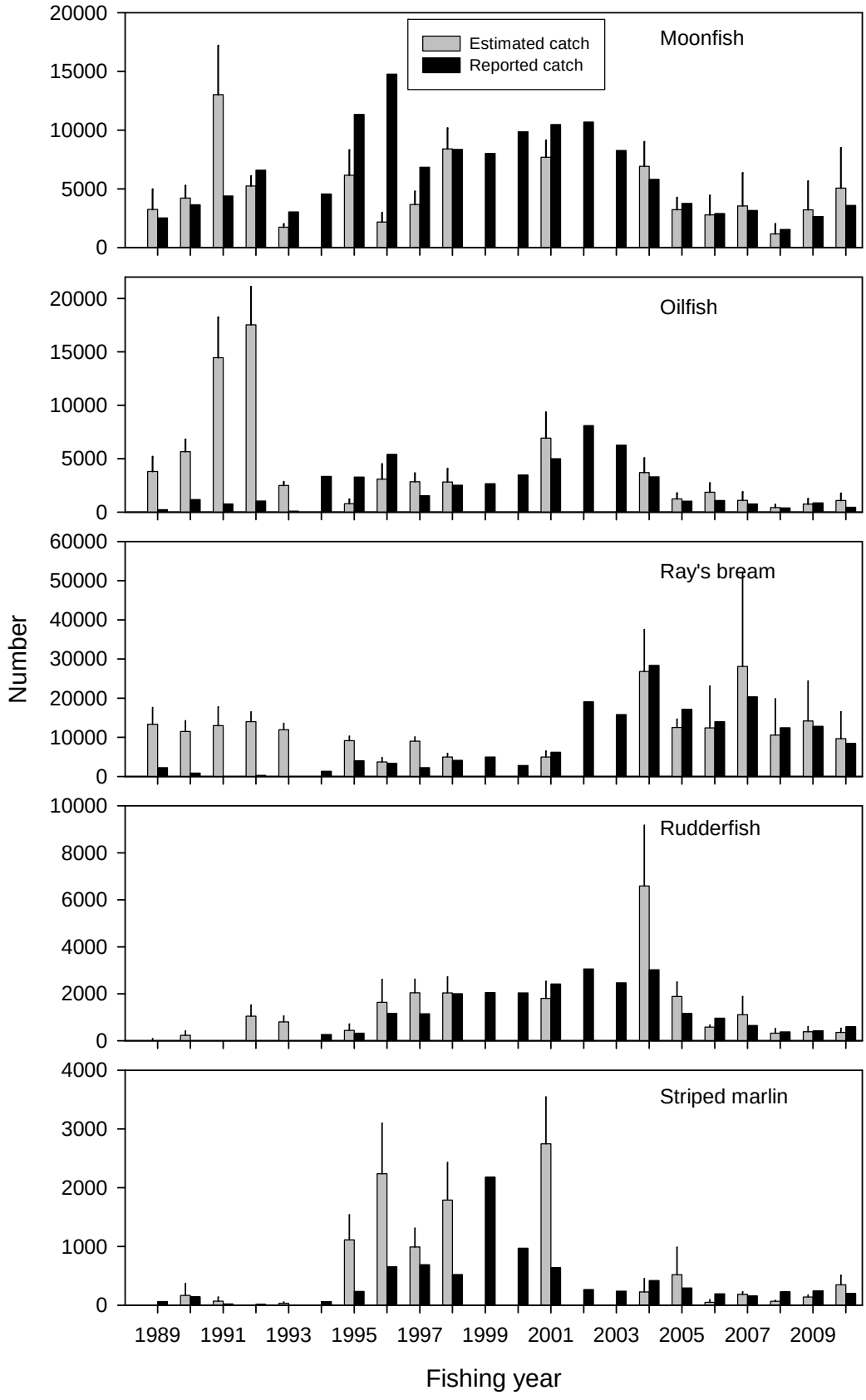


Figure 9: (continued). 3. Other species

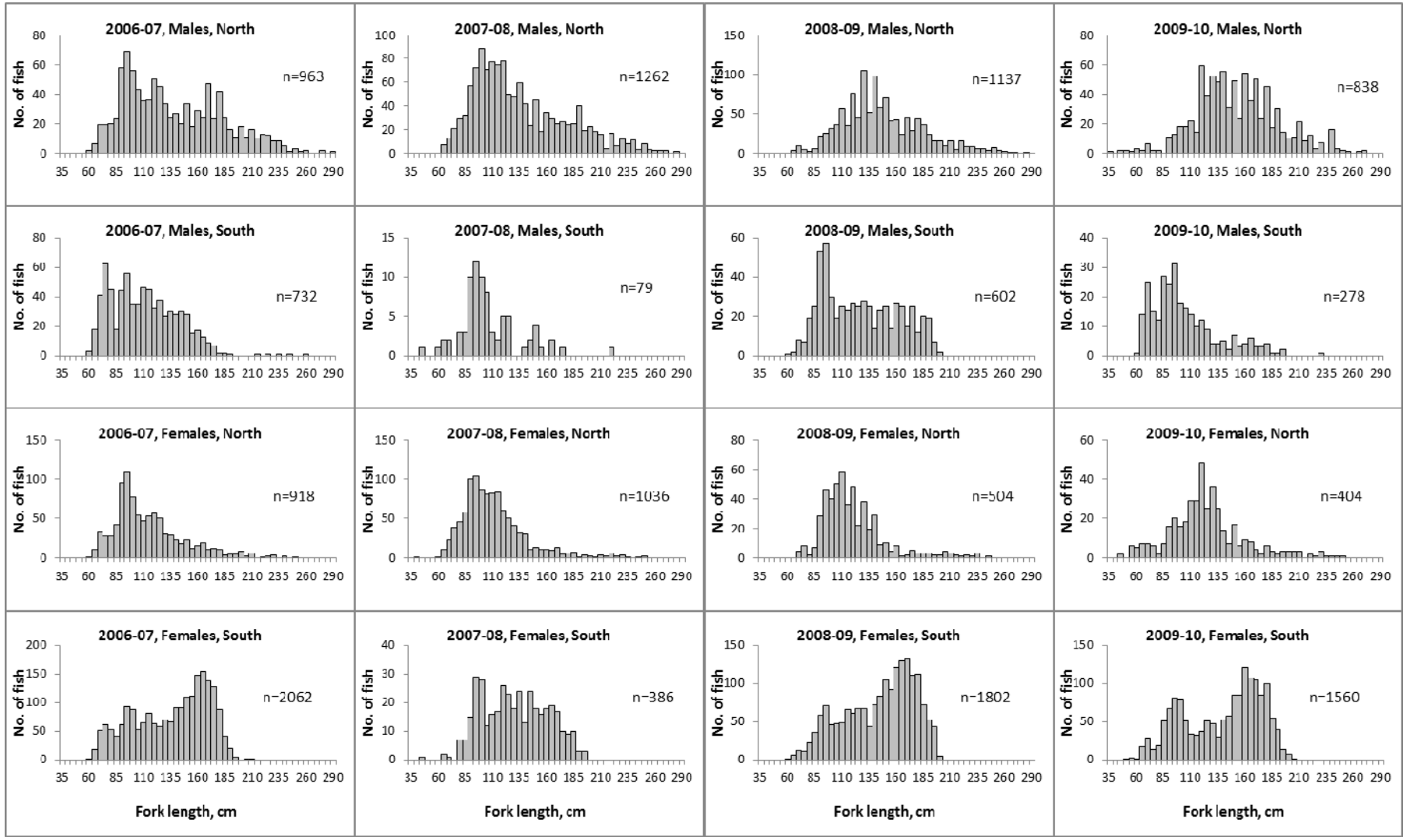


Figure 10: Length-frequency distributions of blue shark by fishing year, sex, and area.

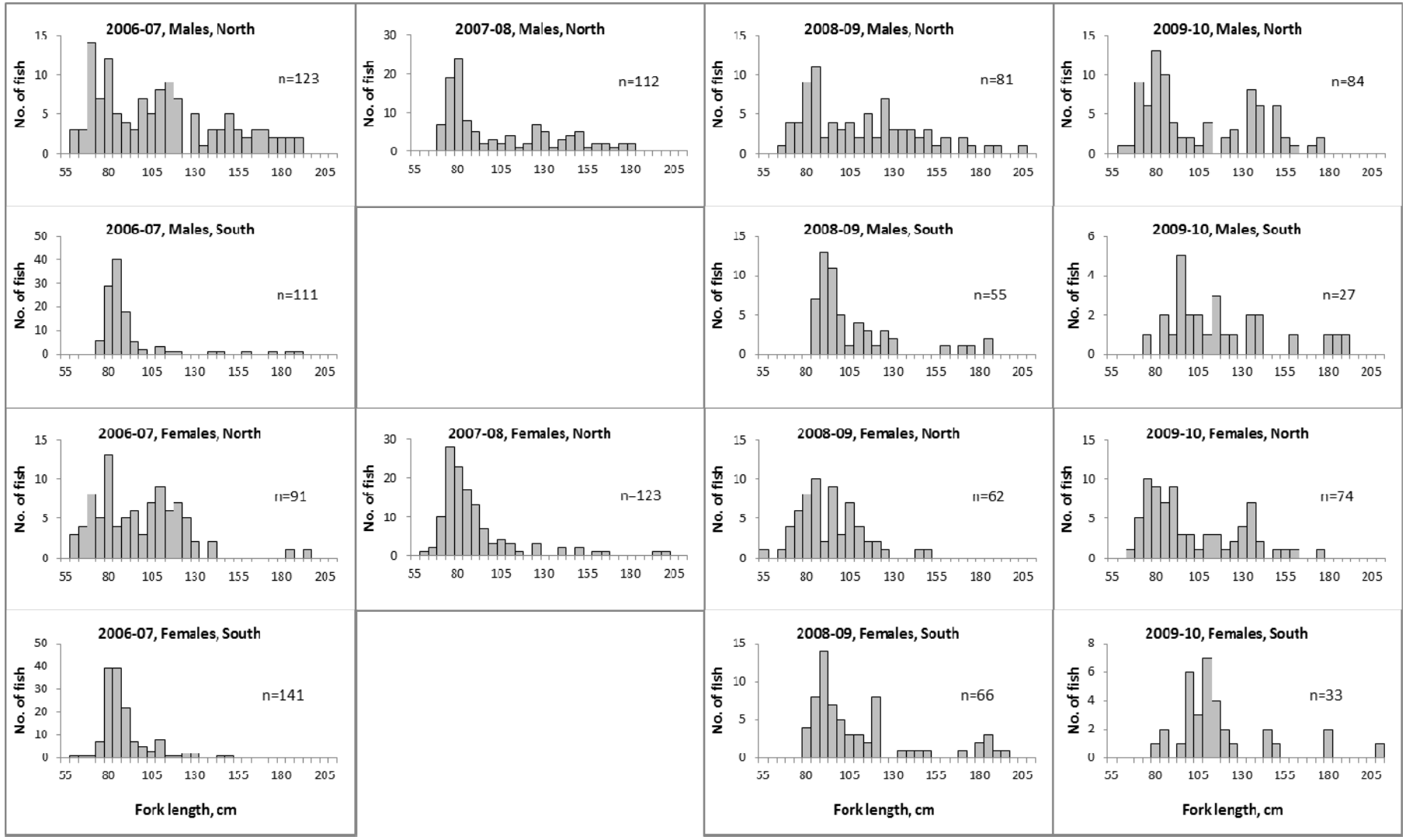


Figure 11: Length-frequency distributions of porbeagle shark by fishing year, sex, and area. Sample sizes of less than 20 fish not shown.

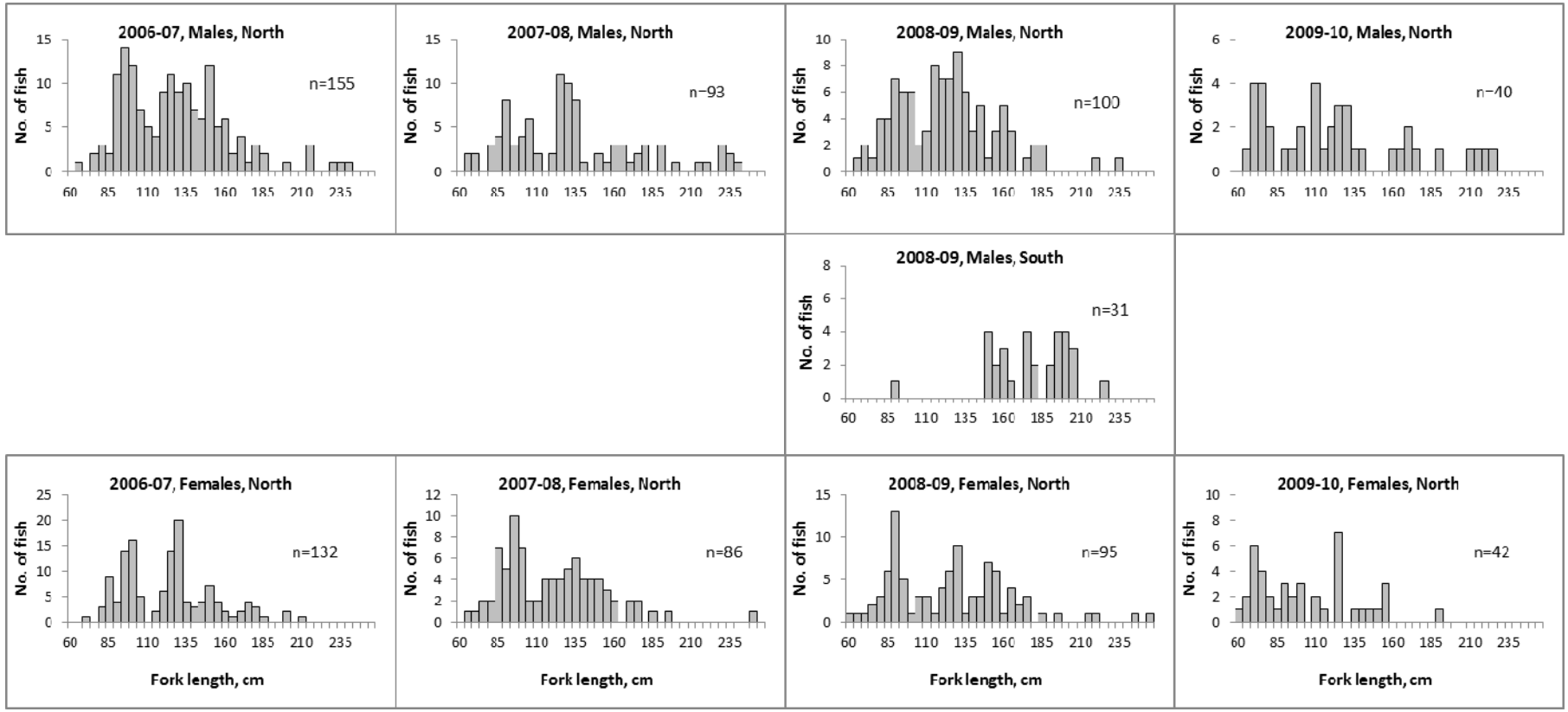


Figure 12: Length-frequency distributions of mako shark by fishing year, sex, and area. Sample sizes of less than 20 fish not shown.

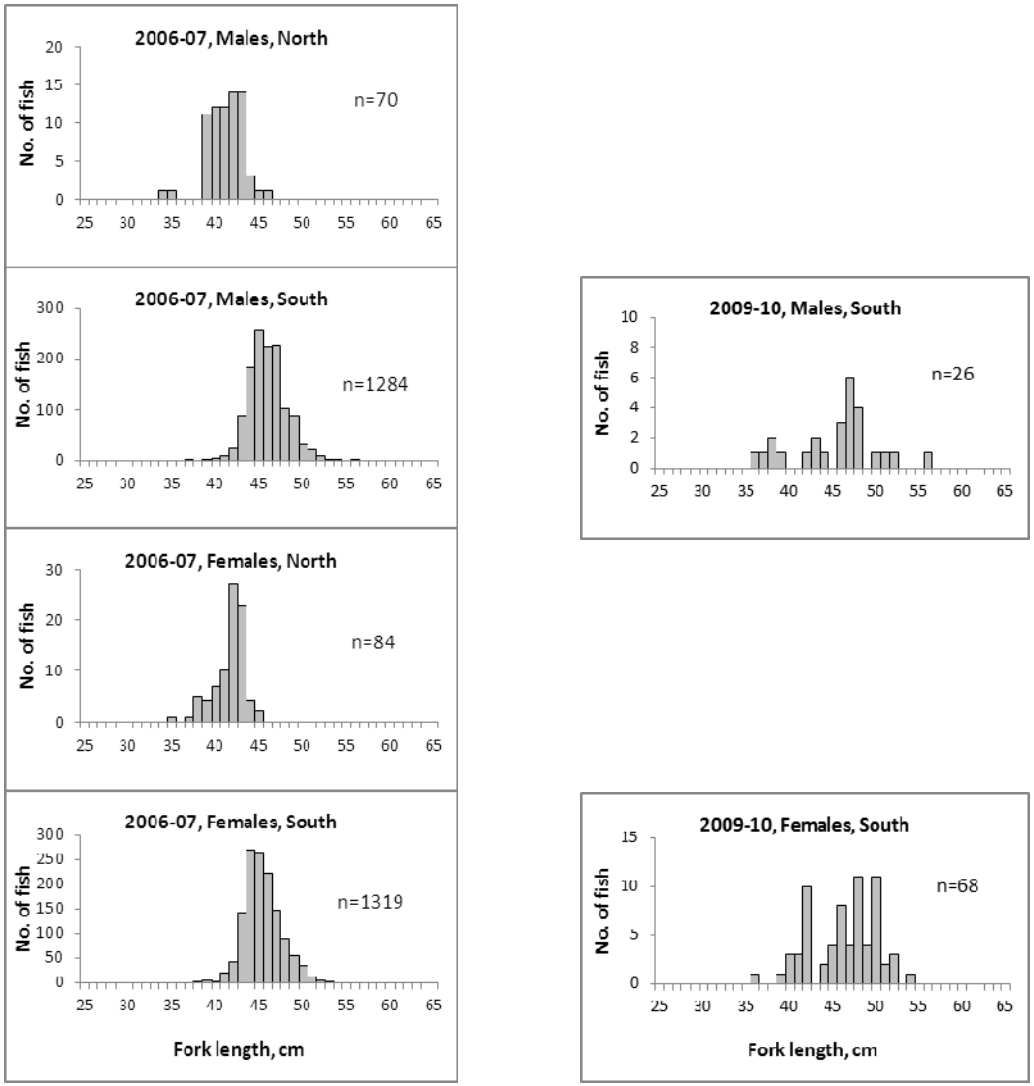


Figure 13: Length-frequency distributions of Ray's bream by fishing year, sex, and area. Sample sizes of less than 20 fish not shown.

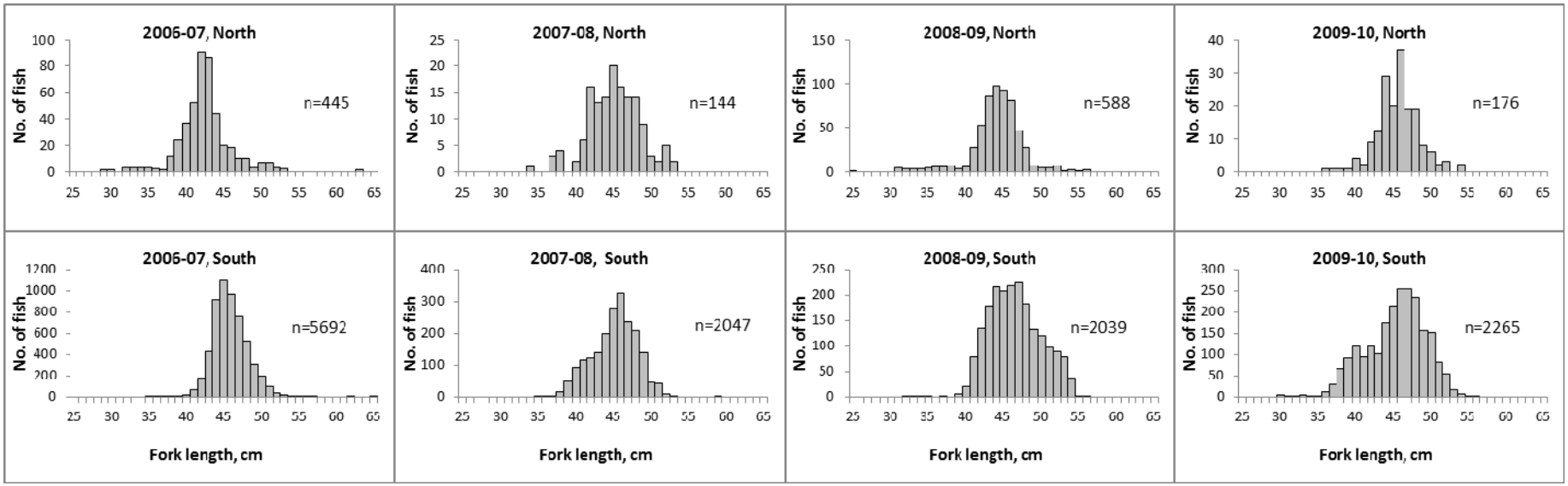


Figure 13: (continued). Length-frequency distributions of Ray's bream by fishing year, and area.

Appendix 1: Numbers of fish reported by observers during 2006–07 to 2009–10, and the total observed catch since 1988–89. Species are ranked in descending order of abundance since 1988–89.

Species	Scientific Name	2006–07 to 2009–10	Total number
Blue shark	*Prionace glauca*	38 162	182 628
Albacore tuna	*Thunnus alalunga*	9 854	101 316
Ray's bream	*Brama brama*	25 277	98 205
Southern bluefin tuna	*Thunnus maccoyii*	10 373	43 291
Porbeagle shark	*Lamna nasus*	2 235	19 011
Dealfish	*Kajikia trachypterus*	2 304	17 185
Lancetfish	*Alepisaurus ferox & A. brevirostris*	5 661	14 383
Moonfish	*Lampris guttatus*	1 683	9 134
Deepwater dogfish	Squaliformes	1 600	9 112
Swordfish	*Xiphias gladius*	2 213	8 286
Big scale pomfret	*Taractichthys longipinnis*	2 954	7 818
Oilfish	*Ruvettus pretiosus*	711	7 542
Mako shark	*Isurus oxyrinchus*	1 676	6 162
Rudderfish	*Centrolophus niger*	373	4 907
Butterfly tuna	*Gasterochisma melampus*	617	4 469
Escolar	*Lepidocybium flavobrunneum*	643	4 422
Bigeye tuna	*Thunnus obesus*	1 240	4 390
School shark	*Galeorhinus galeus*	419	3 620
Yellowfin tuna	*Thunnus albacares*	97	3 342
Sunfish	*Mola mola*	1 000	2 755
Pelagic stingray	*Pteroplatytrygon violacea*	585	2 398
Hoki	*Macruronus novaezelandiae*	265	2 021
Thresher shark	*Alopias vulpinus*	169	1 400
Skipjack tuna	*Katsuwonus pelamis*	38	1 151
Dolphinfish	*Coryphaena hippurus*	134	608
Flathead pomfret	*Taractes asper*	158	516
Striped marlin	*Tetrapturus audax*	59	468
Black barracouta	*Nesiarchus nasutus*	51	386
Barracouta	*Thyrsites atun*	10	357
Pacific bluefin tuna	*Thunnus orientalis*	34	222
Shark, unidentified	Selachii	24	213
Cubehead	*Cubiceps* spp.	79	204
Hapuku and bass	*Polyprion oxygeneios & P. americanus*	36	198
Slender tuna	*Allothunnus fallai*	3	168
Bronze whaler shark	*Carcharhinus brachyurus*	17	136
Shortbill spearfish	*Tetrapturus angustirostris*	8	133
Kingfish	*Seriola lalandi*	21	104
Ray, unidentified	Myliobatiformes	1	90
Frostfish	*Lepidopus caudatus*	0	77
Wahoo	*Acanthocybium solandri*	2	72
Fanfish	*Pterycombus petersii*	2	67
Opah	*Lampris immaculatus*	0	65
Wingfish	*Pteraclis velifera*	19	57

Appendix 1: (continued).

Species	Scientific Name	2006–07 to 2009–10	Total number
Bigeye thresher	*Alopias superciliosus*	19	55
Snipe eel	Nemichthyidae	2	54
Hake	*Merluccius australis*	15	49
Gemfish	*Rexea solandri*	4	22
Blue marlin	*Makaira mazara*	5	20
Unicornfish	*Lophotus capellei*	1	19
Hammerhead shark	*Sphyrna zygaena*	6	19
Oceanic whitetip shark	*Carcharhinus longimanus*	2	18
Skate	Rajidae	0	11
Pilotfish	*Naucrates ductor*	0	10
Snake mackerel	*Gempylus serpens*	10	10
Marlin, unspecified	Isiophoridae	1	9
Bluenose	*Hyperoglyphe antarctica*	0	9
Barracudina	*Magnisudis prionosa*	0	8
Galapagos shark	*Carcharhinus galapagensis*	8	8
Black marlin	*Makaira indica*	0	7
Barracuda	*Sphyraena novaehollandiae*	0	7
Ragfish	*Icichthys australis*	0	7
Pelagic stargazer	*Pleuroscopus pseudodorsalis*	1	7
Seahorse	*Hippocampus* spp.	3	7
Broadnose seven gill shark	*Notorynchus cepedianus*	3	7
Ribaldo	*Mora moro*	0	6
Remora	Echeneidae	0	6
Sawtooth eel	*Serrivomer* spp.	0	6
Squid	Cephalopoda	0	5
Scissortail	*Psenes pellucidus*	4	5
Squaretail	*Tetragonus cuvieri*	0	4
Scalloped dealfish	*Zu elongatus*	1	4
Pomfret, unidentified	Bramidae	0	3
Smallscaled brown slickhead	*Alepocephalus australis*	0	3
Basking shark	*Cetorhinus maximus*	0	3
Black mackerel	*Scombrolabrax heterolepis*	0	3
Manta and devil rays	*Mobula* spp.	0	3
Great white shark	*Carcharodon carcharias*	0	3
Pufferfish	*Sphoeroides pachygaster*	0	3
Bigeye scabbard fish	*Benthodesmus elongatus*	0	2
Blue cod	*Parapercis colias*	0	2
Carpet shark	*Cephaloscyllium isabellum*	0	2
Crab	Crustacea	0	2
Octopus	Cephalopoda	0	2
Pelagic butterfish	*Schedophilus maculatus*	0	2
Amberjack	*Seriola rivoliana*	0	1
Silky shark	*Carcharhinus falciformis*	0	1

Appendix 1: (continued).

Species	Scientific Name	2006–07 to 2009–10	Total number
Prickly anglerfish	*Himantolophus appelii*	0	1
Jack mackerel	*Trachurus* spp.	0	1
Kahawai	*Arripis trutta*	0	1
Trevally	*Pseudocaranx georgianus*	0	1
Large headed slickhead	*Rouleina* spp.	0	1
Brown stargazer	*Xenocephalus armatus*	0	1
Manefish	*Caristius* spp.	0	1
Blue mackerel	*Scomber australasicus*	0	1
Frigate tuna	*Auxis thazard*	0	1
Sharpnose seven gill shark	*Heptranchias perlo*	0	1
Red cod	*Pseudophycis bachus*	0	1
Snapper	*Pagrus auratus*	0	1
Sprat	*Sprattus* spp.	0	1
Tiger shark	*Galeocerdo cuvier*	0	1
Tasmanian ruffe	*Tubbia tasmanica*	0	1
White warehou	*Seriolella caerulea*	0	1
Sixgill shark	*Hexanchus griseus*	1	1
Pipefish	Syngnathidae	1	1
Ocean blue-eye	*Schedophilus velaini*	1	1
Sea perch	*Helicolenus* spp.	1	1
Louvar	*Luvaris imperialis*	1	1
Unidentified fish		177	4 399
Total		111 074	567 943

Appendix 2: Total reported catches of each species caught in 2006–07 to 2009–10.

	Number of fish			
Species	2006–07	2007–08	2008–09	2009–10
Albacore tuna	28 184	18 678	40 047	40 075
Bigeye tuna	4 424	3 047	4 739	2 953
Bigscale pomfret	2 194	1 258	542	386
Butterfly tuna	684	278	693	547
Blue shark	44 216	40 399	43 561	51 977
Dealfish	918	806	990	2 176
Deepwater dogfish	796	603	615	402
Lancetfish	5 265	2 728	4 253	4 160
Escolar	1 382	1 490	1 823	1 171
Mako shark	2 932	2 507	3 435	3 737
Moonfish	3 164	1 542	2 645	3 596
Oilfish	768	382	859	455
Porbeagle shark	1 284	2 211	2 230	2 885
Ray's bream	20 331	12 438	12 827	8 439
Rudderfish	650	376	414	599
School shark	384	49	168	86
Striped marlin	156	228	239	198
Southern bluefin tuna	4 022	4 266	6 496	8 522
Swordfish	6 935	6 106	7 546	10 590
Yellowfin tuna	518	763	119	111

Appendix 3: Suggested allocation of observer days by fishery and month. This is based on 2006–07 to 2009–10 data with all four years combined. The fishery is divided into West Coast targeting southern bluefin tuna (W STN), East Coast targeting southern bluefin tuna (E STN), West Coast targeting bigeye tuna and/or swordfish (W BIG/SWO), East Coast targeting bigeye tuna and/or swordfish (E BIG/SWO). Other minor target species (albacore, Pacific Bluefin tuna, and yellowfin tuna) are included with BIG/SWO. Number of days is based on a future allocation of 378 observer days, rounded to nearest whole number.

Days by fishery:

Fishery	%	Days
E BIG/SWO	58	220
E STN	27	102
W BIG/SWO	10	37
W STN	5	19
Total		378

Days by month:

Month	%	Days
January	6	23
February	8	31
March	12	45
April	11	42
May	11	42
June	12	45
July	15	57
August	10	38
September	4	14
October	2	9
November	4	15
December	4	16

Days by fishery and month:

				Fishery
Month	E BIG/SWO	E STN	W BIG/SWO	W STN
January	22	-	2	-
February	27	-	3	-
March	40	<1	5	<1
April	35	1	7	<1
May	22	11	5	4
June	5	29	2	8
July	5	45	3	5
August	16	15	5	2
September	10	1	2	-
October	8	-	1	-
November	14	-	<1	-
December	16	-	<1	-

Appendix 3: (continued).

Percentage of days by fishery and month:

	E BIG/SWO	E STN	W BIG/SWO	W STN
January	5.71	-	0.49	-
February	7.16	-	0.92	-
March	10.53	0.01	1.37	0.09
April	9.13	0.26	1.78	0.01
May	5.87	3.01	1.20	1.12
June	1.39	7.75	0.66	2.06
July	1.26	11.78	0.82	1.28
August	4.20	3.86	1.35	0.55
September	2.70	0.32	0.65	-
October	2.18	-	0.26	-
November	3.78	-	0.13	-
December	4.31	-	0.04	-

Days by month and fishery (rounded to nearest 5), based on 378 days:

	E BIG/SWO	E STN	W BIG/SWO	W STN
January	20	-	0	-
February	30	-	5	-
March	40	0	5	0
April	35	0	5	0
May	25	10	5	5
June	5	30	5	10
July	5	45	5	5
August	15	15	5	0
September	10	0	0	-
October	10	-	0	-
November	15	-	0	-
December	15	-	0	-

Percentage within each fishery:

	E BIG/SWO	E STN	W BIG/SWO	W STN
January	9.81	-	5.09	-
February	12.30	-	9.50	-
March	18.09	0.04	14.14	1.72
April	15.68	0.97	18.44	0.21
May	10.08	11.15	12.44	21.89
June	2.39	28.71	6.79	40.34
July	2.16	43.63	8.48	25.11
August	7.22	14.31	13.91	10.73
September	4.64	1.18	6.67	-
October	3.74	-	2.71	-
November	6.49	-	1.36	-
December	7.41	-	0.45	-