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Catches, size, and age structure of the 2013–14 hoki fishery, and a summary of input data used for the 2015 stock assessment

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EXECUTIVE SUMMARY

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This report summarises catches by area and presents the length and age structure of hoki caught commercially during the 2013–14 fishing year. Length frequency and catch-at-age data from spawning and non-spawning fisheries are compared with those from previous years. Biomass indices from research surveys and results from other research on hoki in the last year are also briefly described. Data in this report were incorporated in the hoki stock assessment in 2015.

The total reported hoki catch in 2013–14 was 146 335 t, 3700 t below the TACC of 150 000 t, and 20 000 t higher than the catch in 2012–13. Catches in 2013–14 increased in the main western stock areas and decreased slightly in the main eastern stock areas. The spawning catch on the west coast South Island (WCSI) increased by 13 000 t to 69 400 t, and was the largest hoki fishery for the fourth consecutive season. The non-spawning fishery on the Chatham Rise was the second largest hoki fishery, with 33 800 t taken in 2013–14, about 2800 t less than in 2012–13. The spawning catch from Cook Strait decreased by 1000 t to 18 400 t, and the non-spawning catch from the Sub-Antarctic increased by 5800 t to 19 900 t in 2013–14. Catches from other areas remained at low levels. About 90 100 t of the total catch was taken from western stock areas in 2013–14 and 56 200 t was taken from eastern stock areas, consistent with the management targets of 90 000 t west and 60 000 t east.

Length and age frequency distributions from the commercial fishery show that most of the catch in 2013–14 was fish of lengths 45 to 90 cm. Hoki from the 2011 year class (50–65 cm) dominated the length frequency distribution on the Chatham Rise and were abundant in the Sub-Antarctic. In the spawning areas larger hoki from ages 5–7 dominated the catch, but the 2011 year class was also present. In all areas there were few hoki from the 2010 year class. The percentage of small fish in the catch in 2013–14 increased, mainly due to the presence of the 2011 year class.

Only one fishery independent research survey for hoki was carried out in 2013–14. The relative biomass index for hoki from the core strata in the 2014 Sub-Antarctic trawl survey decreased by 43% from 2012. The 2011 year class was evident in the survey length frequency distribution but was not strong at age 3+. Estimates for age 1+ and 2+ (2013 and 2012 year-classes) were low.

1. INTRODUCTION

This report provides data relevant to the 2015 hoki stock assessment. Catch statistics and data from commercial sampling during the 2013–14 fishing year are presented and results from other research programmes since March 2014 are summarised. This includes results of the trawl survey of the Sub-Antarctic in November-December 2014. Details of model structure, results, and yield estimates from the hoki stock assessment carried out in 2015 will be published separately.

This report provides the final reporting requirement for Objective 2 of DEE2010-02HOKD, Objectives 1, 2, and 7 of MID2010-01E, and Objective 1 of DEE2014-02.

DEE2010-02HOKD Objective 2: Provide descriptive analysis of the hoki fishery in 2013–14 fishing year.

MID2010-01E Objective 1: To determine the age and size structure of the commercial catches of hoki in the main non-spawning fisheries from samples collected at sea by the Observer Programme in the 2013–14 year.

MID2010-01E Objective 2: To determine the catch-at-age of commercial catches of hoki from the WCSI and Cook Strait spawning fisheries from data collected by the Observer Programme and from other sources in the 2013–14 year.

MID2010-01E Objective 7: To determine the age and size structure of hoki from the trawl surveys.

DEE2014-02 Objective 1: To collect otolith samples in the fish processing sheds of the commercial landings of hoki from Cook Strait during winter 2014.

1.1 Stock structure

The hoki catch is currently managed under a single TACC which can be caught in all areas of the EEZ, excluding QMA 10 (Fishstock HOK 1). However, since 1990 the Hoki Working Group has assessed hoki as two stocks, “eastern” and “western” (Annala (1990) and subsequent Plenary Reports). Hoki on the west coast of the North and South Islands and in the area south of New Zealand, including Puysegur Bank, Snares Shelf, and Campbell Plateau, are assumed to be one stock unit, the “western stock”. The east coast of the South Island, Mernoo Bank, Chatham Rise, Cook Strait, and the east coast of the North Island up to North Cape are assumed to contain the “eastern stock”. Immature hoki (2–4 years old) from both “stocks” occur together on the Chatham Rise.

Livingston (1997) reviewed the two-stock hypothesis originally adopted in 1990 (Livingston 1990) with respect to data collected in 1990–97, and concluded that this hypothesis was still a valid interpretation for hoki. Morphometric and ageing studies (Horn & Sullivan 1996, Livingston & Schofield 1996) have found consistent differences between adult hoki from the two main dispersed areas (Chatham Rise and Southern Plateau), and from the two main spawning grounds in Cook Strait and west coast South Island (WCSI). These differences demonstrate that there are two sub-populations of hoki. Whether they reflect genetic differences between the two sub-populations, or are the result of environmental differences between the Chatham Rise and Southern Plateau, is not known. The chemistry of otoliths from the WCSI and Cook Strait stocks is similar (Kalish et al. 1996), and no genetic differences were detected between spawning stocks (Smith et al. 1981, 1996).

From 2006 to 2007 (Francis 2007, 2008) and since 2012 (McKenzie 2013, 2015a, 2015b), the hoki stock assessment model has had two variants which were associated with different stock structure hypotheses. The ‘base case’ hypothesis assumes natal fidelity: a fish that was spawned in one area will grow up to spawn in the same area (i.e., a fish is ‘eastern’ or ‘western’ from birth). The alternative hypothesis does not assume natal fidelity, so fish spawned in one area can themselves spawn in another area (i.e., a fish chooses to be ‘eastern’ or ‘western’ when it matures). Under both hypotheses, once a fish has spawned it shows site fidelity – it cannot change spawning grounds. All model runs from 2008–11 assumed natal fidelity because of technical problems concerning the definition of unfished biomass without this assumption (Francis 2009, McKenzie 2013). These problems are now resolved and model runs which do not assume natal fidelity are currently included as a sensitivity run (McKenzie 2015a, 2015b).

Francis et al. (2011) described a pilot study, aimed at determining whether analyses of stable isotopes and trace elements in otoliths could be useful in testing stock structure hypotheses and the question of natal fidelity. However, none of the six trace elements or two stable isotopes considered unambiguously differentiated the two hoki stocks. Two earlier pilot studies appeared to provide weak support for the hypothesis of natal fidelity for the western and eastern spawning stocks. Smith et al. (2001) found significant differences in gill raker counts, and Hicks & Gilbert (2002) found significant differences in measurements of otolith zones between samples of 3 year-old hoki from the 1997 year-class caught on the WCSI and in Cook Strait. However, when additional year-classes were sampled, differences were not always detected (Hicks et al. 2003).

Horn (2011) reviewed the published literature on natal fidelity in relationship to management of hoki. He concluded that, because hoki are an off-shore species, widely dispersed in the non-spawning season, with multiple diffuse spawning areas, it is unlikely that hoki exhibit 100% natal fidelity. Even if natal fidelity is the preferred option for hoki from an evolutionary perspective, it is likely that some proportion of the population would stray routinely. An independent review of the hoki assessment model, commissioned by Ministry for Primary Industries in February 2014, noted that “the extents of natal fidelity are important to identify”, and recommended exploration of a range of model structures (Butterworth et al. 2014).

1.2 Description of the hoki fishery

Historically, the main fishery for hoki has operated from late June to late August on the WCSI where hoki aggregate to spawn. The spawning aggregations begin to concentrate in depths of 300–700 m around the Hokitika Canyon from late June, and further north off Westport later in the season. Fishing in these areas continues into September in some years. In 1988 another fishery developed on large spawning aggregations of hoki in Cook Strait. The spawning season in Cook Strait runs from late June to mid-September, peaking in July and August. Small catches of spawning hoki are taken from other grounds off the east coast of South Island (ECSI), and late in the season at Puysegur Bank. There are also anecdotal reports of spawning hoki being caught near the Snares Islands, Chatham Islands, and several other locations off the east coast of North Island (ECNI).

Outside the spawning season, when hoki disperse to their feeding grounds, substantial fisheries have developed since the early 1990s on the Chatham Rise and in the Sub-Antarctic. These fisheries usually operate in depths of 300–800 m. The Chatham Rise fishery generally has similar catches over all months except in July-September, when catches are lower due to the fishery moving to the spawning grounds. In the Sub-Antarctic, catches have typically peaked in April–June. Out-of-season catches are also taken from Cook Strait and ECNI, but these are small compared to spawning season catches.

From 1986 to 1990 surimi vessels dominated the catches and took about 60% of the annual WCSI catch. However, since 1991, the surimi component of catches has decreased and processing to head and gut or to fillet product has increased, as has “fresher” catch for shore processing. The hoki fishery now operates throughout the year, producing high quality fillet product from both spawning and non-spawning fisheries. Twin-trawl rigs have been used in some hoki fisheries since 1998, and trawls made of spectra twine (a high strength twine with reduced diameter resulting in reduced drag and improved fuel efficiencies) were introduced to some vessels in 2007–08.

The Hoki Fishery Management Company introduced a Code of Practice for hoki target trawling in 2001 with the aim of protecting small fish (less than 60 cm). The Code of Practice was replaced by Operational Procedures for Hoki Fisheries, implemented by the Deepwater Group from 1 October 2009. The Operational Procedures aim to manage and monitor fishing effort within four industry management areas, where there are thought to be high abundance of juvenile hoki (Narrows Basin of Cook Strait, Canterbury Banks, Mernoo, and Puysegur). These areas are closed to hoki target trawling by vessels larger than 28 m, with increased monitoring when targeting species other than hoki. There is also a general recommendation that vessels move from areas where catches of juvenile hoki (defined as less than 55 cm total length) comprise more than 20% of the hoki catch by number.

1.3 Catch history

The total annual catches of hoki within the EEZ from 1969 to 2013–14 are given in Tables 1 and 2. The hoki fishery was developed by Japanese and Soviet vessels in the early 1970s (Table 1). Catches increased to 100 000 t in 1977, but dropped to less than 10 000 t in 1978 when the 200 n. mile Exclusive Economic Zone (EEZ) was declared and a quota limit of 60 000 t was introduced (Figure 1). Hoki remained a relatively small fishery of up to 50 000 t a year until 1986, when the TACC was increased. The fishery expanded to an estimated catch in 1987–88 of about 255 000 t (Table 2). Reported annual catches ranged between 175 000 and 215 000 t from 1988–89 to 1995–96, increasing to 246 000 t in 1996–97, and peaking at 269 000 t in 1997–98, when the TACC was over-caught by 19 000 t. The TACC was reduced to 90 000 t in 2007–08 and catches declined accordingly (Table 2). The TACC has been increased in four steps since 2009–10 and catches have increased. The current TACC set on 1 October 2014 is 160 000 t.

Catches by area since 1988–89 are given in Table 3 and Figure 2. The pattern of fishing has changed markedly since 1988–89 when over 90% of the total catch was taken in the WCSI spawning fishery. This has been due to a combination of TAC changes and redistribution of fishing effort. The catch from the WCSI declined steadily from 1988–89 to 1995–96, increased again to between 90 000 and 107 000 t from 1996–97 until 2001–02, then dropped sharply to a low of 20 500 t in 2008–09. The WCSI catch has increased again over the past five years to 69 400 t in 2013–14. This was about 47% of the total hoki catch in 2013–14, making the WCSI the largest fishery in New Zealand for the four most recent years (Table 3). In Cook Strait, catches peaked at 67 000 t in 1995–96, declined to 14 900 in 2010–11, but have increased over the past two years to 19 400 t in 2002–13 and 18 400 t in 2013–14. Non-spawning catches on the Chatham Rise peaked at about 75 000 t in 1997–98 and 1998–99, decreased to a low of 30 700 t in 2004–05, before increasing again to about 39 000 t from 2008–09 to 2011–12, but decreasing to 36 500 t in 2012–13 and 33 800 t in 2013–14. The Chatham Rise was the largest hoki fishery from 2006–07 to 2009–10, but contributed only about 23% of the total catch in 2013–14. Catches from the Sub-Antarctic peaked at over 30 000 t in 1999–00 to 2001–02, declined to a low of 6200 t in 2004–05 before increasing slowly to 19 900 t in 2013–14. Catches from Puysegur decreased from 960 t in 2012–13 to 780 t in 2013–14, ECSI decreased from 3300 t to 2800 t, and ECNI increased from 1000 t to 1300 t (Table 3).

From 1999–2000 to 2001–02, there was a redistribution in catch from eastern stock areas (Chatham Rise, ECSI, ECNI, and Cook Strait) to western stock areas (WCSI, Puysegur, and Sub-Antarctic) (Figure 2). This was initially due to industry initiatives to reduce the catch of small fish in the area of the Mernoo Bank, but from 1 October 2001 was part of an informal agreement with the Minister of Fisheries that 65% of the catch should be taken from the western fisheries to reduce pressure on the eastern stock. This agreement was removed following the 2003 hoki assessment in 2002–03, which indicated that the eastern hoki stock was less depleted than the western stock and effort was shifted back into eastern areas, particularly Cook Strait. From 2004–05 to 2006–07 there was a further agreement with the Minister that only 40% of the catch should be taken from western fisheries. From 1 October 2007 the target catch from the western fishing grounds was further reduced to 25 000 t within the overall TACC of 90 000 t. This target was exceeded in both 2007–08 and 2008–09, with about 30 000 t taken from western areas. In 2009–10, the target catch from the western fishing grounds was increased to 50 000 t within the overall TACC of 110 000 t, and catches were at about the industry-agreed catch split. The target catch from the western fishing grounds was further increased to 60 000 t in 2010–11 (within the overall TACC of 120 000 t), to 70 000 t in 2011–12 and 2012–13 (overall TACC of 130 000 t), and to 90 000 t in 2013–14 (overall TACC 150 000 t). The split between eastern and western catches has been within 2000 t of the management targets since 2011–12.

1.4 Recent hoki research

McKenzie (2015b) reported the stock assessment carried out in 2014, using the Bayesian model developed in 2002 (Francis et al. 2003) and implemented in the general-purpose stock-assessment program CASAL (Bull et al. 2012). The Deepwater Working Group agreed on a single base model run in 2014. In this base model the problem of the lack of old fish in both fishery-based and survey-based observations is dealt with by allowing natural mortality to be age dependent. Two alternative models were investigated where two catchabilities were fitted to the Southern Plateau series instead of just one: (i) a different catchability from other years was used for 2004–07 inclusive, and (ii) a different catchability from other years was used for 2008–13 inclusive. However, it was decided that for a time series of the length of the Southern Plateau series it was not unexpected statistically for there to be a series of years where the biomass was consecutively low/high, and two catchabilities were not needed. Other sensitivity runs were conducted: (iii) using a domed spawning selectivity instead of allowing for an age varying natural mortality, and (iv) not assuming natal fidelity (but assuming adult fidelity). Both the eastern and western hoki stocks were estimated to be increasing after reaching their lowest levels in about 2006. The western stock is estimated to be 48–66%B_0 and the eastern stock 59– 67%B_0. The western stock experienced an extended period of poor recruitment from 1995 to 2001 inclusive. However, recruitment has been near or above average since 2001, except for in 2010 and 2012 where it was likely to have been below average (although estimated with high uncertainty for both years) (McKenzie 2015b).

An independent review of the hoki assessment model was commissioned by the Ministry for Primary Industries and carried out from 17–21 February 2014. The Review Panel concluded that in broad terms, the results from the hoki assessment model were satisfactory and robust in regard to resource status and trends (Butterworth et al. 2014). The Panel made 26 recommendations for future work to explore, document, and improve the assessment. Recommendations identified as urgent were addressed for the 2014 assessment (McKenzie 2015b). A recommendation to use two catchabilities for the sub-Antarctic trawl survey was considered in the working group process, where it was decided not to follow the recommendation, and instead to have a single catchability for the base model. There is currently a project in progress looking at potential reasons for changes in catchability (“Catchability in the Sub-Antarctic trawl surveys”, Project DEE2014-01). McKenzie (2015d) provided an update on progress towards adopting other recommendations before the 2015 assessment.

O’Driscoll et al. (2015b) reviewed the trawl and acoustic components of the west coast South Island (WCSI) *Tangaroa* survey to inform future survey design. Specific aspects considered were: a) vessel and gear suitability; b) survey timing for each component; c) spatial and depth coverage of each component; d) vessel days and number of tows in trawl component; e) vessel days and number of snapshots and mark identification tows in acoustic component; f) additional biological sampling; g) quality of the estimates of biomass. The authors concluded that the current acoustic survey area and timing is appropriate for hoki and provides a useful index for stock assessment. The trawl survey component provides fisheries-independent estimates of abundance for hake, ling, and associated middle depth species. Trawl estimates from the northern area do not appear to be providing reliable indices of hoki abundance.

Ballara & O’Driscoll (2015) provided estimates of annual levels of bycatch and discards in the New Zealand hoki, hake, and ling target trawl fishery for 1990–91 to 2012–13, using commercial catch and effort data to scale up rates calculated from the observed portion of the fishery. Hoki, hake, and ling accounted for about 91% of the total catch. The main bycatch species were silver warehou, javelinfish, rattails, and spiny dogfish. Annual bycatch ranged from about 28 000 t to 87 500 t. The main species discarded were spiny dogfish, rattails, javelinfish, hoki, and shovelnose dogfish. There was an average of 0.11 kg of observed species discarded per kilogram of observed hoki, hake, and ling caught.

Dunford et al. (2015) estimated a new acoustic target strength (TS) to total length (TL) relationship for hoki of TS = $24.5\log_{10}(\mathrm{TL})-83.9$ based on a weighted non-linear least-squares fit to acoustic backscattering cross-section measurements from 62 New Zealand hoki between 35 and 93 cm TL on the WCSI in 2012. These measurements were collected *in situ* using a trawl-mounted acoustic-optical system (AOS). Using the new TS–TL relationship decreased absolute estimates of hoki abundance by 50–60% from those currently used in stock assessment, but had little impact on relative indices. Estimated 90% confidence intervals around the new TS–TL relationship based on bootstrapping suggested uncertainty in mean TS of ±1.5 dB at typical New Zealand hoki lengths, with resulting uncertainty in abundance estimates of up to 50%. Dunford et al. (2015) concluded that further *in situ* measurements and modelling are required to reduce this uncertainty and to investigate potential differences in TS between AOS-measured and 'undisturbed' fish.

The only new fisheries-independent estimates of hoki abundance since the 2014 hoki assessment was the trawl survey of the Sub-Antarctic in November–December 2014. Results from this survey are summarised in Section 3.1. Results from hoki surveys in 2013–14 published in the past year were: 2013 Cook Strait acoustics (O'Driscoll et al. 2015c), 2013 WCSI trawl and acoustics (O'Driscoll et al. 2015a), and 2014 Chatham Rise trawl (Stevens et al. 2015).

2. HOKI FISHERY, 2013–14

2.1 Catch and effort information

2.1.1 Total Allowable Commercial Catch (TACC) and other management controls

In the 2013–14 fishing year the TACC for HOK1 was 150 000 t. This TACC applied to all areas of the EEZ except the Kermadec FMA which had a TACC of 10 t. There was an agreement with the Minister for Primary Industries that no more than 90 000 t of the TACC should be taken from western stock areas. The TACC was increased to 160 000 t from 1 October 2014, with an agreement that 100 000 t should be taken from western areas.

Chartered vessels may not fish inside the 12-mile Territorial Sea and there are various vessel size restrictions around some parts of the coast. On the WCSI, a 25-mile line closes much of the hoki spawning area in the Hokitika Canyon and most of the area south to the Cook Canyon to vessels over 46 m overall length. In Cook Strait, the whole spawning area is closed to vessels over 46 m overall length.

2.1.2 Catch

The overall catch of 146 335 t was 20 000 t higher than the catch in 2012–13 and about 3700 t lower than the TACC (see Table 2). The total estimated catch from catch-effort-and-landing-return (CELR), lining-catch-effort-return (LCER), net-catch-effort-and-landing-return (NCELR), trawl-catch-effort-return (TCER), lining-trip-catch-effort-return (LTCER), tuna-long-lining-catch-effort-return (TLCER), and trawl-catch-effort-and-processing-return (TCEPR) data was 143 706 t. As the data extraction was done in mid-December 2014, a small amount of data may still not have been entered into the database. As estimated catches did not match the total monthly harvest return (MHR) catch, estimated catches were scaled up to the MHR total catch of 146 335 t.

Relative to 2012–13, catches in 2013–14 increased in the main western stock areas and decreased slightly in the main eastern stock areas (Figure 2a, Table 3). The WCSI was the largest fishery for the fourth consecutive year, with the catch increasing by 13 000 t to 69 400 t in 2013–14. Catches inside the 25 n. mile line made up 13% of the total WCSI catch in 2013–14, an increase compared to 2012–13, but down from a peak of 41% of the catch taken inside-the-line in 2003–04 (Table A1a). The Chatham Rise was the second largest hoki fishery, with 33 800 t taken from this area in 2013–14, a decrease of 2800 t from the 2012–13 level. The catch from Cook Strait of 18 400 t was down by about 1000 t from that in 2012–13, and back to a catch level similar to that in 2007–08. The catch from the Sub-Antarctic of 19 900 t in 2013–14 was about 5800 t higher than that in 2012–13 (see Table 3). Catches from ECNI increased by 280 t to 1300 t, whereas catches from Puysegur and ECSI decreased by 170 t to 780 t, and 560 t to 2 800 t respectively. Overall, about 90 100 t of the total catch in 2013–14 was taken from western stock areas with 56 200 t from the eastern stock areas (Figure 2a) — close to the industry agreed catch split.

Most hoki catch was recorded on the TCEPR form (138 000 t), with the WCSI and Cook Strait the only areas where a substantial amount of catch was recorded on the TCER form (Table A1, Figure 2b). Most hoki catch on the WCSI and in Cook Strait was taken by midwater trawling, whereas most catch on the Chatham Rise and Sub-Antarctic was taken by bottom trawling (Figure 2b). Up until 2003–04 almost all of the hoki catch was from target hoki tows. Hoki targeting then decreased, especially on the Sub-Antarctic, WCSI and Chatham Rise, until 2008–09 when only 86% of the overall hoki catch was from tows targeting hoki (Figure 3). With the increases in TACC from 2009–10, hoki targeting has again increased, and in 2013–14, 95% of the overall catch was taken from hoki target tows (97% of the hoki catch on the WCSI, 87% on the Sub-Antarctic, and 98% on the Chatham Rise). Cook Strait has remained almost exclusively a hoki target fishery.

A high proportion of the hoki catch in 2013–14 was taken during the spawning season from June to September (Figure 4). Peak catches on the WCSI spawning grounds were in July and August, as in previous years (Figure 5), with most of the catch taken by late-August. The WCSI fishing season is now longer – with fishing in May (although most pre-June catch is from inside the 25 n.mile line), and the 2014 season had higher catches through to mid-August compared to the previous four seasons (Figure 4b, Figure 5). In Cook Strait, peak catches were from mid-July to mid-September, with about 3800 t caught outside the spawning season (Figure 5). The seasonal pattern of fishing in Cook Strait was similar to that in previous years, but catches were lower in mid-July 2014 compared to those in the 2013 season (Figure 4b, Figure 5). Fishing during the spawning season on the ECSI occurred mainly in September. Fishing at Puysegur was mainly in May, June and September (Figure 5). Outside the spawning season, most of the catch was taken from October 2013 to June 2014 on the Chatham Rise and in the Sub-Antarctic, with small amounts of catch taken over the rest of the year in these areas (see Figures 4 and 5). Small catches were taken year-round from the ECNI (Figures 4 and 5).

2.1.3 CPUE analysis

Unstandardised catch and effort from TCEPR data for the six largest hoki fisheries (WCSI, Cook Strait, Chatham Rise, ECSI, Sub-Antarctic, and Puysegur) are summarised in Appendix 1. Standardised CPUE analyses on tow-by-tow target hoki catches reported on TCEPR for the WCSI, Cook Strait, Chatham Rise, and Sub-Antarctic were also carried out (Appendix 1 and Figure 6). Catch rate analysis did not include data from CELR forms (which account for up to a third of the catch in some years in Cook Strait and some catch from the WCSI, but do not provide tow-by-tow effort data), from TCER forms (which have been in use for only six years), or from the LCER, LTCER, TLCER or NCELR forms. Standardised CPUE analyses using observer tow-by-tow target hoki catches for the WCSI, Cook Strait, Chatham Rise, and Sub-Antarctic were also carried out.

Standardised analyses were carried out only to explore trends in catch rate. CPUE indices are not believed to provide reliable estimates of hoki abundance and are not currently included in the hoki stock assessment (McKenzie 2015c). Changes in fishing pratice (e.g., use of twin trawls), fishing practices (e.g., target fishing, use of escapement panels on smaller boats, incorrect recording of tow duration as some vessels leave the catch in the water until ready to process, changes in target bag size to reflect processing capacity of vessel, quality of fish product, and precision seafood harvesting (PSH)), and the reliability of gear parameters recorded on the fishing returns are problems for CPUE analyses. There are also other effects on catching ability that cannot be quantified, such as improvements or changes in net and bottom rig design, and electronic equipment. PSH trawls were identified in TCEPR data using extra data from MPI and removed from unstandardised and standardised analyses. There were no PSH tows in the observer data.

A lognormal linear model was used for all standardised analysis models following Dunn (2002). A forward stepwise Generalised Linear Model (Chambers & Hastie 1991) implemented in R code (R Development Core Team 2013) was used to select variables in the model. *Fishing year* was forced into the model as the first term, and the algorithm added variables based on changes in residual deviance. The explanatory power of a particular model is described by the reduction in residual deviance relative to the null deviance defined by a simple intercept model. Variables were added to the model until an improvement of less than 1% of residual deviance explained was seen following inclusion of an additional variable. Variables were either categorical or continuous, with model fits to continuous variables being made as third-order polynomials, though a fourth-order polynomial was also offered to the models for duration. Categorical variables offered to the model included *vessel key*, *primary method, month, vessel experience* (number of years vessel in the fishery*), twin vessel* (true/false variable for a vessel that has used a twin trawl), *statistical area*; continuous variables included *fishing duration*, *fishing distance* (calculated from positions at start and end of tow), *distance 2* (calculated as *fishing duration* × *speed*), *start latitude*, *start longitude*, *start time*, *mid time* (mid time of tow), *depth of bottom*, *effort depth (*depth of net*)*, *depth above bottom* (*depth of bottom* minus *effort depth*), *effort width (*wing spread*)*, *day of season*, and *effort height* (headline height). As the WCSI dataset included both midwater and bottom tows, nested effects between *method* and *effort duration*, *effort depth*, *effort height*, *effort speed, depth above bottom* and *effort width* were investigated. The dependent variable was the log-transformed estimated catch per tow, with positive catches retained and zero hoki catches excluded.

A vessel variable was incorporated into the CPUE standardisation to allow for differences in fishing power between vessels. A subset of "core" vessels was chosen for each analysis, with vessels not involved in the fishery for a certain number of years (varied by analysis) and with a minimum level of annual effort excluded because they provided little information for the standardisations, which could result in model over-fitting (Francis 2001b). TCEPR data were investigated for level of catch and effort for different years of vessel participation in the fishery, and "core" vessels were defined as those which reported approximately 80% of hoki catches in the defined fishery. For observer data (where there were fewer tows), core vessels were defined as those that were in the fishery for at least two years, and contributed more than 35 observed tows.

The standardised indices were calculated using GLM, with associated standard errors. Indices were presented using the canonical form (Francis 1999) so that the year effects for an area were standardised to have a geometric mean of 1. The CVs represent the ratio of the standard error to the index. The 95% confidence intervals are also calculated for each index.

The influence of each variable accepted into the lognormal models was described by influence plots (Bentley et al. 2012). They show the combined effect of (a) the expected log catch for each level of the variable (model coefficients) and (b) the distribution of the levels of the variable in each year, and therefore describe the influence that the variable has on the unstandardised CPUE and which is accounted for by the standardisation.

Fits to the model were investigated using standard residual diagnostics. For each model, a plot of residuals against fitted values and a plot of residuals against quantiles of the standard normal distribution were produced to check for departures from the regression assumptions of homoscedasticity and normality of errors in log-space (i.e., log-normal errors).

On the WCSI, CPUE models were run for tows targeting hoki, with sensitivity runs using other target species ("main target species"), and midwater and bottom trawls targeting hoki. Cook Strait CPUE models were for midwater tows that targeted hoki. For the Chatham Rise and ECSI, and Sub-Antarctic, CPUE models were run for bottom tows with target hoki tows, with a sensitivity run using main target species. An analysis of hoki target tows in Statistical Areas 602 and 603 was also run for the Sub-Antarctic. Selected explanatory variables for target hoki runs are listed in Table 4.

Unstandardised catch rates for the WCSI are presented for both midwater and bottom trawls (Table A2). Midwater trawl catches accounted for 71% of the total spawning season catch on the WCSI in 2013–14. The unstandardised catch rate from all non-zero midwater tows in 2013–14 decreased slightly from 2012–13, but was the fourth highest in the series, with a median catch of 5.9 t per hour, and a median tow duration of 2.8 hours. Catch rates were slightly higher for target hoki tows, but median tow duration was similar. Catch rates in bottom trawls on the WCSI were lower than those in midwater trawls, with a median catch rate of 1.8 t per hour for all non-zero hoki catches, and 3.8 t per hour for target hoki tows. Median tow duration of bottom trawls increased slightly to 5.2 hours for all target species, and 3.9 hours for target hoki only tows, in 2013–14. From 1999–2000 to 2003–04, standardised catch rates from non-zero tows showed a similar decline to non-standardised catch rates. However, standardised indices have increased at a much higher rate than unstandardised indices since 2003–04 (Table A3–A4, Figure 6a), with a slight decrease in standardised catch rates in 2013–14. All WCSI datasets for TCEPR and observer data showed similar overall trends (Figure 6b).

Midwater trawl catches accounted for 99.9% of the spawning season catch of 18 399 t reported on TCEPR forms from Cook Strait in 2013–14. A further 3184 t of catch was reported on TCER forms (see Figure 2b). Non-standardised catch rates continued to be high in Cook Strait, although there was a decrease in median catch rate from 17.0 to 12.3 t per hour in non-zero mid-water tows in 2013–14, and an increase in median tow duration to 1 hour (equivalent to a median catch of 11.2 t per tow). Overall the non-standardised catch rates showed a slight increase from 1989–90 to 2001–02 with a flat but undulating trend since then, whereas standardised catch rates showed a flat trend (Table A3–A4, Figure 6). Catch rates in Cook Strait appear to reflect a fishing strategy where vessels limit the size of catches to maintain fish quality.

Over 97% of the Chatham Rise catch in 2013–14 was taken in bottom trawls, with most of the catch reported on TCEPR forms (see Figure 2b). There has been a general increase in tow duration on the Chatham Rise since the 1990s, with a median tow duration of 4.8 hour in 2013–14. The median non-standardised catch rate in bottom trawls on the Chatham Rise in 2013–14 of 1.1 t per hour was similar to that in the previous five years. The catch rate in hoki target trawls increased from 0.6 t per hour in 2002–03 to 1.7 t per hour in 2008–09, and has decreased slightly to 1.4 t per hour in 2013–14. Standardised catch rates generally decreased from 1991–92 to 2003–04, increased to 2008–09 and have levelled off with small ups and downs since then (Table A3–A4, Figure 6a). Similar trends were observed for all Chatham Rise data sets (Figure 6b).

Bottom trawl catches reported on TCEPR forms accounted for over 99% of the catch taken from the Sub-Antarctic in 2013–14 (see Figure 2b). Median tow duration in 2013–14 increased slightly to 5.0 hours and non-standardised catch rates in bottom trawls also increased slightly to 0.7 t per hour. Catch rates for hoki target bottom trawls were much higher than those for all target trawls (1.6 t per hour in 2013–14) and were higher than those on the Chatham Rise in 2013–14. Standardised catch rates generally decreased from 1996–97 to 2003–04 and have increased to much higher levels since (Figure 6a). Vessels targeting main species showed generally similar trends (Table A3–A4, Figure 6b), but observed vessels had lower CPUE indices in 2011–12 and 2012–13. The Statistical Area 602 and 603 data subset for target hoki tows showed a similar trend to all target hoki tows although indices were slightly higher to 2001–02 and lower from 2004–05. Indices from 2003–04 to 2006–07 were the lowest in the series (Figure 6b), consistent with lower observed biomass recorded in the trawl survey during this period.

Spawning season catches from the ECSI were mainly reported on TCEPR forms (see Figure 2b).

Midwater tow target hoki catch rates in 2013–14 increased to 8.4 t per hour, and bottom tow catch rates were 2.5 t per hour. Spawning season catches from Puysegur were also mainly reported on TCEPRs (see Figure 2b), with midwater and bottom tow target hoki catch rates in 2013–14 at 3.6 t and 4.1 t per hour respectively.

Standardised CPUE indices for WCSI, Chatham Rise, and Sub-Antarctic all showed overall similar trends: decreasing from 1991–92 to 2003–04 and then increasing since, although Chatham Rise indices have been flatter than those in the other areas since 2008–09 (Figure 6b). Observed CPUE indices for WCSI, Chatham Rise, and Sub-Antarctic also showed overall similar trends, but were more spiky due to fewer data.

2.1.4 Bycatch

Estimates of bycatch in the hoki fishery were determined from data collected by Ministry for Primary Industries observers. For target hoki trawls, the observer data in 2013–14 represent about 47.6% of vessels, 12.6% of tows, and 18.2% of the total catch (Table 5). The bycatch rate (defined as the percentage of the hoki catch) was estimated for the main bycatch species by fishery in Table 6. Other bycatch species are also taken, particularly in the non-spawning fisheries, but bycatch rates for these species are usually less than 1%. Note that some of the apparent changes in bycatch rates may have been related to changes in observer coverage between years (e.g., Livingston et al. 2002), so the data should be treated with caution. As there have been changes in the proportion of hoki target catches (see Figure 3, Section 2.1.2), caution also needs to be exercised when interpreting the definition of the hoki target fishery. A more comprehensive analysis of catch and discards in the hoki, hake and ling fishery from 1990–91 to 2012–13 is provided by Ballara & O'Driscoll (2015). Bycatch rates were also plotted by area for midwater and bottom tows (Figure 7).

Overall bycatch rates in the spawning areas in 2013–14 were generally low (less than 2%) for most species. On the WCSI, 2013–14 bottom trawl fishery bycatch rates were high for hake (11.1%), ling (5.6%), and silver warehou (1.9%), whereas midwater trawl bycatch rates were much lower with hake at 1.8%, ling at 1.2%, and silver warehou at 0.2%. In 2013–14 bottom trawl bycatch rates increased for silver warehou, but decreased for hake, ling and spiny dogfish from 2012–13. In midwater trawls, frostfish increased and hake and ling decreased from 2012–13. Bycatch rates for spiny dogfish were similar for both fishing methods (1.1% for bottom trawls and 1.2% for midwater trawls). As in the past, there was very little bycatch in the midwater Cook Strait fishery, with spiny dogfish having the largest observed bycatch rate (1%).

In the non-spawning areas, bycatch rates in 2013–14 were generally higher than those for spawning areas. On the Chatham Rise bottom trawl fishery, bycatch rates for silver warehou (4.4%), ling (4.0%) and spiny dogfish (2.6%) increased from 2012–13, whereas javelinfish (5.0%) and rattails (5.2%) decreased. Of the main Sub-Antarctic bottom trawl bycatch species, bycatch rates decreased for silver warehou (1.1%), but increased for all other main bycatch species: hake (1.5%), ling (11.1%), white warehou (1.4%), spiny dogfish (4.5%), rattails (2.8%), and javelinfish (4.2%).

2.2 Size and age composition of commercial catches

Data to estimate length frequency distributions in 2013–14 were available from the at-sea Ministry for Primary Industries' Observer Programme (OP). Shed ('market') sampling of landed hoki in Cook Strait was also carried out in Cook Strait in 2013–14, resuming a programme that was discontinued in 2010–11. The industry observer programme formerly run by the Hoki Fishery Management Company (HMC) has been discontinued and no data have been provided since 2004–05.

Density plots of all commercial TCEPR and TCER trawls in which hoki was caught in 2013–14 are shown in Figure 8. Observed positions of all tows sampled for hoki length frequency by the OP are provided in the TCEPR plot. Hoki were measured by OP observers in 2077 tows (slightly less than in 2012–13 where data from 2335 tows were collected), of which 864 came from the WCSI, 76 from Cook Strait, 656 from the Chatham Rise, 448 from the Sub-Antarctic, 1 from the ECSI, 20 from Puysegur, and 12 from other areas. Tables 7 and 8 describe timing of observed trips in the main areas sampled. In Cook Strait, 33 market samples were collected by NIWA scientists.

Length frequency distributions were estimated for each of the major fisheries as the weighted (by the catch weight) average of individual length samples. Length frequency data from each area were post-stratified. Data from the WCSI were stratified by area (inside or outside 25 n. miles) and time. Length frequency data from outside the line from May to July were split into weekly time periods and applied to the outside the line catch (Table 8). Length frequency data from inside the line from May to the beginning of August were scaled up to the inside the line catch by time strata described in Table 8b. Length frequency data from outside the line from August to September were split into weekly time periods throughout the season, although adjacent weeks were combined if there were fewer than 10 OP length samples available, and applied to the inside and outside the line catch as there were no length frequency data from inside the line for this period (Table 8). Length frequency data from Cook Strait are normally stratified by month, island of landing, and vessel size. However, because of patchy OP coverage in 2014, Cook Strait stratification was by two-month periods for vessels less than 40 m (June–July, and August–September), and by month for vessels greater than 40 m (Table 8). A regression tree method (described below) was used to stratify the two non-spawning fishing areas.

Catch-at-age from spawning fisheries was estimated using age-length keys derived from otolith ageing. Otoliths were available from the OP and market samples. A subsample of 748 otoliths from Cook Strait (179 OP samples, and 569 market samples) and 754 otoliths from the WCSI were selected, prepared, and read using the validated technique of Horn & Sullivan (1996) as modified by Cordue et al. (2000). The sub-sample was derived by randomly selecting a set number of otoliths from each of a series of 1 cm length bins covering the bulk of the catch and then systematically selecting additional otoliths to ensure that the tails of the length distribution were represented. The chosen sample sizes approximated those necessary to produce mean weighted CVs of less than 20% across all age classes, in each of the spawning areas.

Age-length keys were constructed for each spawning fishery and applied to the total length frequency distribution to produce an age frequency distribution for the catch of each sex separately. Catch-at-age estimates were determined using the ‘catch.at.age’ software (Bull & Dunn 2002). This software also incorporates data from otolith ring measurements using the consistency scoring method of Francis (2001a) in the age-length key.

Catch-at-age in both the Chatham Rise and Sub-Antarctic fisheries was estimated by sampling directly for age. This continued the approach used since 1998–99 for the Chatham Rise (Francis 2002) and since 2000–01 for the Sub-Antarctic (Ballara et al. 2003). Sampling directly for age is necessary because a single age-length key is not appropriate in non-spawning fisheries. The fisheries are spread over much of the year and there will be substantial fish growth. This means that for any given length the proportions at age will change through the fishery. To sample directly for age, observer coverage must be sufficient to provide a random sample of otoliths from the fishery. Francis (2002) suggested that even a sample size of 1200 otoliths may not be sufficient to achieve a target CV of 0.20 in some years.

On the Chatham Rise in 2013–14, 1216 otoliths out of 5993 otoliths collected (including 2304 males, 3684 females, and 5 unsexed fish) from 585 tows were selected as follows:
1. Reject all otoliths from tows catching less than 1 t of hoki.
2. For tows catching between 1 t and 4 t of hoki, select at random 1 otolith from each tow.
3. For tows catching between 4 t and 6 t of hoki, select at random 2 otoliths from each tow.
4. For tows catching between 6 t and 8 t of hoki, select at random 3 otoliths from each tow.
5. For tows catching more than 8 t of hoki, select at random 4 otoliths from each tow.

On the Sub-Antarctic in 2013–14, 1196 otoliths out of 3581 otoliths collected (including 1558 males, 1994 females, and 13 unsexed fish) from 29 tows were selected as follows:
1. Reject all otoliths from tows catching less than 1 t of hoki.

2. For tows catching between 1 t and 3 t of hoki select at random 1 otolith from each tow.
3. For tows catching between 3 t and 6 t of hoki select at random 3 otoliths from each tow.
4. For tows catching between 6 t and 12 t of hoki select at random 4 otoliths from each tow.
5. For tows catching more than 12 t of hoki select at random 5 otoliths from each tow.

The method to estimate catch-at-age for the Chatham Rise and Sub-Antarctic followed that of Francis (2002) as modified by Smith (2005). First, the regression tree method (Breiman et al. 1984) was used to stratify the two fishing areas by minimising the weighted least squares of the mean lengths (as a proxy for age) of fish in the observed tows (see Smith (2005) for details). Next, the estimated age frequencies by sex for the observed tows within each stratum were obtained by scaling the otolith ages and sexes up by the estimated numbers of hoki of each sex caught in the tow and averaging over all tows in the stratum. Finally, the number of fish caught in each stratum was estimated from the TCEPR data, and catch-at-age frequencies were calculated as the weighted average, over the strata, of the estimated age frequencies by sex. Numbers of fish were estimated from catch weights using the length-weight relationship of Francis (2003).

Estimates of catch-at-age before 1999–2000 in the Sub-Antarctic and up to 1997–98 on the Chatham Rise were based on an optimised length frequency model (OLF) described in detail by Hicks et al. (2002).

2.2.1 Size and age composition in spawning fisheries

West coast South Island

Most of the 2014 catch from the WCSI fishery was dominated by larger fish of 60 to 100 cm (Figure 9) from the 2005–09 year-classes (ages 5–9), with the smaller mode comprising the 2011 year class (age 3) (Figure 10). The main length modes for female and male hoki were from 70–110 cm and 70–100 cm respectively (Figure 9), and were made up of hoki aged 5 (2009 year-class) and older. The 2010 year-class, at average length 70 cm, was poorly represented in the catch (Figures 9 and 10). The mode centred on 62 cm represented fish from the 2011 year-class. A few small from 45–55 cm and 30–35 cm hoki from the 2012 and 2013 year-classes were also caught (Figures 9 and 10).

From 2000 to 2004, the sex ratio of the WCSI catch was highly skewed (Figure 11a), with many more females caught than males. In 2005–11, as the catch of younger fish increased, the sex ratio reversed with more males than females caught, and in 2012, the catch contained about 50% males and females (Figure 11a). In 2013 and 2014 the percentage of males decreased to 45 and 47% respectively. The percentage of hoki aged 7 and older in the WCSI catch declined steeply from 68% in 2003–04 to 16% in 2005–06, but has increased again to 47–49% in 2013 and 2014 (Figure 11b). Conversely, the percentage of small fish (less than 65 cm, which is approximately equivalent to ages 3 years and younger) by number in the WCSI catch increased from 20% in 2006–07 to 31% in 2008–09, then decreased again to 8% in 2012–13, and 14% in 2013–14 (Figure 11b). Some of these small fish are spawning: 31% of the female fish less than 55 cm (i.e., mostly 2 year-olds) were in spawning condition (ripe and running ripe), compared to 51% of all fish (Table 9). The spawning state of male hoki is not recorded by observers, but observations from research tows in other areas suggest that a higher proportion of small males than females would be mature.

Comparisons in previous years show that there were differences in the length frequency distributions from shed samples of hoki caught inside the 25 n. mile line and at-sea samples of fish outside this area in most years, with a higher proportion of larger fish (greater than 70 cm) from samples taken inside the line (Ballara & O'Driscoll 2014). In 2014, the observer data from inside the line in May–July had very large fish (Figure 12).

The overall mean length of both female and male hoki decreased during the 2014 WCSI spawning season (Figure 13). The pattern of declining mean length over the spawning season used to be a common feature of the WCSI fishery, but was not observed between 1999 and 2006. The large difference between the mean lengths of males and females seen in catches from the 2004 and 2005 seasons was reduced in 2006–10 (Figure 13). The mean length at age for hoki aged from 3–8 years on the WCSI has increased since the start of the fishery, but now is decreasing (Figure 14).

The OP data used to estimate catch-at-age was reasonably representative of the overall spatial, depth, and temporal distribution of the catch in 2013–14, although small vessels and vessels from 65–70 m were not well sampled (Figure 15).

Cook Strait

The length distribution of female hoki from Cook Strait in 2014 had three modes from 55 to 110 cm, while males had two modes and were mainly 55–95 cm (see Figure 16). There was a broad age distribution of females from ages 3 to 14, while most males were ages 3–10 (see Figure 17). The modal age was 5 (2009 year-class), with age 3 (2011 year class) the next most abundant age-class by number (see Figure 17). Few fish from the 2010 year-class (age 4) were caught in Cook Strait in 2014, and only 16% of the catch was fish less than 65 cm (see Figure 11b).

In 2014, the OP data used to estimate catch-at-age was reasonably representative of the overall spatial and depth distribution of the catch, but temporal coverage was poor for vessels, especially for vessels less than 46 m (Figures 18 and 19, see Table 8). Market samples were also collected for vessels less than 40 m in June–August, and for vessels greater than 40 m in June–September and were well spread throughout the spawning season (Table 8, Figure 19).

Length frequency distributions by month and vessel size showed that the size distribution of the catch was broadly similar in each month and vessel size category, and that there were more males measured than females (Figure 20). The sex ratio of the Cook Strait catch has fluctuated over time, but was female dominated from 2001–05, and has been generally male-dominated since then (see Figure 11a).The apparent change in sex ratio may be related to a sampling bias, as there is some evidence that larger vessels catch a higher proportion of female hoki in Cook Strait (e.g., O'Driscoll 2012). There was a slight decreasing trend in the mean length of hoki in June and July (Figure 21). As on the WCSI, the mean length at age has increased over time in the Cook Strait fishery (Figure 22), although there is now a slight decreasing trend especially at ages 2, and 4–9 in the males and 6–8 in the females.

The Cook Strait catch-at-age data for 2010–11 to 2012–13 were not used in the 2015 hoki stock assessment model as they were not considered representative of the commercial catch due to poor observer coverage and the rapidly changing sex ratio. With improved coverage due to reinstatement of the shore-based shed sampling programme for hoki from Cook Strait in 2014, the catch-at-age data for 2014 was included in the assessment model.

Puysegur

In 2013–14, 20 OP samples were collected from Puysegur during the spawning season, and these were mainly fish of 45–90 cm (Figure 23). These fish have not been aged but are probably the 2011 year class as age 3+ (largest mode) dominating the length frequency distribution, with some smaller fish from 45–55 cm from the 2012 year class, and few larger fish over 70 cm.

East coast South Island

In the 2014 spawning season only one sample was collected from the ECSI spawning area, so no length frequency distribution was calculated. Fish from this area (Figure 24) in other years have showed a similar overall length distribution to the Chatham Rise distribution although it often has more larger fish and without the smaller length modes less than 60 cm seen on the Chatham Rise.

2.2.2 Size and age composition in non-spawning fisheries

Chatham Rise

About 97 % of the commercial catch, 88% of length frequency data, and 95% of the available otoliths came from the hoki target fishery in 2013–14 (Figure 25). The remainder of otoliths were from tows targeting hake, white warehou, and silver warehou. The tree-based regression split the OP data from the Chatham Rise fishery into five strata based on depth of net, longitude, and date (Table 10). The mean length of hoki on the Chatham Rise was smaller in shallower water, earlier in the season, and to the west. The length distribution of hoki from the Chatham Rise in 2013–14 was bimodal and similar for males and females (Figure 26). The catch was dominated by hoki of 50–90 cm, with the left hand mode from the 2011 year-class (age 2+), the right hand mode from the 2007–09 year-classes (ages 4–6), and few larger, older fish. Few fish from the 2010 year class (age 3+) were caught (Figure 27).

The modal age was 2+ (2011 year-class). More females than males were caught in 2013–14, with males comprising 40% of the catch (see Figure 11a). There was a lower proportion of large old fish (males and females) in the Chatham Rise than in other areas, with only 23% of the catch aged 7 years or older (see Figure 10b), and only 22% of these being male (see Figure 11a). About 45% of the catch by number in 2013–14 was less than 65 cm, an increase from 2012–13 (30%), due to the high numbers of 2+ hoki caught (see Figure 11b).

The OP data used to estimate catch-at-age was reasonably representative of the overall spatial and temporal distribution of the catch in 2013–14 (Figure 28), although coverage was lower than ideal in March–April, and June (Figure 28).

Sub-Antarctic

About 87% of the commercial catch, 40% of length frequency data, and 53% of the available otoliths came from the hoki target fishery in 2013–14 (Figure 29). The remainder of the otoliths were from tows targeting hake, ling, oreos, southern blue whiting, squid, silver warehou, or white warehou. The tree-based regression split the OP data from the Sub-Antarctic fishery into four strata based on depth of net and latitude (Table 10). The Sub-Antarctic stratum 1 was further stratified by depth of net at 400 m, as it was felt by the Hoki Working Group that squid target trawls that are in shallower depths and tend to catch smaller hoki could overwhelm catches in the overall length frequency distribution for this stratum — although this did not greatly change the overall length frequency distribution. Smaller fish tended to occur on the Snares Shelf, especially in shallower water, and early on in the season.

The length distribution of hoki from the Sub-Antarctic in 2013–14 was bimodal and similar for males and females, although there were more large females (Figure 30). The catch was dominated by hoki of 45–90 cm for the males, and 45–100 for the females with the left hand mode from the 2011 year-class (age 2+), and the right hand mode primarily from the 2007–09 year-classes (ages 4–6) but with some older fish. As on the Chatham Rise, few fish from the 2010 year class (age 3+) were caught (Figure 31). The modal age of females and males was 2+ (2011 year-class). There was a higher proportion of old fish caught in the Sub-Antarctic than on the Chatham Rise (Figure 31), but the catch of fish less than 65 cm increased markedly from 8% in 2012–13 to 42% in 2013–14 (see Figure 11b). About 46% of the fish caught in the Sub-Antarctic in 2013–14 were males (see Figure 11a).

The OP sampling in the Sub-Antarctic was reasonably representative of the overall spatial and temporal distribution of the catch (Figure 32), with good sampling in most months except March (see Table 7). Coverage was good on the Snares Shelf, but lower in statistical area 603.

Problems with estimation of catch-at-age in non-spawning fisheries

In addition to the problems associated with whether OP coverage is representative of the catch, there is an on-going problem with selection of otoliths. Observers collect otoliths from 10 fish out of the 50–150 sampled for length measurement (and otoliths from three fish in the spawning fisheries). As in previous years (e.g., Ballara et al. 2008), a rank sums test showed that the observers tended to select larger fish for extraction of otoliths from the Sub-Antarctic and Chatham Rise in 2013–14 (Figure 33). This introduces a bias into the age estimates which is difficult to correct. Electronic aids now being used to help observerstake random samples for otoliths should have solved this problem.

2.2.3 Comparison of size and age composition between main areas

Length distributions from the main fisheries in 2013–14 are compared in Figure 34. The catch in all areas was mainly fish from 45 to 90 cm. The 2011 year class (50–65 cm) dominated the length frequency distribution on the Chatham Rise and Sub-Antarctic as 2+ fish. In the spawning areas, larger hoki from ages 5–7 were most abundant, with a smaller mode of fish from the 2011 year class at age 3. In all areas there were few hoki from the 2010 year class. Most fish on the Chatham Rise were less than 80 cm. Large female fish (over 90 cm) were proportionately more abundant in Cook Strait, ECNI, Sub-Antarctic, and WCSI.

3. HOKI RESEARCH

3.1 Resource surveys

3.1.1 Trawl surveys

Chatham Rise

No Chatham Rise trawl survey was carried out in January 2015. This was the first year in the time-series (going back to 1992) when there has not been a survey of this area.

Sub-Antarctic

The sixteenth survey in the *Tangaroa* summer trawl time series was carried out from 26 November to 23 December 2014. There were 87 successful tows, of which 76 were in the core 300–800 depth strata. Previous surveys in the summer series were in November–December 1991–1993, and 2000–2009, and 2011–2012. An autumn series has also been carried out in the same area in March–June 1992, 1993, 1996, and 1998.

The total biomass of hoki in the core strata in 2014 decreased by 43% from the 2012 survey to 31.3 Kt (Table 11). The estimates for age 1+ (2013 year-class) and age 2+ (2012 year-class) were low. The age 3+ (2011 year class) was evident in the length frequency distribution, but not particularly strong. Compared to the 2012 survey, there was a decrease in biomass from most strata in 2014 except for 3B and 5A south of the Snares Shelf, and stratum 14 east of Campbell Island. The estimated biomass in 2014 was the lowest estimate since 2006. There was no evidence of unusual catchability in 2014 based on other key species.

Measured hoki in 2014 ranged from 37–111 cm (Figure 35). The main adult mode consisted of fish from the 2009–04 year-classes at ages 5–10, with some larger older fish (Figures 35 and 36). There were very few fish in the 69–74 cm range, reflecting lack of 4+ hoki (2010 year class). The mode at 38–48 cm corresponds to 1+ hoki (2013 year-class) and these small fish were mainly caught at Puysegur and on the Stewart-Snares shelf (Figures 35 and 36). Hoki from 49–59 and 60–69 cm represented 2+ and 3+ hoki (the 2012 and 2011 year-classes) respectively (Figures 35 and 36). The 2014 Sub-Antarctic trawl survey included additional deepwater strata from 800–1000 m. Some large hoki (typically longer than 80 cm) were caught deeper than the core survey boundary at 800 m, but the deepwater strata only contributed a small percentage (1.3%) of the total hoki biomass.

The summer Sub-Antarctic trawl survey series shows large annual changes in numbers-at-age (particularly between 2006 and 2007) which cannot be explained by changes in abundance, and are suggestive of a change in catchability for the survey. There is currently a project in progress looking at potential reasons for changes in catchability (Project DEE2014-01).

3.1.2 Acoustic surveys

No acoustic surveys for hoki were carried out in 2014.

4. CONCLUSIONS

The total reported hoki catch in 2013–14 was 146 335 t, 3700 t below the TACC of 150 000 t, and 20 000 t higher than the catch in 2012–13. Catches in 2013–14 increased in the main western areas and decreased in the main eastern areas. The WCSI was the largest hoki fishery for the fourth consecutive season, followed by the non-spawning fishery on the Chatham Rise

Length and age frequency distributions from the commercial fishery show that most of the catch in 2013–14 was fish from 45 to 90 cm. Hoki from the 2011 year class (50–65 cm) dominated the length frequency distribution on the Chatham Rise and Sub-Antarctic as age 2+ fish. In the spawning areas, larger hoki from ages 5–7 were most abundant, with a smaller mode of fish from the 2011 year class at age 3. In all areas there were few fish from the 2010 year class. The percentage of small fish in the catch increased in 2013–14, mainly due to the presence of the 2011 year class. Most fish caught on the Chatham Rise in 2013–14 were less than 80 cm, and the largest hoki came from the WCSI, east coast North Island, Sub-Antarctic, and Cook Strait fisheries.

The relative biomass index for hoki from the core strata in the 2014 Sub-Antarctic trawl survey decreased by 43% from 2012. The estimate for age 1+ and 2+ (2013 and 2012 year-classes) was low, and the age 3+ (2011 year class) was evident in the length frequency distribution but not particularly strong.

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TABLES

Table 1: Reported trawl catches (t) from 1969 to 1987–88; 1969–83 by calendar year, 1983–84 to 1987–88 by fishing year (1 October to 30 September). Source, FSU data.

				New Zealand		
Year	U.S.S.R.	Japan	South Korea	Domestic	Chartered	Total
1969		95				95
1970		414				414
1971		411				411
1972	7 300	1 636				8 936
1973	3 900	4 758				8 658
1974	13 700	2 160		125		15 985
1975	36 300	4 748		62		41 110
1976	41 800	24 830		142		66 772
1977	33 500	54 168	9 865	217		97 750
1978*	2 028 +	1 296	4 580	678		8 581
1979	4 007	8 550	1 178	2 395	7 970	24 100
1980	2 516	6 554		2 658	16 042	27 770
1981	2 718	9 141	2	5 284	15 657	32 802
1982	2 251	7 591		6 982	15 192	32 018
1983	3 853	7 748	137	7 706	20 697	40 141
1983–84	4 520	7 897	93	9 229	28 668	50 407
1984–85	1 547	6 807	35	7 213	28 068	43 670
1985–86	4 056	6 413	499	8 280	80 375	99 623
1986–87	1 845	4 107	6	8 091	153 222	167 271
1987–88	2 412	4 159	10	7 078	216 680	230 339

* Catches for foreign licensed and New Zealand chartered vessels from 1978 to 1984 are based on estimated catches from vessel logbooks. Few data are available for the first 3 months of 1978 because these vessels did not begin completing these logbooks until 1 April 1978.

\+ Soviet hoki catches are taken from the estimated catch records and differ from official Ministry for Primary Industries statistics. Estimated catches are used because of the large amount of hoki converted to meal and not recorded as processed fish.

Table 2: Reported catch (t) from QMS[1], estimated catch (t) data, and TACC (t) for HOK 1 from 1986–87 to 2013–14. Estimated catches include TCEPR and CELR data (from 1989–90), LCER data (from 2003–04), NCELR data (from 2006–07), and TCER and LTCER data (from 2007–08).

	Estimated	Reported catch (MHR)		
Year	catch	Exclude HOKET	Include HOKET	TACC
1986–87	175 000		158 171	250 000
1987–88	255 000		216 206	250 000
1988–89	210 000		208 500	250 000
1989–90	210 000		208 851	251 884
1990–91	215 000		212 720	201 897
1991–92	215 000		212 167	201 897
1992–93	195 000		191 994	202 155
1993–94	190 000		192 385	202 155
1994–95	168 000		176 787	220 350
1995–96	194 000		209 639	240 000
1996–97	230 000		246 756	250 000
1997–98	261 000		269 239	250 000
1998–99	234 000		244 528	250 000
1999–00	237 000		242 423	250 000
2000–01	230 625	229 858	229 862	250 000
2001–02	200 054	195 492	195 506	200 000
2002–03	182 560	184 659	184 668	200 000
2003–04	133 764	135 784	135 787	180 000
2004–05	102 885	104 364	106 189	100 000
2005-06	101 984	104 385	105 965	100 000
2006–07	97 790	101 009	102 861	100 000
2007–08	87 815	89 318	91 045	90 000
2008–09	87 598	88 805	89 475	90 000
2009–10	105 105	107 209	107 209	110 000
2010–11	115 782	118 805	118 805	120 000
2011–12	126 184	130 108	130 108	130 000
2012–13	127 962	131 575	132 618	130 000
2013–14	143 706	146 335	146 335	150 000

1. Discrepancies between QMS data and estimated catches from 1986 to 1990 arose from incorrect surimi conversion factors. The estimated catch in those years was corrected from conversion factors measured each year by Ministry observers on the WCSI fishery. Since 1990 the current conversion factor of 5.8 has been used, and the total catch reported to the QMS is considered to be more representative of the true level of catch. From 2000–01 MHR catches have been shown including and excluding HOK ET catches (catches outside the EEZ).

Table 3: Estimated total catch (t) of hoki by area[1], 1988–89 to 2013–14. Estimated (TCEPR and CELR) catches were scaled to reported (QMR or MHR) catch totals. Data also includes LCER (from 2003–04), and NCELR estimated data (from 2006–07), and TCER and LTCER data (from 2007–08).

	Spawning fisheries				Non-spawning fisheries					
Fishing Year	WCSI	Puysegur	Cook Strait	ECSI	Sub-Antarctic	Chatham Rise	ECNI	WCNI	Other[2]	Total catch
1988–89	188 000	3 500	7 000	-	5 000	5 000	-	-	-	208 500
1989–90	165 000	8 000	14 000	-	10 000	13 000	-	-	-	210 000
1990–91	154 000	4 000	26 500	1 000	18 000	11 500	-	-	-	215 000
1991–92	105 000	5 000	25 000	500	34 000	45 500	-	-	-	215 000
1992–93	98 000	2 000	21 000	-	26 000	43 000	2 000	-	3 000	195 000
1993–94	113 000	2 000	37 000	-	12 000	24 000	2 000	-	1 000	191 000
1994–95	80 000	1 000	40 000	-	13 000	39 000	1 000	-	-	174 000
1995–96	73 000	3 000	67 000	1 000	12 000	49 000	3 000	-	2 000	210 000
1996–97	91 000	5 000	61 000	1 500	25 000	56 500	5 000	-	1 000	246 000
1997–98	107 000	2 000	53 000	1 000	24 000	75 000	4 000	-	3 000	269 000
1998–99	94 562	2 883	45 252	1 977	23 753	73 594	2 315	94	97	244 527
1999–00	102 721	2 880	43 192	2 351	33 772	56 014	1 387	98	4	242 419
2000–01	102 235	6 798	36 298	2 411	30 076	49 847	2 035	147	-	229 847
2001–02	92 719	5 322	23 976	2 971	30 175	39 151	1 147	39	-	195 500
2002–03	73 856	5 948	36 713	7 382	20 199	39 092	929	532	8	184 659
2003–04	45 112	1 158	41 034	2 140	11 635	33 650	880	126	-	135 735
2004–05	32 647	5 501	24 485	4 259	6 337	30 434	516	36	-	104 215
2005–06	38 281	1 457	21 405	653	6 961	34 944	673	8	-	104 382
2006–07	33 328	408	20 113	1 006	7 661	37 813	667	8	-	101 004
2007–08	20 928	308	18 470	2 323	8 708	37 920	640	19	-	89 316
2008–09	20 548	233	17 535	1 054	9 807	39 011	588	25	-	88 801
2009–10	36 349	272	17 880	669	12 275	39 138	618	7	-	107 208
2010–11	48 373	1 176	14 937	1 625	12 655	38 447	1 588	2	-	118 803
2011–12	54 532	1 308	15 859	2 531	15 743	39 246	858	31	-	130 108
2012–13	56 221	955	19 390	3 312	14 099	36 538	1 051	9	-	131 575
2013–14	69 396	779	18 399	2 750	19 925	33 750	1 326	9	-	146 334

[1] Estimated catches by area from TCEPR, CELR, LCER, NCELR, and TCER adjusted pro rata to the total reported (QMR or MHR) catches (excluding HOK ET catches) in Table 2.
[2] Area undefined because of missing positions or statistical areas.
- No catches

Table 4: Variables retained in order of decreasing explanatory value by each lognormal CPUE model for each area and the corresponding total R^2 value.

WCSI: TCEPR tow-by-tow, target hoki

Variable	R-squared
Year	6.44
Day of year	16.80
Vessel	24.53
Mid time of tow	27.81

WCSI: Observer catch, target hoki

Variable	R-squared
Year	6.59
Vessel	16.04
Day of year	24.29
Start time of tow	27.33

Cook Strait: TCEPR tow-by-tow, target hoki

Variable	R-squared
Year	1.84
Day of year	16.28
Vessel	21.95

Cook Strait: Observer catch, target hoki

Variable	R-squared
Year	4.10
Vessel	11.24
Day of year	16.63

Chatham Rise: TCEPR tow-by-tow, target hoki

Variable	R-squared
Year	10.40
Vessel	15.10
Start time of tow	18.32
Duration	21.24
Month	22.49

Chatham Rise: Observer catch, target hoki

Variable	R-squared
Year	12.48
Vessel	16.10
Start time of tow	18.86
Duration	21.38
Month	22.65

Sub-Antarctic: TCEPR tow-by-tow, target hoki

Variable	R-squared
Year	6.61
Start time of tow	12.18
Vessel	16.62
Day of year	20.42
Duration	22.95
Statistical area	24.71
Depth of net	25.76

Sub-Antarctic: Observer catch, target hoki

Variable	R-squared
Year	8.68
Start time of tow	14.24
Vessel	18.73
Duration	21.37
Depth of net	23.57
Month	24.99
Statistical area	27.06

Table 5: Observer coverage 2013–14 by area, BT (bottom trawl), BPT (bottom pair trawl), MW (midwater tow), MPT (midwater pair trawl) trawl methods only. WCSI, Cook Strait and ECSI are for June to September only.

(a) All target species tows

	Number of vessels			Number of tows			Catch (t)		
Area	**All**	**Observed**	**Percent**	**All**	**Observed**	**Percent**	**All**	**Observed**	**Percent**
Chatham Rise	56	19	33.9	5 835	656	11.2	33 743	5 380	15.9
Cook Strait	30	3	10.0	1 243	76	6.1	14 595	1 178	8.1
ECNI	50	7	14.0	2 474	13	0.5	1 314	7	0.5
ECSI	16	1	6.2	181	1	0.6	2 744	3	0.1
Macquarry	2	1	50.0	2	1	50.0	1	-	-
Puysegur	14	8	57.1	180	49	27.2	779	248	31.9
Sub-Antarctic	31	20	64.5	3 387	458	13.5	19 925	2 766	13.9
WCNI	17	1	5.9	93	1	1.1	9	-	-
WCSI	40	17	42.5	4 639	851	18.3	67 817	17 792	26.2
All areas combined	108	34	31.5	19 661	2 126	10.8	146 310	27 618	18.9

(b) Target hoki tows

	Number of vessels			Number of tows			Catch (t)		
Area	**All**	**Observed**	**Percent**	**All**	**Observed**	**Percent**	**All**	**Observed**	**Percent**
Chatham Rise	23	11	47.8	4 122	579	14.0	32 912	5 103	15.5
Cook Strait	19	3	15.8	1 169	76	6.5	14 588	1 178	8.1
ECNI	20	4	20.0	466	6	1.3	822	5	0.6
ECSI	13	1	7.7	164	1	0.6	2 682	3	0.1
Macquarry	-	-	-	-	-	-	-	-	-
Puysegur	4	1	25.0	47	7	14.9	355	69	19.3
Sub-Antarctic	14	13	92.9	1 874	182	9.7	17 315	1 685	9.7
WCNI	1	1	100.0	5	1	20.0	1	-	-
WCSI	34	17	50.0	3 904	742	19.0	65 513	17 114	26.1
All areas combined	63	30	47.6	12 836	1 614	12.6	139 476	25 393	18.2

Table 6: Bycatch rates (in parentheses) on vessels with Observer Programme observers in the hoki fishery for tows targeting hoki from 1990–91 to 2013–14. The WCSI (bottom and midwater trawls), Cook Strait, and ECSI data cover the spawning season (June–September) only. -, less than 0.1 t (except for Cook Strait 1994–95 and 1996–97, Puysegur 1997–98 to 2008–09, and ECSI 2006–07 for which there are no observer data). Bycatch rates not calculated where observed hoki catch is less than 100 t. Species chosen are the top eight by observed catch in an area. Species include: BAR, barracouta; CSQ, leafscale gulper shark; FRO, frostfish; GSP, pale ghost shark; HAK, hake; HOK, hoki; JAV, javelinfish; JMA, jack mackerels; LIN, ling; RAT, rattails; RCO, red cod; SPD, spiny dogfish; SPO, rig; SQU, arrow squid; SWA, silver warehou; and WWA, white warehou.

(a) WCSI (bottom trawl)

									Catch in t (% of hoki catch)
Year	HOK	HAK	JAV	LIN	RAT	SPD	SQU	SWA	Other
1990–91	1 046	25 (2.4)	1 (0.1)	56 (5.3)	2 (0.2)	8 (0.8)	11 (1.1)	67 (6.4)	67 (3.7)
1991–92	516	7 (1.4)	1 (0.2)	44 (8.5)	2 (0.4)	5 (1)	13 (2.5)	9 (1.7)	9 (8.5)
1992–93	3 375	82 (2.4)	1 (0)	79 (2.3)	6 (0.2)	30 (0.9)	4 (0.1)	78 (2.3)	78 (1.8)
1993–94	1 503	52 (3.5)	4 (0.3)	56 (3.7)	4 (0.3)	28 (1.9)	17 (1.1)	23 (1.5)	23 (3.9)
1994–95	179	24 (13.4)	1 (0.6)	30 (16.8)	3 (1.7)	7 (3.9)	8 (4.5)	9 (5)	9 (14)
1995–96	360	48 (13.3)	- (-)	31 (8.6)	2 (0.6)	43 (11.9)	1 (0.3)	26 (7.2)	26 (7.8)
1996–97	1	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)
1997–98	673	69 (10.2)	3 (0.4)	45 (6.7)	5 (0.7)	15 (2.2)	1 (0.2)	19 (2.8)	19 (4.5)
1998–99	2 660	244 (9.2)	19 (0.7)	159 (6)	24 (0.9)	67 (2.5)	3 (0.1)	85 (3.2)	85 (4.1)
1999–00	3 033	438 (14.4)	17 (0.6)	122 (4)	26 (0.9)	35 (1.1)	4 (0.1)	84 (2.8)	84 (5.8)
2000–01	1 462	54 (3.7)	4 (0.3)	66 (4.5)	6 (0.4)	13 (0.9)	6 (0.4)	57 (3.9)	57 (2.5)
2001–02	7 493	592 (7.9)	33 (0.4)	306 (4.1)	51 (0.7)	80 (1.1)	39 (0.5)	60 (0.8)	60 (3.7)
2002–03	2 609	213 (8.2)	17 (0.6)	139 (5.3)	19 (0.7)	28 (1.1)	21 (0.8)	49 (1.9)	49 (5.4)
2003–04	2 034	335 (16.5)	32 (1.6)	270 (13.3)	20 (1)	28 (1.4)	37 (1.8)	182 (8.9)	182 (14.3)
2004–05	1 507	74 (4.9)	5 (0.3)	126 (8.4)	5 (0.3)	23 (1.5)	13 (0.9)	74 (4.9)	74 (7.7)
2005–06	2 242	102 (4.5)	26 (1.2)	141 (6.3)	17 (0.8)	50 (2.2)	18 (0.8)	70 (3.1)	70 (6.4)
2006–07	1 375	71 (5.2)	12 (0.9)	38 (2.8)	11 (0.8)	7 (0.5)	11 (0.8)	42 (3)	42 (4.5)
2007–08	1 297	23 (1.8)	8 (0.6)	43 (3.3)	6 (0.5)	28 (2.2)	5 (0.4)	36 (2.8)	36 (2.5)
2008–09	61	31 (50.8)	2 (3.3)	4 (6.6)	- (-)	4 (6.6)	- (-)	1 (1.6)	1 (16.4)
2009–10	3 888	67 (1.7)	14 (0.4)	132 (3.4)	9 (0.2)	73 (1.9)	6 (0.2)	41 (1.1)	41 (1.6)
2010–11	2 961	194 (6.5)	18 (0.6)	154 (5.2)	21 (0.7)	49 (1.6)	6 (0.2)	75 (2.5)	75 (4.3)
2011–12	5 284	169 (3.2)	21 (0.4)	217 (4.1)	16 (0.3)	136 (2.6)	14 (0.3)	61 (1.1)	61 (1.6)
2012–13	6 874	865 (12.6)	98 (1.4)	449 (6.5)	82 (1.2)	158 (2.3)	43 (0.6)	102 (1.5)	102 (5.3)
2013–14	4 996	554 (11.1)	67 (1.3)	278 (5.6)	50 (1.0)	55 (1.1)	34 (0.7)	96 (1.9)	96 (6.5)

(b) WCSI (midwater trawls)

									Catch in t (% of hoki catch)
Year	HOK	BAR	FRO	HAK	JMA	LIN	SPD	SWA	Other
1990–91	27 606	36 (0.1)	285 (1)	1 548 (5.6)	197 (0.7)	187 (0.7)	35 (0.1)	397 (1.4)	397 (0.6)
1991–92	18 157	57 (0.3)	174 (1)	145 (0.8)	83 (0.5)	97 (0.5)	94 (0.5)	147 (0.8)	147 (0.8)
1992–93	15 720	67 (0.4)	82 (0.5)	289 (1.8)	16 (0.1)	104 (0.7)	27 (0.2)	61 (0.4)	61 (0.4)
1993–94	31 065	29 (0.1)	253 (0.8)	166 (0.5)	128 (0.4)	111 (0.4)	187 (0.6)	591 (1.9)	591 (0.8)
1994–95	25 541	30 (0.1)	188 (0.7)	817 (3.2)	261 (1)	191 (0.8)	186 (0.7)	152 (0.6)	152 (0.7)
1995–96	17 346	85 (0.5)	111 (0.6)	1 361 (7.8)	157 (0.9)	247 (1.4)	272 (1.6)	446 (2.6)	446 (1.8)
1996–97	14 270	10 (0.1)	192 (1.4)	647 (4.5)	89 (0.6)	131 (0.9)	59 (0.4)	422 (3)	422 (0.6)
1997–98	17 981	15 (0.1)	84 (0.5)	1 008 (5.6)	20 (0.1)	281 (1.6)	230 (1.3)	427 (2.4)	427 (1.4)
1998–99	14 768	12 (0.1)	203 (1.4)	781 (5.3)	21 (0.1)	130 (0.9)	151 (1)	136 (0.9)	136 (0.9)
1999–00	15 729	2 (0)	155 (1)	643 (4.1)	6 (0)	169 (1.1)	76 (0.5)	299 (1.9)	299 (1)
2000–01	14 971	90 (0.6)	270 (1.8)	460 (3.1)	3 (0)	196 (1.3)	69 (0.5)	238 (1.6)	238 (1.1)
2001–02	9 175	38 (0.4)	215 (2.3)	868 (9.5)	1 (0)	206 (2.2)	39 (0.4)	65 (0.7)	65 (2.8)
2002–03	7 582	73 (1)	166 (2.2)	315 (4.2)	2 (0)	52 (0.7)	13 (0.2)	47 (0.6)	47 (1.1)
2003–04	6 396	63 (1)	213 (3.3)	482 (7.5)	63 (1)	237 (3.7)	22 (0.3)	87 (1.4)	87 (2.9)
2004–05	5 671	221 (3.9)	262 (4.6)	271 (4.8)	8 (0.1)	155 (2.7)	15 (0.3)	25 (0.4)	25 (3.2)
2005–06	7 283	35 (0.5)	152 (2.1)	302 (4.2)	3 (0)	91 (1.2)	12 (0.2)	26 (0.4)	26 (0.9)
2006–07	8 410	26 (0.3)	175 (2.1)	41 (0.5)	1 (0)	41 (0.5)	23 (0.3)	38 (0.4)	38 (0.8)
2007–08	6 478	6 (0.1)	158 (2.4)	24 (0.4)	1 (0)	29 (0.4)	20 (0.3)	17 (0.3)	17 (1.2)
2008–09	8 733	3 (0)	106 (1.2)	37 (0.4)	24 (0.3)	64 (0.7)	21 (0.2)	58 (0.7)	58 (1.8)
2009–10	7 731	- (-)	17 (0.2)	18 (0.2)	- (-)	30 (0.4)	6 (0.1)	24 (0.3)	24 (0.6)
2010–11	6 595	25 (0.4)	15 (0.2)	37 (0.6)	- (-)	35 (0.5)	13 (0.2)	23 (0.4)	23 (0.7)
2011–12	13 150	2 (0)	43 (0.3)	132 (1.0)	1 (0)	117 (0.9)	108 (0.8)	29 (0.2)	29 (0.6)
2012–13	24 970	3 (0)	162 (0.6)	647 (2.6)	18 (0.1)	372 (1.5)	91 (0.4)	44 (0.2)	44 (0.9)
2013–14	26 989	7 (0)	295 (1.1)	476 (1.8)	1 (-)	331 (1.2)	89 (0.3)	50 (0.2)	50 (1)

Table 6: continued.

(c) Cook Strait (midwater trawls)

	Catch in t (% of hoki catch)								
Year	HOK	CSQ	LIN	RAT	RCO	SPD	SPO	SWA	Other
1992–93	107	- (-)	- (-)	- (-)	- (-)	1 (0.9)	- (-)	- (-)	- (-)
1993–94	495	- (-)	6 (1.2)	- (-)	- (-)	1 (0.2)	- (-)	- (-)	- (0.2)
1995–96	734	- (-)	2 (0.3)	- (-)	- (-)	13 (1.8)	- (-)	- (-)	- (-)
1997–98	3 435	- (-)	7 (0.2)	- (-)	- (-)	55 (1.6)	7 (0.2)	- (-)	- (0.2)
1998–99	3 513	- (-)	16 (0.5)	- (-)	- (-)	76 (2.2)	- (-)	- (-)	- (0.2)
1999–00	3 017	- (-)	9 (0.3)	- (-)	- (-)	103 (3.4)	- (-)	- (-)	- (0.1)
2000–01	4 089	- (-)	15 (0.4)	- (-)	- (-)	84 (2)	- (-)	1 (0)	1 (0.2)
2001–02	1 991	- (-)	6 (0.3)	- (-)	- (-)	44 (2.2)	- (-)	- (-)	- (0.1)
2002–03	2 416	- (-)	5 (0.2)	- (-)	- (-)	104 (4.3)	- (-)	- (-)	- (0.1)
2003–04	2 482	- (-)	4 (0.2)	- (-)	- (-)	39 (1.6)	- (-)	- (-)	- (0.2)
2004–05	2 176	- (-)	4 (0.2)	- (-)	- (-)	38 (1.8)	- (-)	2 (0.1)	2 (0.4)
2005–06	1 080	- (-)	2 (0.2)	- (-)	- (-)	15 (1.4)	- (-)	- (-)	- (0.2)
2006–07	2 102	- (-)	10 (0.5)	- (-)	2 (0.1)	84 (4.0)	- (-)	2 (0.1)	2 (0.2)
2007–08	3 437	3 (0.1)	8 (0.2)	2 (0.1)	1 (0)	63 (1.8)	- (-)	1 (0)	1 (0.1)
2008–09	2 290	- (-)	3 (0.1)	1 (0)	- (-)	27 (1.2)	- (-)	- (-)	- (0.1)
2009–10	3 353	- (-)	4 (0.1)	3 (0.1)	- (-)	27 (0.8)	- (-)	- (-)	- (0.2)
2010–11	1 590	1 (0.1)	- (-)	- (-)	- (-)	13 (0.8)	- (-)	2 (0.1)	2 (0.1)
2011–12	1 551	1 (0.1)	4 (0.3)	3 (0.2)	1 (0.1)	27 (1.7)	- (-)	7 (0.4)	7 (0.4)
2012–13	956	- (-)	3 (0.3)	- (-)	- (-)	6 (0.6)	- (-)	- (-)	- (0.2)
2013–14	2 537	6 (0.2)	7 (0.3)	3 (0.1)	1 (0)	24 (1)	- (-)	6 (0.2)	6 (0.6)

(d) Puysegur (bottom and midwater trawls)

	Catch in t (% of hoki catch)								
Year	HOK	CSQ	HAK	LIN	RCO	SND	SPD	SWA	Other
1990–91	986	- (-)	3 (0.3)	25 (2.5)	2 (0.2)	2 (0.2)	1 (0.1)	1 (0.1)	1 (1.4)
1991–92	1 028	1 (0.1)	27 (2.6)	431 (41.9)	16 (1.6)	4 (0.4)	4 (0.4)	2 (0.2)	2 (5.3)
1992–93	530	3 (0.6)	3 (0.6)	80 (15.1)	2 (0.4)	1 (0.2)	- (-)	1 (0.2)	1 (3)
1993–94	959	- (-)	- (-)	8 (0.8)	5 (0.5)	- (-)	6 (0.6)	7 (0.7)	7 (1)
1994–95	226	- (-)	- (-)	8 (3.5)	- (-)	- (-)	- (-)	- (-)	- (0.4)
1995–96	719	- (-)	2 (0.3)	33 (4.6)	3 (0.4)	- (-)	2 (0.3)	3 (0.4)	3 (0.7)
1996–97	455	1 (0.2)	- (-)	6 (1.3)	- (-)	- (-)	3 (0.7)	3 (0.7)	3 (2)
1998–99	226	- (-)	4 (1.8)	25 (11.1)	6 (2.6)	1 (0.4)	9 (4)	6 (2.6)	6 (6.2)
1999–00	370	- (-)	- (-)	25 (6.8)	- (-)	2 (0.5)	7 (1.9)	17 (4.6)	17 (4)
2000–01	823	- (-)	6 (0.7)	30 (3.6)	4 (0.5)	5 (0.6)	16 (1.9)	221 (26.9)	221 (6.3)
2001–02	561	- (-)	- (-)	20 (3.6)	1 (0.2)	- (-)	1 (0.2)	34 (6.1)	34 (1.2)
2002–03	678	2 (0.3)	2 (0.3)	52 (7.7)	- (-)	1 (0.2)	2 (0.3)	25 (3.7)	25 (3.8)
2003–04	549	- (-)	- (-)	32 (5.8)	1 (0.2)	2 (0.4)	2 (0.4)	14 (2.5)	14 (3.1)
2004–05	1 237	- (-)	1 (0.1)	20 (1.6)	1 (0.1)	- (-)	11 (0.9)	1 (0.1)	1 (1.4)
2005–06	478	5 (1.1)	3 (0.6)	105 (22)	1 (0.2)	10 (2.1)	1 (0.2)	26 (5.4)	26 (7.7)
2006–07	10	- (-)	- (-)	4 (40.0)	- (-)	- (-)	- (-)	- (-)	- (20.0)
2009–10	31	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	1 (3.2)	1 (-)
2010–11	1	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)
2011–12	381	6 (1.6)	6 (1.6)	19 (5)	- (-)	2 (0.5)	- (-)	5 (1.3)	5 (2.6)
2012–13	444	13 (2.9)	12 (2.7)	22 (5)	- (-)	12 (2.7)	1 (0.2)	30 (6.8)	30 (7.7)
2013–14	69	3 (4.3)	1 (1.4)	6 (8.7)	- (-)	1 (1.4)	- (-)	- (-)	- (5.8)

Table 6: continued.

(e) Sub-Antarctic (bottom trawls)

Catch in t (% of hoki catch)

Year	HOK	HAK	JAV	LIN	RAT	SPD	SWA	WWA	Other
1990–91	1 974	204 (10.3)	17 (0.9)	91 (4.6)	14 (0.7)	3 (0.2)	- (-)	3 (0.2)	3 (10.9)
1991–92	3 452	332 (9.6)	47 (1.4)	248 (7.2)	39 (1.1)	15 (0.4)	9 (0.3)	35 (1)	35 (5.9)
1992–93	2 566	509 (19.8)	30 (1.2)	224 (8.7)	21 (0.8)	8 (0.3)	5 (0.2)	22 (0.9)	22 (4.4)
1993–94	1 118	31 (2.8)	11 (1)	98 (8.8)	10 (0.9)	12 (1.1)	11 (1)	5 (0.4)	5 (5.5)
1994–95	877	22 (2.5)	14 (1.6)	57 (6.5)	12 (1.4)	15 (1.7)	- (-)	8 (0.9)	8 (6.2)
1995–96	742	27 (3.6)	9 (1.2)	95 (12.8)	15 (2)	5 (0.7)	8 (1.1)	22 (3)	22 (6.7)
1996–97	66	8 (12.1)	4 (6.1)	3 (4.5)	3 (4.5)	- (-)	- (-)	- (-)	- (30.3)
1997–98	1 893	127 (6.7)	66 (3.5)	190 (10)	59 (3.1)	20 (1.1)	3 (0.2)	28 (1.5)	28 (6)
1998–99	4 727	133 (2.8)	74 (1.6)	256 (5.4)	77 (1.6)	20 (0.4)	26 (0.6)	18 (0.4)	18 (4.8)
1999–00	5 020	212 (4.2)	186 (3.7)	336 (6.7)	65 (1.3)	47 (0.9)	158 (3.1)	25 (0.5)	25 (6.7)
2000–01	2 739	87 (3.2)	76 (2.8)	369 (13.5)	50 (1.8)	58 (2.1)	159 (5.8)	26 (1)	26 (7.7)
2001–02	3 889	154 (4)	308 (7.9)	193 (5)	94 (2.4)	97 (2.5)	35 (0.9)	27 (0.7)	27 (7.7)
2002–03	2 003	81 (4)	99 (4.9)	363 (18.1)	47 (2.4)	80 (4)	21 (1.1)	20 (1.0)	20 (10.3)
2003–04	548	37 (6.8)	36 (6.6)	309 (56.4)	16 (2.9)	171 (31.2)	54 (9.8)	13 (2.4)	13 (15.7)
2004–05	391	24 (6.1)	71 (18.2)	189 (48.3)	15 (3.8)	6 (1.5)	5 (1.3)	10 (2.6)	10 (11.5)
2005–06	1 170	14 (1.2)	29 (2.5)	118 (10.1)	14 (1.2)	63 (5.4)	68 (5.8)	70 (6)	70 (4)
2006–07	1 225	16 (1.3)	50 (4.1)	225 (18.4)	18 (1.5)	85 (6.9)	82 (6.7)	85 (6.9)	85 (7.3)
2007–08	2 670	100 (3.8)	176 (6.6)	1 002 (37.5)	28 (1.1)	30 (1.1)	9 (0.3)	76 (2.8)	76 (10.8)
2008–09	2 890	93 (3.2)	127 (4.4)	359 (12.4)	40 (1.4)	83 (2.9)	52 (1.8)	39 (1.4)	39 (6.6)
2009–10	2 905	64 (2.2)	147 (5.1)	232 (8)	85 (2.9)	68 (2.3)	26 (0.9)	30 (1)	30 (7.2)
2010–11	2 014	34 (1.7)	61 (3)	208 (10.3)	58 (2.9)	105 (5.2)	58 (2.9)	56 (2.8)	56 (8.3)
2011–12	2 141	46 (2.1)	64 (3)	404 (18.9)	48 (2.2)	46 (2.1)	1 (0)	30 (1.4)	30 (5.4)
2012–13	6 059	58 (1)	197 (3.2)	647 (10.7)	129 (2.1)	132 (2.2)	226 (3.7)	39 (0.6)	39 (4.7)
2013–14	5 327	81 (1.5)	225 (4.2)	593 (11.1)	149 (2.8)	240 (4.5)	58 (1.1)	74 (1.4)	74 (7.3)

(f) Chatham Rise and ECSI (excludes ECSI from June–September) (bottom trawl).

Catch in t (% of hoki catch)

Year	HOK	GSP	HAK	JAV	LIN	RAT	SPD	SWA	Other
1990–91	3 323	33 (1)	132 (4)	142 (4.3)	157 (4.7)	100 (3)	24 (0.7)	210 (6.3)	210 (15.9)
1991–92	4 853	24 (0.5)	59 (1.2)	70 (1.4)	144 (3)	129 (2.7)	5 (0.1)	28 (0.6)	28 (7.1)
1992–93	455	- (-)	46 (10.1)	13 (2.9)	8 (1.8)	7 (1.5)	- (-)	9 (2)	9 (11)
1993–94	3 526	6 (0.2)	50 (1.4)	76 (2.2)	112 (3.2)	108 (3.1)	16 (0.4)	15 (0.4)	15 (7.5)
1994–95	1 463	- (-)	23 (1.6)	58 (4)	51 (3.5)	38 (2.6)	7 (0.5)	6 (0.4)	6 (6)
1995–96	3 477	- (-)	112 (3.2)	103 (3)	131 (3.8)	190 (5.5)	47 (1.4)	128 (3.7)	128 (5.6)
1996–97	1 027	- (-)	86 (8.4)	38 (3.7)	49 (4.8)	90 (8.8)	6 (0.6)	116 (11.3)	116 (10.4)
1997–98	5 388	- (-)	107 (2)	291 (5.4)	184 (3.4)	297 (5.5)	67 (1.2)	90 (1.7)	90 (10.5)
1998–99	7 745	61 (0.8)	90 (1.2)	339 (4.4)	267 (3.5)	313 (4)	131 (1.7)	84 (1.1)	84 (7)
1999–00	3 457	68 (2)	62 (1.8)	217 (6.3)	103 (3)	156 (4.5)	135 (3.9)	126 (3.6)	126 (11.7)
2000–01	4 262	117 (2.8)	125 (2.9)	344 (8.1)	214 (5)	291 (6.8)	91 (2.1)	214 (5)	214 (14.2)
2001–02	4 643	117 (2.5)	95 (2)	385 (8.3)	223 (4.8)	385 (8.3)	121 (2.6)	50 (1.1)	50 (13.1)
2002–03	2 260	104 (4.6)	67 (3)	429 (19)	199 (8.8)	330 (14.6)	48 (2.1)	139 (6.2)	139 (21.1)
2003–04	2 384	69 (2.9)	52 (2.2)	250 (10.5)	157 (6.6)	265 (11.1)	58 (2.4)	245 (10.3)	245 (16.4)
2004–05	4 768	104 (2.2)	52 (1.1)	528 (11.1)	177 (3.7)	338 (7.1)	106 (2.2)	134 (2.8)	134 (11.6)
2005–06	5 182	99 (1.9)	49 (1)	396 (7.6)	132 (2.5)	316 (6.1)	93 (1.8)	260 (5)	260 (9.3)
2006–07	5 533	69 (1.2)	80 (1.4)	500 (9)	155 (2.8)	165 (3)	39 (0.7)	195 (3.5)	195 (7)
2007–08	5 695	62 (1.1)	77 (1.4)	408 (7.2)	121 (2.1)	323 (5.7)	73 (1.3)	153 (2.7)	153 (9.1)
2008–09	4 427	28 (0.6)	50 (1.1)	355 (8)	96 (2.2)	289 (6.5)	45 (1)	71 (1.6)	71 (4.9)
2009–10	5 743	39 (0.7)	73 (1.3)	546 (9.5)	136 (2.4)	437 (7.6)	48 (0.8)	244 (4.2)	244 (6.3)
2010–11	6 012	51 (0.8)	52 (0.9)	385 (6.4)	143 (2.4)	317 (5.3)	46 (0.8)	222 (3.7)	222 (6)
2011–12	7 868	69 (0.9)	42 (0.5)	329 (4.2)	185 (2.4)	350 (4.5)	107 (1.4)	237 (3)	237 (5.8)
2012–13	10 254	116 (1.1)	106 (1)	754 (7.3)	390 (3.8)	822 (8)	96 (0.9)	321 (3.1)	321 (9.8)
2013–14	8 808	83 (0.9)	88 (1.0)	444 (5)	350 (4)	462 (5.2)	229 (2.6)	389 (4.4)	389 (9.8)

Table 6: continued.

(g) ECSI, June–September (bottom and midwater trawls).

									Catch in t (% of hoki catch)
Year	**HOK**	**BAR**	**HAK**	**JAV**	**LIN**	**RAT**	**SPD**	**SWA**	**Other**
2000–01	5	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)	- (-)
2001–02	97	- (-)	- (-)	- (-)	1 (1)	1 (1)	- (-)	- (-)	- (1)
2002–03	914	16 (1.8)	22 (2.4)	6 (0.7)	8 (0.9)	18 (2)	5 (0.6)	20 (2.2)	20 (1.2)
2003–04	939	- (-)	2 (0.2)	4 (0.4)	4 (0.4)	6 (0.6)	1 (0.1)	1 (0.1)	1 (0.8)
2004–05	280	- (-)	- (-)	1 (0.4)	1 (0.4)	2 (0.7)	- (-)	- (-)	- (0.4)
2005–06	505	- (-)	5 (1)	1 (0.2)	- (-)	3 (0.6)	1 (0.2)	35 (6.9)	35 (0.6)
2007–08	72	- (-)	2 (2.8)	2 (2.8)	1 (1.4)	9 (12.5)	- (-)	2 (2.8)	2 (6.9)
2008–09	311	- (-)	- (-)	- (-)	- (-)	1 (0.3)	- (-)	- (-)	- (0.3)
2009–10	41	- (-)	- (-)	1 (2.4)	1 (2.4)	18 (43.9)	- (-)	- (-)	- (9.8)
2010–11	413	- (-)	2 (0.5)	- (-)	1 (0.2)	4 (1)	- (-)	- (-)	- (0.7)
2011–12	355	- (-)	1 (0.3)	2 (0.6)	1 (0.3)	15 (4.2)	- (-)	10 (2.8)	10 (1.4)
2012–13	1 451	- (-)	7 (0.5)	3 (0.2)	4 (0.3)	17 (1.2)	4 (0.3)	99 (6.8)	99 (0.2)
2013–14	43	- (-)	3 (7)	1 (2.3)	1 (2.3)	2 (4.7)	- (-)	- (-)	- (4.7)

Table 7: Number of 2013–14 hoki length frequency samples and otoliths by observer trips, target species, and monthly timing. Length frequency samples with errors, missing data or outside the sample period (e.g. non-spawning in a spawning area) have been removed. Note: 10 length frequency samples were excluded as these were from large vessels inside the 25 n.mile line, which may have position errors.

(a) WCSI observer samples

			Number of	
Trip	**Month**	**Target species**	**Length samples**	**Otoliths**
1	Jun	HAK/HOK	16	-
2	May/Jun	HAK	11	20
3	May/Jun	HOK	23	41
4	May/Jun	HOK	22	48
5	May/Jun	HOK	14	32
6	Jun/Jul	HOK	49	65
7	Jun	HAK/HOK	34	20
8	Jun	HAK/HOK	26	50
9	Jun/Jul	HOK	21	36
10	Jun/Jul	HAK/HOK	13	19
11	Jun/Jul	HOK	10	-
12	Jun/Jul	HAK/HOK	12	15
13	Jun/Jul/Aug	HOK	40	72
14	Jun/Jul	HOK	36	66
15	Jun/Jul	HOK	26	-
16	Jun/Jul	HAK/HOK	12	-
17	Jul	HOK	6	-
18	Jun/Jul	HOK	21	43
19	Jul/Aug	HOK	8	23
20	Jul/Aug	HOK	32	-
21	Jul	HOK	19	-
22	Jul/Aug	HAK/HOK	23	12
23	Aug	HOK	7	22
24	Jul	HOK	11	-
25	Jul	HAK/HOK	8	-
26	Jul	HAK/HOK	20	55
27	Jul/Aug	HOK	17	-
28	Jul/Aug	HOK	23	-
29	Jul/Aug	HOK	38	100
30	Jul/Aug	HOK	63	-
31	Jul/Aug	HOK	25	-
32	Jul/Aug	HOK	19	-
33	Aug/Sep	HAK/HOK	15	3
34	Aug/Sep	HOK	16	-
35	Jul/Aug	HOK	19	-
36	Aug/Sep	HAK/HOK	18	3
37	Aug	HAK/HOK	17	4
38	Aug	HAK/HOK	9	-
39	Aug	HOK	7	-
40	Aug/Sep	HAK/HOK	37	5
41	Sep	HAK/HOK	7	-
42	Sep	HAK/HOK	14	-
Total	-	-	864	754
		HAK(108), HOK(755)	(822 outside, 42 inside)	

Table 7: continued.

(b) Cook Strait observer and market samples.

			Number of	
Trip	**Month**	**Target species**	**Length samples**	**Otoliths**
1	Jun/Jul	HOK	44	179
2	Jul	HOK	6	-
3	Jul	HOK	10	-
4	Sep	HOK	16	-
Observer total	-	-	76	179
Market	Jun	HOK	6	118
Market	Jul	HOK	9	144
Market	Aug	HOK	15	254
Market	Sep	HOK	3	53
Market total	-	-	33	569
Total	-	-	109	748

Table 7: continued.

(c) Chatham Rise and ECSI observer data; Chatham Rise includes ECSI non-spawning data.

Trip	Month	Target species	Number of length samples		Number of otoliths
			Chatham Rise	ECSI spawning	
1	Oct	JMA	1	-	-
2	Oct	HOK/SWA	9	-	11
3	Oct	HOK	2	-	4
4	Oct	SWA	5	-	-
5	Oct	RBT	1	-	-
6	Oct	HOK	2	-	-
7	Oct	BAR/JMA/RBT	6	-	-
8	Oct/Nov	SWA	9	-	4
9	Oct/Nov	HAK/HOK	72	-	128
10	Oct/Dec	HOK/SWA	8	-	8
11	Nov/Dec	HOK	83	-	150
12	Nov	HOK	1	-	3
13	Nov/Dec	HOK/SWA	57	-	110
14	Nov/Dec	HOK	18	-	38
15	Dec	HOK	2	-	3
16	Jan	HOK	2	-	6
17	Dec	SCI	2	-	-
18	Dec/Jan	HOK/SWA/WWA	79	-	162
19	Dec/Jan	HOK/SWA	15	-	37
20	Dec/Jan	HOK	4	-	7
21	Dec/Jan	HOK	21	-	56
22	Jan	HOK	3	-	6
23	Jan	BAR	1	-	-
24	Mar/Apr	SCI	6	-	-
25	Jan	HOK	2	-	6
26	Jan/Feb	HOK	103	-	186
27	Feb/Mar	HOK	28	-	63
28	Feb	BAR	3	-	-
29	Feb	BAR	2	-	-
30	Mar	JMA	2	-	-
31	Mar	BAR/JMA	7	-	-
32	Mar	BAR	1	-	-
33	Apr/May	HOK	67	-	168
34	May	HOK	2	-	4
35	Sep	HOK/SWA	28	1	44
36	Sep	SWA	2	-	13
Total	-	-	656	1	1217

Table 7: continued.
(d) Sub-Antarctic observer data

			Number of	
Trip	**Month**	**Target species**	**Length samples**	**Otoliths**
1	Oct	HOK/SBW	4	17
2	Oct	SWA	1	-
3	Oct	HAK/LIN/WWA	18	60
4	Nov	HOK/SWA	5	9
5	Nov/Dec	HOK/SWA	6	21
6	Nov	LIN/SWA/WWA	10	35
7	Nov	HOK/SWA	5	20
8	Nov	HAK/LIN/SQU/WWA	12	21
9	Nov	HOK	3	9
10	Nov/Dec	HOK	12	67
11	Nov/Dec	SWA	6	17
12	Nov/Dec/Jan	LIN/SWA/WWA	26	57
13	Dec	HOK/SWA	9	30
14	Dec	SQU/WWA	3	8
15	Dec/Jan	HOK/LIN/SQU/SWA	18	70
16	Dec/Jan	HAK/SQU/WWA	20	37
17	Jan	SQU	1	-
18	Dec/Jan	HOK/SQU/SWA	12	36
19	Dec/Jan	HOK/SQU/SWA	16	44
20	Jan/Feb	HAK/HOK/LIN/SWA	9	31
21	Jan	SQU	5	-
22	Feb	HOK/SQU	6	12
23	Jan	HOK/SQU	2	6
24	Jan	SQU	2	-
25	Jan	SQU	1	-
26	Jan	WWA	3	9
27	Feb	SQU	1	7
28	Feb	HOK/SQU	3	4
29	Feb	HOK/LIN/SQU/SWA	5	28
30	Feb	HOK/SQU/SWA	4	-
31	Feb	HOK/WWA	7	37
32	Feb/Mar	SQU/SWA	5	10
33	Feb	SQU	1	5
34	Mar	SQU	1	-
35	Mar	SQU	2	1
36	Mar	JMA/SQU	3	-
37	Apr	SQU	1	-
38	Mar/Apr	SQU	2	9
39	Mar	SQU	3	10
40	Apr	SQU	1	4
41	Apr	SQU	1	-
42	Apr	SQU	1	1
43	Mar/Apr	SQU	3	1
44	Apr	WAR	1	-
45	Apr	SQU/SWA	4	13
46	Apr/May	HOK	53	285
47	Apr	OEO	1	1
48	Apr	SQU	1	1
49	Apr	SQU	3	-
50	Apr	SQU	2	-
51	Apr/May/Jun	HOK	34	-
52	May	SQU/WWA	2	2
53	May	SQU	1	-
54	May	SQU	1	-
55	May/Jun	HOK	13	50
56	May/Jun	HOK/SQU	4	4
57	May/Jun	HOK	28	97
58	Jun	SQU	1	5
59	Jun	SQU	1	1
60	Sep	SBW	9	-
61	Aug/Sep	SBW	13	-
62	Sep	SBW	4	-
63	Sep	SBW	1	-
64	Sep	SBW	4	-
65	Sep	LIN	1	-
66	Sep	SBW	9	-
67	Sep	SBW	6	-
68	Sep	HOK/SWA	2	2
Total	-	-	458	1194

Table 8: Stratification for the 2014 WCSI and Cook Strait length samples.

(a) Number of WCSI hoki length frequency samples and catch by week from inside and outside the 25 n. mile line.

Week	Date	Number of length samples		Catch (t)	
		Inside	Outside	Inside	Outside
19	7–13 May	2	-	139.5	1.0
20	14–18 May	5	-	383.1	25.9
21	21–27 May	3	-	417.9	1.5
22	28 May–3 Jun	6	16	467.3	428.9
23	4–10 Jun	5	20	611.0	362.5
24	11–17 Jun	2	44	775.5	1 405.6
25	18–24 Jun	-	40	671.1	954.8
26	25 Jun–1 Jul	-	68	828.5	2 852.1
27	2–8 Jul	4	67	1 090.5	4 409.9
28	9–15 Jul	5	74	704.3	5 775.4
29	16–22 Jul	2	84	980.7	7 005.7
30	23–29 Jul	4	90	977.9	5 804.5
31	30 Jul–5 Aug	4	84	567.8	7 906.0
32	6–12 Aug	-	65	804.6	8 193.6
33	13–19 Aug	-	54	466.3	5 716.2
34	20–26 Aug	-	35	234.1	3 962.3
35	27 Aug–2 Sep	-	19	191.8	2 600.3
36	3–9 Sep	-	24	32.4	1 169.2
37	10–16 Sep	-	22	20.4	337.8
38	17–23 Sep	-	12	0.0	70.5
39	24–30 Sep	-	4	0.1	24.6

(b) Stratification of WCSI hoki fishery length frequency data.

	Length samples		Catch	
Stratum	Description	Number	Description	Catch (t)
1	12–27 May; Inside line	10	3–27 May; Inside line	941.0
2	28 May – 14 Jun; Inside line	13	28 May – 24 Jun; Inside line	2524.8
3	5 – 15 Jul; Inside line	9	25 Jun – 15 Jul; Inside line	2623.2
4	16 Jul – 2 Aug; Inside line	10	16 Jul – 5 Aug; Inside line	2526.4
5	28 May – 3 Jun; Outside line	16	1 May – 3 Jun; Outside line	457.9
6	4 – 10 Jun; Outside line	20	4 – 10 Jun; Outside line	362.5
7	11 – 17 Jun; Outside line	44	11 – 17 Jun; Outside line	1405.6
8	18 – 24 Jun; Outside line	40	18 – 24 Jun; Outside line	954.8
9	25 Jun – 1 Jul; Outside line	68	25 Jun – 1 Jul; Outside line	2852.1
10	2 – 8 Jul; Outside line	66	2 – 8 Jul; Outside line	4409.9
11	9 –15 Jul; Outside line	74	9 –15 Jul; Outside line	5775.4
12	16– 22 Jul; Outside line	84	16– 22 Jul; Outside line	7005.7
13	23–29 Jul; Outside line	90	23–29 Jul; Outside line	5804.5
14	30 Jul–5 Aug; Outside line	84	30 Jul–5 Aug; Outside line	7906.0
15	6–12 Aug; Outside line	65	6–12 Aug	8998.2
16	13–19 Aug; Outside line	54	13–19 Aug	6182.5
17	20–26 Aug; Outside line	35	20–26 Aug	4196.4
18	27 Aug–2 Sep; Outside line	18	27 Aug–2 Sep	2792.1
19	3–9 Sep; Outside line	24	3–9 Sep	1201.5
20	10–16 Sep; Outside line	22	10–16 Sep	358.1
21	17–26 Sep; Outside line	15	17–30 Sep	95.2

Table 8: continued.

(c) Cook Strait 2014 hoki length frequency data and catch by month and vessel size

		Month				Total
Data set	Stratum	Jun	Jul	Aug	Sep	
Catches (t)	Nelson/Picton vessel < 30 m	69	1 342	2 305	247	3 963
	Nelson/Picton vessel 30–40 m	425	569	693	279	1 966
	Nelson/Picton vessel > 40 m	1 208	1 397	2 612	2 573	7 790
	Wellington	58	234	400	183	875
Observer samples	Nelson/Picton vessel < 30 m	-	6	-	-	6
	Nelson/Picton vessel > 40 m	35	19	-	16	70
Market samples	Nelson/Picton vessel < 30 m	2	7	11	-	20
	Nelson/Picton vessel > 40 m	4	2	4	3	13

(d) Cook Strait 2014 stratification

			Stratum	Number of samples	
Stratum	Vessel size	Date range	Catch (t)	Market	Observer
1	< 40 m	Jun–Jul	2 697	9	6
2	< 40 m	Aug–Sep	4 108	11	-
3	≥ 40 m	Jun	1 208	4	35
4	≥ 40 m	Jul	1 397	2	19
5	≥ 40 m	Aug	2 612	4	-
6	≥ 40 m	Sep	2 573	3	16

Table 9: Percentage of female hoki by observer stages on the WCSI for female fish less than or equal to 55 cm (n = 1798) and female fish greater than 55 cm (n = 44 045) for the 2014 spawning season.

		Females ≤ 55 cm		Females > 55 cm	
Stage		Number	Percent	Number	Percent
1	Immature and resting	580	32.3	2479	5.6
2	Ripening	613	34.1	15234	34.6
3	Ripe	458	25.5	15671	35.6
4	Running ripe	97	5.4	6754	15.3
5	Spent	50	2.8	3907	8.9

Table 10: Strata for the 2013–14 non spawning fisheries based on the tree regression of all data (Observer Programme only), with comparison of the TCEPR, Observer Programme (OP), and otolith data by stratum. The catch for OP is the total catch for the observed tows.

(a) Chatham Rise

	Splitting variables			Mean length	Hoki catch (t)		No. of tows sampled		No. of otoliths	No. of fish Measured
Stratum	Depth of net	Longitude	Dates	(cm)	TCEPR	OP	TCEPR	OP		
1	< 597.75	< 177.9º		65.9	18 868	2 401	3 173	360	415	33 564
2	597.75	≥177.9º	2 Jan–30 Sep	68.8	6 565	873	884	88	156	8 721
3	< 597.75	≥177.9º	1 Oct – 1 Jan	74.4	2 680	628	557	95	153	9 628
4	597.75-656.5			76.2	2 520	416	336	57	95	5 683
5	≥ 656.5			82.9	3 107	429	841	56	108	5 645

(b) Sub-Antarctic

	Splitting variables		Mean length	Hoki catch (t)		No. of tows sampled		No. of otoliths	No. of fish Measured
Stratum	Depth of net	Latitude	(cm)	TCEPR	OP	TCEPR	OP		
1A	< 400	≤ 48.99	59.0	862	481	334	104	80	4 007
1B	400– 483.5	≤ 48.99	59.6	1 064	333	187	43	60	2 989
2	483.5– 625	≤ 48.99	66.0	3 656	703	586	94	213	7 273
3	< 625	> 48.99	75.7	4 689	390	1 144	124	140	4 214
4	≥ 625		84.2	9 649	850	1 112	90	269	7 492

Table 11: Relative biomass estimates (t in thousands) of hoki in 300–800 m depths from Sub-Antarctic spring, autumn and summer *Tangaroa* trawl surveys. (3++ all hoki aged 3 years and older.) The CV is the coefficient of variation as % (in parentheses).

Survey	1+ hoki			2+ hoki			3 ++ hoki		Total hoki	
	1+ year class	t	CV	2+ year class	t	CV	t	CV	t	CV
Dec 91	1990	0.7	(87)	1989	0.2	(56)	79.4	(7)	80.3	(7)
May 92	1990	0.8	(39)	1989	1.4	(13)	65.6	(9)	67.8	(8)
Sep 92	1991	0.1	(94)	1990	0.01	(58)	34.1	(14)	34.3	(14)
Dec 92	1991	0.2	(66)	1990	0.2	(90)	86.9	(6)	87.4	(6)
May 93	1991	1.8	(76)	1990	0.2	(33)	51.4	(10)	53.5	(11)
Dec 93	1992	1.1	(98)	1991	3.7	(49)	94.9	(9)	99.7	(9)
Apr 96	1994	1.7	(58)	1993	3.2	(41)	85.4	(9)	90.4	(10)
Apr 98	1996	0.2	(62)	1995	0.6	(27)	67.1	(11)	67.8	(11)
Dec 00	1999	0.1	(99)	1998	0.03	(51)	55.6	(13)	55.7	(13)
Dec 01	2000	0.2	(49)	1999	0.1	(46)	37.8	(16)	38.2	(16)
Dec 02	2001	0.01	(53)	2000	2.5	(51)	37.4	(14)	39.9	(14)
Dec 03	2002	1.8	(28)	2001	0.1	(26)	12.4	(14)	14.3	(13)
Dec 04	2003	1.1	(58)	2002	3.3	(57)	13.2	(9.4)	17.6	(12)
Dec 05	2004	0.4	(50)	2003	1.6	(25)	18.5	(14)	20.4	(13)
Dec 06	2005	0.5	(48)	2004	0.7	(25)	13.1	(11)	14.3	(11)
Dec 07	2006	1.0	(54)	2005	1.9	(42)	43.0	(17)	45.9	(16)
Dec 08	2007	1.0	(48)	2006	1.6	(37)	44.4	(15)	47.0	(14)
Dec 09	2008	0.5	(54)	2007	11.1	(64)	53.4	(12)	65.0	(16)
Dec 11	2010	0.01	(100)	2009	2.3	(21)	43.8	(15)	46.1	(15)
Dec 12	2011	0.90	(44)	2010	0.2	(60)	54.6	(15)	55.7	(15)
Dec 14	2013	0.25	(67)	2012	1.7	(48)	29.0	(13)	31.3	(13)

FIGURES

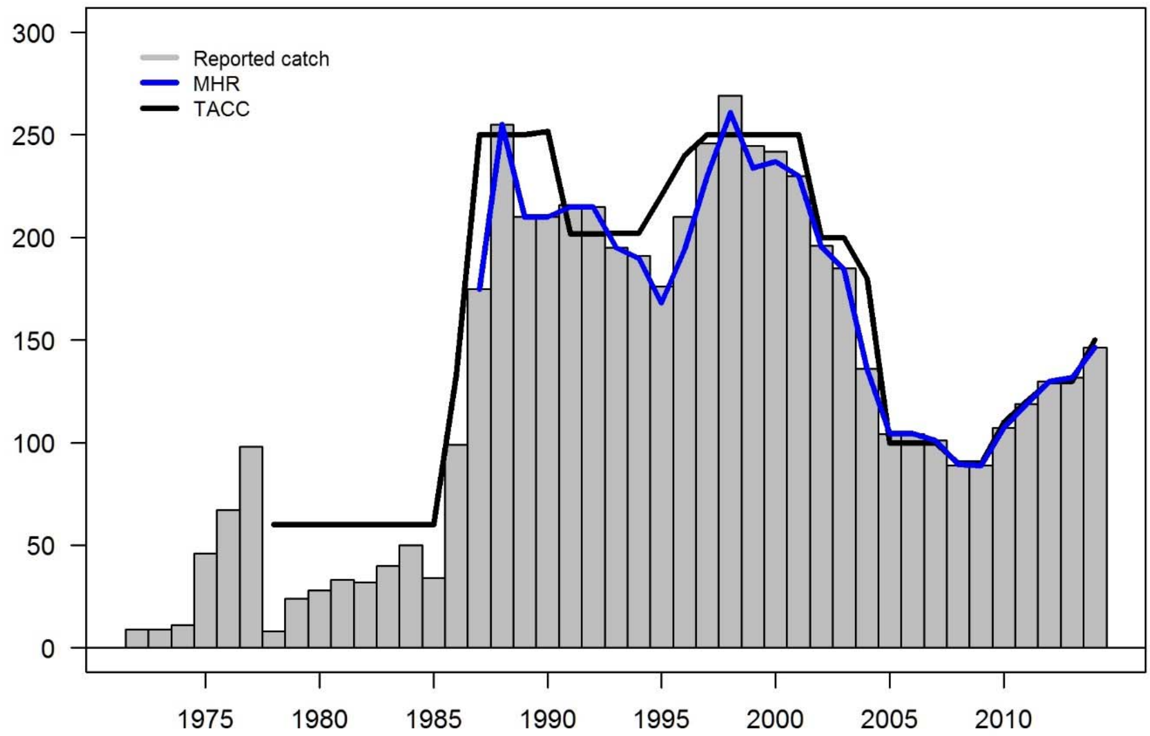


Figure 1: Total New Zealand hoki catch estimated from reported landings for calendar years 1972 to 1983 and fishing years 1983–84 (1984) to 2013–14.

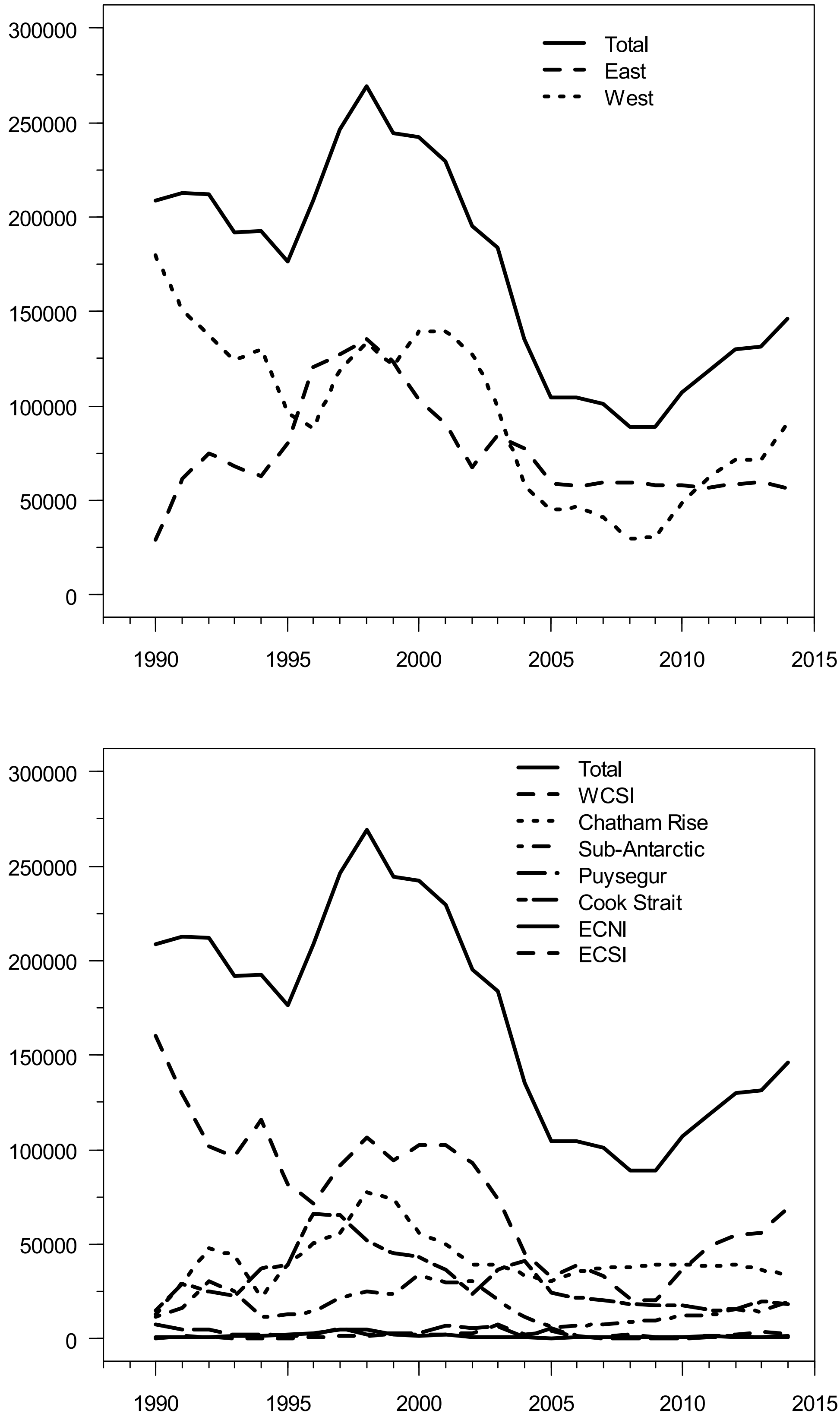


Figure 2a: Estimated total catch (t) of hoki by 'stock' area (upper panel) and fishing area (lower panel) from 1988–89 (1989) to 2013–14 (2014). "Eastern" areas include Chatham Rise, east coast South Island (ECSI), Cook Strait, and east coast North Island (ECNI). "Western" areas include west coast South Island (WCSI), Sub-Antarctic, and Puysegur.

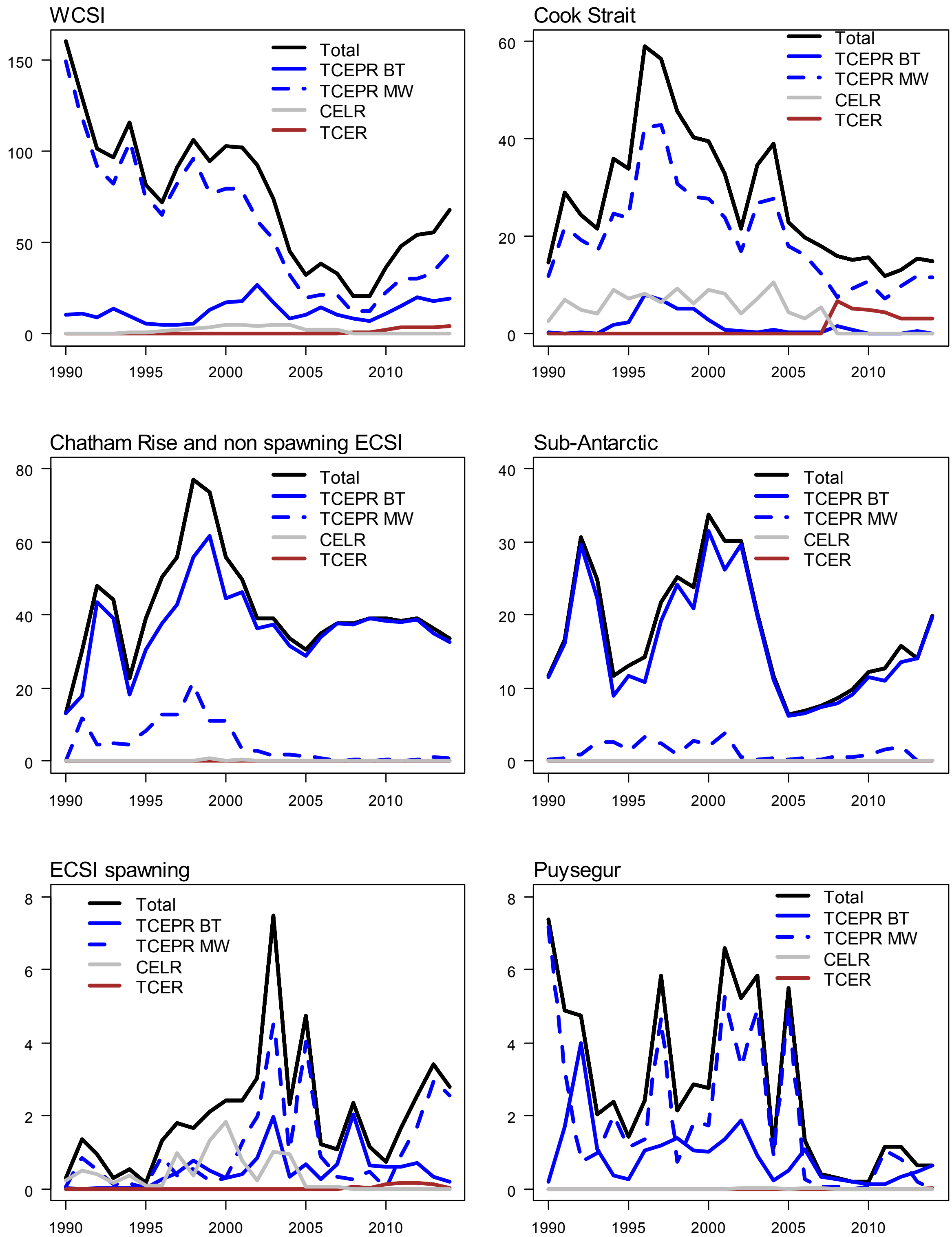


Figure 2b: Total catches and catches by form type by hoki area and fishing year. All areas (except Cook Strait) also show TCEPR data split by MW (midwater trawl) and BT (Bottom trawl). Sub-Antarctic and Puysegur have very little CELR or TCER data. There are no TCER or CELR catches for Sub-Antarctic.

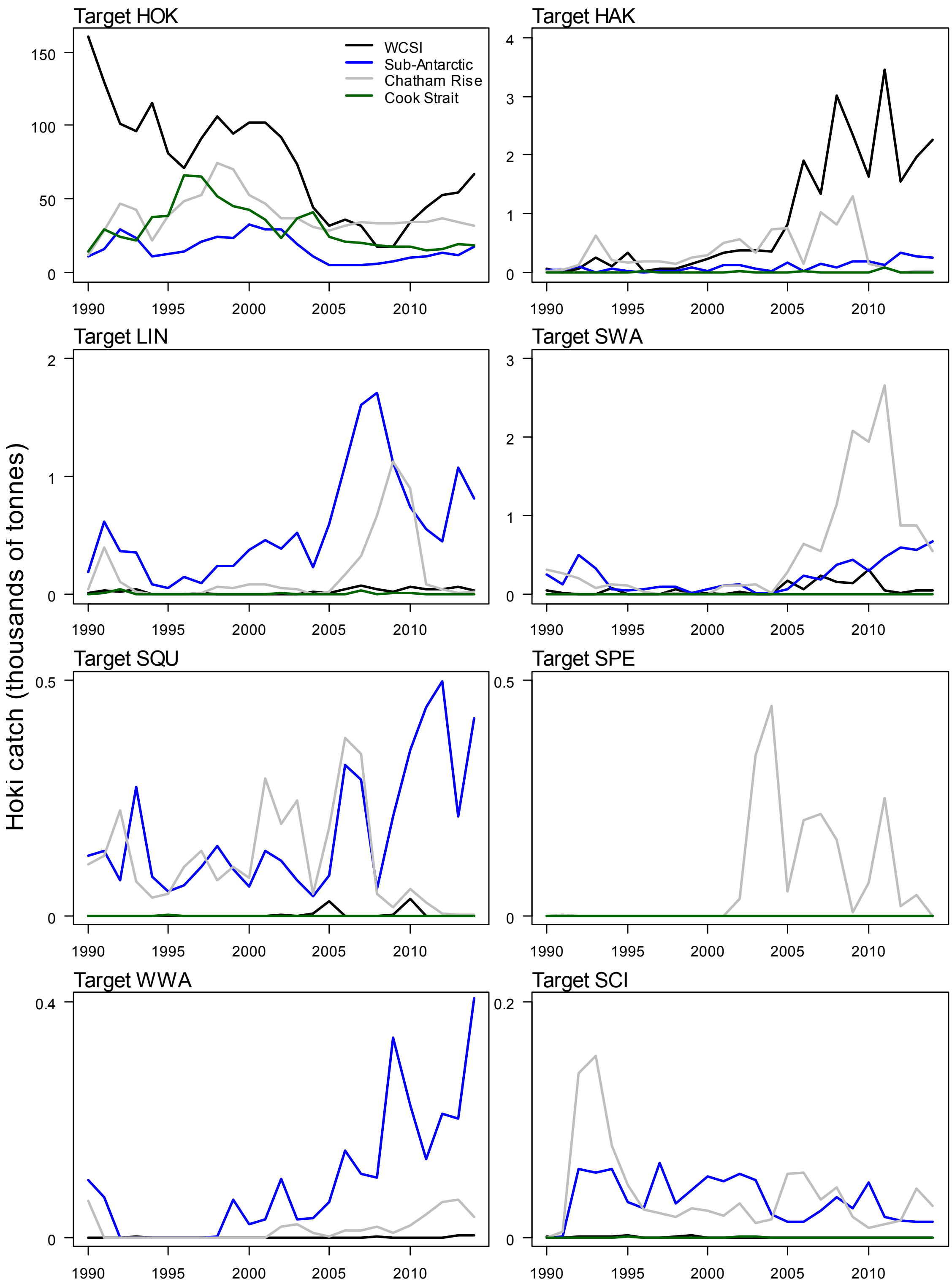


Figure 3: Hoki catch by target species and area for the 1989–90 to 2013–14 fishing years. Hoki catches by target species include HOK, hoki; HAK, hake; LIN, ling; SWA, silver warehou; SQU, arrow squid; SPE, sea perch; WWA, white warehou; and SCI, scampi.

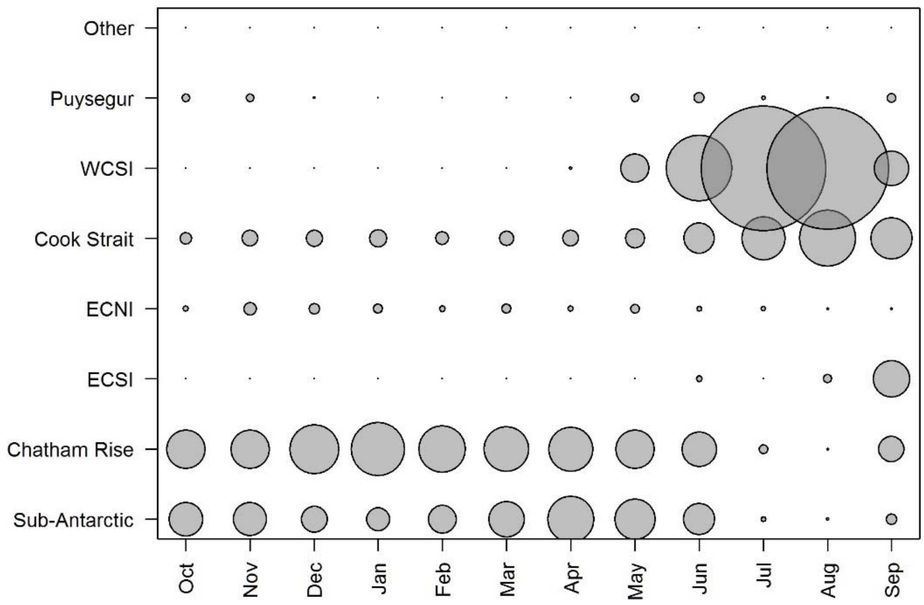


Figure 4a: Hoki catch by month and area for the 2013–14 fishing year (maximum circle size is 30 000 t).

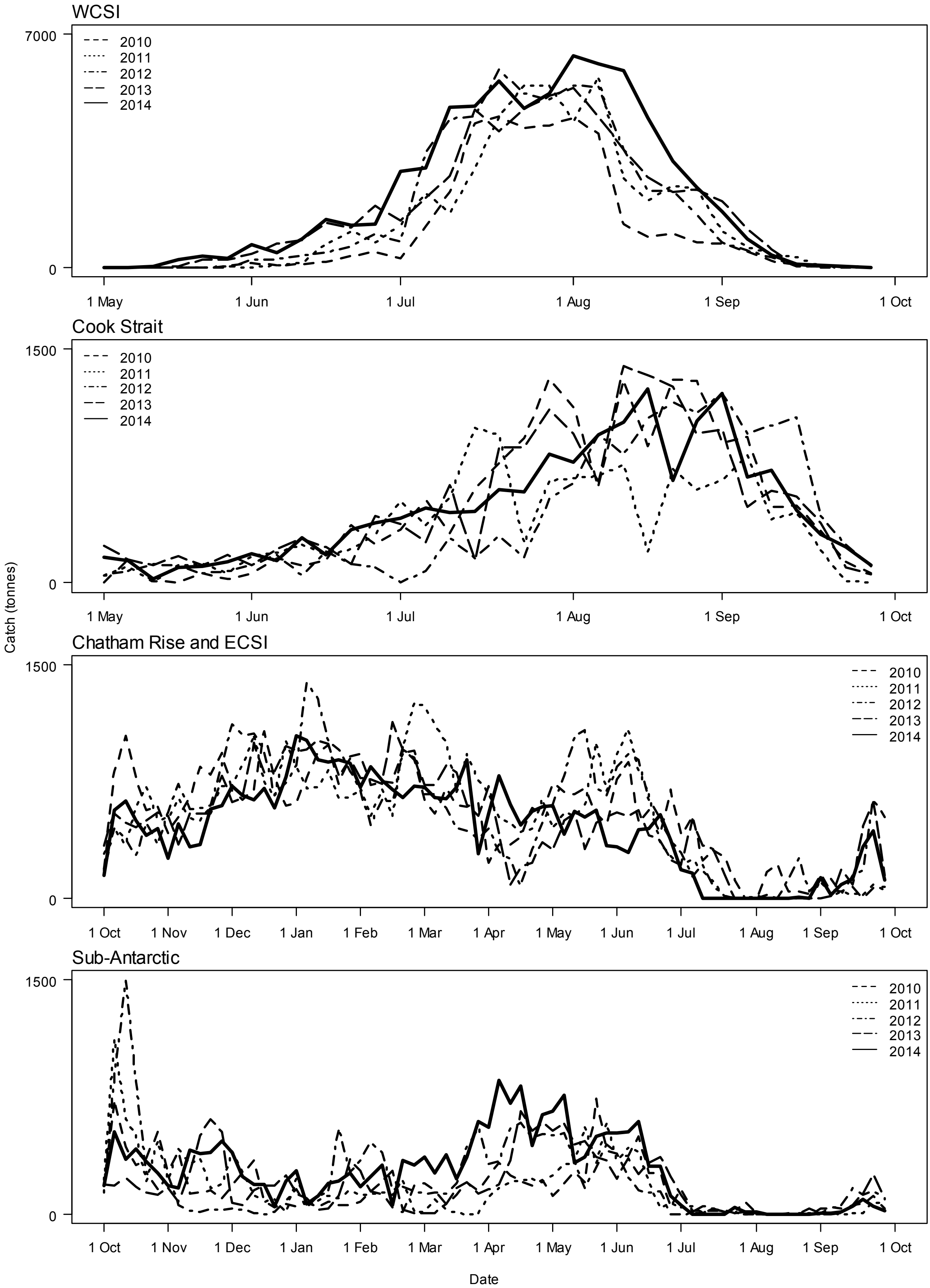


Figure 4b: Daily distribution of hoki catch by area (in 5-day bins) by main area for 2009–10 to 2013–14 fishing years.

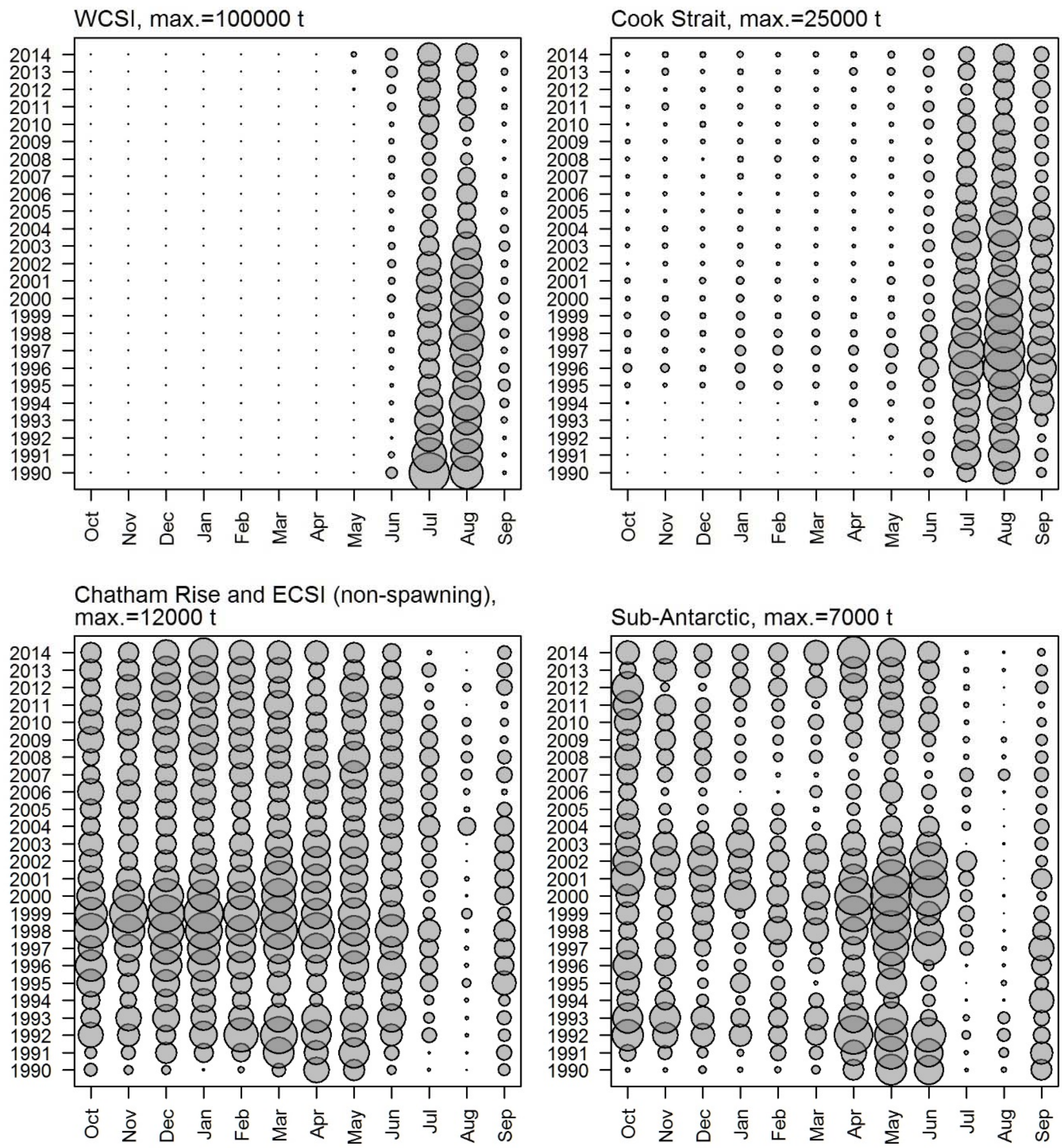
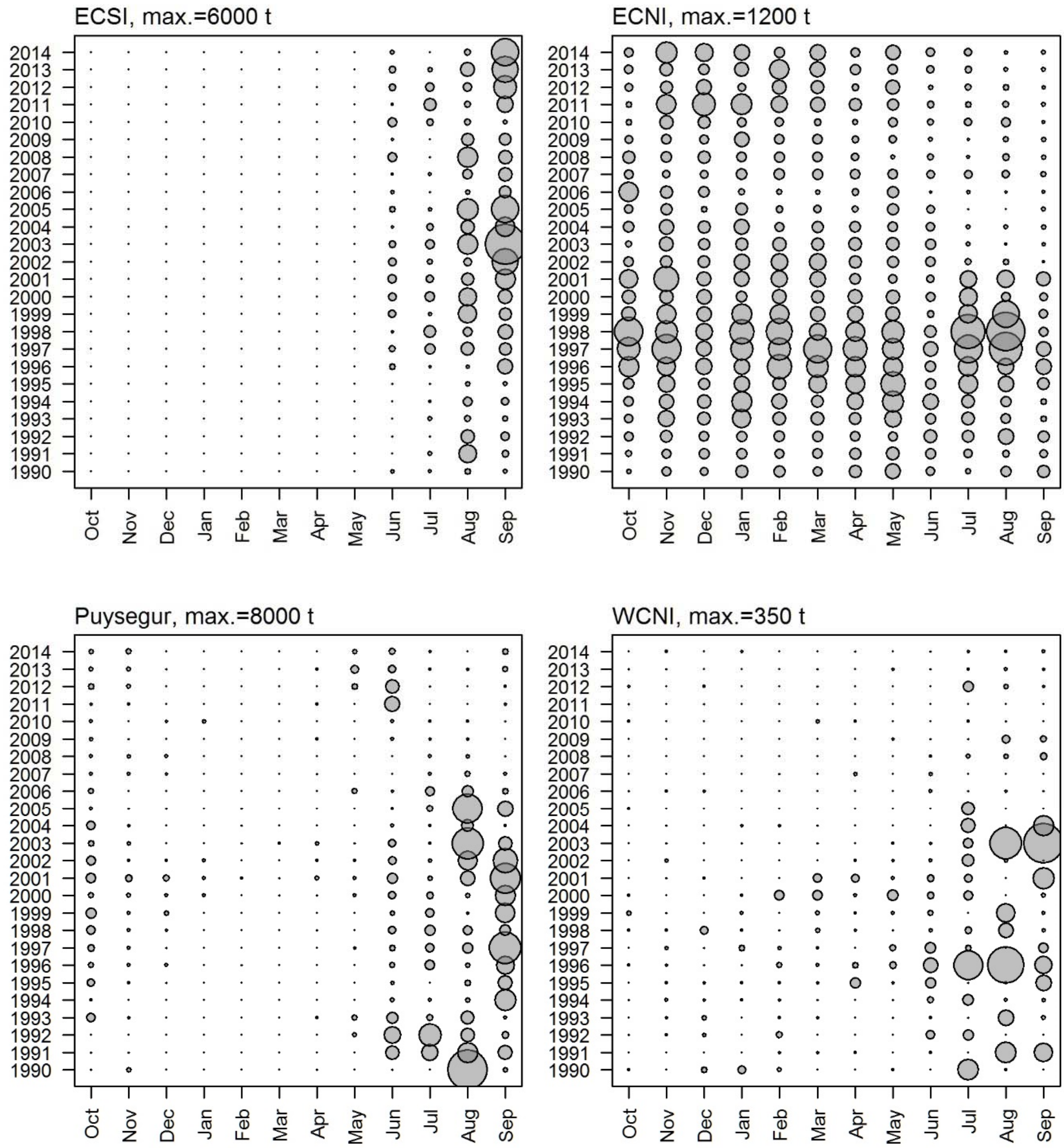


Figure 5: Distribution of hoki catch by month and area for the 1989–90 to 2013–14 fishing years.



ECSI, max.=6000 t
ECNI, max.=1200 t
Puysegur, max.=8000 t
WCNI, max.=350 t
2014
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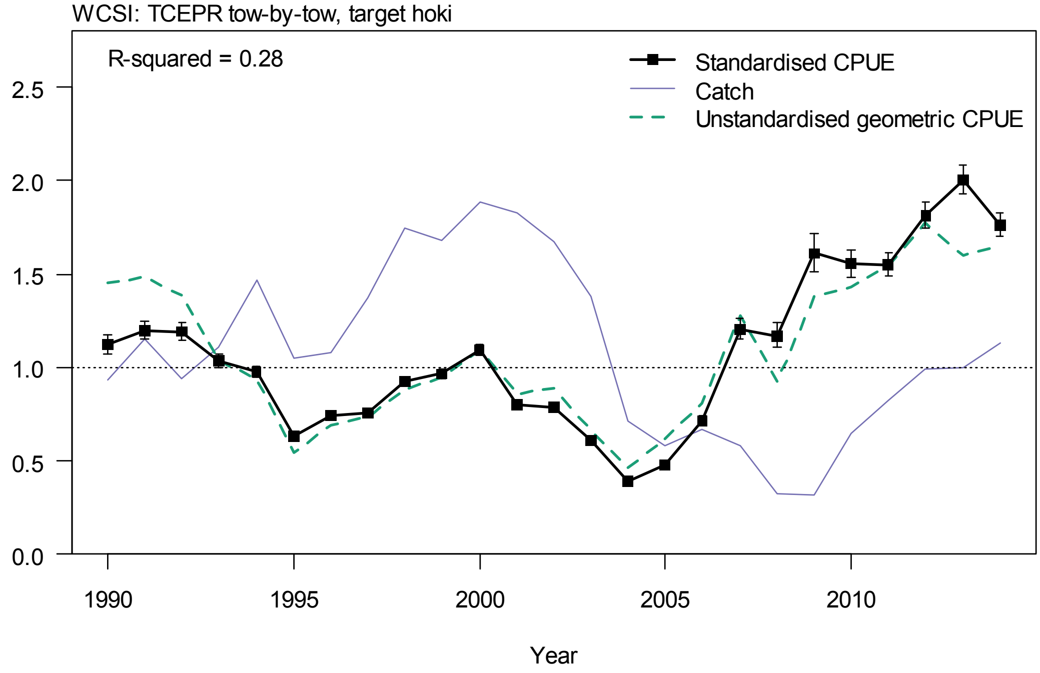
Figure 5 ctd.



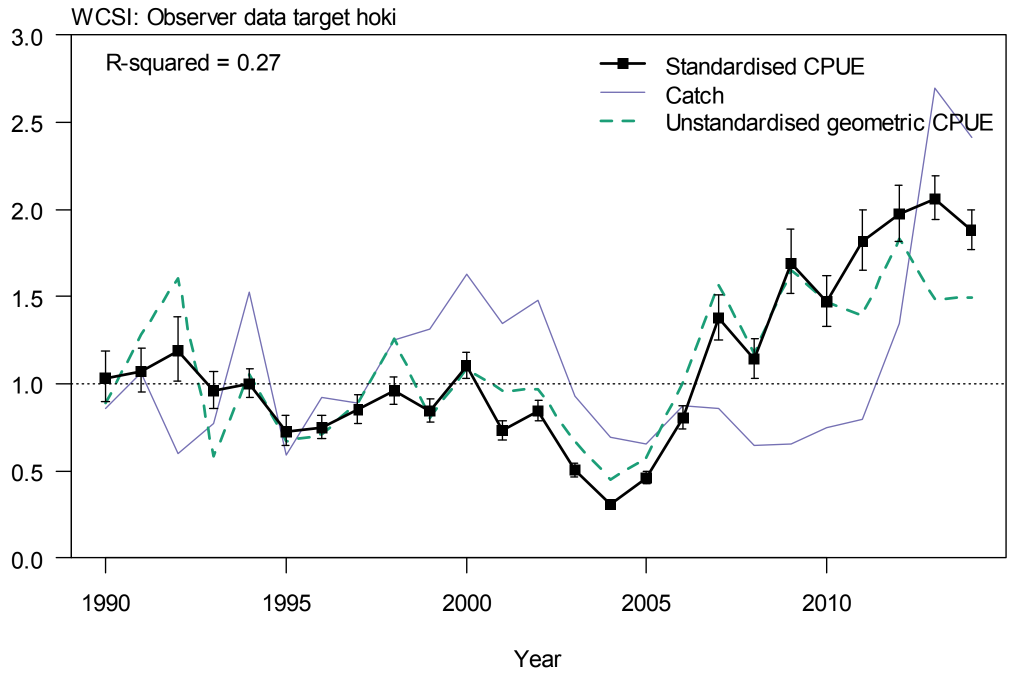


Figure 6a: Model catch, and unstandardised geometric and standardised CPUE indices for core data hoki tows from the WCSI for 1990–2014.

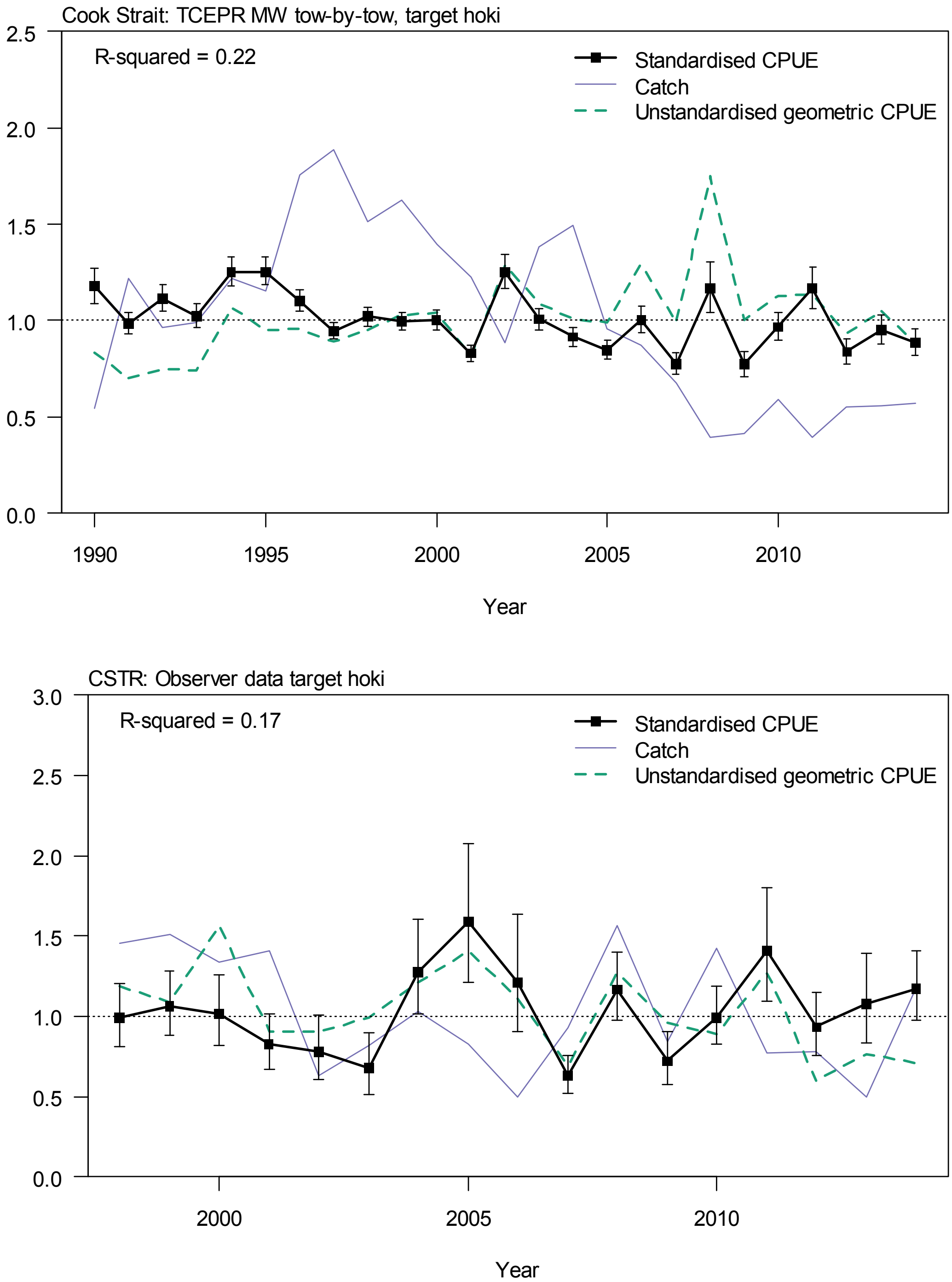
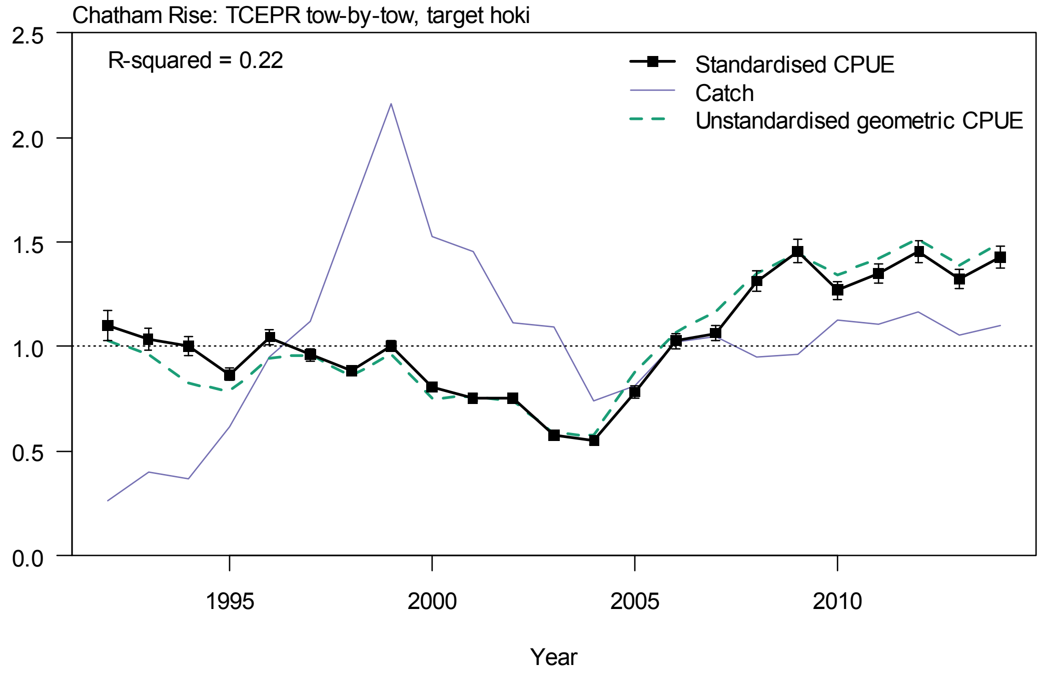


Figure 6a ctd. Model catch, and unstandardised geometric and standardised CPUE indices for core data hoki tows from Cook Strait for 1990–2014. Cook Strait included only midwater tows.



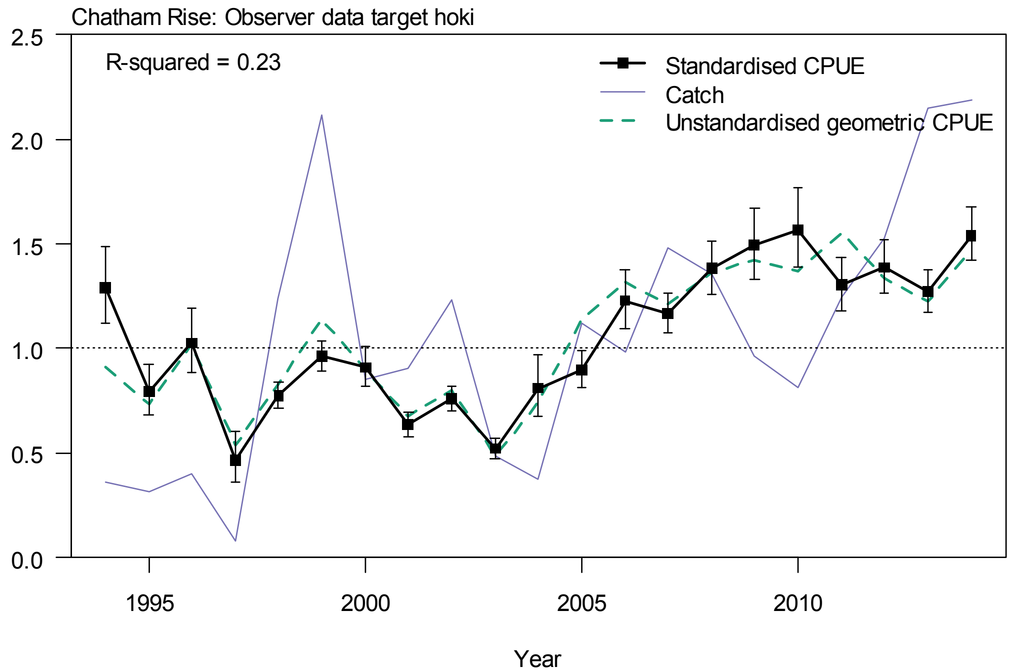
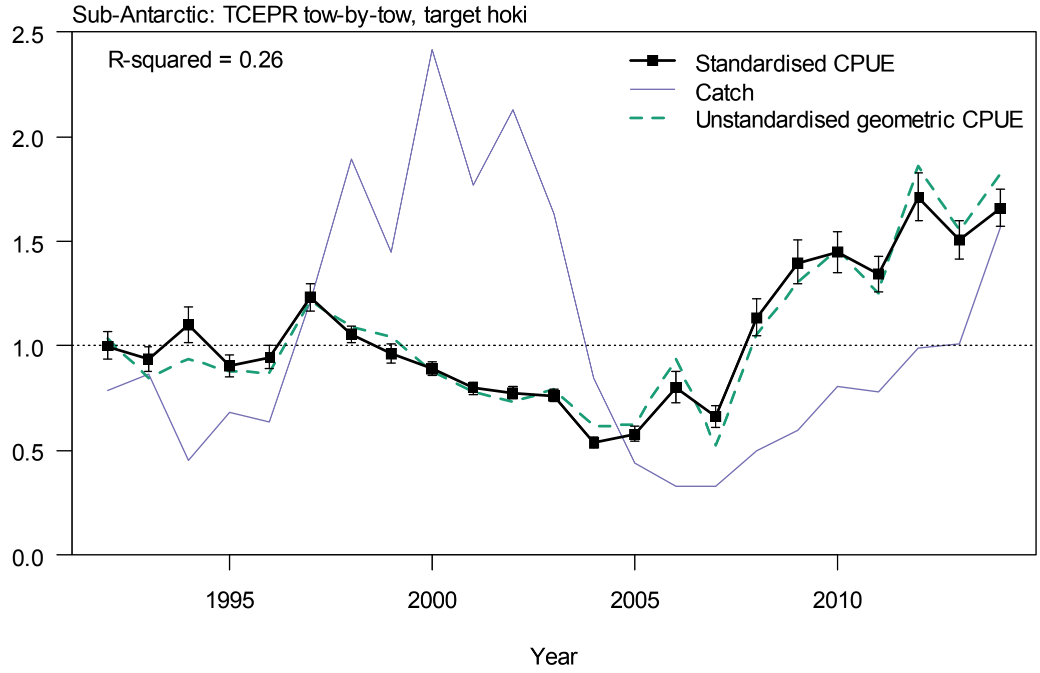


Figure 6a ctd. Model catch, and unstandardised geometric and standardised CPUE indices for core data hoki tows from the Chatham Rise for 1990–2014. Dataset for Chatham Rise included only bottom tows.



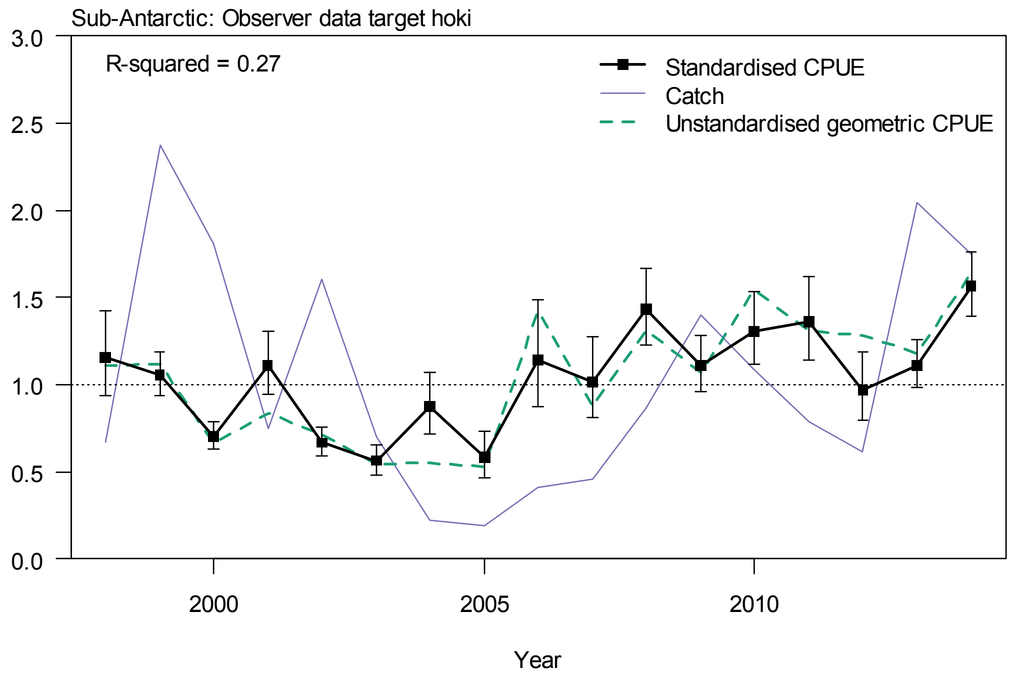


Figure 6a ctd. Model catch, and unstandardised geometric and standardised CPUE indices for core data hoki tows from the Sub-Antarctic for 1990–2014. Datasets for Sub-Antarctic included only bottom tows.

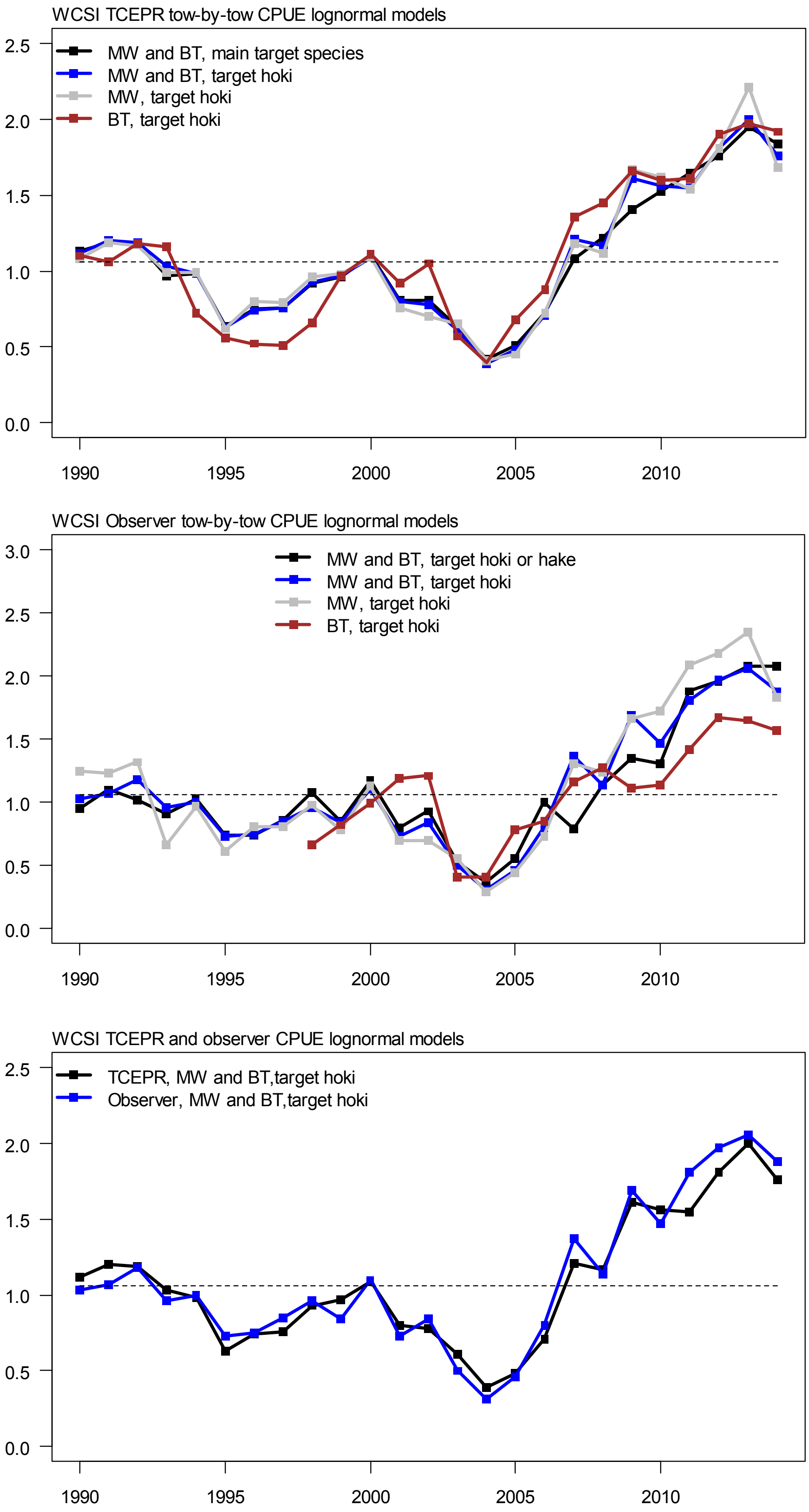


Figure 6b: Comparison of relative standardised CPUE indices from model runs for each area.

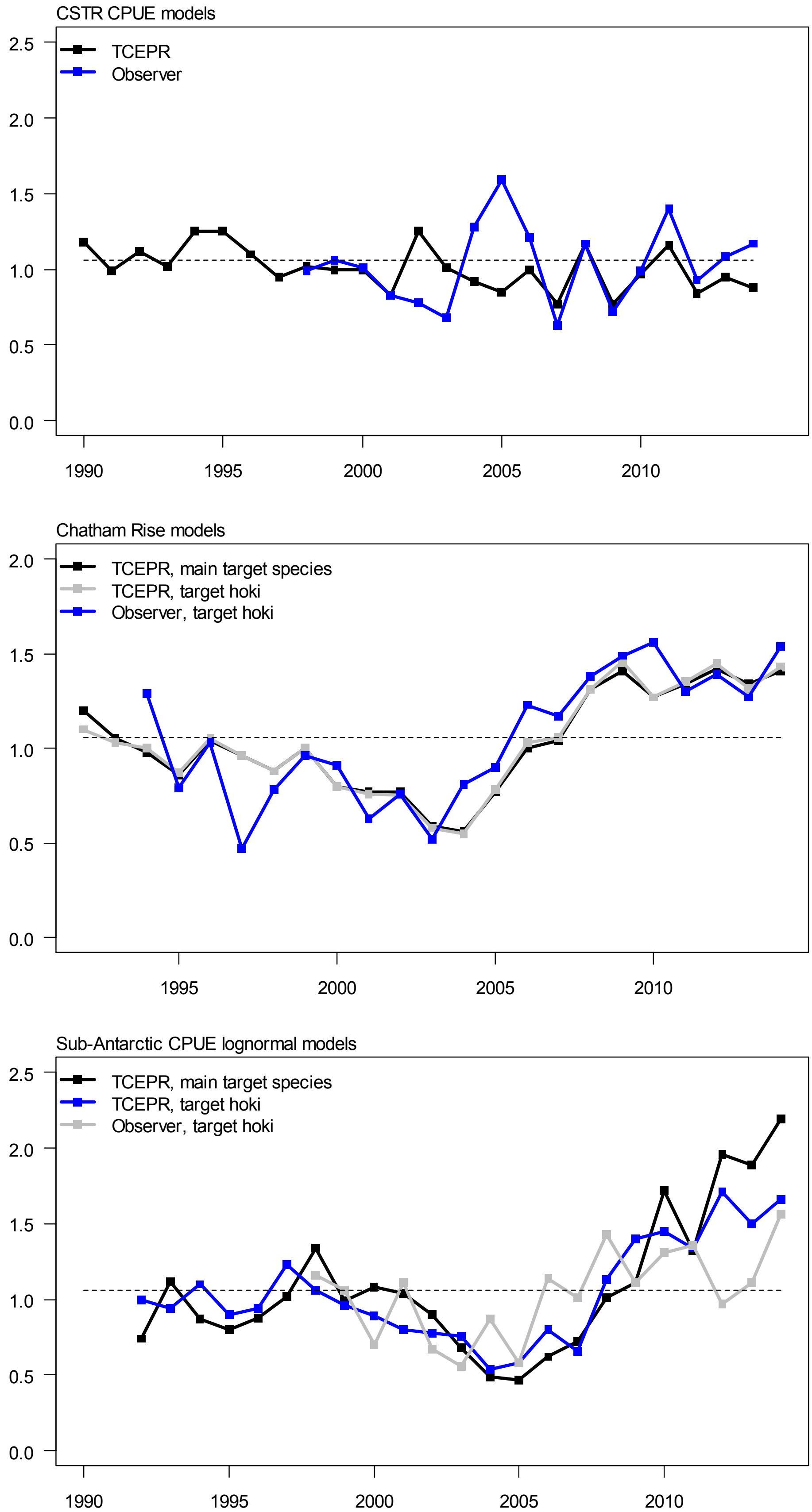


Figure 6b: ctd.

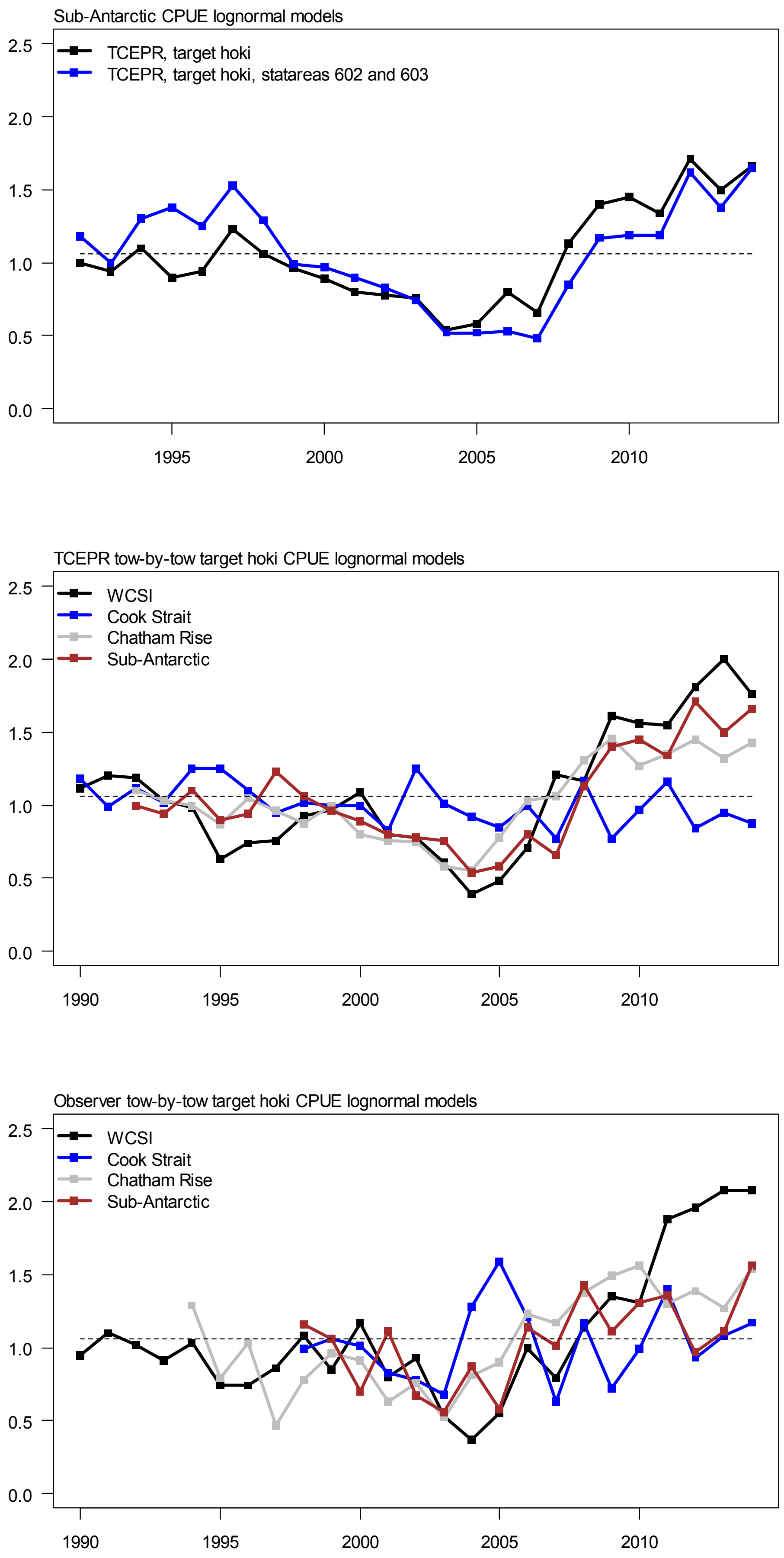


Figure 6b: ctd.

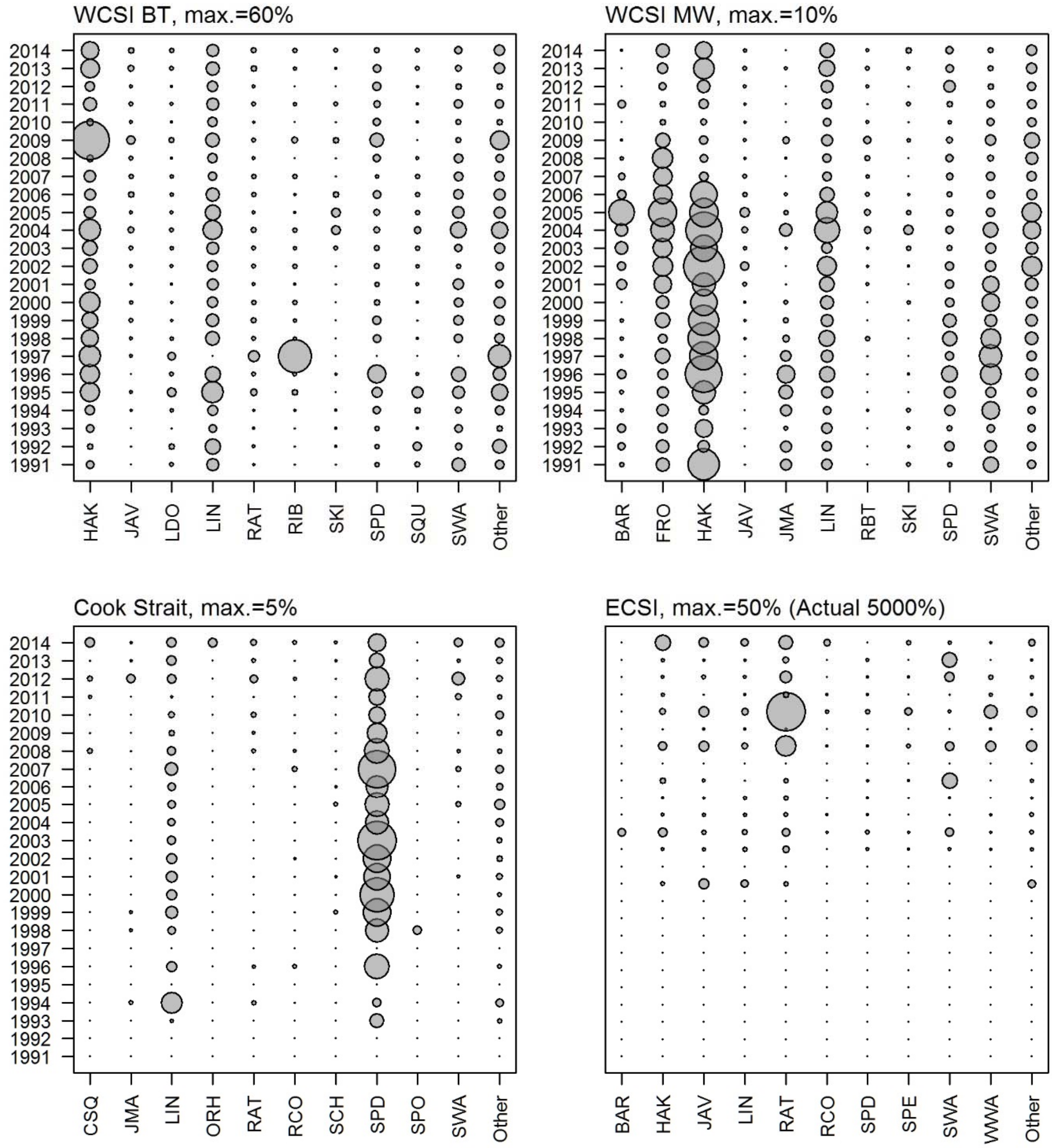
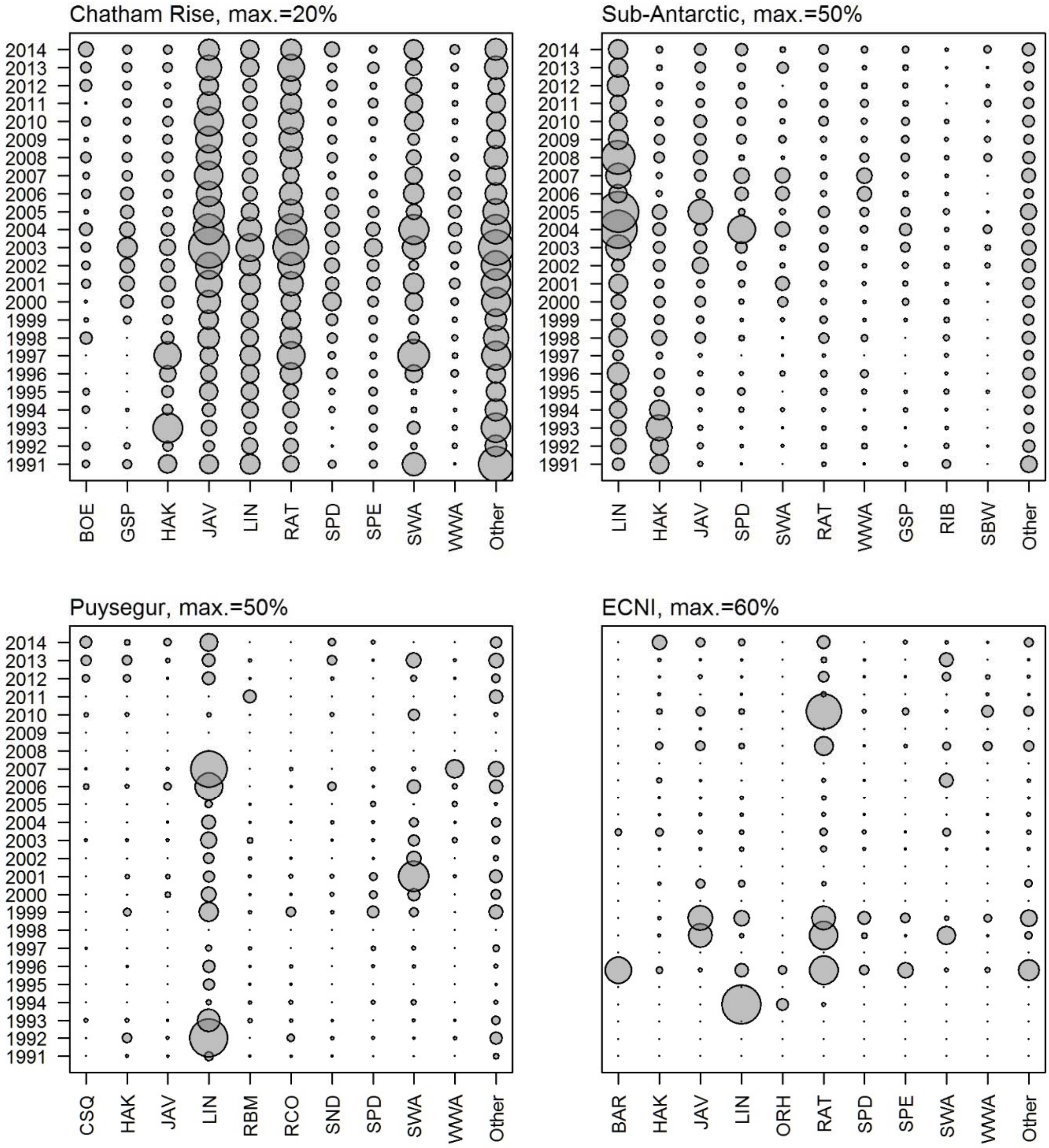
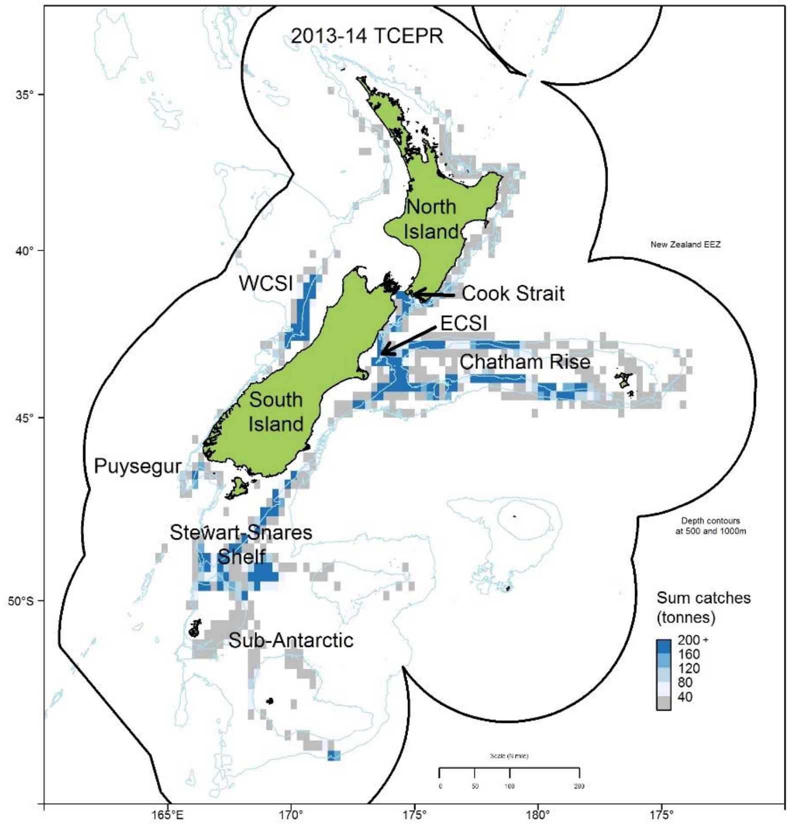


Figure 7: Bycatch rates on vessels with Observer Programme observers in the hoki fishery for tows targeting hoki from 1990–91 to 2013–14. The WCSI (bottom and midwater trawls), Cook Strait, and ECSI data cover the spawning season (June–September) only. No observer data for Cook Strait 1994–95 and 1996–97, Puysegur 1997–98 to 2008–09, and ECSI 2006–07. Bycatch rates not calculated where observed hoki catch is less than 100 t. Species chosen are the top eight by observed catch in an area. Species include: BAR, barracouta; CSQ, leafscale gulper shark; FRO, frostfish; GSP, pale ghost shark; HAK, hake; HOK, hoki; JAV, javelinfish; JMA, jack mackerels; LIN, ling; RAT, rattails; RCO, red cod; SPD, spiny dogfish; SPO, rig; SQU, arrow squid; SWA, silver warehou; and WWA, white warehou.



Chatham Rise, max.=20%
BOE GSP HAK JAV LIN RAT SPD SPE SWA WWA Other
Sub-Antarctic, max.=50%
LIN HAK JAV SPD SWA RAT WWA GSP RIB SBW Other
Puysegur, max.=50%
CSQ HAK JAV LIN RBM RCO SND SPD SWA WWA Other
ECNI, max.=60%
BAR HAK JAV LIN ORH RAT SPD SPE SWA WWA Other
2014 2013 2012 2011 2010 2009 2008 2007 2006 2005 2004 2003 2002 2001 2000 1999 1998 1997 1996 1995 1994 1993 1992 1991

Figure 7: ctd



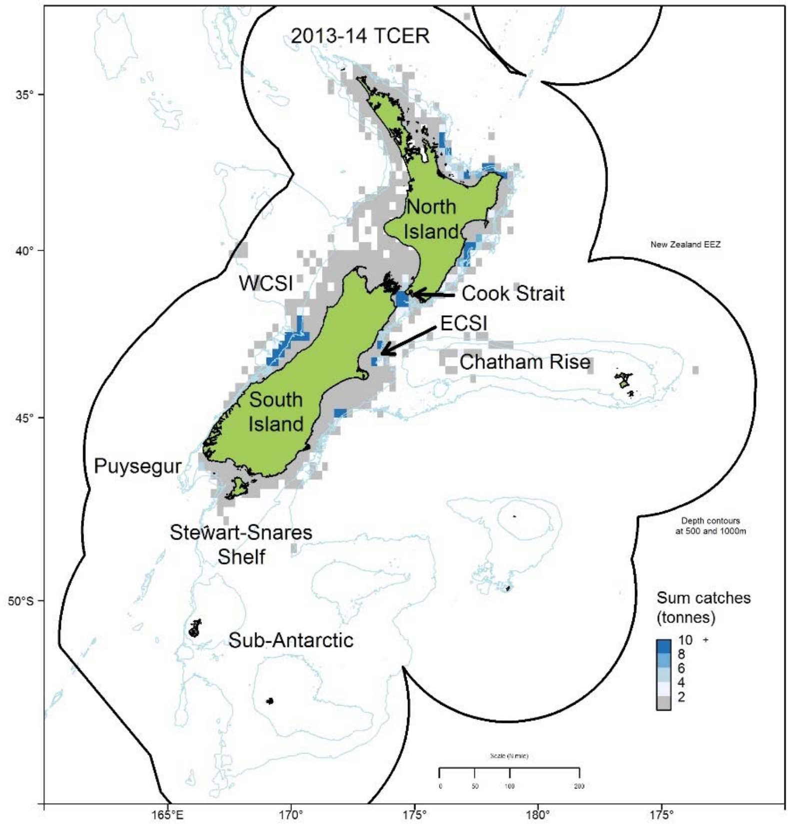


Figure 8: Density plots of all commercial TCEPR and TCER trawls where hoki was caught in the 2013–14 fishing year. TCEPR plot also shows observed positions as black dots.

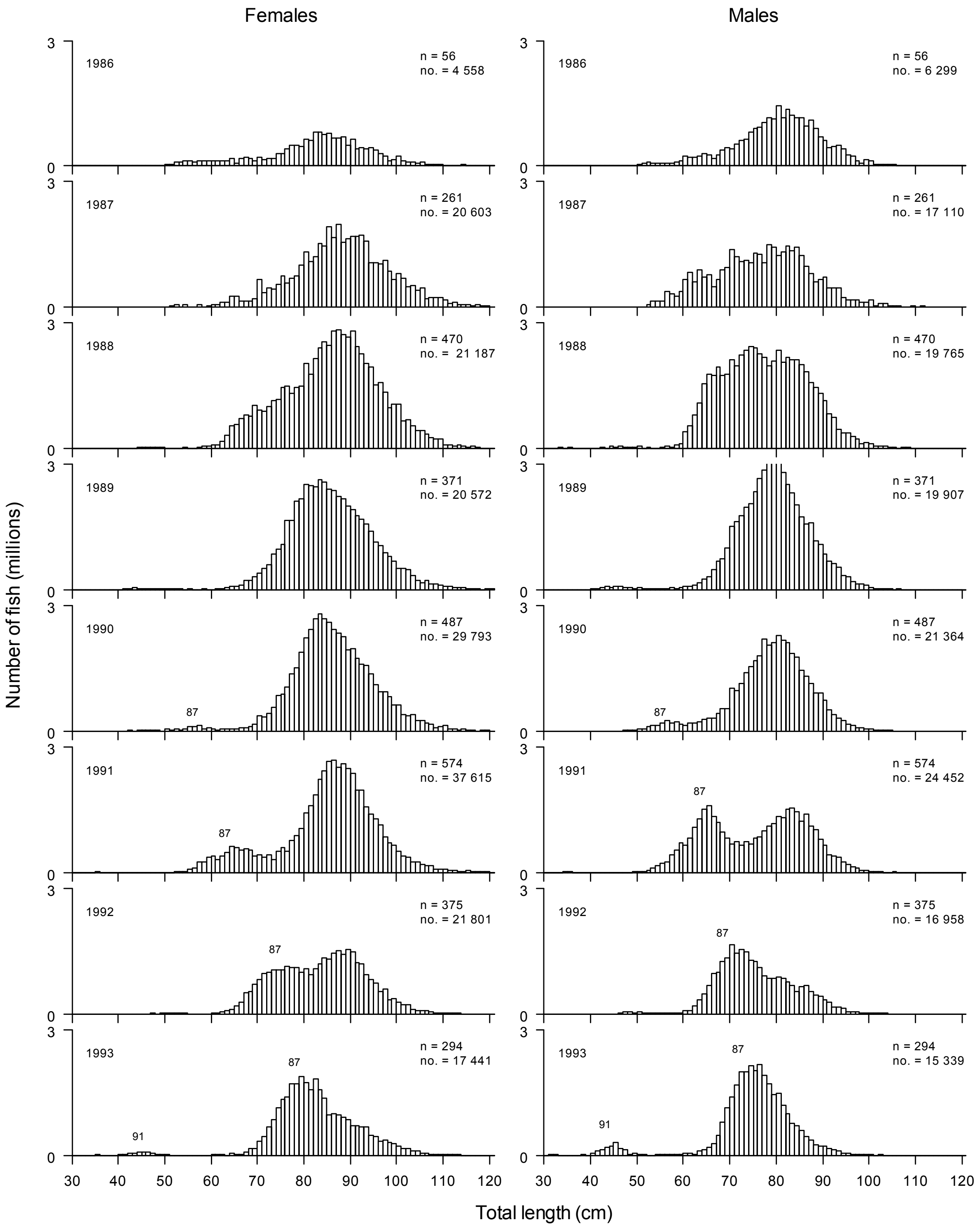


Figure 9: Length frequency distributions of hoki in commercial catches from the west coast South Island spawning fishery from 1989 to 1993 sampled at sea by the Observer Programme. n, number of tows sampled; no., number of fish sampled. Numbers above the histograms mark estimated year-class modes, e.g., 91 = 1991 year-class.

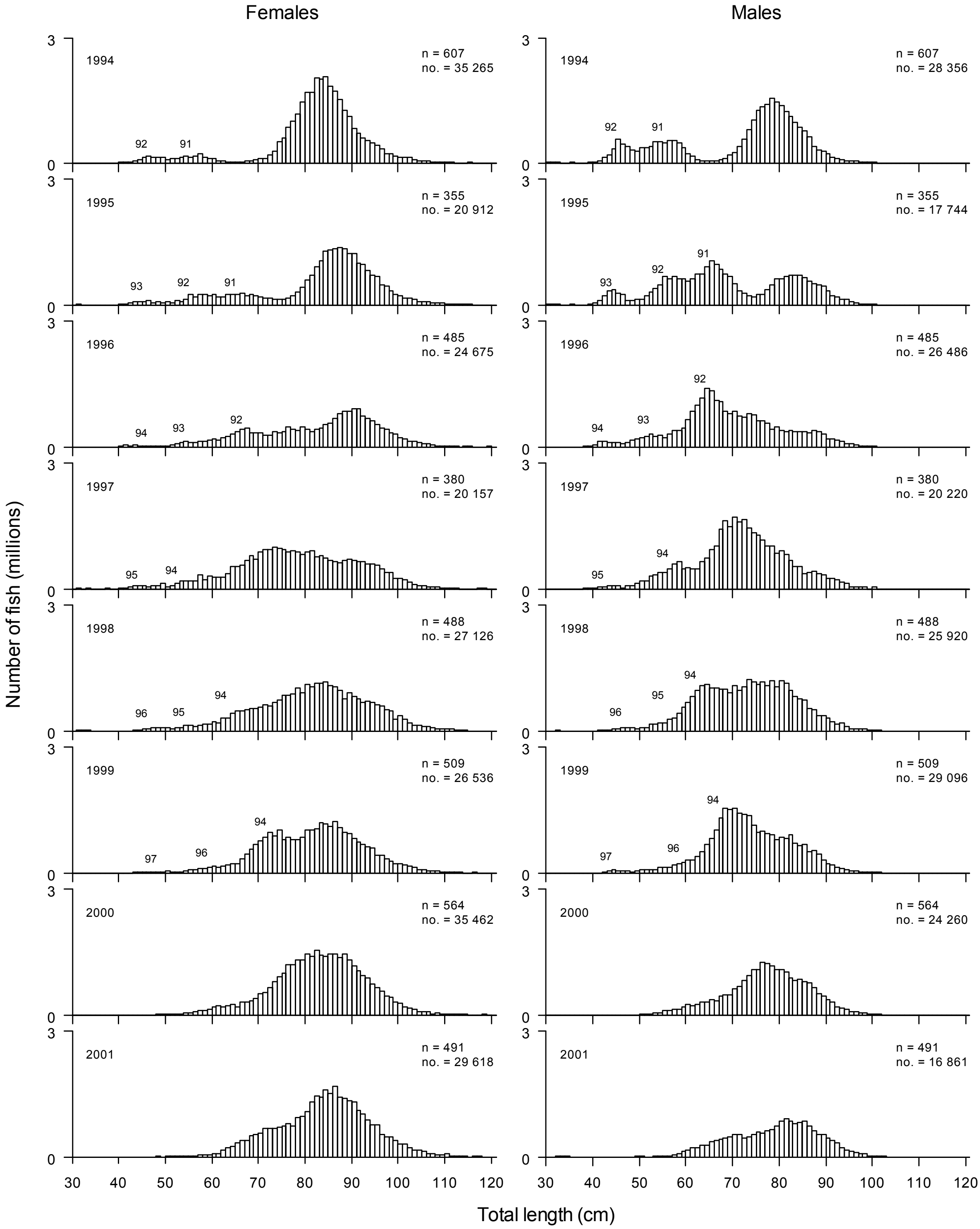


Figure 9 ctd. Length frequency distributions of hoki in commercial catches from the west coast South Island spawning fishery from 1994 to 2001 sampled at sea by the Observer Programme. n, number of tows sampled; no., number of fish sampled. Numbers above the histograms mark estimated year-class modes, e.g., 91 = 1991 year-class.

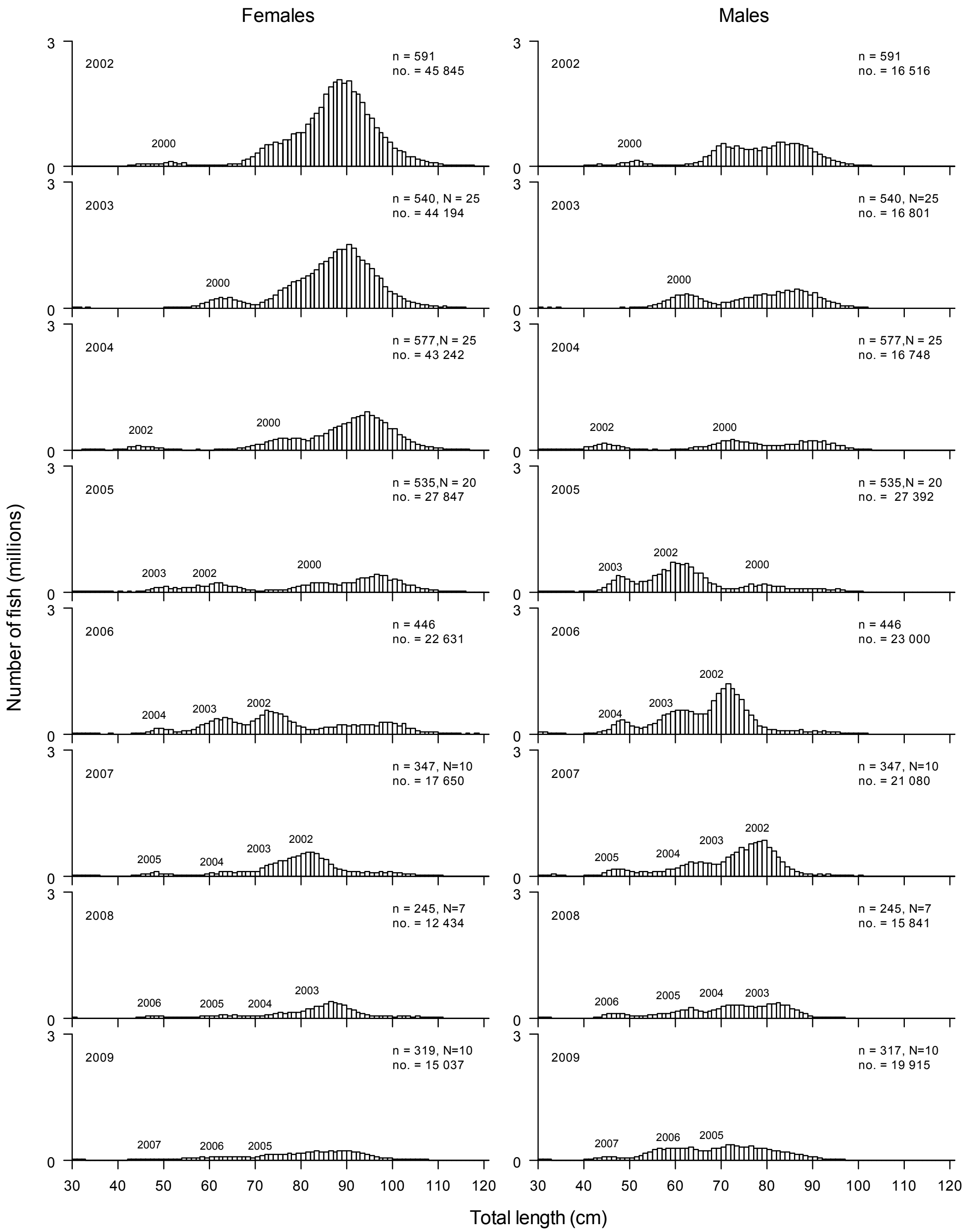


Figure 9 ctd. Length frequency distributions of hoki in commercial catches from the west coast South Island spawning fishery from 2002 to 2009. In 2003–05 and 2007–09, Observer Programme data are combined with samples of landings from inside the 25 n. mile line sampled by NIWA. n, number of tows sampled; no., number of fish sampled; N, number of landings sampled. Numbers above the histograms mark estimated year-class modes, e.g., 2004 = 2004 year-class.

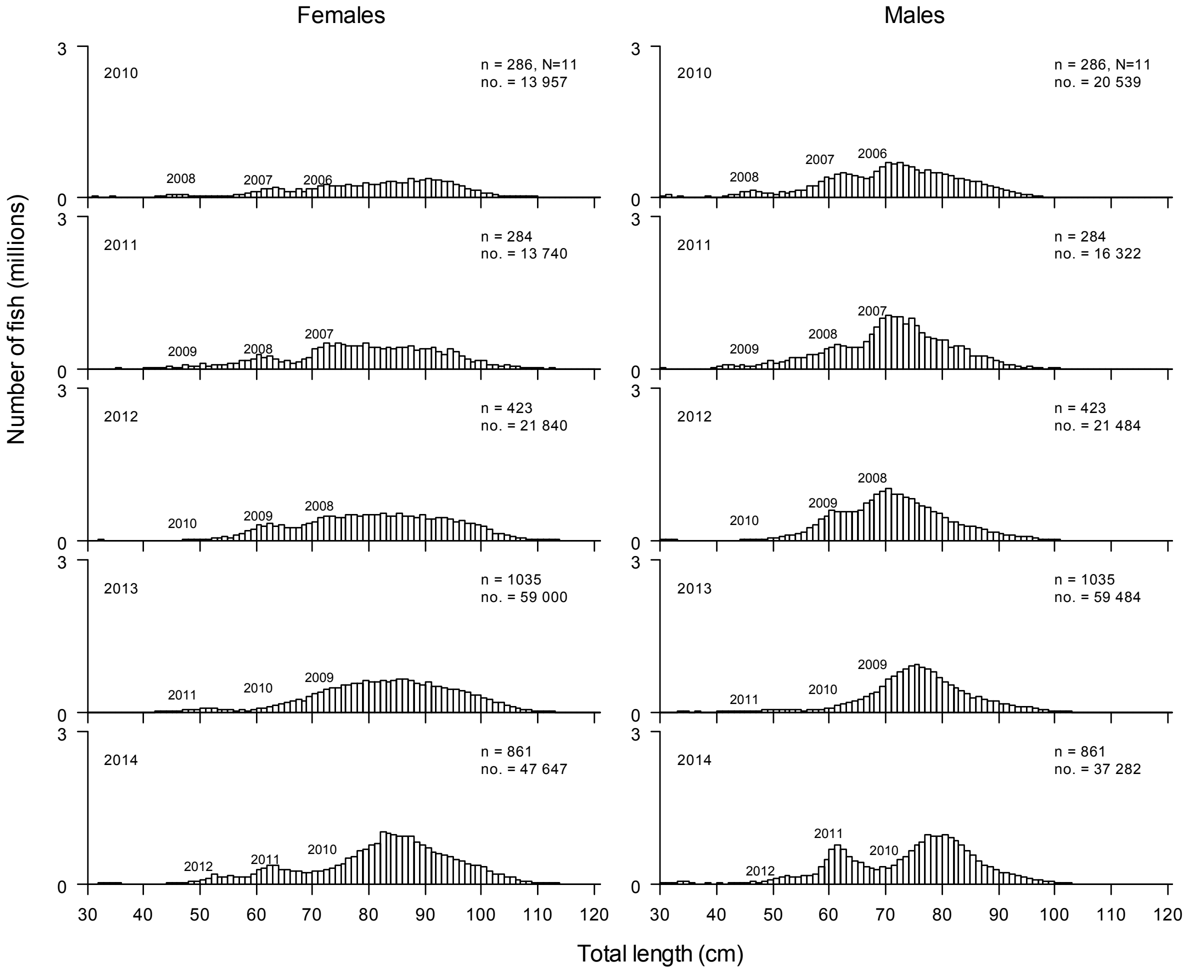


Figure 9 ctd. Length frequency distributions of hoki in commercial catches from the west coast South Island spawning fishery from 2010 to 2014. In 2010, Observer Programme data are combined with samples of landings from inside the 25 n. mile line sampled by NIWA, in 2011–2012 there is only Observer data outside the 25 n. mile line, and in 2013 and 2014 there are Observer data inside the 25 n. mile line in May-June, and Observer data outside the 25 n. mile line in June–September. n, number of tows sampled; no., number of fish sampled; N, number of landings sampled. Numbers above the histograms mark estimated year-class modes, e.g., 2007 = 2007 year-class.

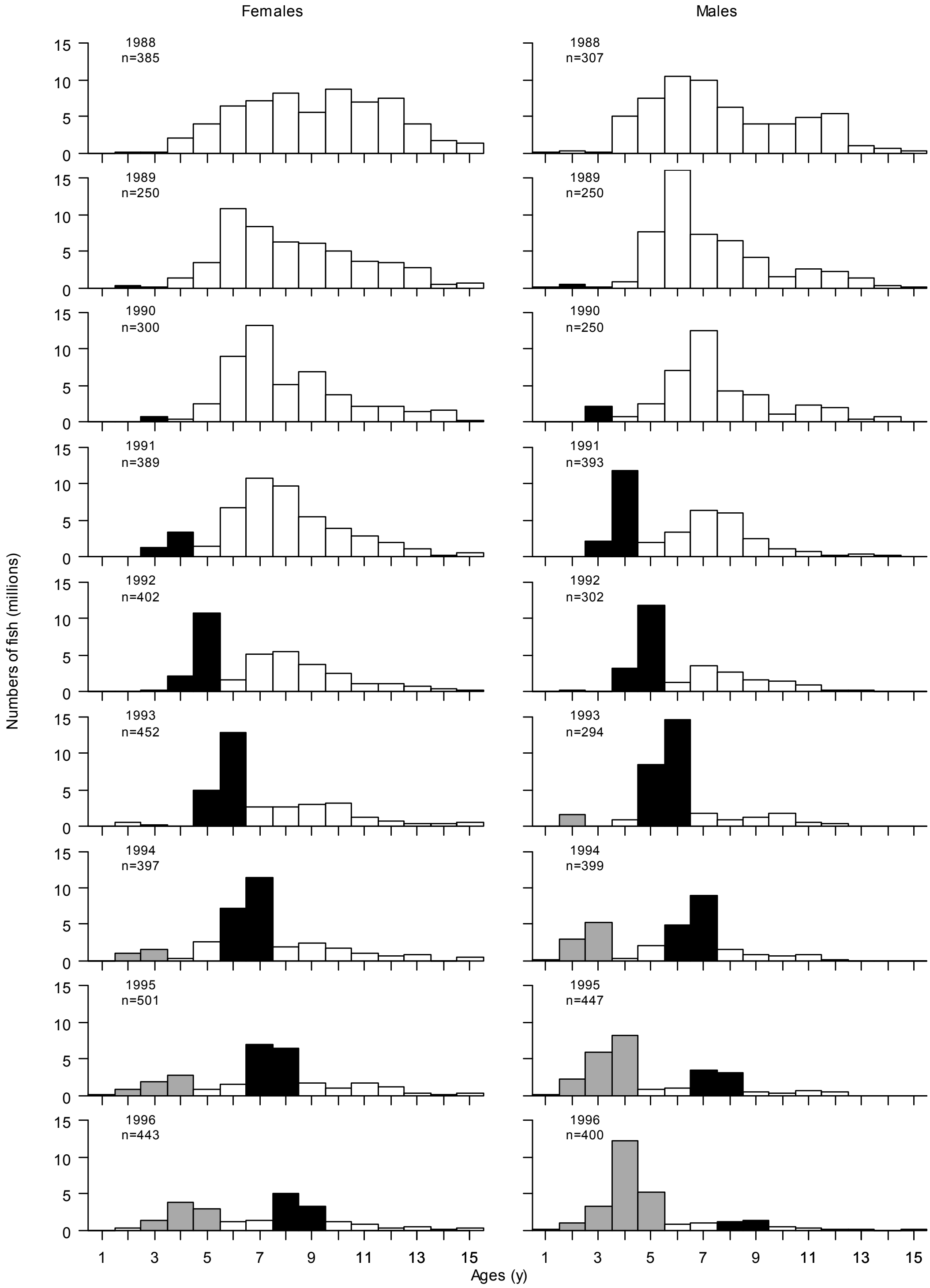


Figure 10: Catch at age of hoki in commercial catches from the west coast South Island spawning fishery from 1988 to 2014. n, number of fish aged. Black bars for the years 1990 to 2000 show 1987 and 1988 year-classes, grey bars show 1991–94 year-classes, and light grey bars in the 2004–2012 seasons represent the 2002 and 2003 year-classes.

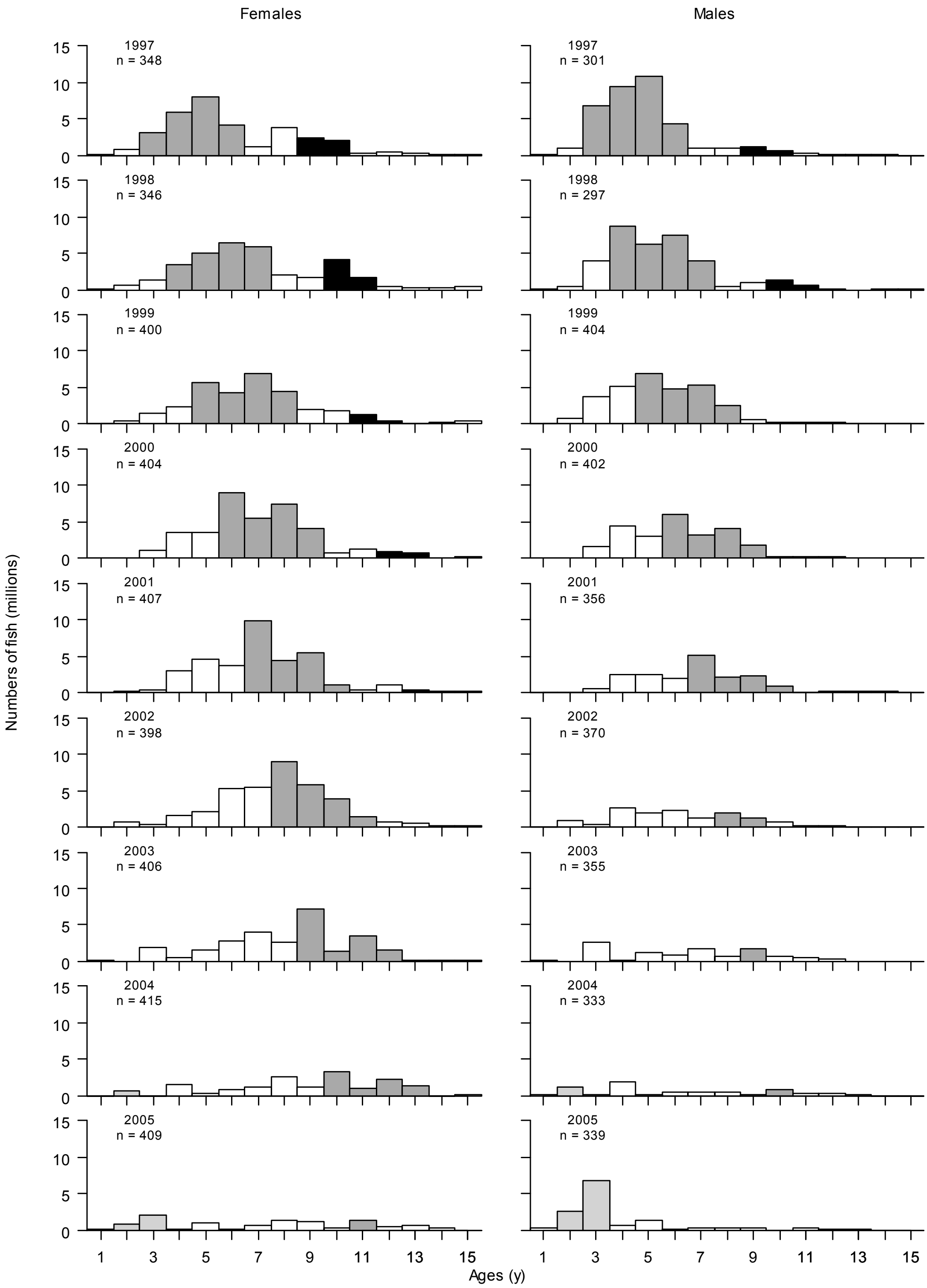


Figure 10 ctd.

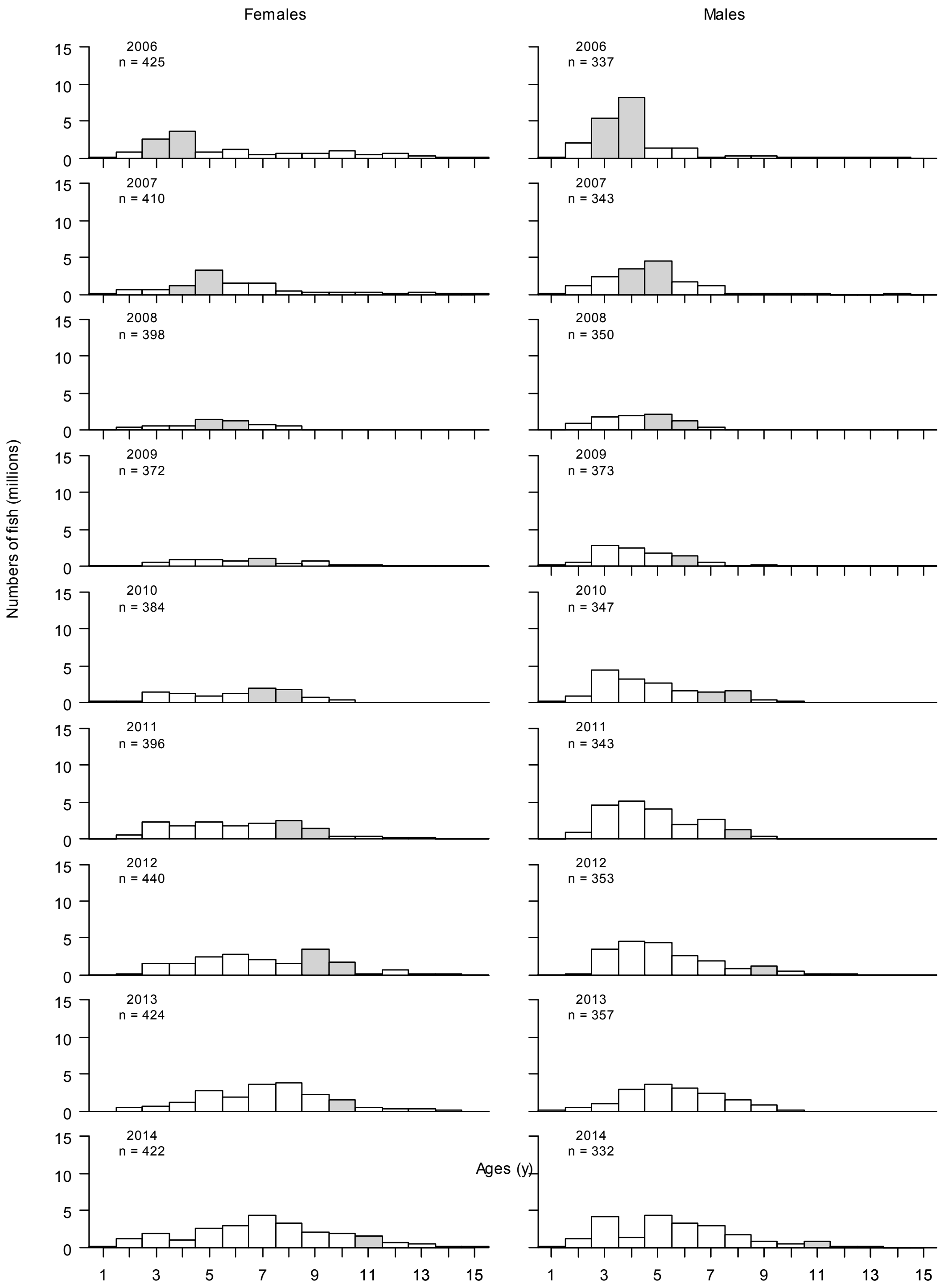


Figure 10 ctd.

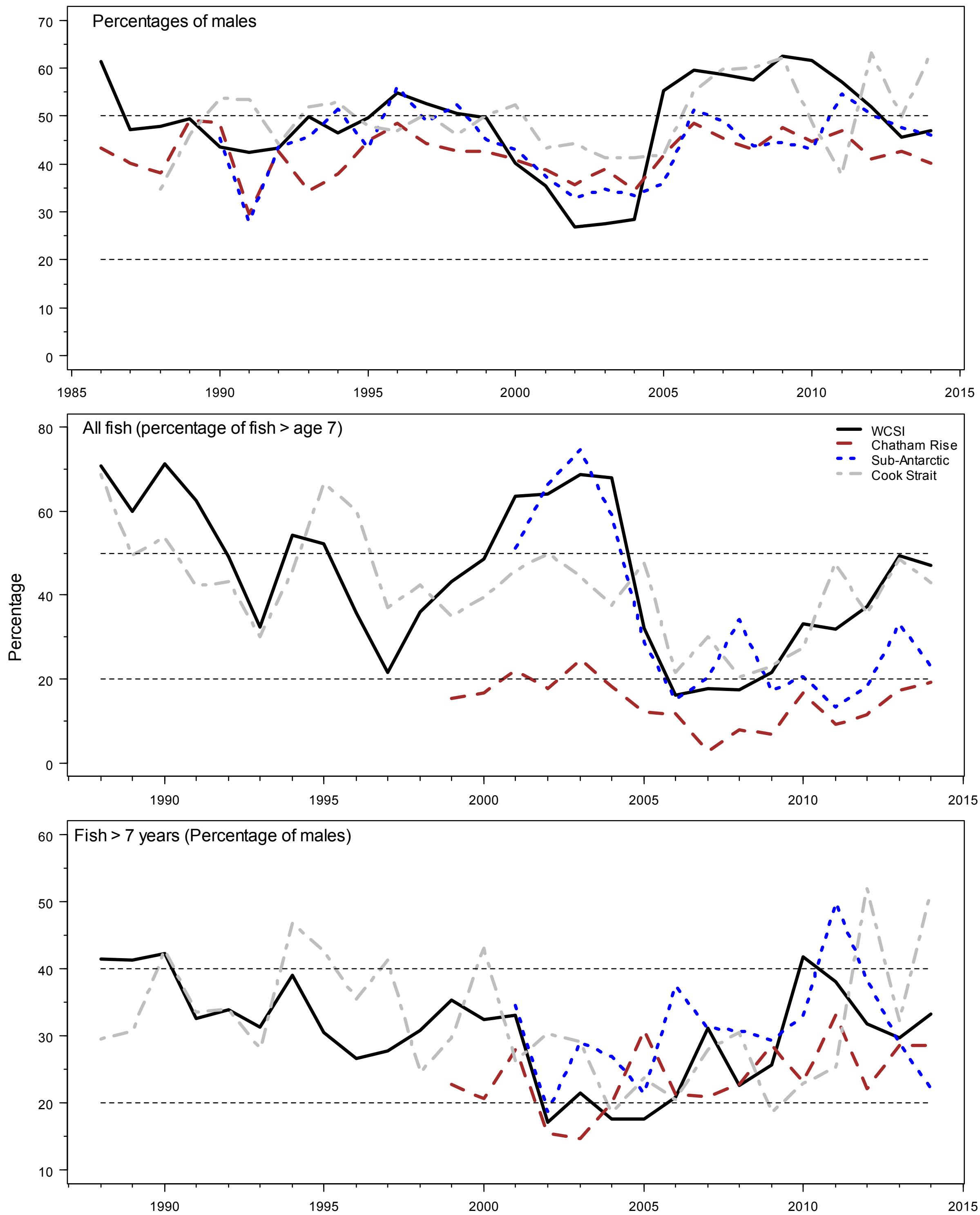


Figure 11a: Percentage of males in the catch, percentage of all fish aged 7 and older in the catch, and percentage of male fish (of those that are over seven and older) in the catch, by area and fishing year.

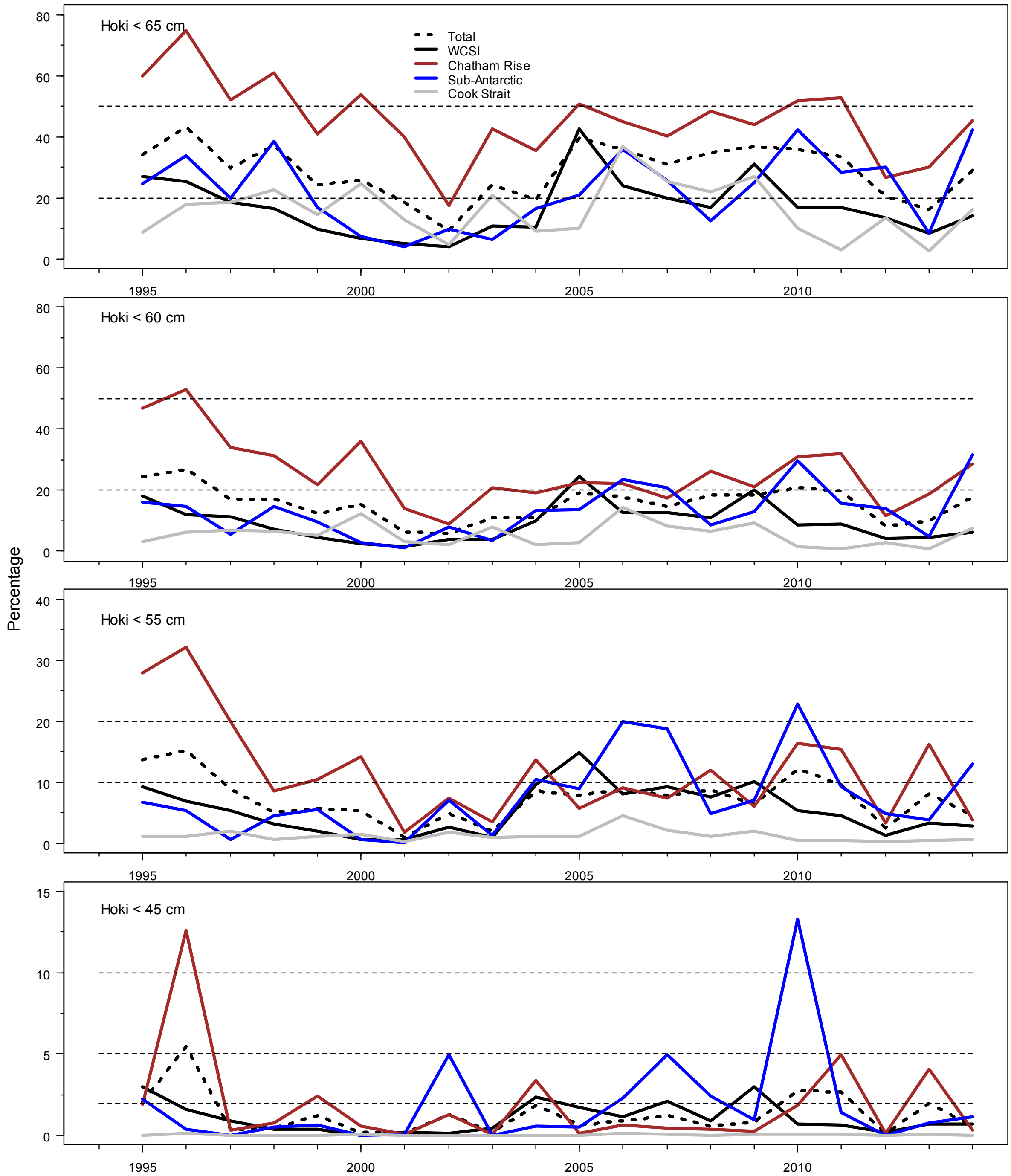
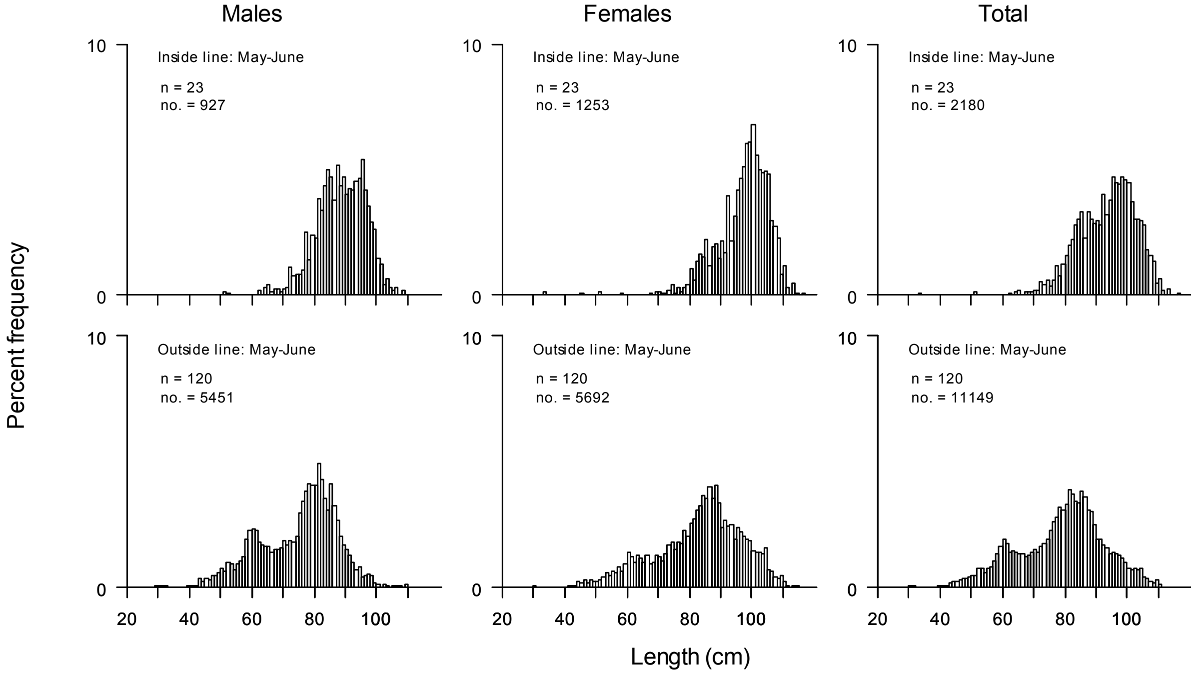


Figure 11b: Percentage of small fish in the catch by area and fishing year.

(a) May–June 2014



(b) July 2014

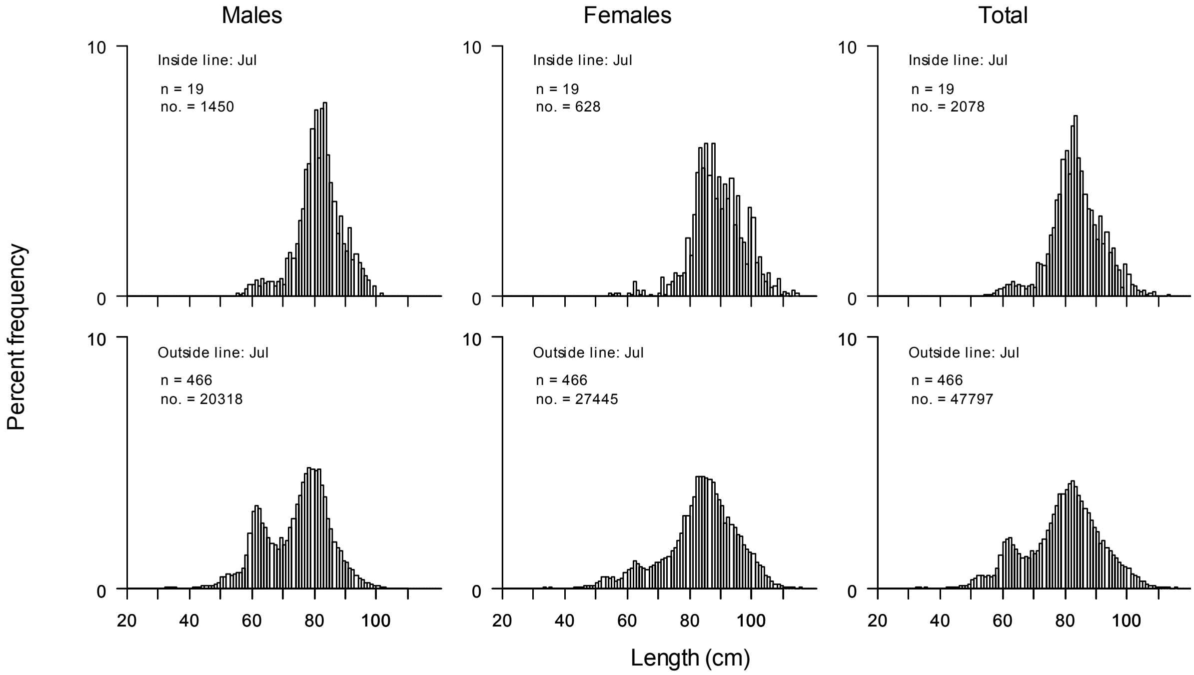


Figure 12: Comparison of length frequency distributions from inside and outside the 25 n. mile line from fish sampled at sea by the Observer Programme in (a) May-June, and (b) July 2014. n, number of landings or tows sampled; no., number of fish sampled.

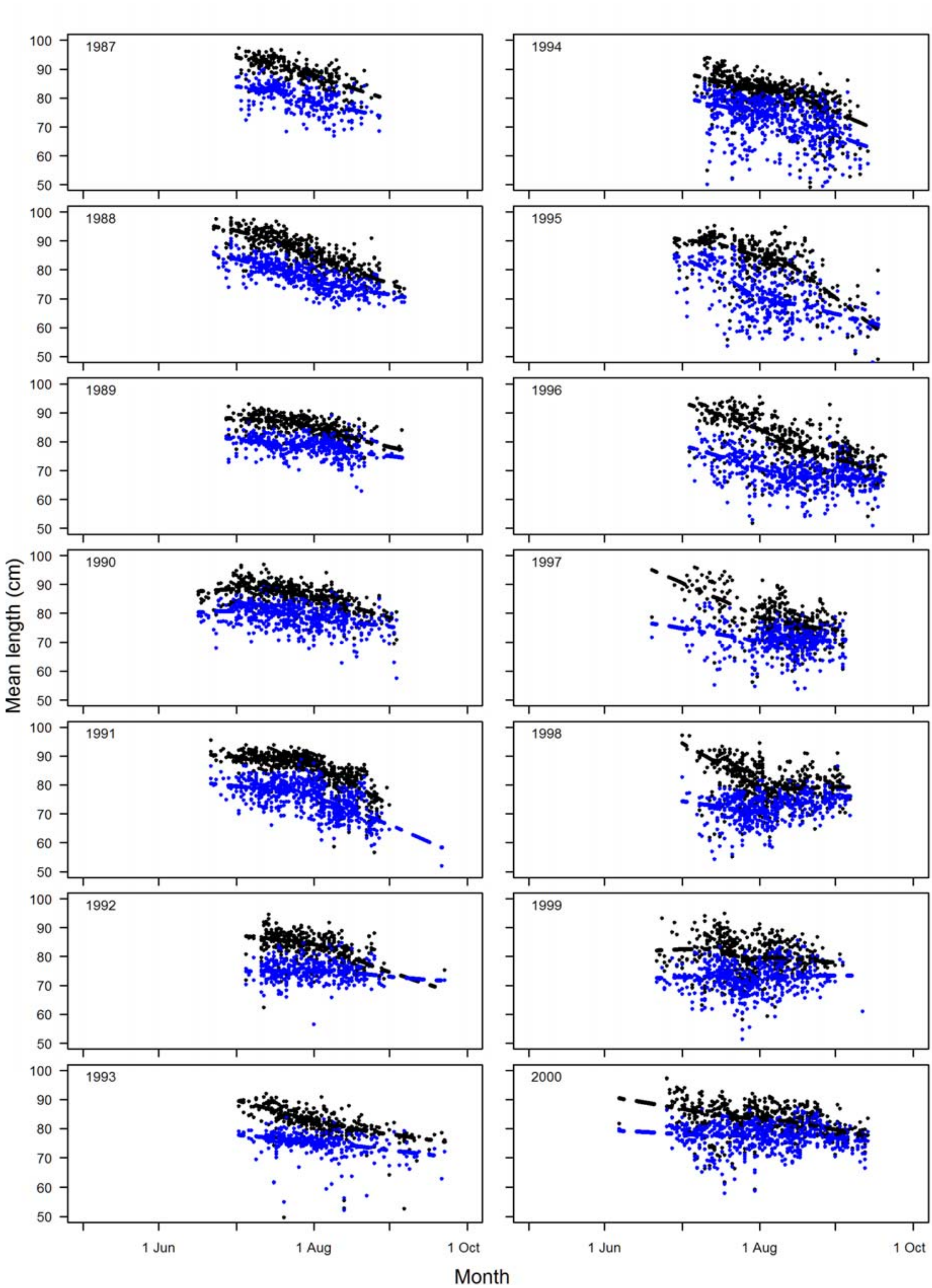


Figure 13: Mean length of female (black) and male (blue) hoki taken in commercial catches from the west coast South Island spawning fishery 1987–2000 sampled at sea by the Observer Programme. Lines are a loess fit.

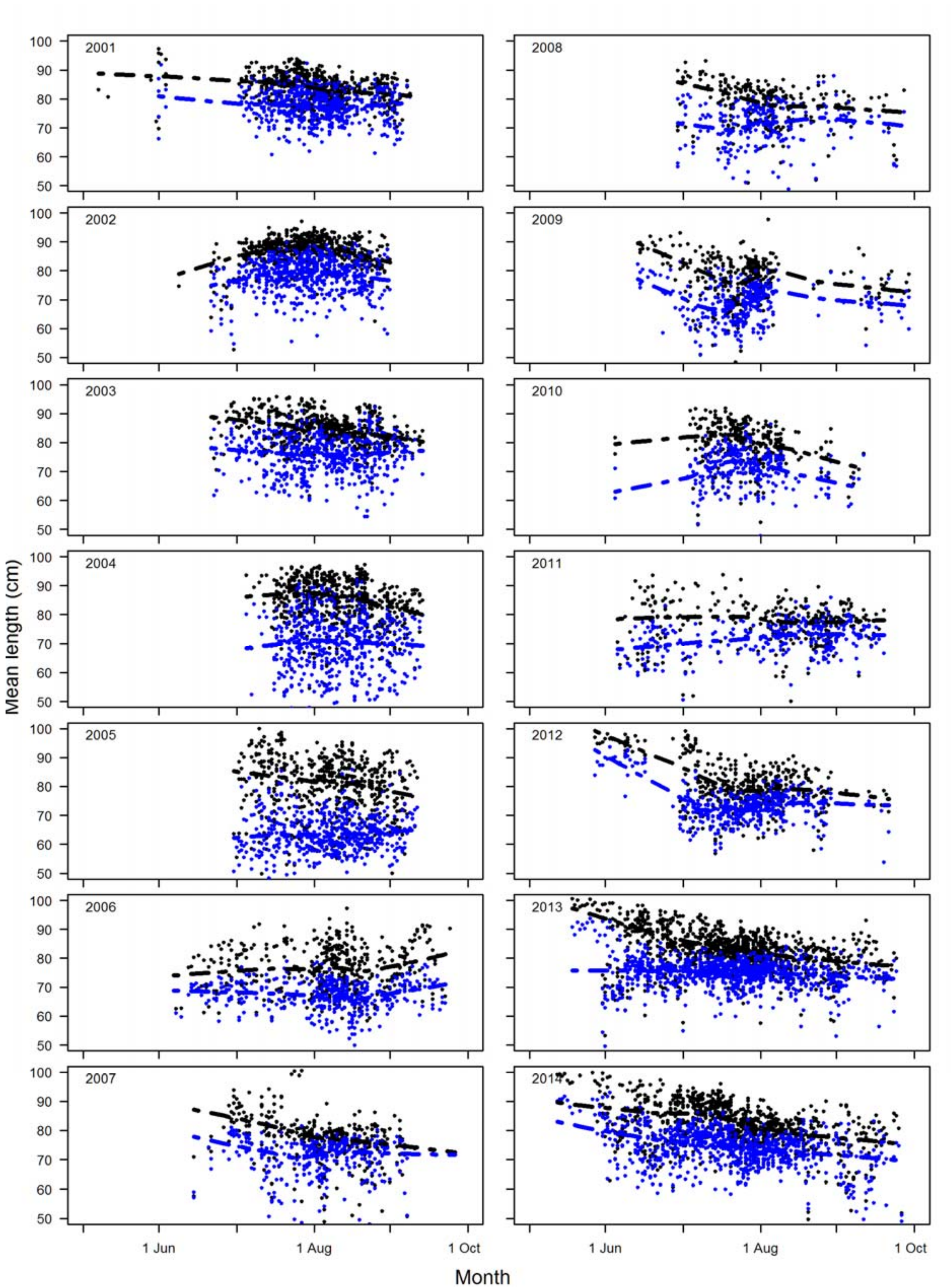
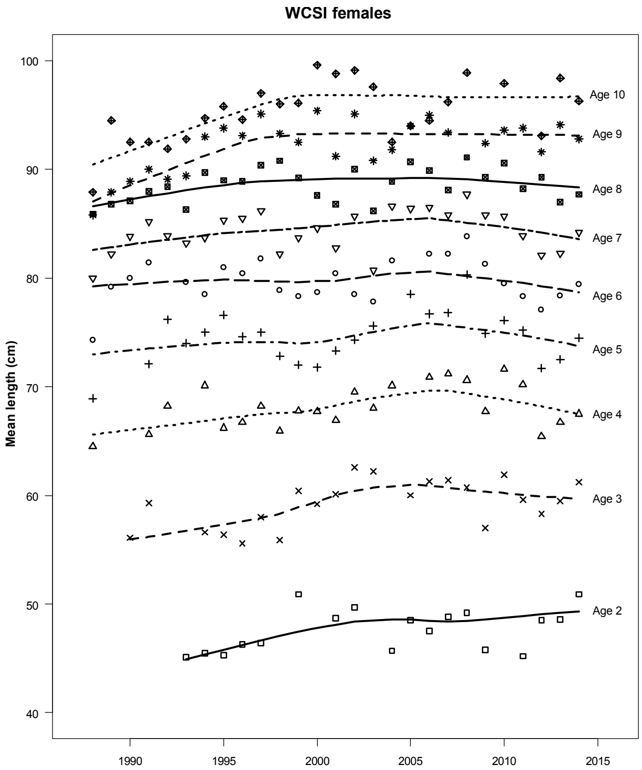


Figure 13 ctd.



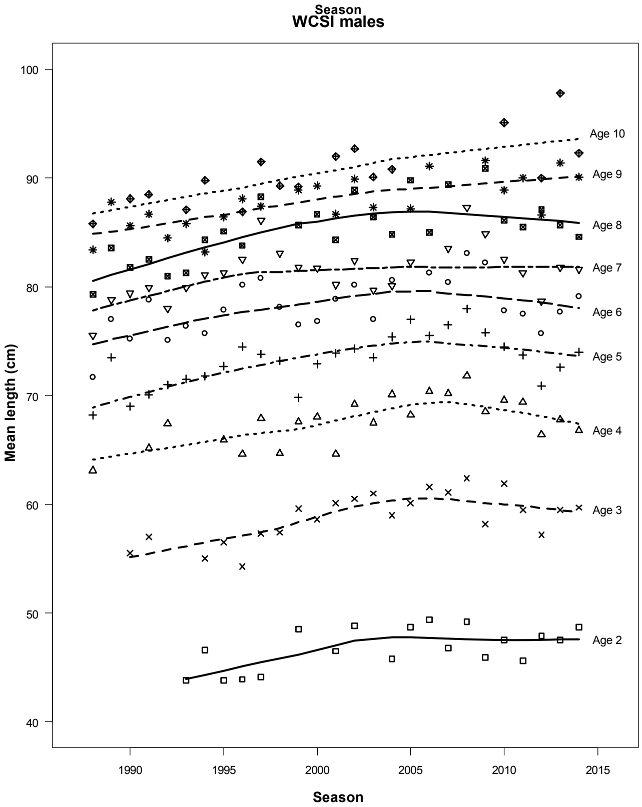


Figure 14: Mean length at age of female and male hoki taken in commercial catches from the west coast South Island spawning fishery 1988–2014 sampled at sea by the Observer Programme. Lines are a loess fit. Points with fewer than ten records are excluded.

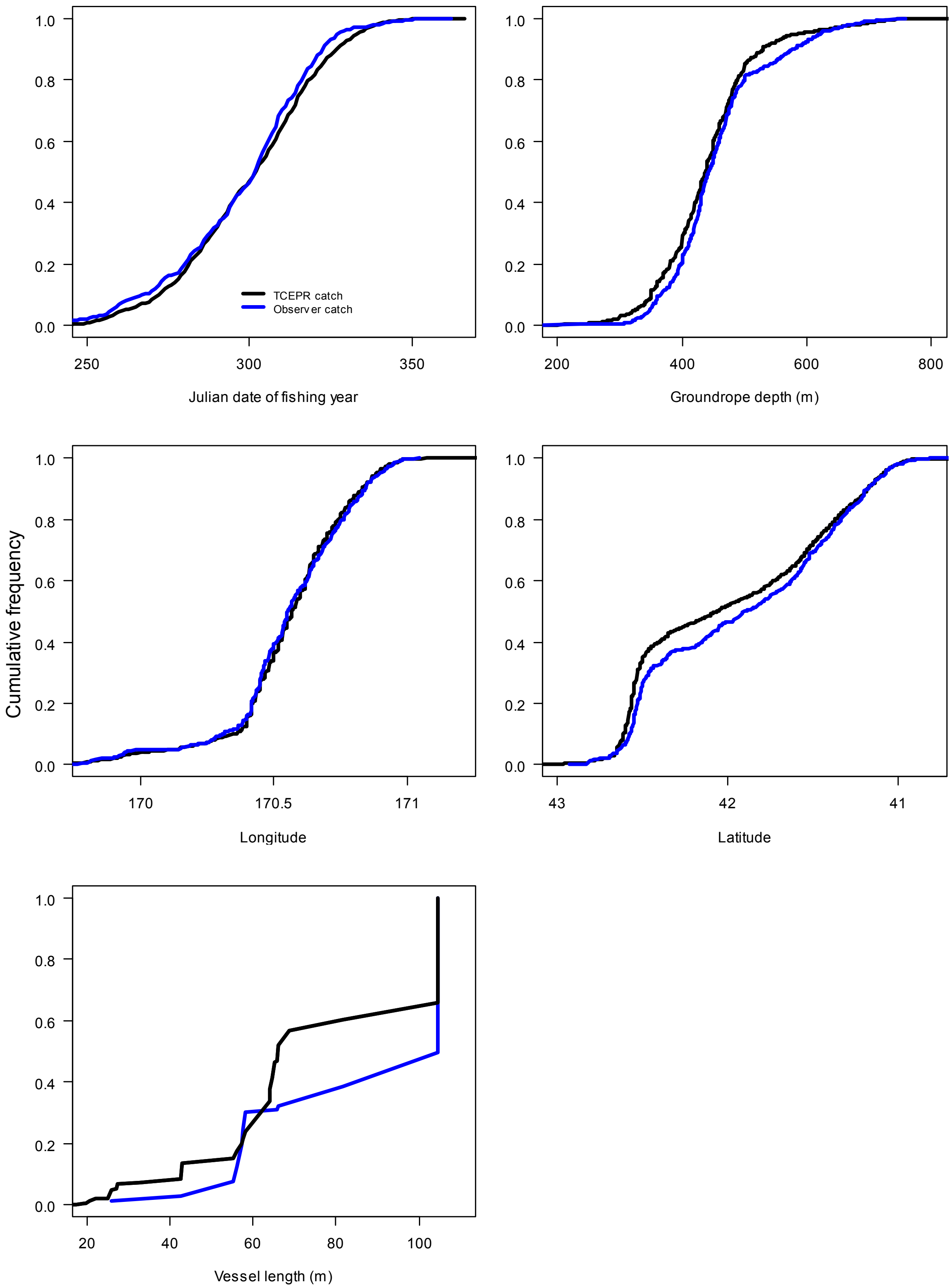


Figure 15: Comparison of WCSI 2013–14 Observer Programme catch coverage with TCEPR catches by day of year, depth, latitude, longitude, and vessel length. If sampling is representative of the fishery, then blue lines (observed catches) should overlay the black lines (TCEPR catch).

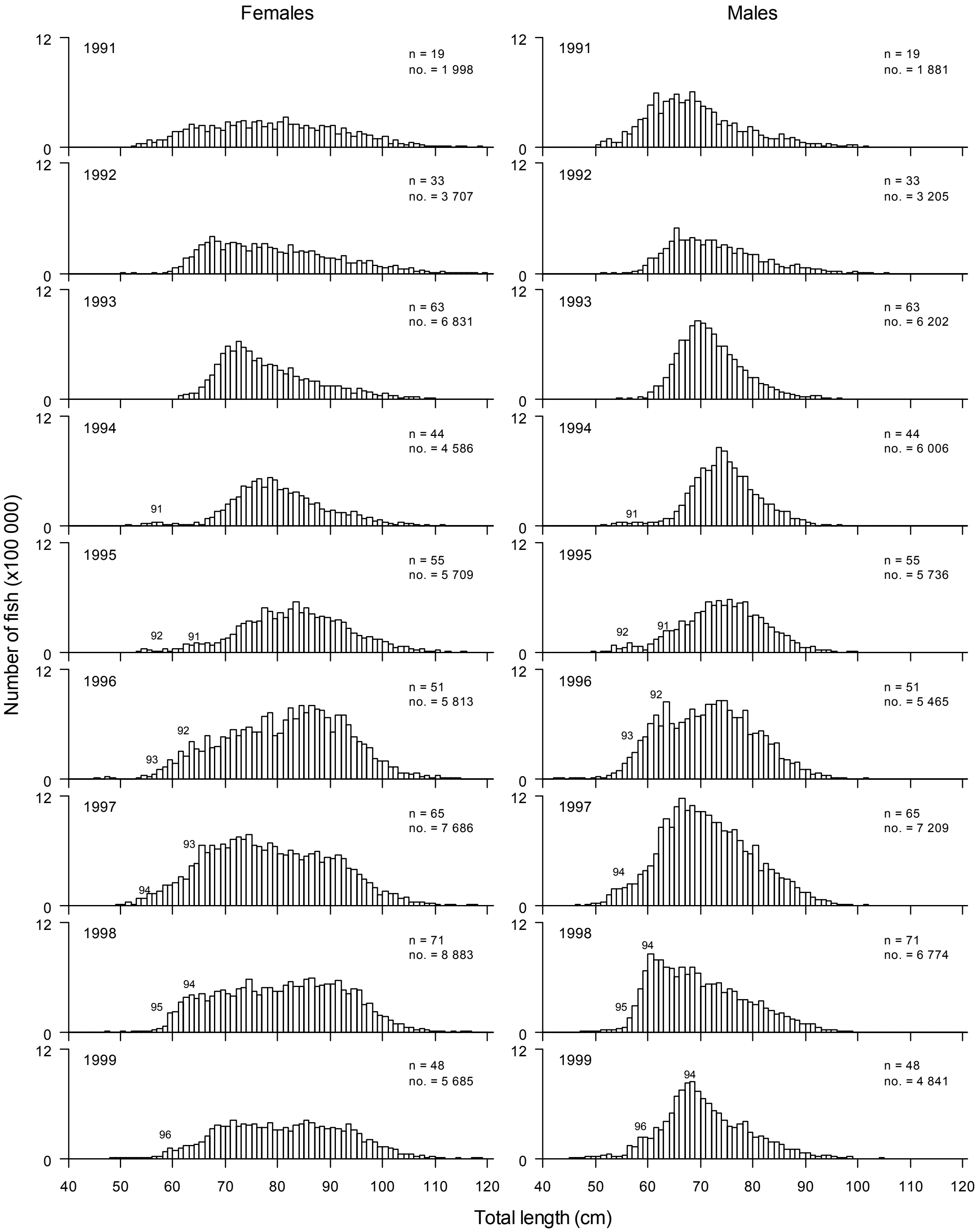


Figure 16: Length frequency distributions of hoki in commercial catches from the Cook Strait spawning fishery from 1991 to 2014 sampled in sheds by the Stock Monitoring Programme and NIWA, and at sea by the Observer Programme. n, number of landings sampled; no., number of fish sampled. Numbers above the histograms mark year-class modes, e.g., 91 = 1991 year-class.

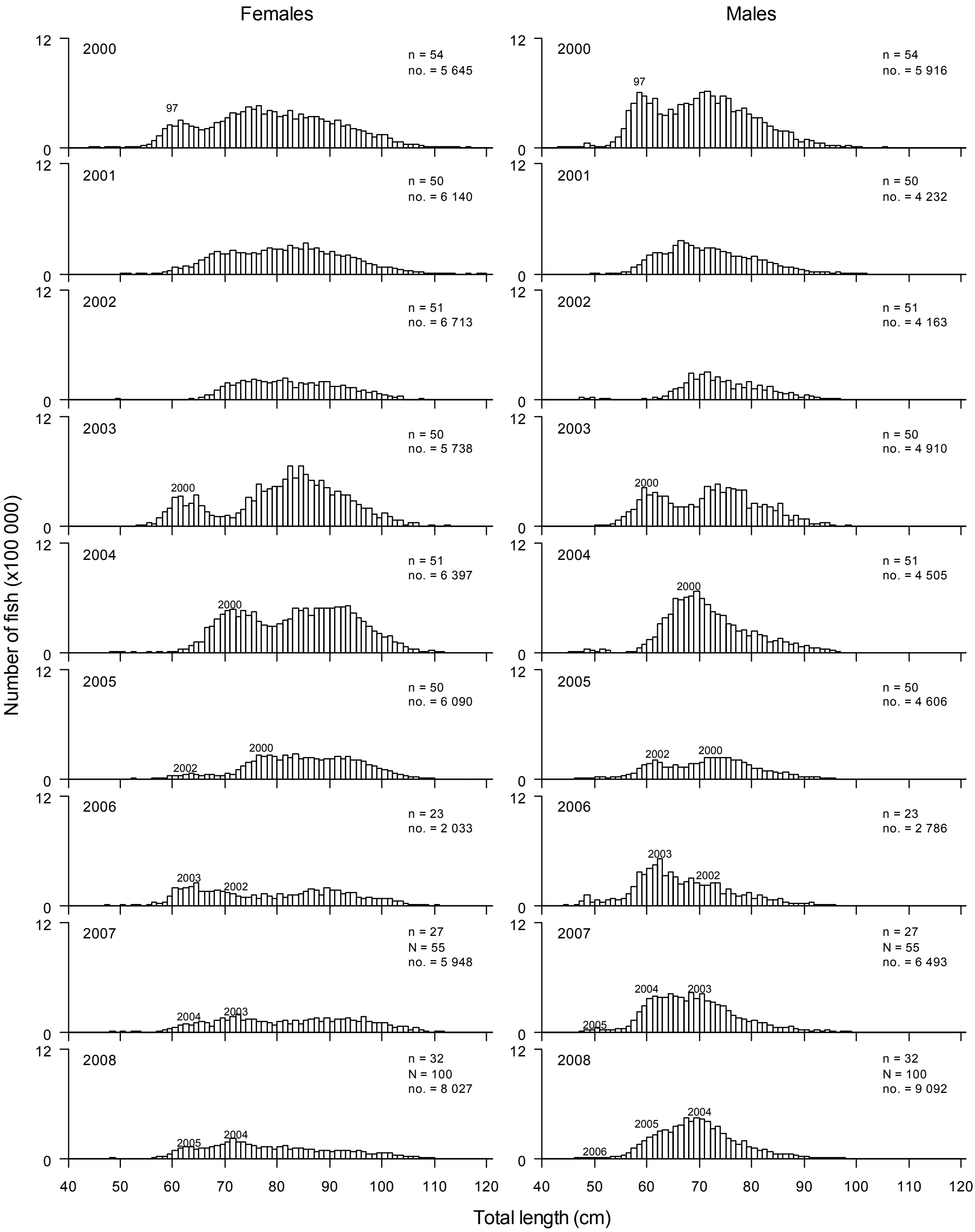


Figure 16 ctd.: 2006 data excludes Nelson vessels at least 40 m which sorted their catch at sea. 2007 and 2008 data includes shed samples (vessels less than 40 m) and observer samples (vessels at least 40 m). n, number of landings sampled; N, number of observed tows; no., number of fish sampled. Numbers above the histograms mark year-class modes, e.g., 97 = 1997 year-class and 2000 = 2000 year-class.

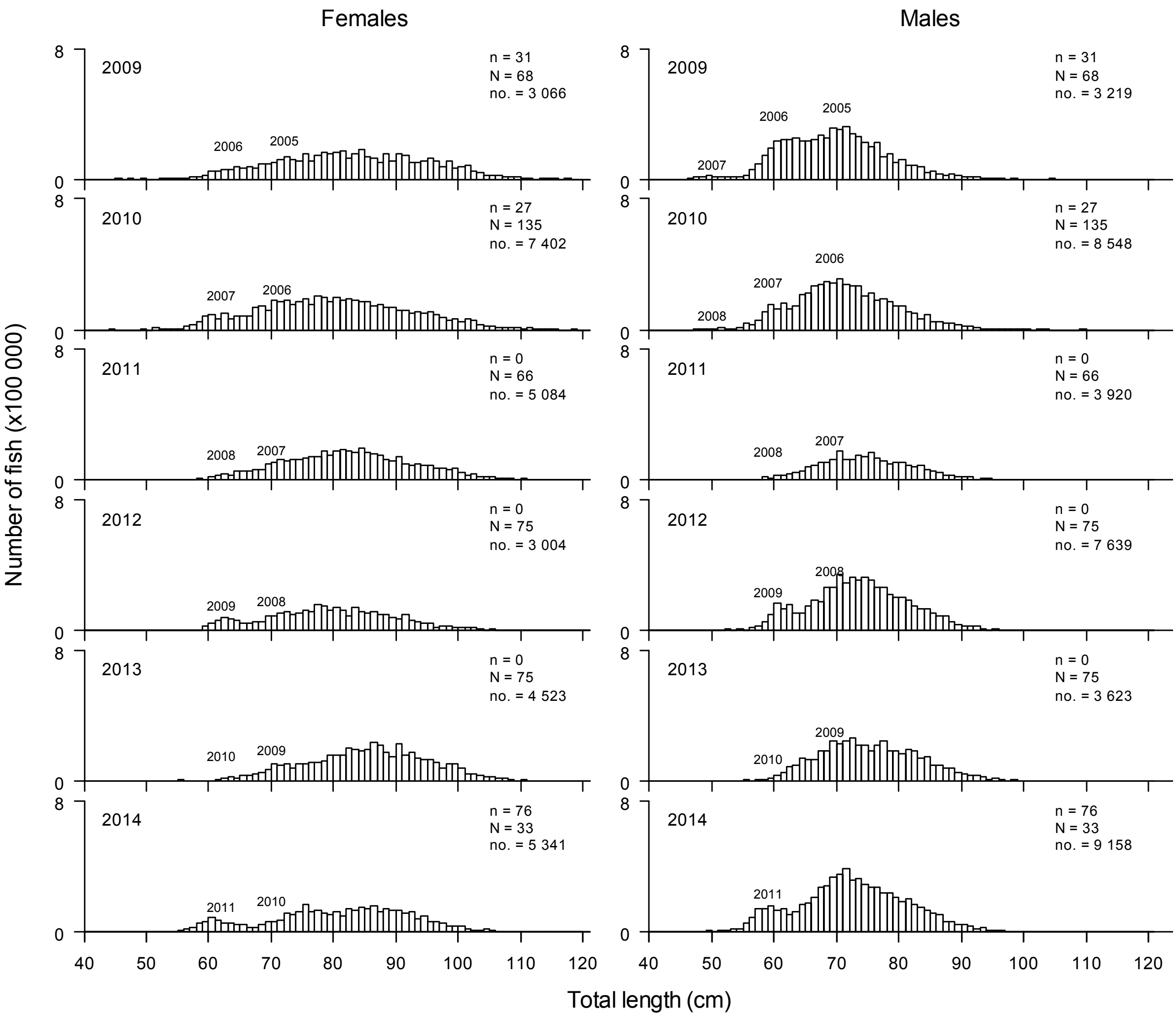


Figure 16 ctd.: 2009 data includes shed samples (vessels less than 40 m) and observer samples (vessels at least 40 m), 2010 data includes shed samples (vessels less than 40 m) and shed and observer samples (vessels at least 40 m), 2011–2013 data comprise only observer samples, and 2014 data includes observer and shed samples (vessels less than 40 m) and shed samples (vessels at least 40 m). n, number of landings sampled; N, number of observed tows; no., number of fish sampled. Numbers above the histograms mark year-class modes, e.g., 2007 = 2007 year-class.

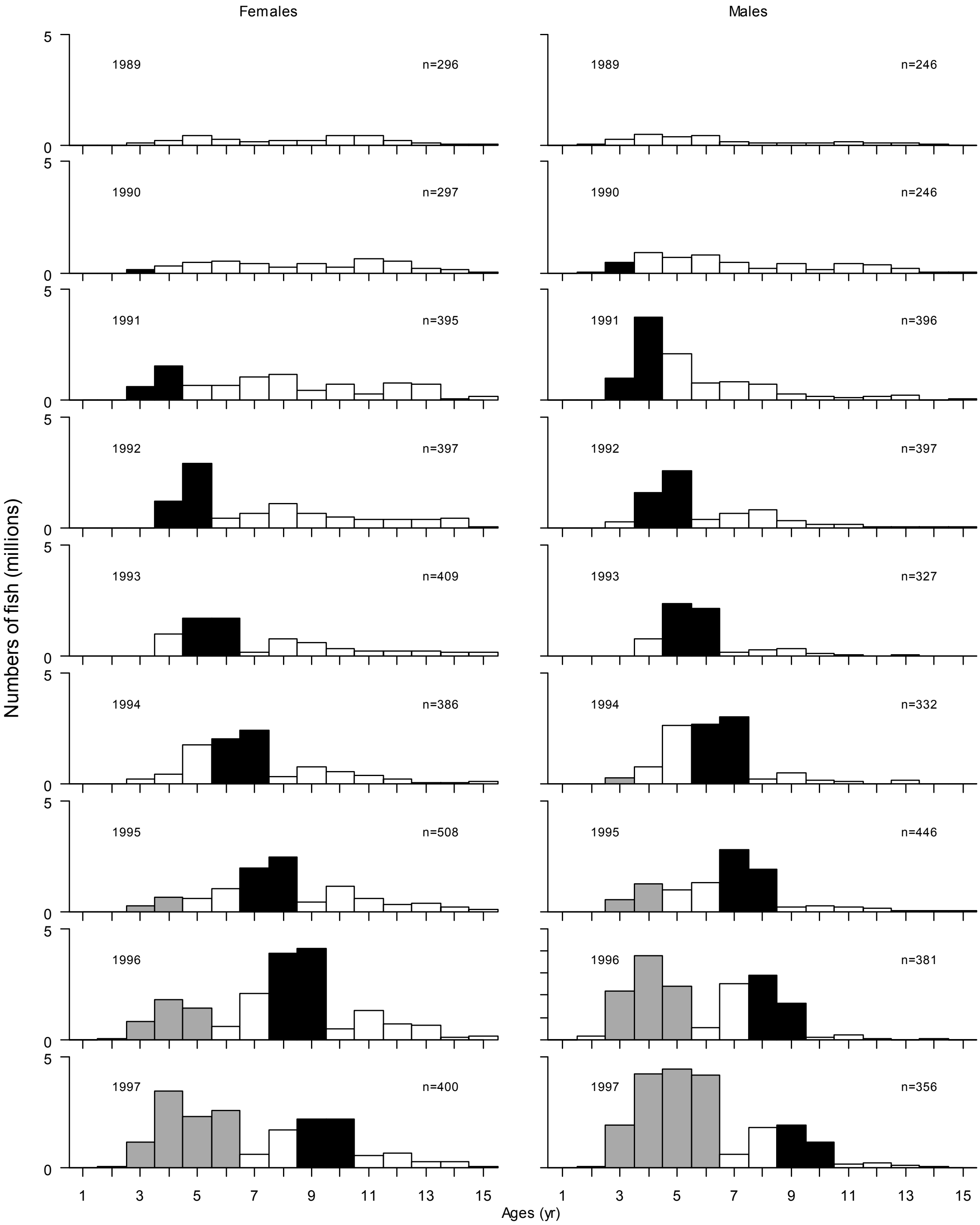


Figure 17: Catch at age of hoki in commercial catches from the Cook Strait spawning fishery from 1988 to 2014 sampled in sheds by the Stock Monitoring Programme and NIWA, and at sea by observers. 2006 data excludes Nelson shed samples from vessels at least 40 m which sorted their catch at sea. 2007–2009 data includes shed samples (vessels less than 40 m) and tows sampled at sea by the Observer Programme (vessels at least 40 m), 2010 data includes shed samples (vessels less than 40 m) and shed and observer samples (vessels at least 40 m), and 2011–2013 data includes observer samples only from vessels longer and shorter than 40 m. n, number of fish aged. Black bars show 1987 and 1988 year-classes in the 1990–2003 seasons; dark grey bars show 1991–94 year-classes, light grey bars show the 2000 year-class, and black bars show the 2002–2003 year-classes from the 2005 season.

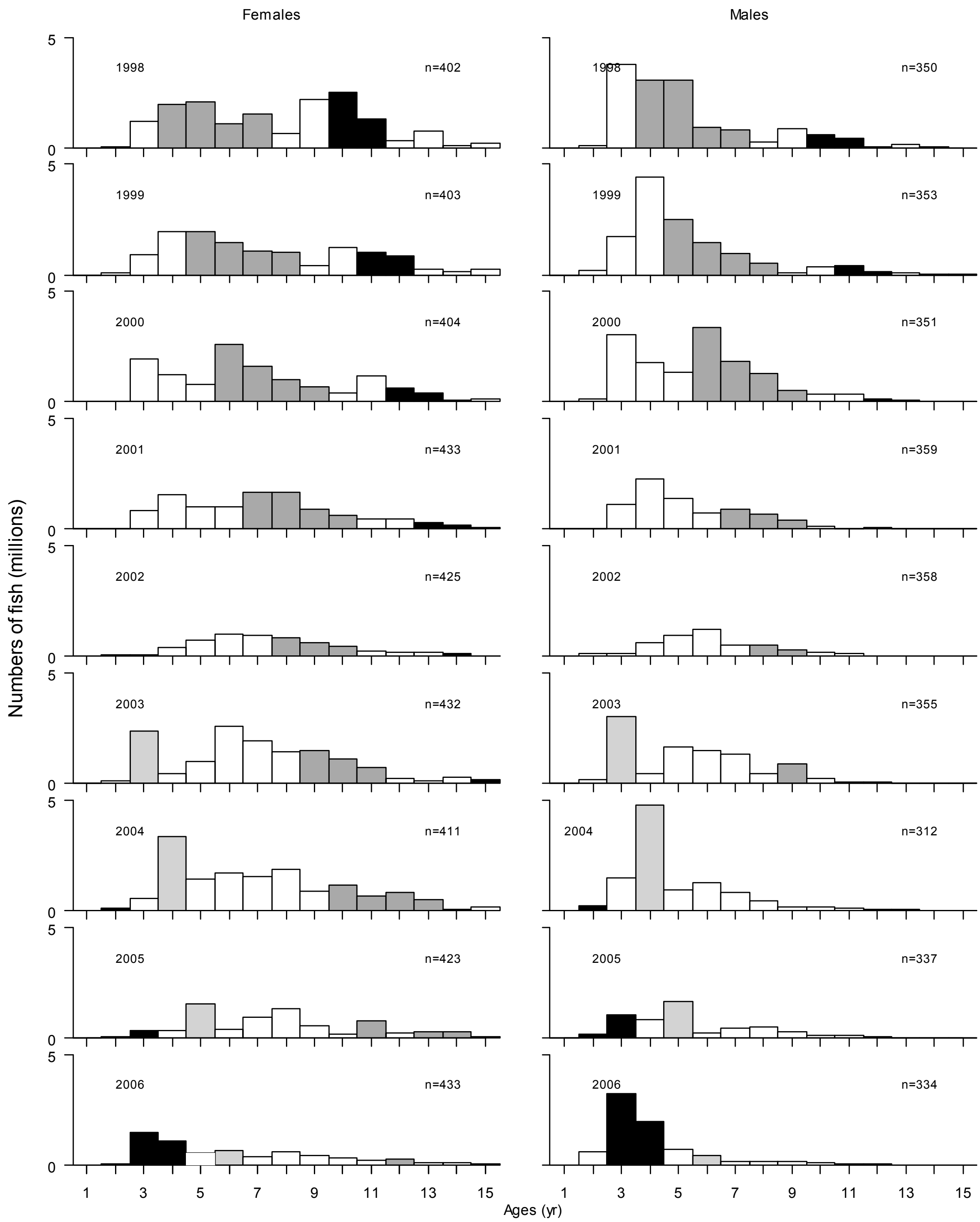


Figure 17 ctd.

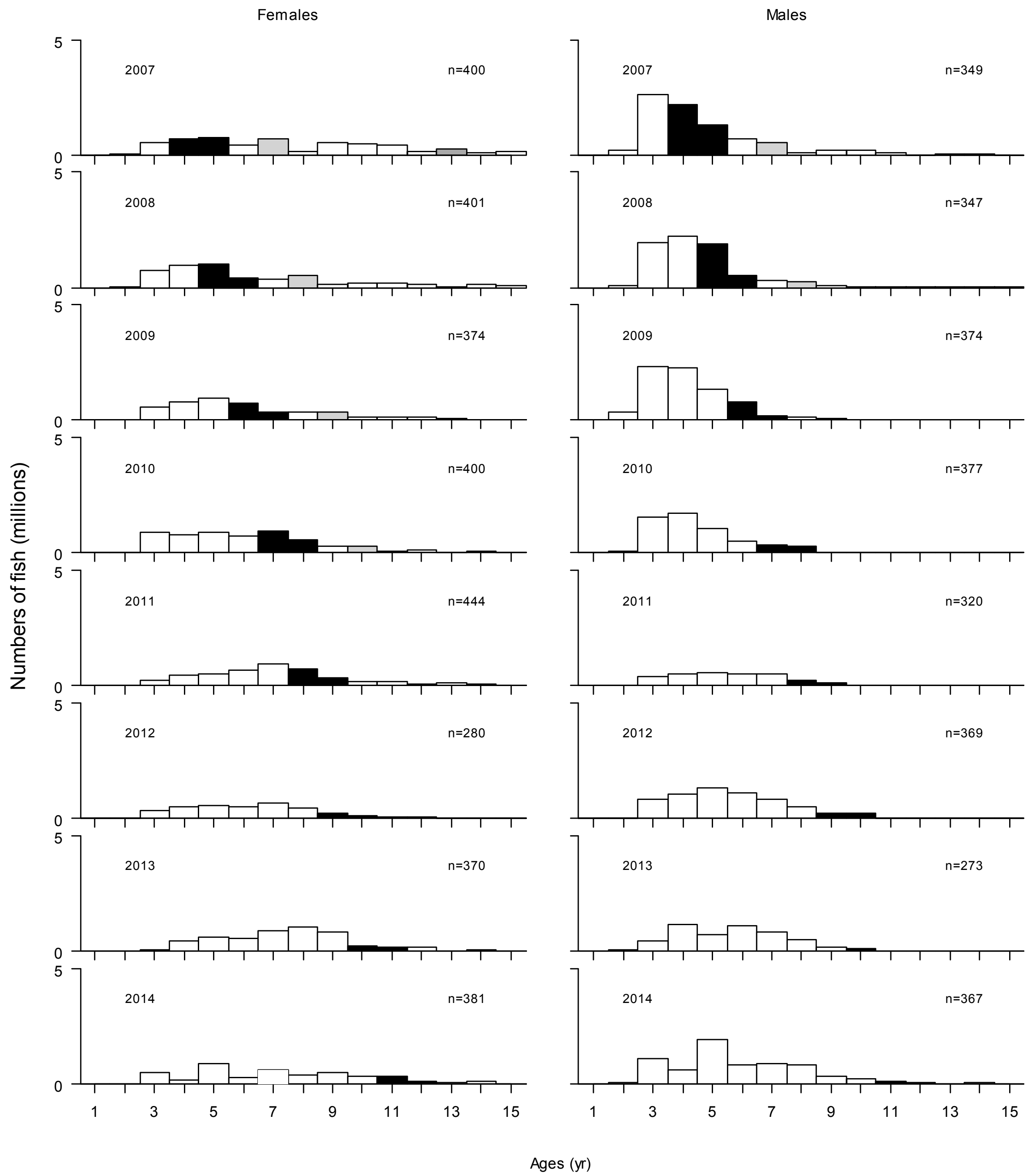


Figure 17 ctd.

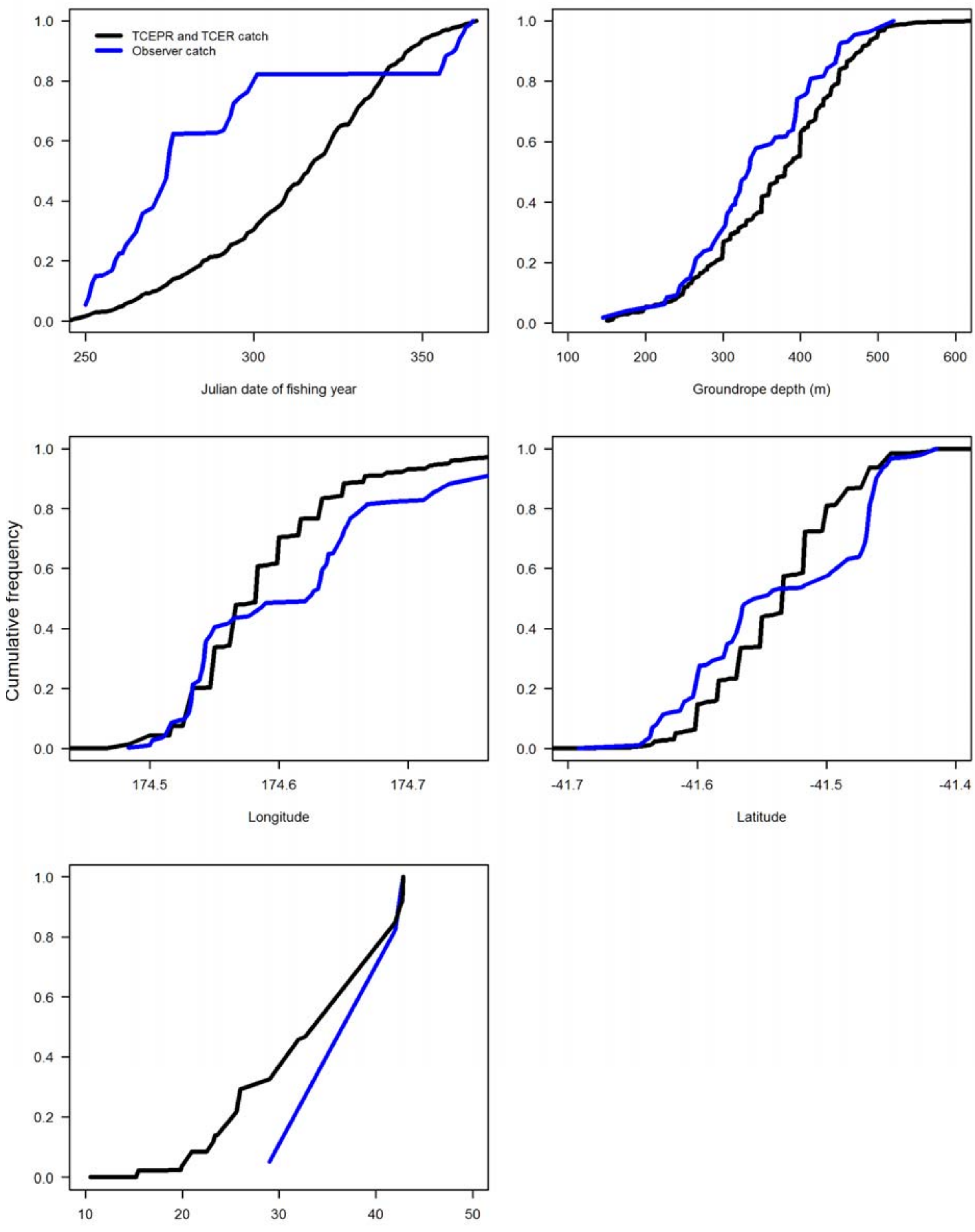


Figure 18: Comparison of Cook Strait 2013–14 Observer Programme catch coverage for TCEPR and TCER catches by day of year, depth, latitude, longitude, and vessel length. If sampling is representative of the fishery, then blue lines (sampled catches) should overlay black lines (catches).

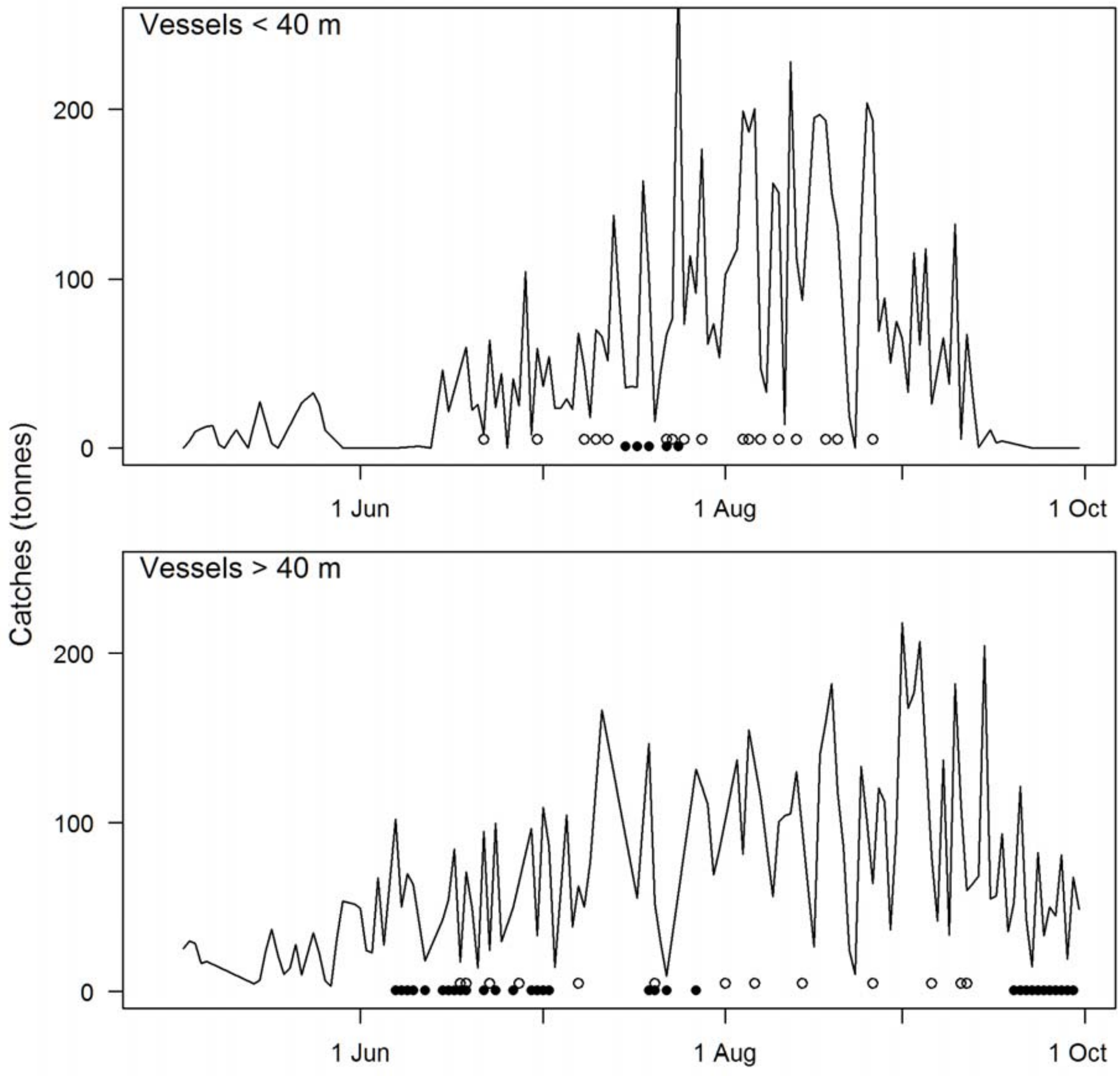


Figure 19: Cook Strait 2013–14 catch by day for vessels less than 40 m and 40 m or longer during the spawning season, showing timing of Observer Programme samples (black dots), and shed samples (hollow dots).

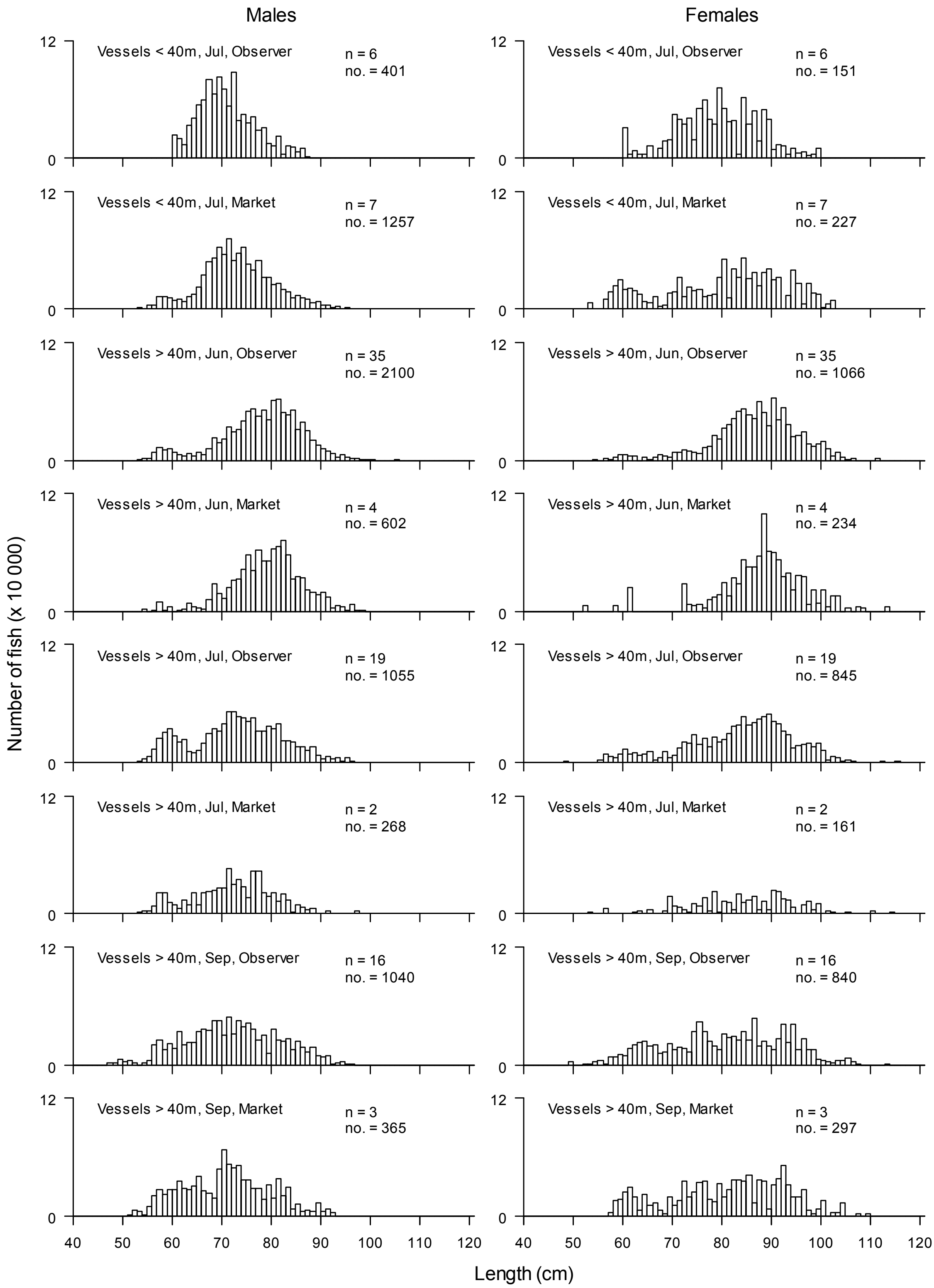


Figure 20: Comparison of Observer Programme and shed sampling length frequency distributions of hoki taken in commercial catches from Cook Strait during 2014. n, number of tows sampled; no., number of fish sampled.

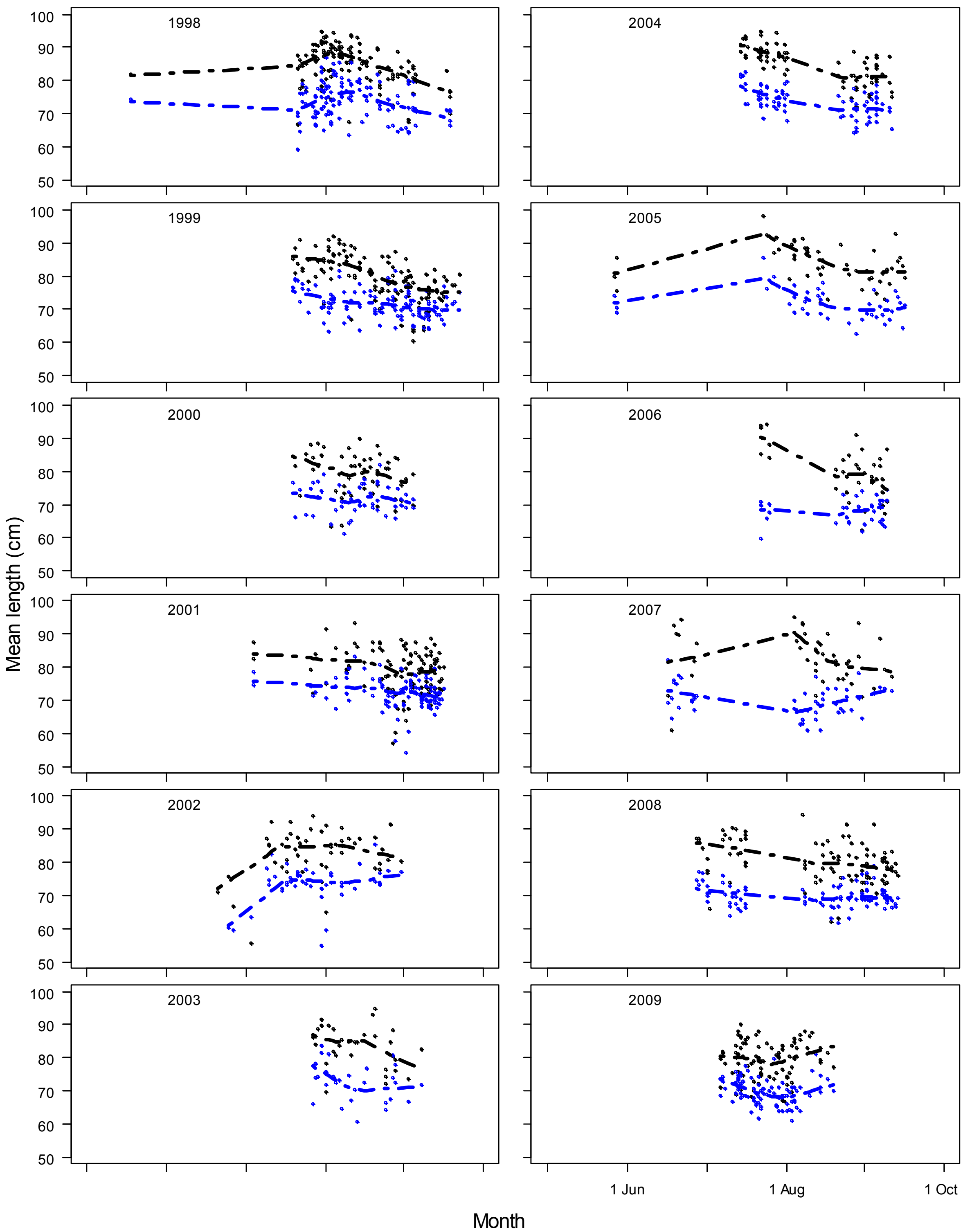


Figure 21: Mean length of female (black) and male (blue) hoki taken in commercial catches from the Cook Strait spawning fishery 1989–2014 from landings sampled by the Observer Programme. Lines are a loess fit.

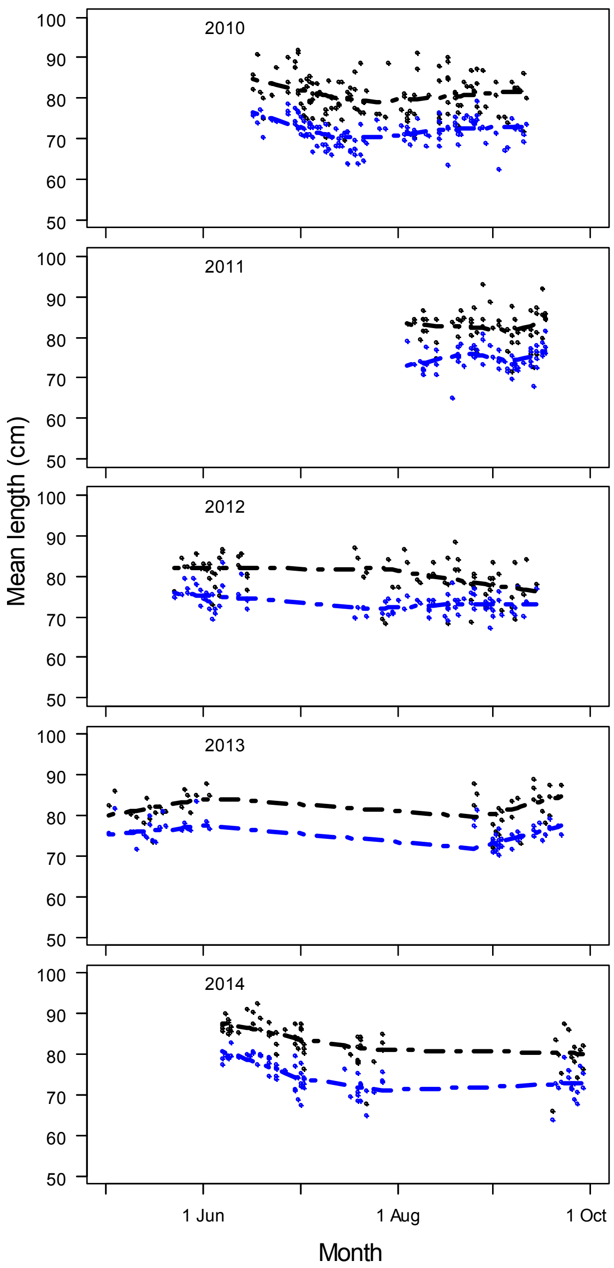


Figure 21 ctd.

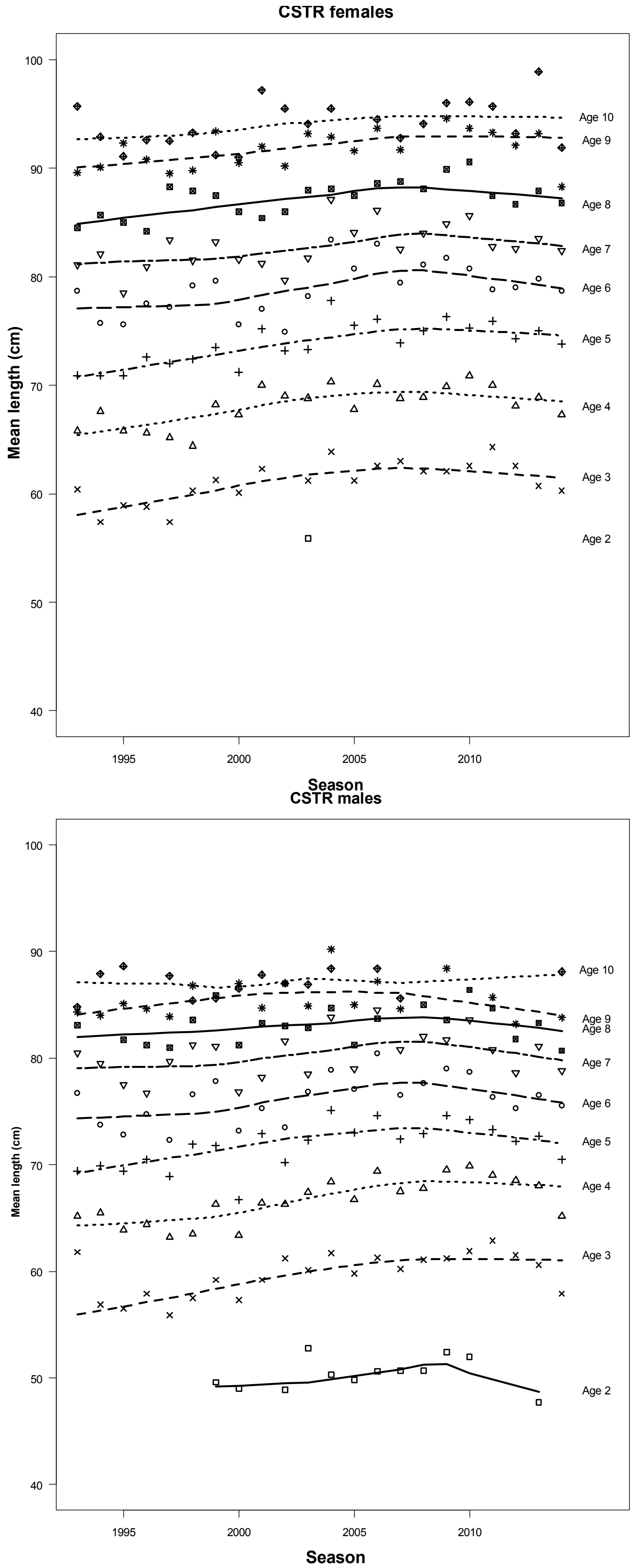


Figure 22: Mean length at age of female and male hoki taken in commercial catches from the Cook Strait spawning fishery 1988–2014 sampled at sea by the Observer Programme and NIWA shed sampling Programme. Lines are a loess fit. Points with fewer than ten records are excluded.

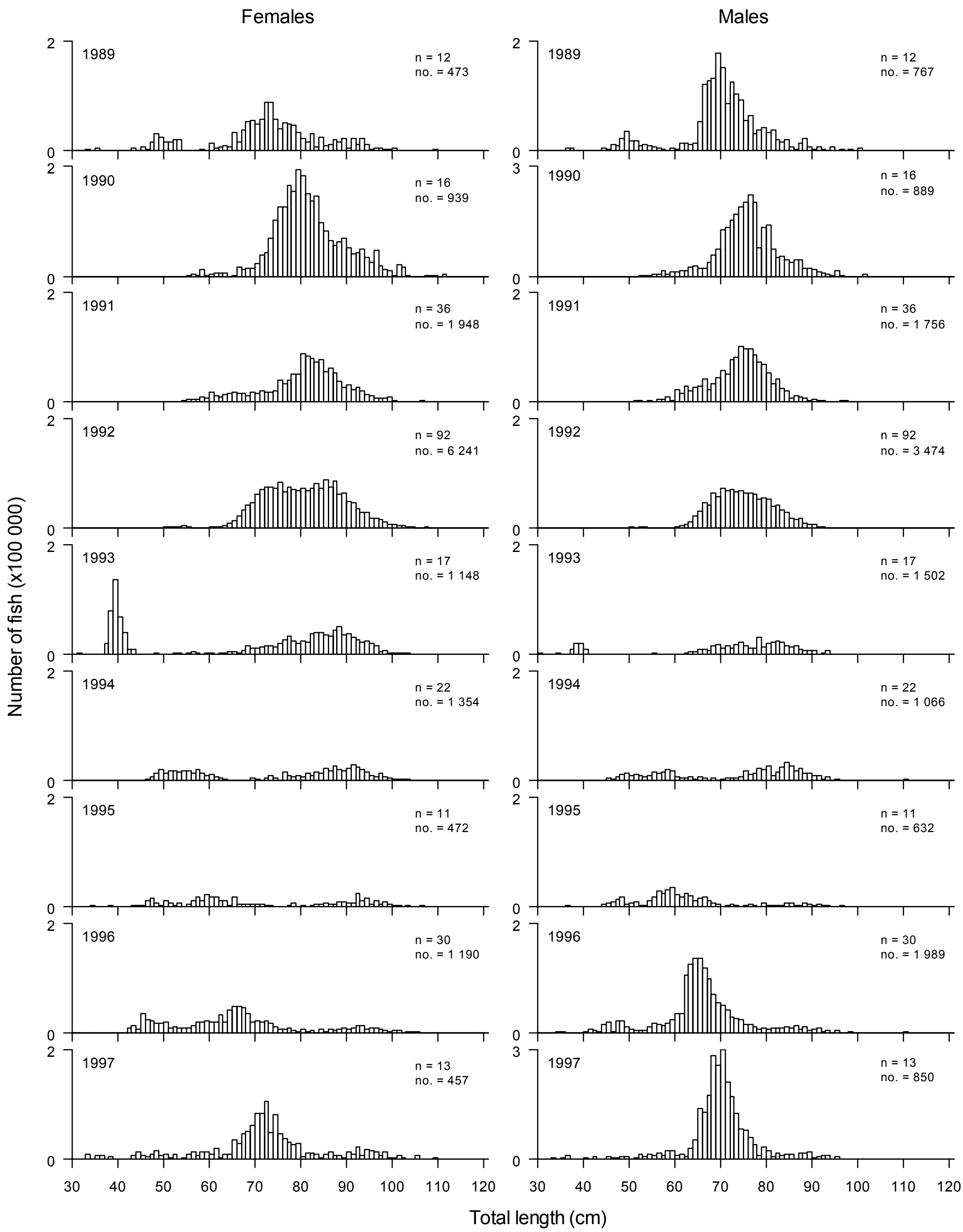


Figure 23: Length frequency distributions of hoki in commercial catches from the Puysegur spawning fishery from 1989 to 1997, and 1999 to 2014 sampled at sea by the Observer Programme. n, number of tows sampled; no., number of fish sampled.

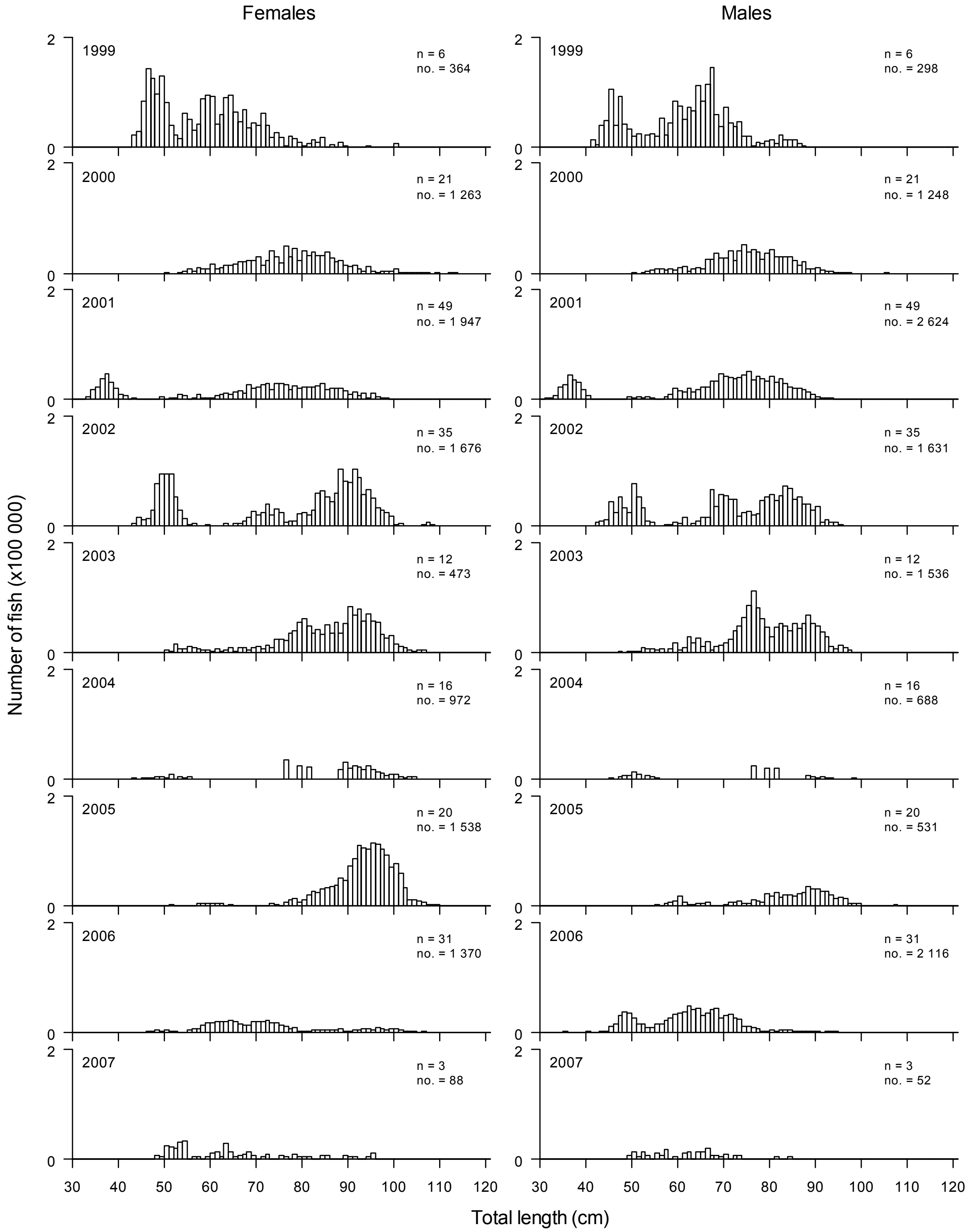


Figure 23 ctd.

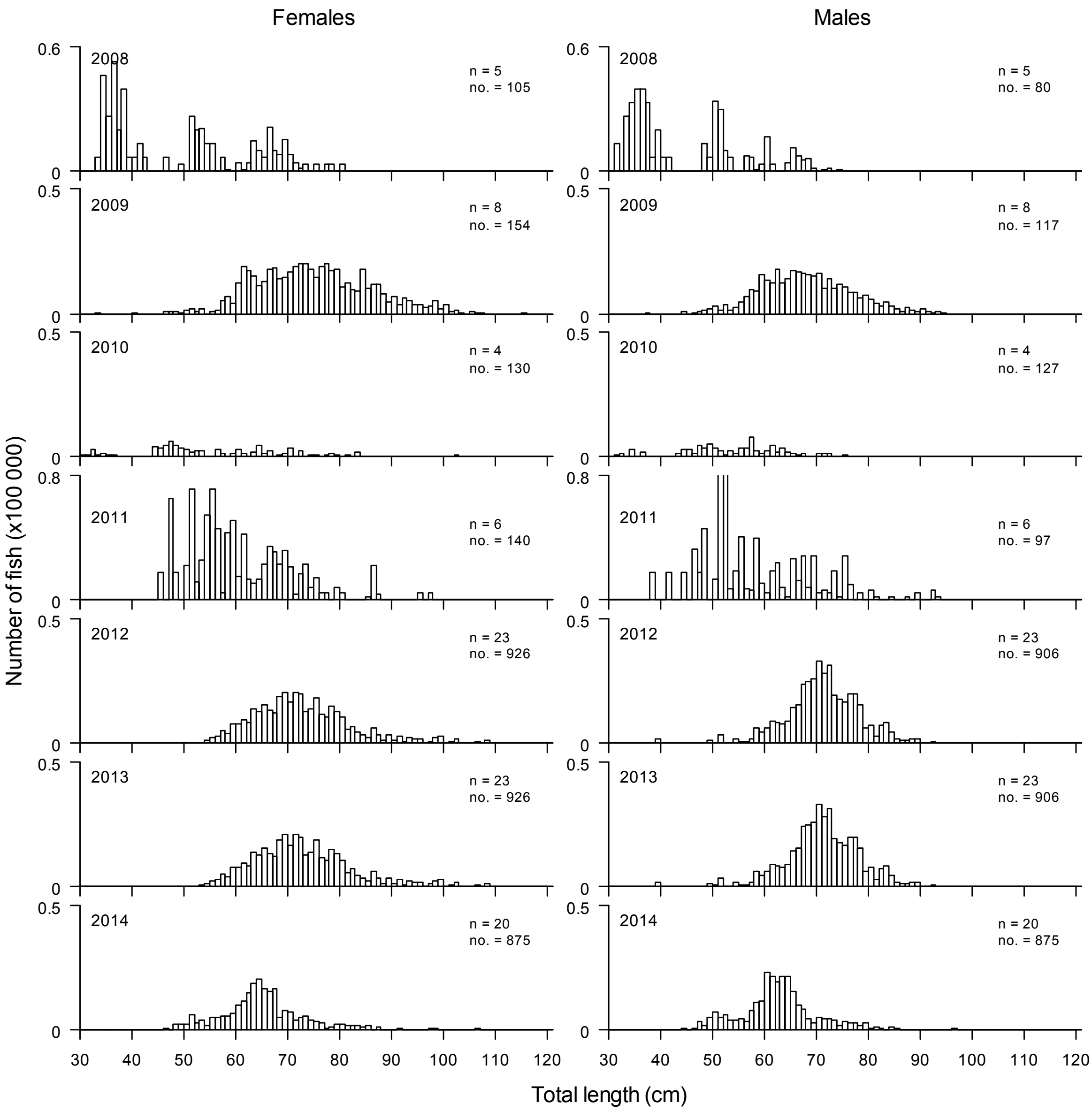


Figure 23 ctd.

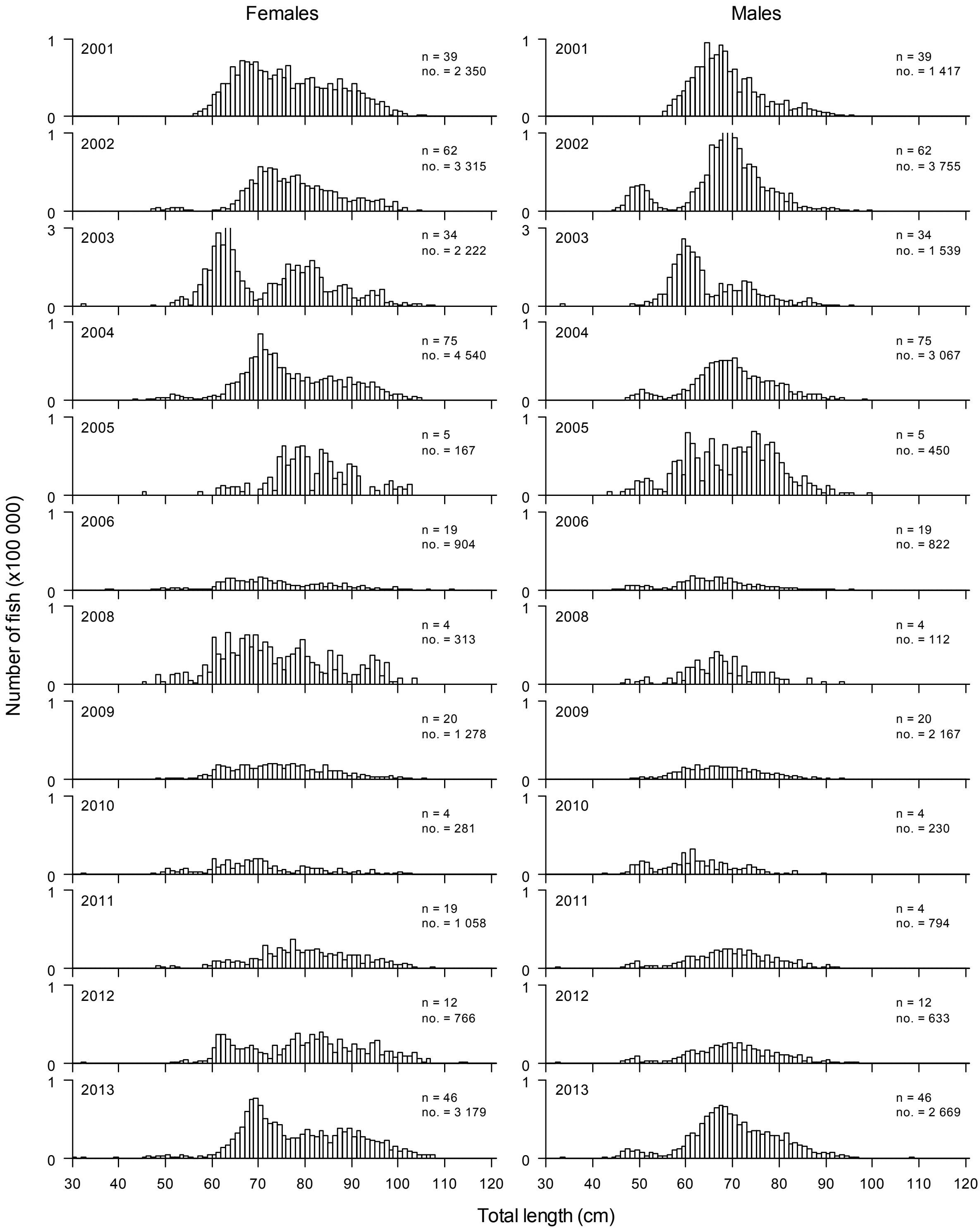


Figure 24: Length frequency distributions of hoki taken in commercial catches from the ECSI spawning fishery from 2001 to 2013 sampled by the Scientific Observer Programme (2001–2006, 2008–2013) and combined with Hoki Management Company data (2001 to 2005). There were no samples in 2007 or 2014. n, number of tows sampled; no., number of fish sampled.

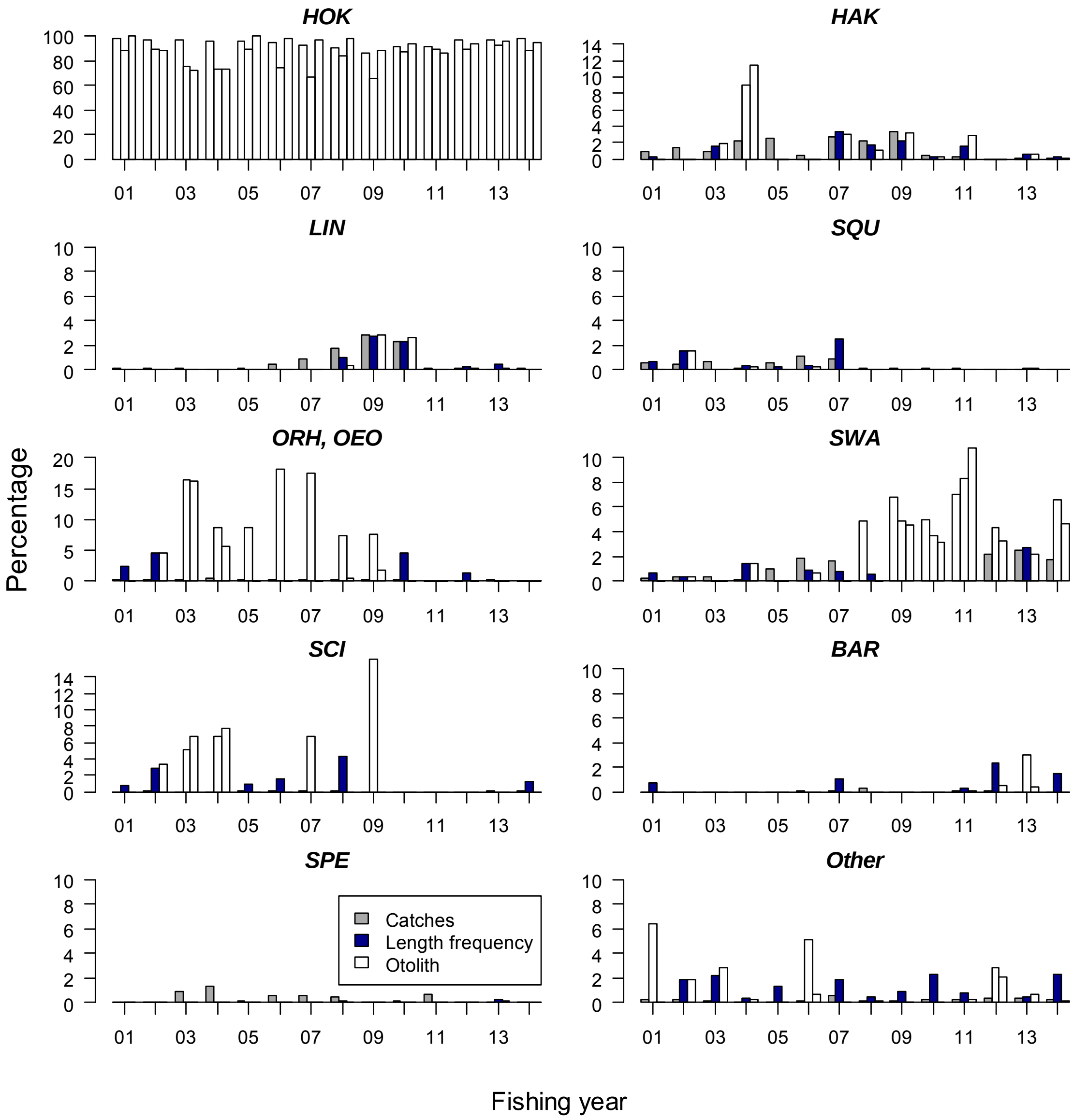


Figure 25: Percentage of hoki TCEPR, CELR and TCER catch, hoki length frequency samples and hoki otoliths collected by the Observer Programme, by target species for the Chatham Rise fishery from 2000–01 to 2013–14. Three-letter codes denote target species: HOK, hoki; ORH, orange roughy; OEO, oreos; SQU, squid; SWA, silver warehou; HAK, hake; SCI, scampi; LIN, ling; BAR, barracouta; SPE, sea perch; Other, all other target species combined.

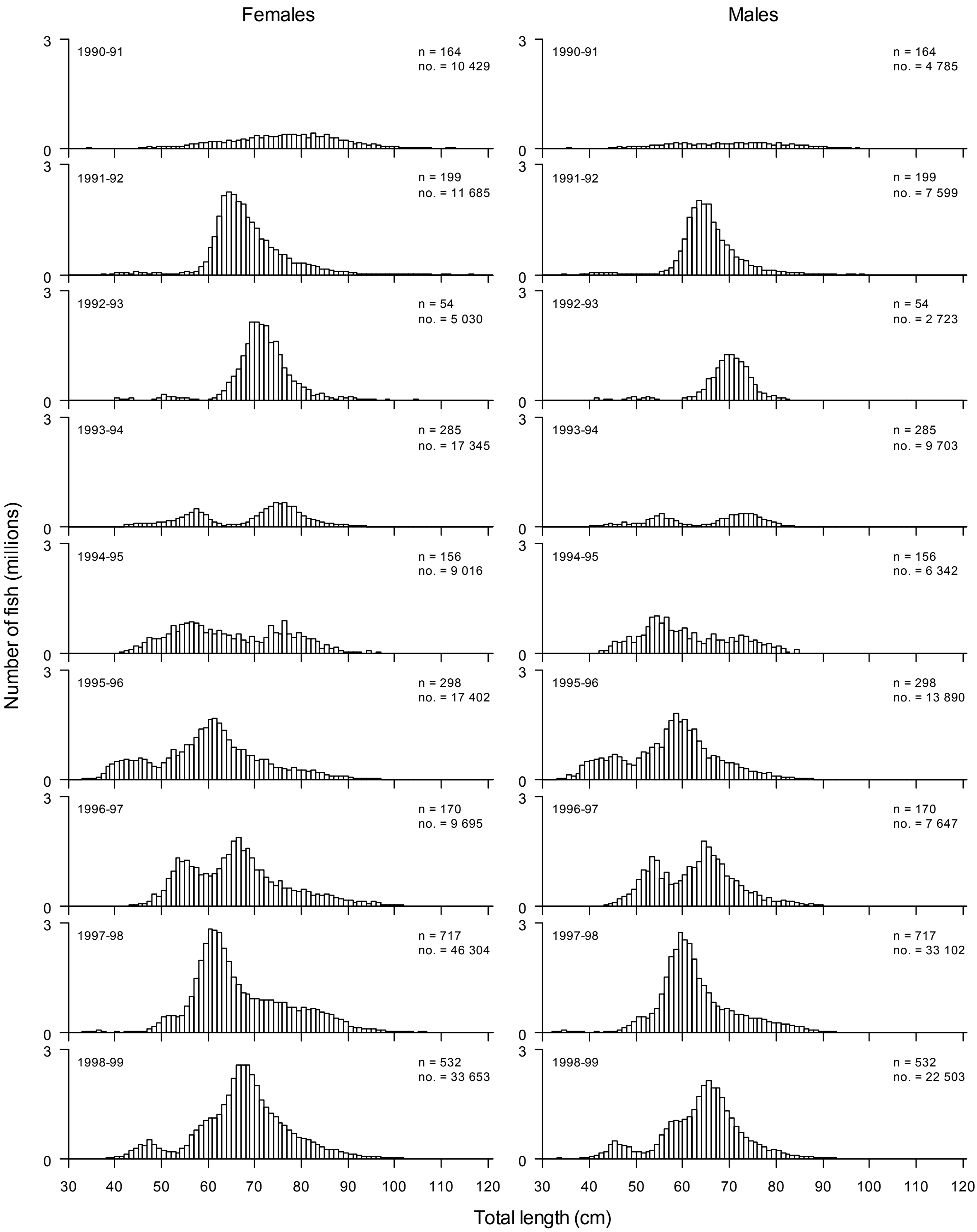


Figure 26: Length frequency distributions of hoki taken in commercial catches from the Chatham Rise fishery from 1990–91 to 2013–14 sampled by the Observer Programme (and combined with Hoki Management Company data in 2000–01 to 2003–04). 2006–07 data include target hoki and hake tows. n, number of tows sampled; no., number of fish sampled.

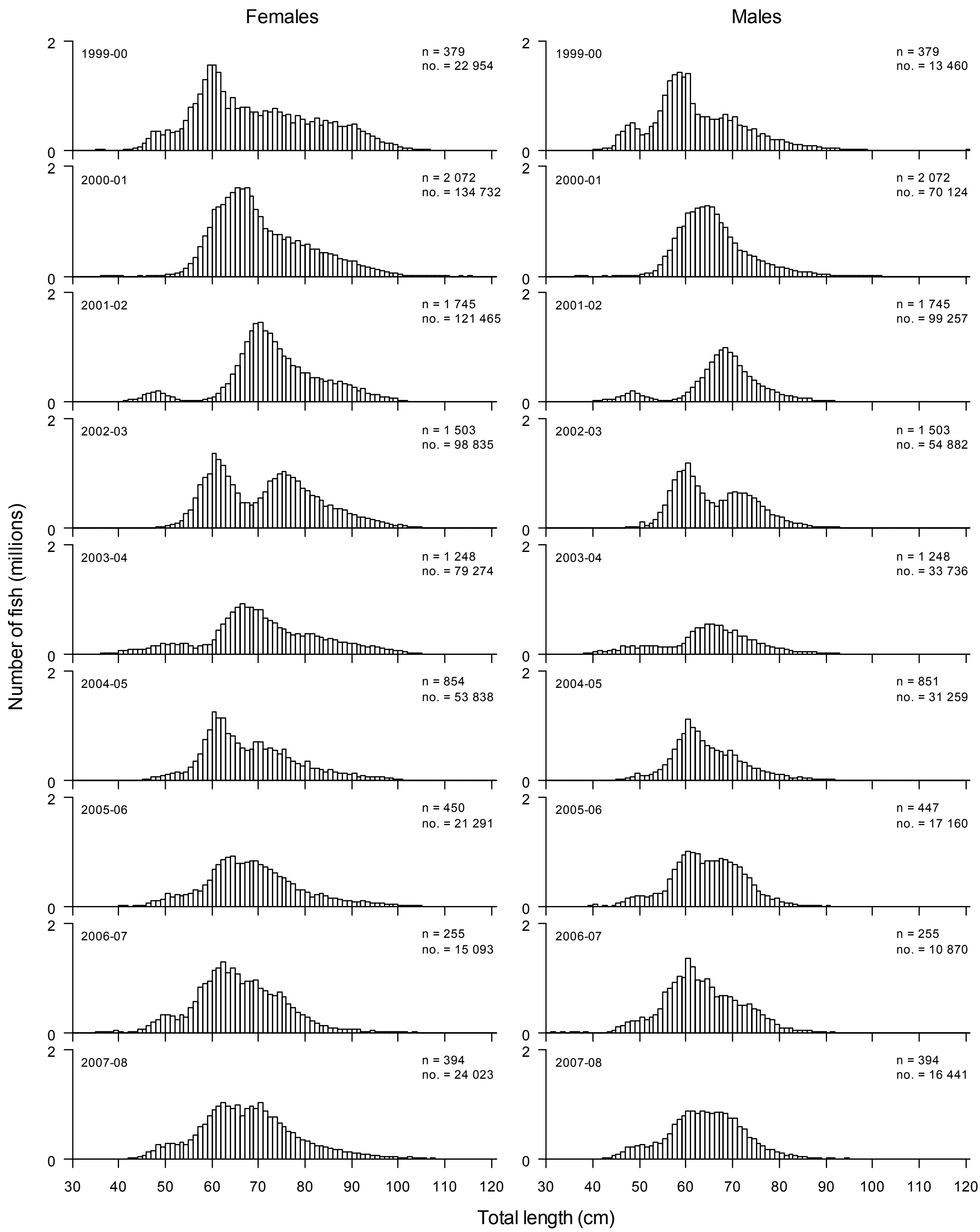


Figure 26 ctd.

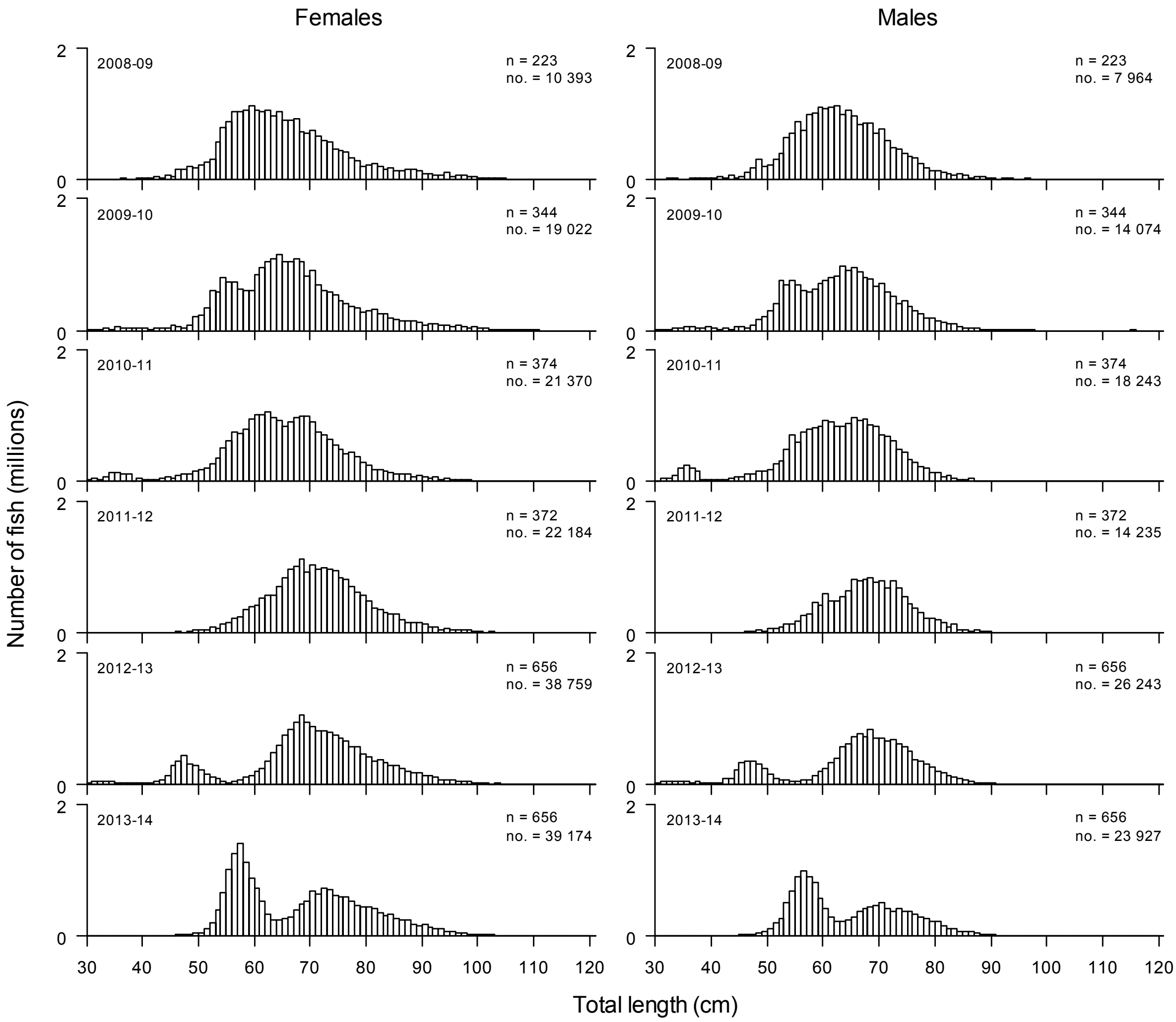


Figure 26 ctd.

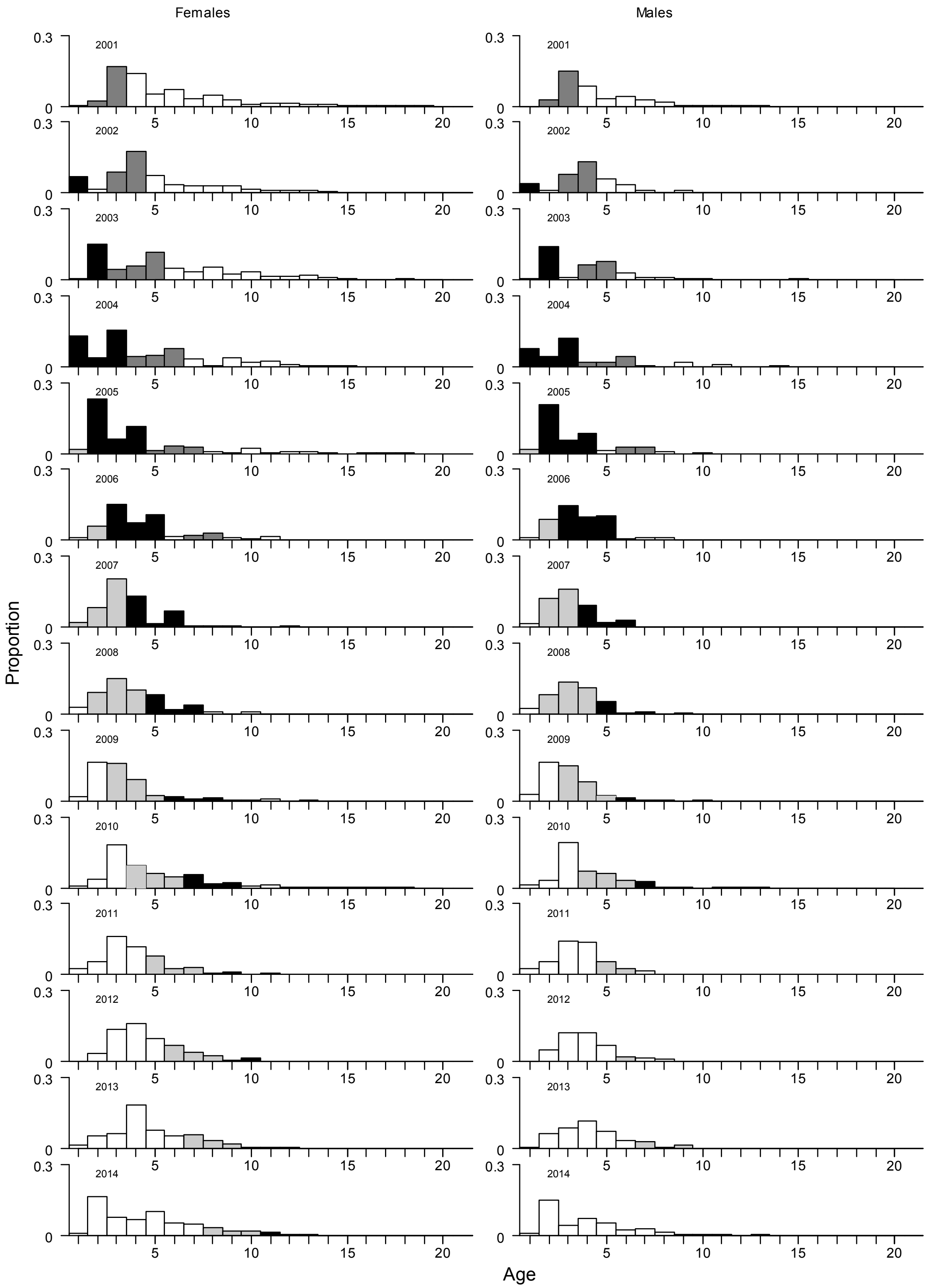


Figure 27: Proportions at age and sex in the catch from the Chatham Rise fishery as estimated by direct ageing of otoliths from 2000–01 to 2013–14. Dark grey bars show 1997–99 year-classes; black bars show 2000–02 year-classes; light grey bars show 2003–2005 year-classes.

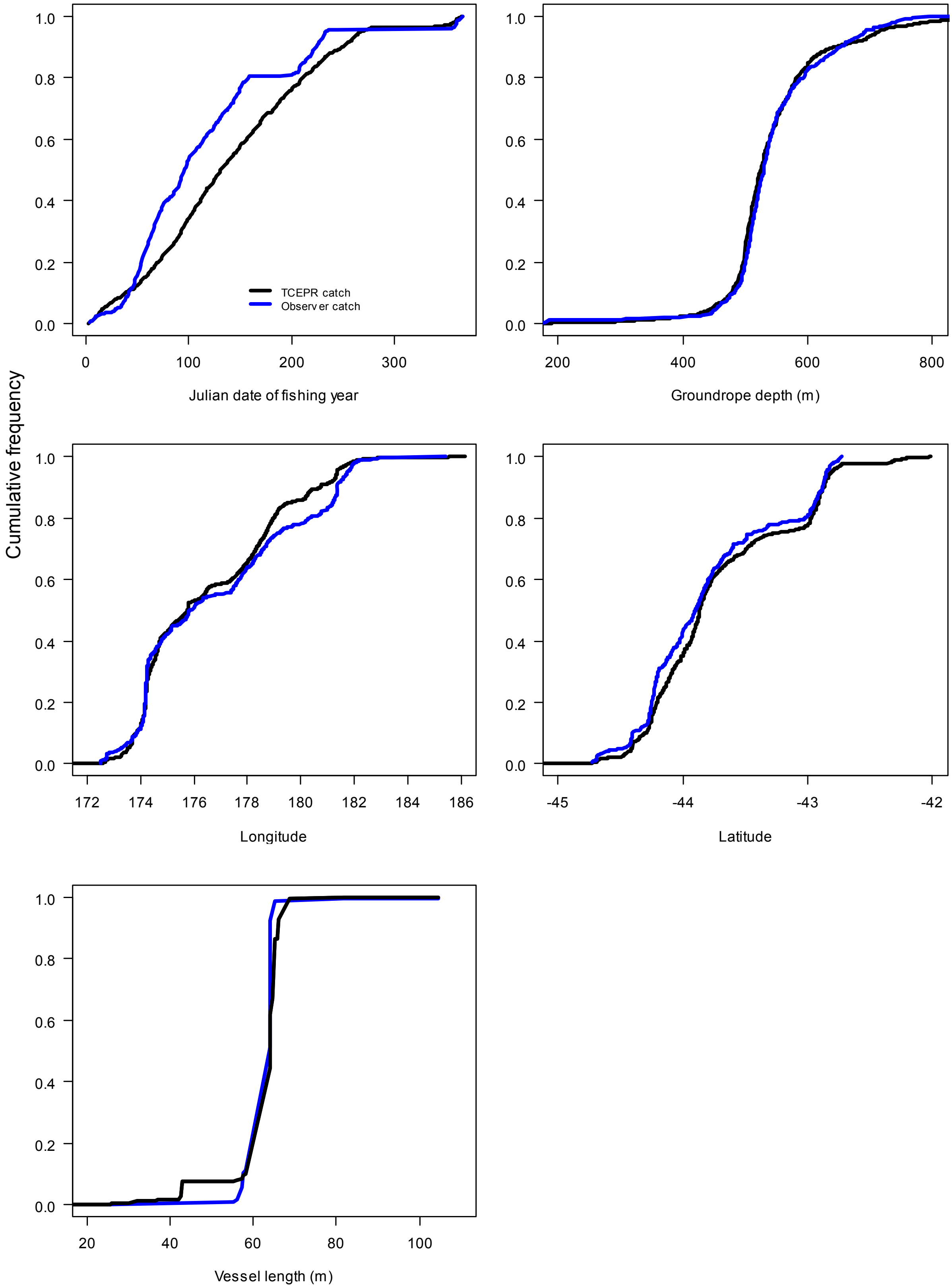


Figure 28: Comparison of Chatham Rise 2013–14 Observer Programme catch coverage with TCEPR catches by day of year, depth, latitude, longitude, and vessel length (m). If sampling is representative of the fishery, then blue lines (observed catches) should overlay black lines (TCEPR catch).

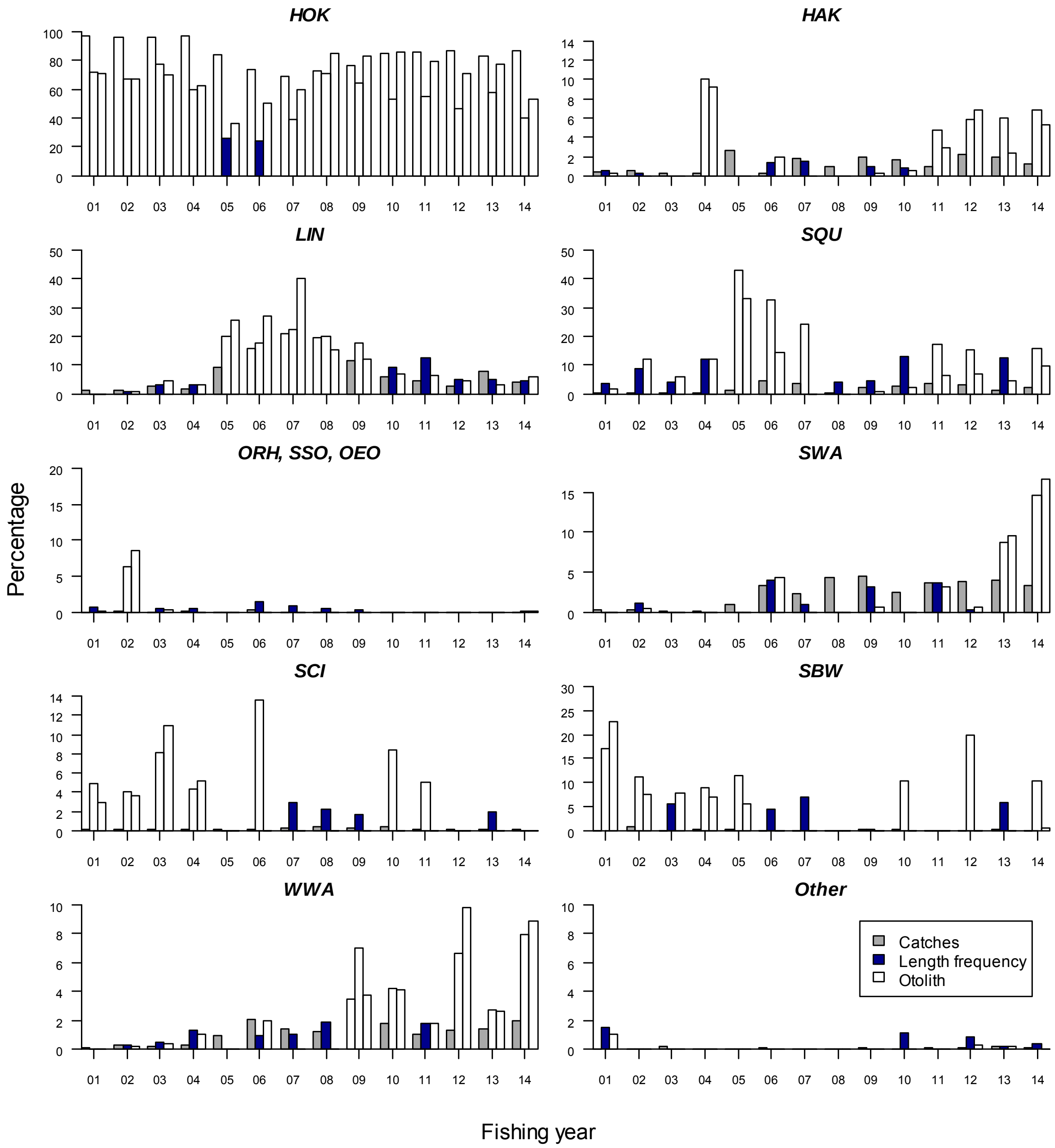


Figure 29: Percentages of hoki TCEPR, TCER and CELR catch, hoki length frequency samples, and hoki otoliths collected by the Observer Programme, by target species for the Sub-Antarctic fishery from 2000–01 to 2013–14. Three-letter codes denote target species: HOK, hoki; HAK, hake; SQU, squid; ORH, orange roughy, SSO, smooth oreo; OEO, oreo; SWA, silver warehou; SBW, southern blue whiting; SCI, scampi; LIN, ling; WWA, white warehou; Other, other target species combined.

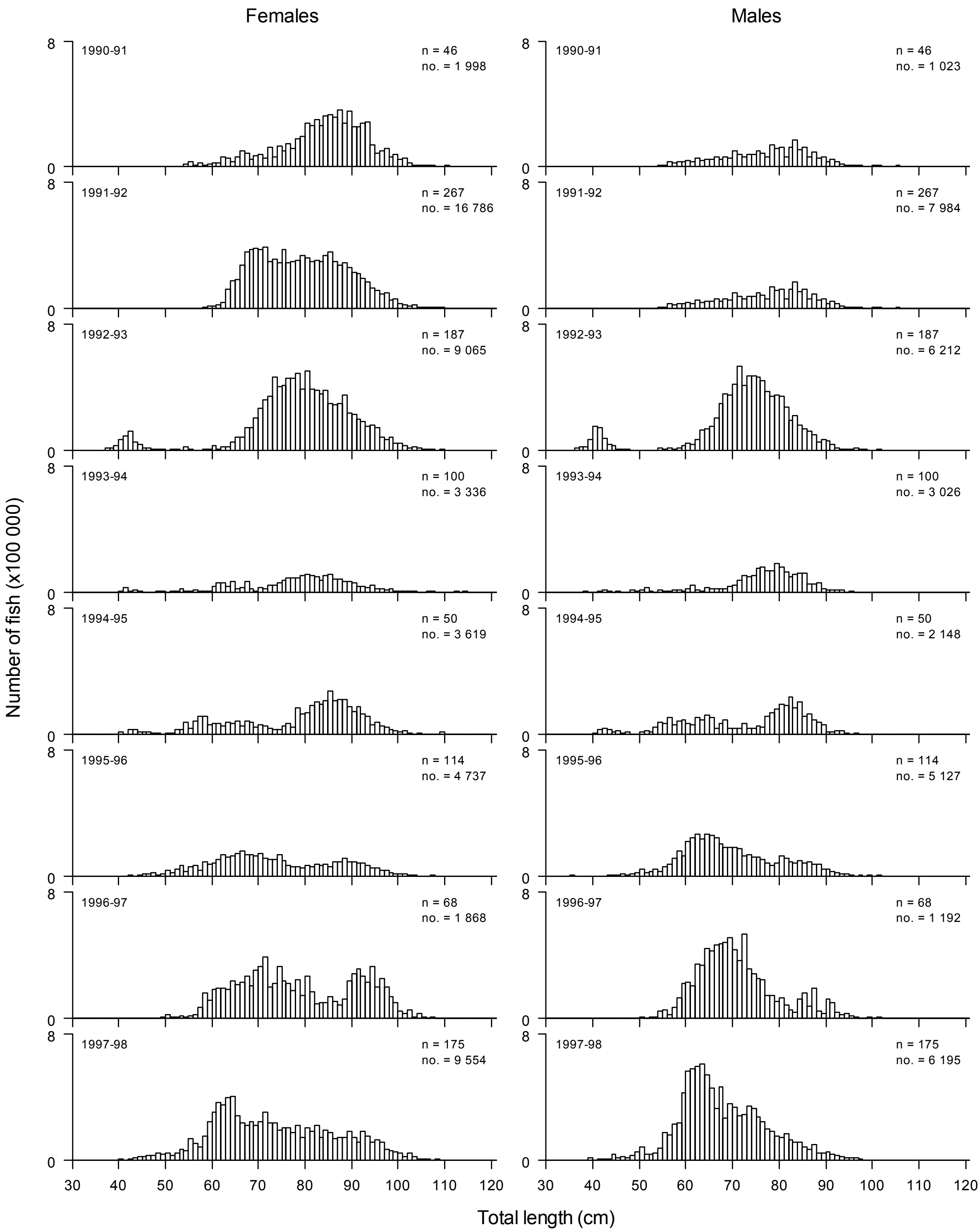


Figure 30: Length frequency distributions of hoki taken in commercial catches from the Sub-Antarctic fishery from 1990–91 to 2013–14 sampled by the Observer Programme (and combined with Hoki Management Company data in 2000–01 to 2004–05). 2006–07 data includes target hoki and ling tows only. n, number of tows sampled; no., number of fish sampled.

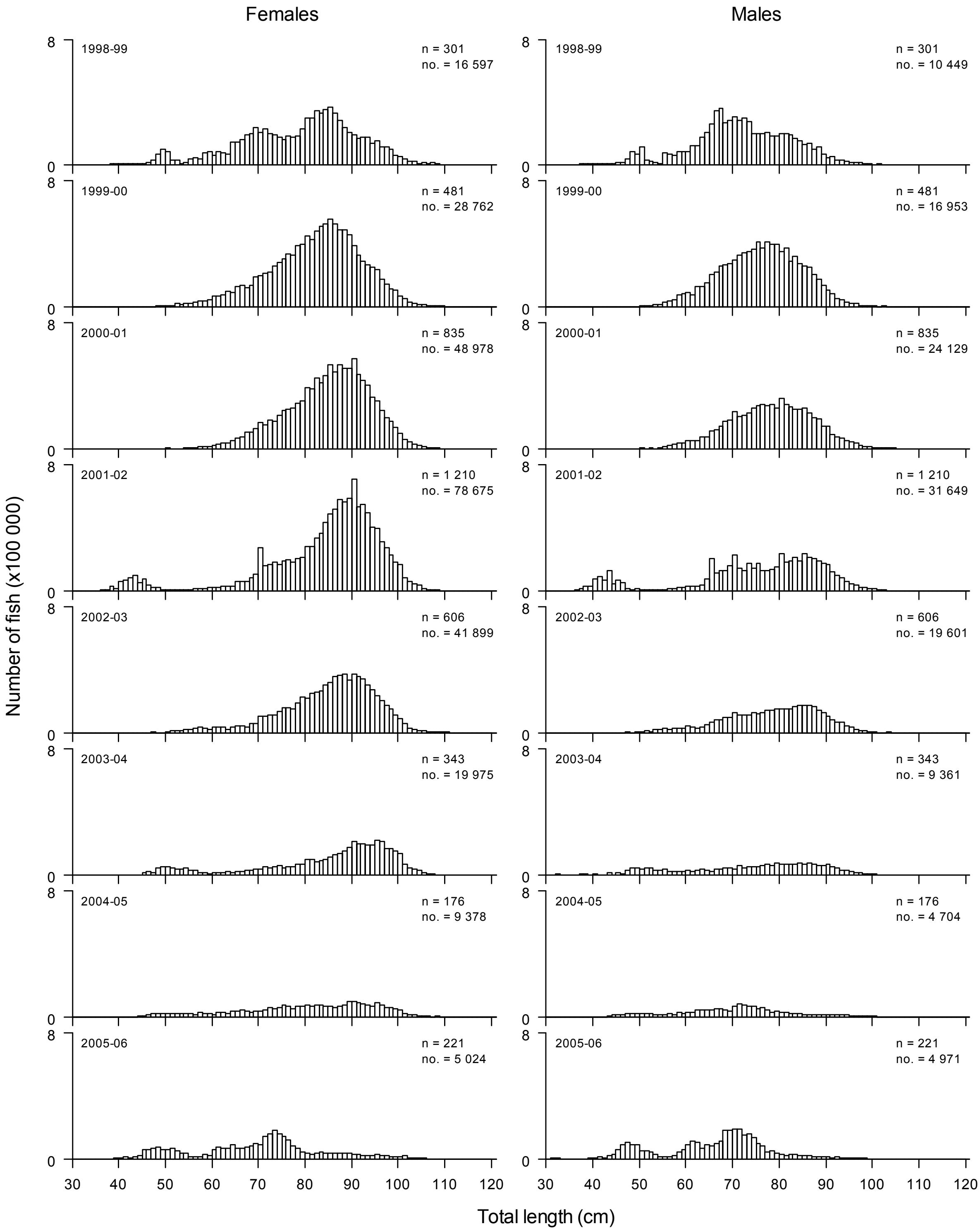


Figure 30 ctd.

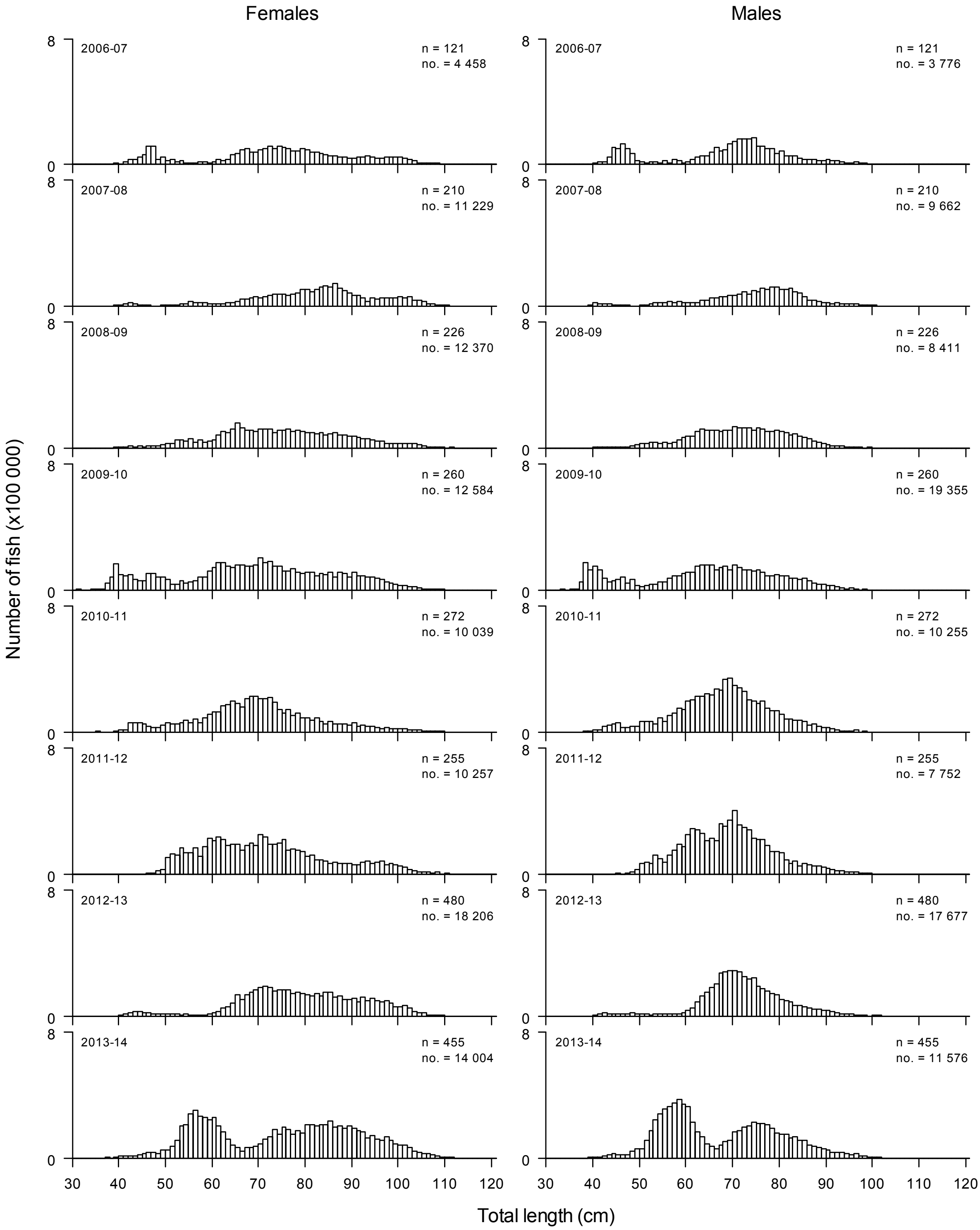


Figure 30 ctd.

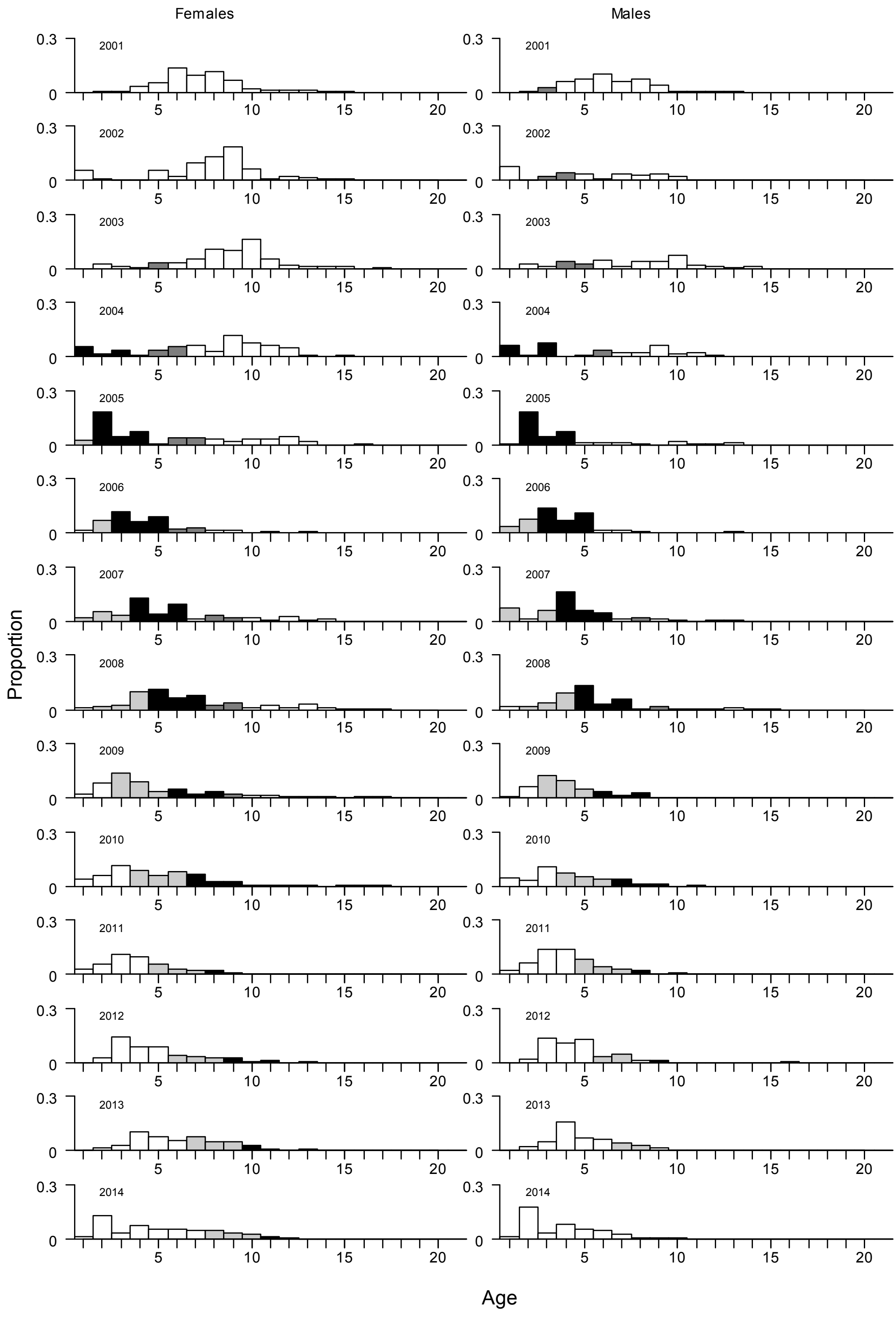


Figure 31: Proportions at age and sex in the catch from the Sub-Antarctic fishery as estimated by direct ageing of otoliths from 2000–01 to 2013–14. Dark grey bars show 1997–99 year-classes; black bars show 2000–02 year-classes; light grey bars show 2003–2005 year-classes.

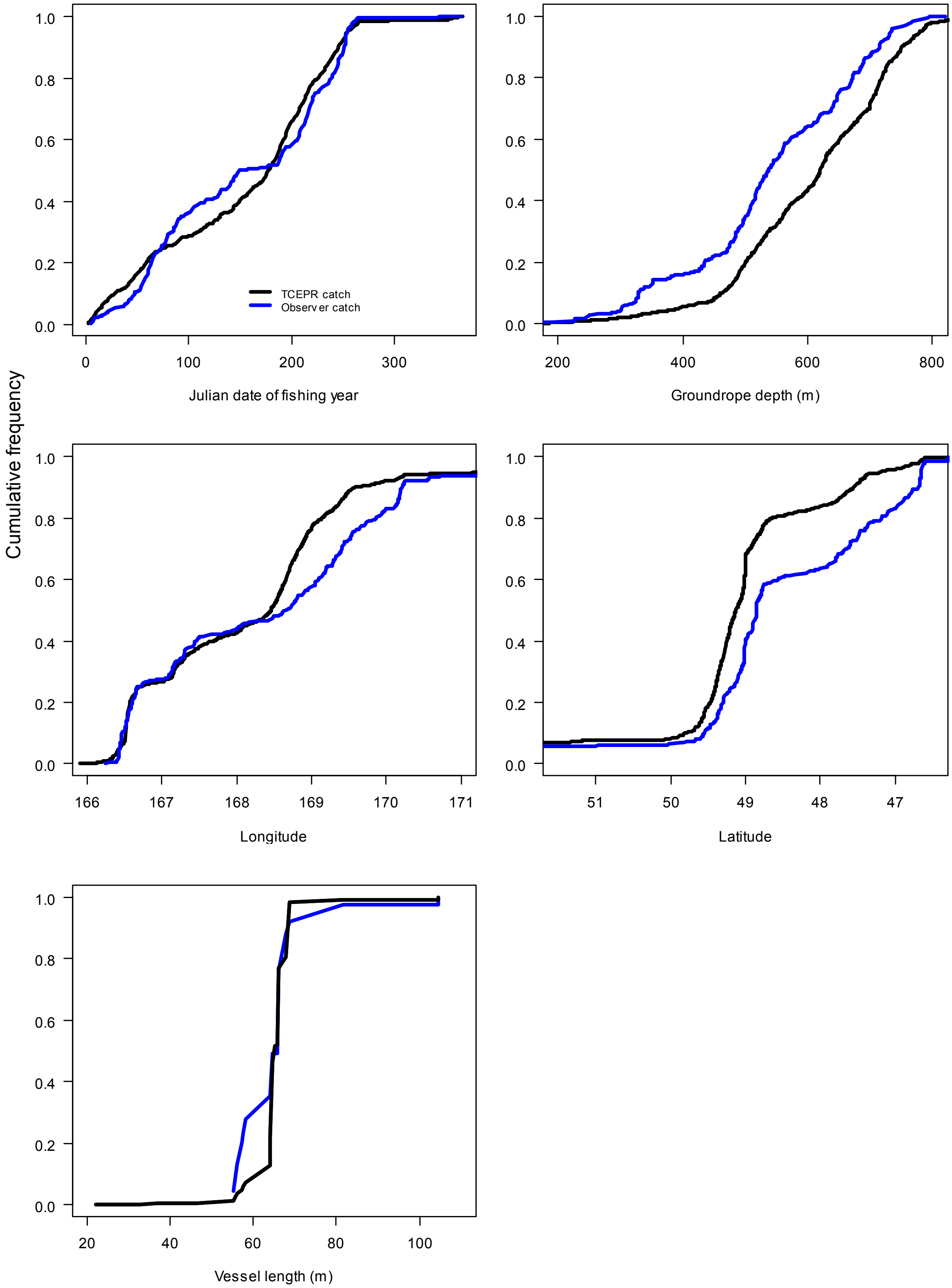


Figure 32: Comparison of Sub-Antarctic 2013–14 Observer Programme catch coverage with TCEPR catches by day of year, depth, latitude, longitude and vessel length (m). If sampling is representative of the fishery, then blue lines (observed catches) should overlay black lines (TCEPR catch).

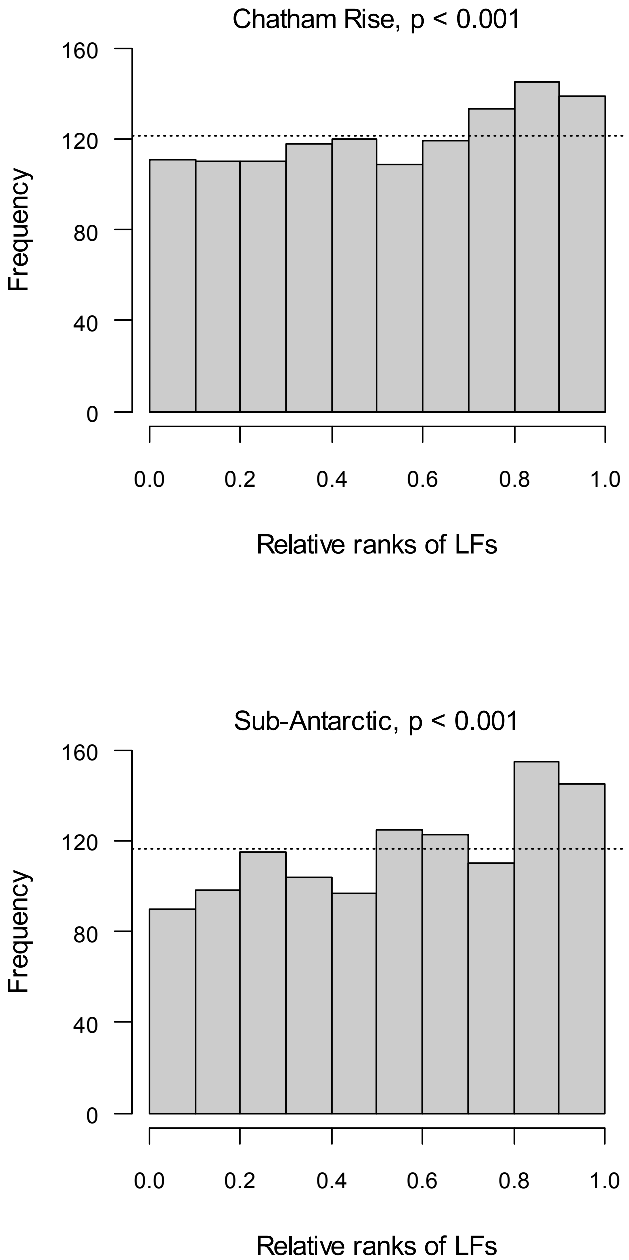


Figure 33: Histograms of ranks of the lengths that yielded 2013–14 Chatham Rise and Sub-Antarctic otoliths relative to the lengths of hoki measured for each tow. If sampling is random then the expected counts are given by the dotted line. The p-value is calculated using the rank-sum test.

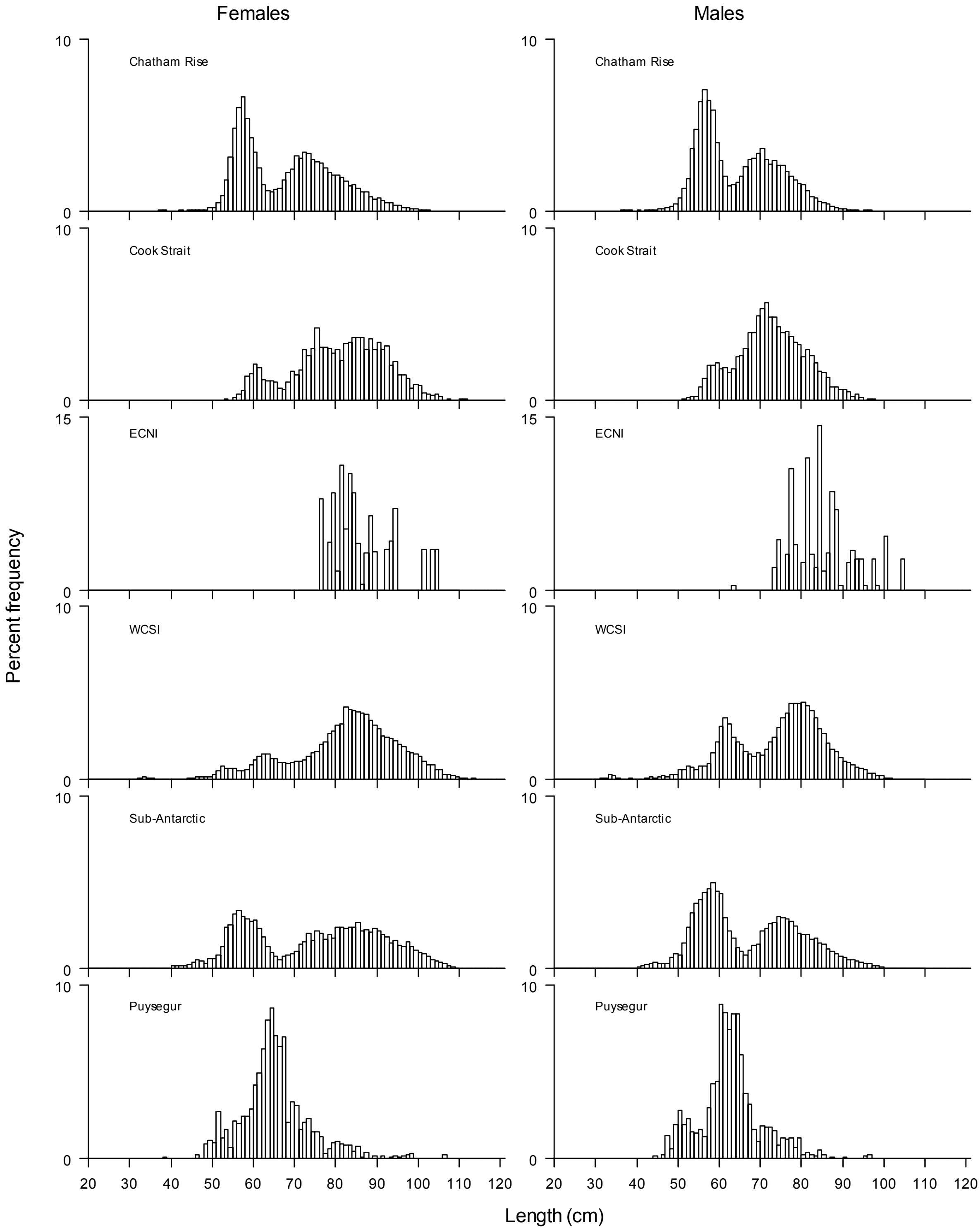


Figure 34: Length frequency distributions of female and male hoki taken in commercial catches from different areas during the 2013–14 fishing year. All areas sampled by the Observer Programme.

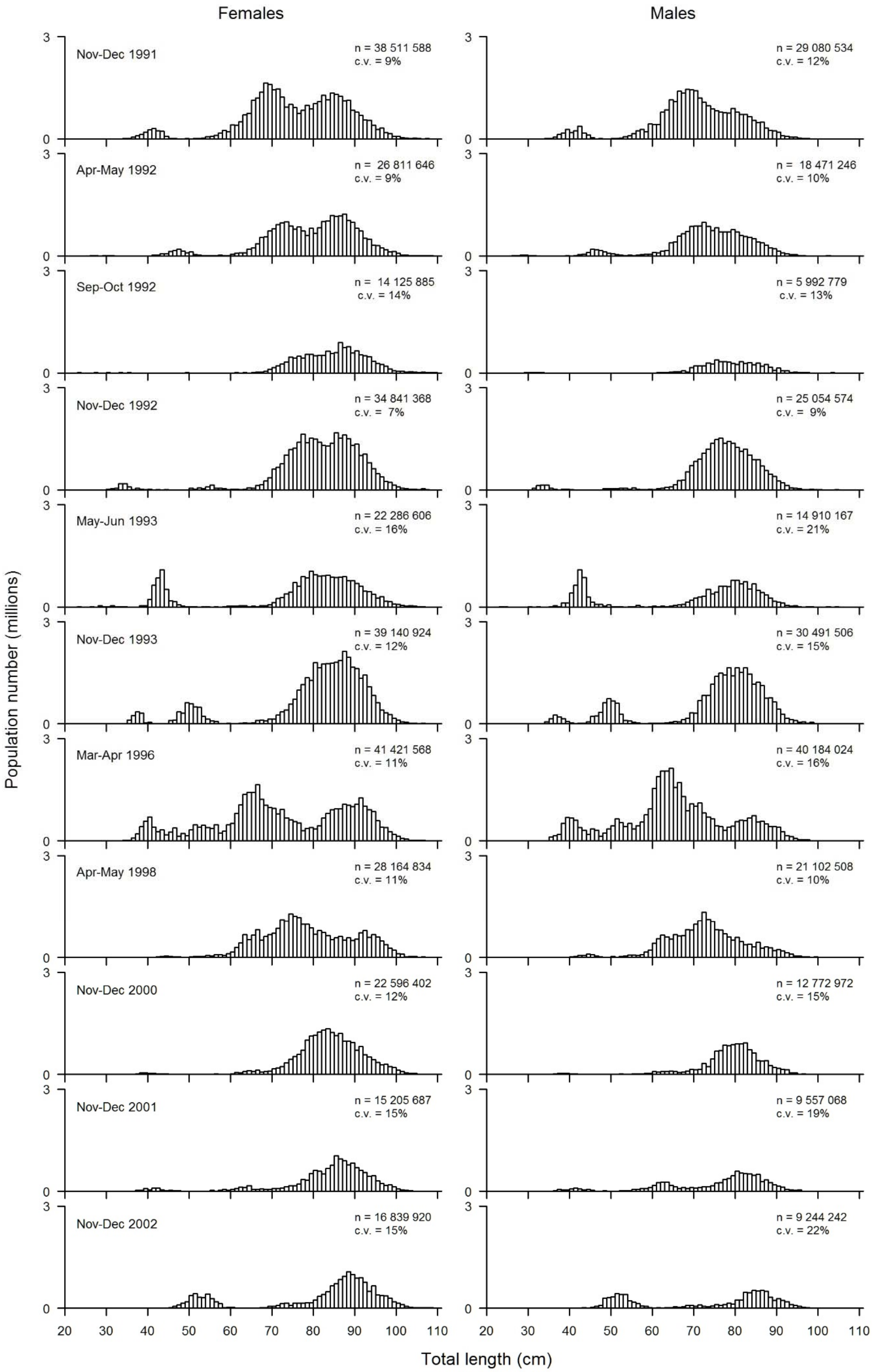


Figure 35: Scaled length frequency distributions for hoki from Sub-Antarctic *Tangaroa* trawl surveys. n, population numbers of fish; CV, coefficients of variation; no., number of fish measured.

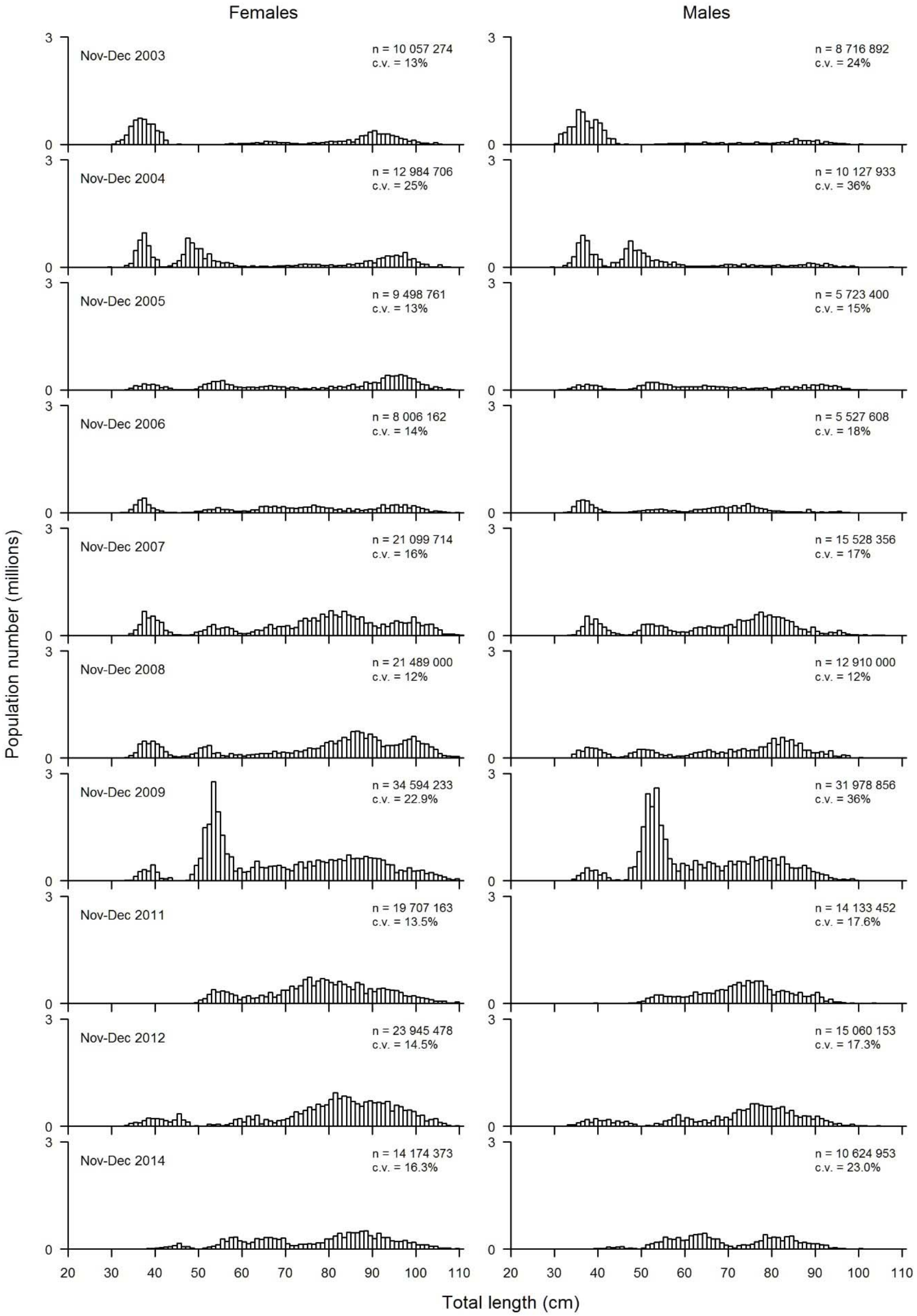


Figure 35 ctd.

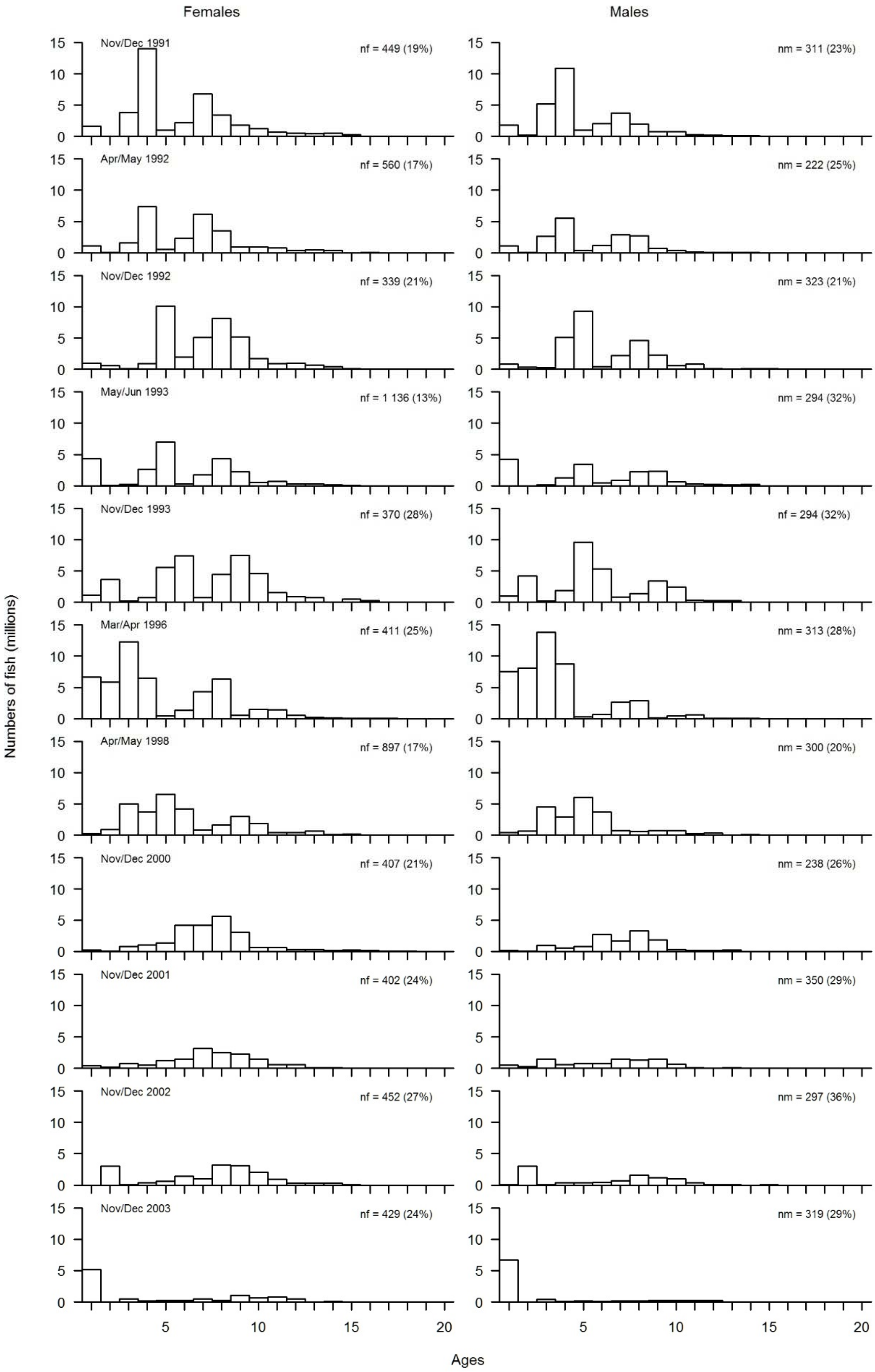


Figure 36: Scaled age frequency distributions for hoki from Sub-Antarctic *Tangaroa* trawl surveys 1991–2014.

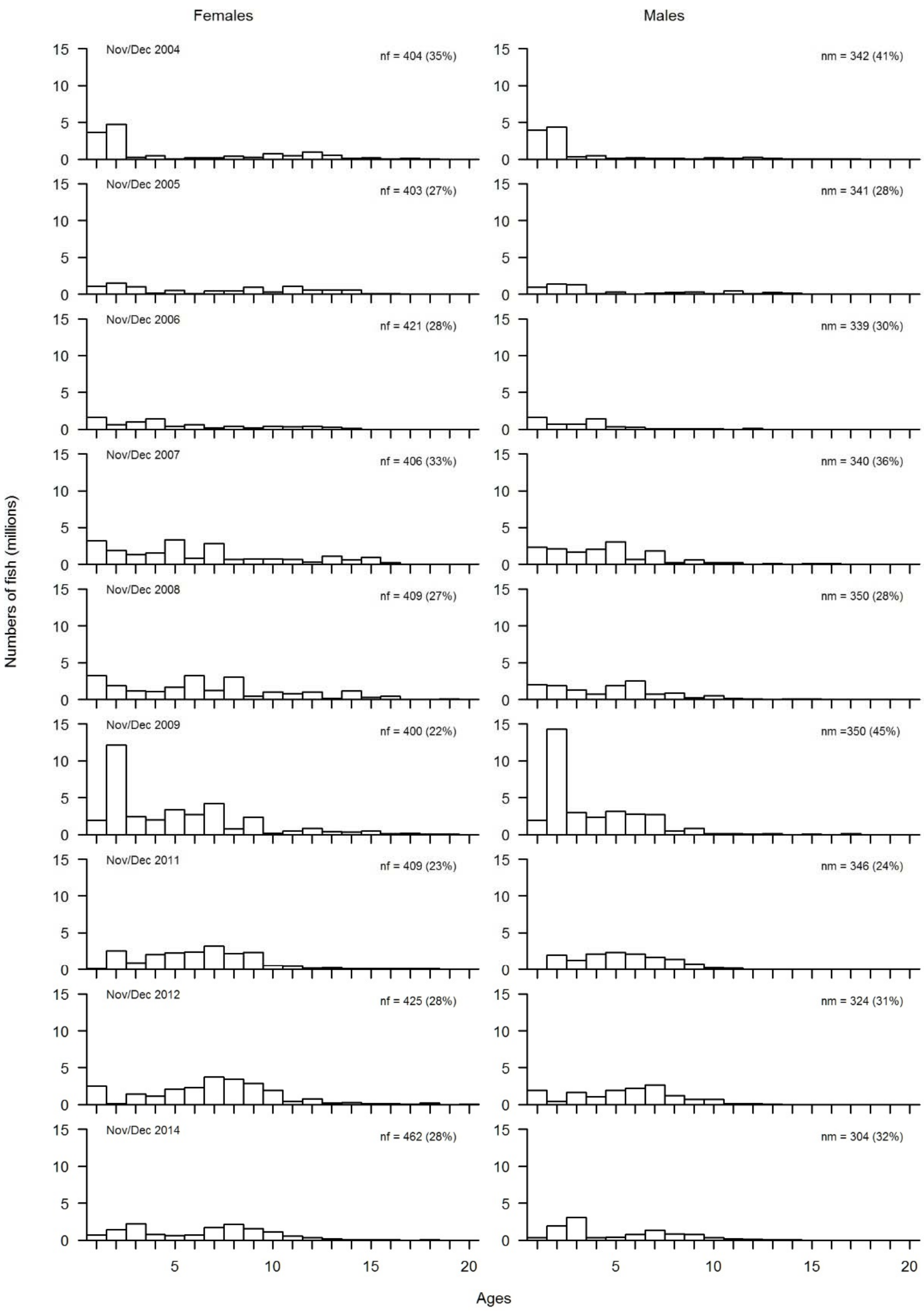


Figure 36 ctd.

APPENDICES

Table A1a: Number of vessels, tows, and total catch inside and outside the 25 nautical mile line off WCSI, by year. Data source ungroomed non-zero TCEPR, TCER, and CELR data. Year defined as June to October. There were no October data available for 2014. It is assumed that CELR data all comes from inside the 25 nautical mile line, and includes mid-water and bottom trawl tows reported on the CELR form only.

	Number of vessels					Number of tows				
Fishing year	TCEPR Outside	TCER Outside	TCEPR Inside	TCER Inside	CELR	TCEPR Outside	TCER Outside	TCEPR Inside	TCER Inside	CELR
1990	79	-	37	-	13	7 989	-	83	-	196
1991	75	-	41	-	17	8 135	-	68	-	302
1992	71	-	25	-	17	6 171	-	47	-	358
1993	64	-	22	-	18	6 886	-	108	-	511
1994	69	-	30	-	18	8 463	-	137	-	425
1995	65	-	36	-	21	8 521	-	189	-	319
1996	59	-	27	-	23	6 631	-	157	-	583
1997	73	-	45	-	23	7 597	-	440	-	747
1998	67	-	35	-	23	7 609	-	365	-	449
1999	53	-	34	-	18	6 835	-	280	-	624
2000	47	-	28	-	15	6 624	-	725	-	855
2001	52	-	45	-	16	6 960	-	1 380	-	819
2002	47	-	37	-	13	6 401	-	1 253	-	563
2003	44	-	29	-	8	6 619	-	829	-	680
2004	42	-	31	-	10	5 133	-	1 271	-	748
2005	37	-	15	-	10	3 623	-	530	-	464
2006	35	-	20	-	5	3 993	-	210	-	348
2007	30	-	9	-	6	2 620	-	146	-	253
2008	24	5	8	9	-	2 335	18	45	155	-
2009	25	6	3	11	-	1 961	15	3	253	-
2010	28	5	8	12	-	2 318	13	56	313	-
2011	29	6	9	16	-	2 802	40	298	474	-
2012	29	9	12	14	-	2 848	54	379	488	-
2013	24	10	11	13	-	3 057	91	181	588	-
2014	25	9	9	13	-	3 469	127	383	666	-

	Catches (kg)								
Fishing year	TCEPR Outside	TCER Outside	Total Outside	TCEPR Inside	TCER Inside	CELR	Total Inside	Total Overall	Percent Inside
1990	158 447	-	158 447	1 585	-	339	1 924	160 371	1
1991	128 259	-	128 259	1 015	-	222	1 237	129 496	1
1992	100 507	-	100 507	849	-	184	1 033	101 540	1
1993	95 402	-	95 402	737	-	522	1 259	96 661	1
1994	113 833	-	113 833	1 110	-	693	1 803	115 636	1
1995	79 083	-	79 083	1 851	-	747	2 598	81 681	3
1996	67 247	-	67 247	2 492	-	1 908	4 400	71 647	3
1997	82 141	-	82 141	5 637	-	2 360	7 997	90 138	6
1998	96 144	-	96 144	5 522	-	2 610	8 132	104 276	5
1999	85 486	-	85 486	4 295	-	3 846	8 141	93 627	5
2000	87 547	-	87 547	9 443	-	4 719	14 162	101 709	9
2001	80 508	-	80 508	16 627	-	4 979	21 606	102 114	16
2002	70 674	-	70 674	17 846	-	4 180	22 026	92 700	19
2003	57 211	-	57 211	11 583	-	4 944	16 527	73 738	16
2004	26 287	-	26 287	13 922	-	4 885	18 807	45 094	31
2005	24 820	-	24 820	5 574	-	2 223	7 797	32 617	17
2006	33 131	-	33 131	2 681	-	2 438	5 119	38 250	7
2007	30 192	-	30 192	1 128	-	1 962	3 090	33 282	3
2008	19 926	32	19 958	327	567	-	894	20 852	4
2009	19 285	23	19 308	36	1 102	-	1 138	20 446	6
2010	33 178	36	33 214	951	1 983	-	2 934	36 148	8
2011	40 653	168	40 821	4 047	3 441	-	7 488	48 309	16
2012	45 837	148	45 985	4 641	3 598	-	8 239	54 224	15
2013	49 039	97	49 136	2 596	3 589	-	6 185	55 321	11
2014	58 650	124	58 774	4 593	4 451	-	9 044	67 818	13

Table A1b: Number of TCEPR, TCER and CELR Cook Strait tows, total catch, and number of vessels by year. Data source is un-groomed non-zero TCEPR, TCER, and CELR tows catching hoki. 'CELR trawl' includes mid-water and bottom trawl tows reported on the CELR form only. Year defined as June to October. There were no October data available for 2014.

	Number of vessels				Number of tows			
Fishing year	**TCEPR**	**TCER**	**CELR**	**Total**	**TCEPR**	**TCER**	**CELR**	**Total**
1990	18	-	30	48	1 071	-	568	1 639
1991	22	-	41	63	2 097	-	1 510	3 607
1992	24	-	31	55	1 684	-	845	2 529
1993	20	-	30	50	1 532	-	934	2 466
1994	31	-	39	70	1 957	-	1 377	3 334
1995	26	-	33	59	2 291	-	1 266	3 557
1996	42	-	37	79	4 700	-	1 485	6 185
1997	40	-	28	68	4 921	-	1 061	5 982
1998	31	-	28	59	3 022	-	1 317	4 339
1999	21	-	28	49	2 656	-	942	3 598
2000	22	-	32	54	2 372	-	1 157	3 529
2001	25	-	23	48	2 042	-	981	3 023
2002	19	-	22	41	1 127	-	531	1 658
2003	21	-	25	46	1 933	-	998	2 931
2004	20	-	31	51	1 863	-	1 134	2 997
2005	15	-	15	30	1 454	-	476	1 930
2006	13	-	13	26	1 067	-	328	1 395
2007	8	-	14	22	980	-	491	1 471
2008	7	20	-	27	668	581	-	1 249
2009	10	21	1	32	878	551	1	1 430
2010	8	18	-	26	841	523	-	1 364
2011	7	20	-	27	519	571	-	1 090
2012	9	20	-	29	779	401	-	1 180
2013	10	20	-	30	971	359	-	1 330
2014	10	20	-	30	965	385	-	1 350

	Catches (kg)			
Fishing year	**TCEPR**	**TCER**	**CELR**	**Total**
1990	12 109	-	2 596	14 705
1991	22 153	-	7 013	29 166
1992	19 583	-	4 973	24 556
1993	17 533	-	4 199	21 732
1994	26 785	-	9 071	35 856
1995	26 600	-	7 361	33 962
1996	50 986	-	8 018	59 005
1997	49 946	-	6 562	56 508
1998	36 308	-	9 408	45 716
1999	34 040	-	6 222	40 262
2000	30 603	-	8 986	39 588
2001	24 630	-	8 188	32 818
2002	17 628	-	4 104	21 732
2003	27 341	-	7 271	34 613
2004	28 509	-	10 520	39 030
2005	18 482	-	4 369	22 851
2006	16 670	-	3 035	19 704
2007	12 594	-	5 403	17 997
2008	9 215	6 661	-	15 876
2009	10 044	5 112	-	15 156
2010	10 916	4 875	-	15 791
2011	7 315	4 519	-	11 834
2012	9 998	3 154	-	13 152
2013	12 304	3 119	-	15 423
2014	11 690	3 163	-	14 853

Table A1c: Number of Chatham Rise and ECSI vessels, tows and catch for all vessels by year for the non-spawning season. Data source is un-groomed non-zero TCEPR, TCER, and CELR tows catching hoki. 'CELR' includes all fishing methods reported on the CELR form, and 'CELR trawl' includes mid-water and bottom trawl tows only. Chatham Rise data includes data from October to September, and ECSI data includes data from October to May.

	Number of vessels				Number of tows			
Fishing year	**TCEPR**	**TCER**	**CELR**	**Total**	**TCEPR**	**TCER**	**CELR**	**Total**
1990	47	-	23	70	3 325	-	529	3 854
1991	69	-	38	107	5 724	-	900	6 624
1992	76	-	30	106	8 601	-	539	9 140
1993	75	-	29	104	8 575	-	512	9 087
1994	78	-	26	104	6 447	-	525	6 972
1995	87	-	31	118	10 028	-	675	10 703
1996	102	-	26	128	11 651	-	405	12 056
1997	105	-	18	123	12 609	-	303	12 912
1998	97	-	18	115	16 176	-	212	16 388
1999	87	-	24	111	14 984	-	421	15 405
2000	70	-	16	86	13 432	-	330	13 762
2001	68	-	11	79	12 360	-	373	12 733
2002	60	-	14	74	10 343	-	280	10 623
2003	63	-	15	78	11 400	-	255	11 655
2004	59	-	11	70	9 511	-	211	9 722
2005	51	-	12	63	7 418	-	132	7 550
2006	52	-	14	66	7 314	-	134	7 448
2007	47	-	11	58	7 324	-	153	7 477
2008	42	11	-	53	7 012	65	-	7 077
2009	37	12	1	50	6 227	79	2	6 308
2010	39	16	-	55	6 003	278	-	6 281
2011	39	14	-	53	5 446	140	-	5 586
2012	37	13	-	50	5 647	190	-	5 837
2013	39	14	-	53	5 456	416	-	5 872
2014	39	17	-	56	5 421	414	-	5 835

	Catches (kg)			
Fishing year	**TCEPR**	**TCER**	**CELR**	**Total**
1990	13 091	-	71	13 161
1991	29 965	-	162	30 126
1992	48 036	-	99	48 134
1993	44 169	-	63	44 231
1994	22 662	-	63	22 725
1995	38 991	-	182	39 173
1996	50 283	-	86	50 368
1997	55 726	-	93	55 819
1998	77 105	-	93	77 197
1999	72 656	-	929	73 585
2000	55 912	-	98	56 010
2001	49 307	-	532	49 840
2002	39 105	-	38	39 144
2003	39 071	-	17	39 088
2004	33 608	-	39	33 647
2005	30 423	-	8	30 432
2006	34 934	-	6	34 941
2007	37 797	-	10	37 806
2008	37 855	60	-	37 915
2009	38 997	8	-	39 005
2010	39 086	47	-	39 133
2011	38 402	40	-	38 442
2012	39 169	72	-	39 241
2013	36 442	89	-	36 531
2014	33 698	45	-	33 743

Table A1d: Number of ECSI vessels, tows and catch for all vessels by year for the spawning season. Data source is un-groomed non-zero TCEPR, TCER, and CELR tows catching hoki. Year defined as June to October. 'CELR trawl' includes mid-water and bottom trawl tows reported on the CELR form only. There were no data available for October 2014.

	Number of vessels				Number of tows			
Fishing year	**TCEPR**	**TCER**	**CELR**	**Total**	**TCEPR**	**TCER**	**CELR**	**Total**
1990	8	-	17	25	45	-	123	168
1991	12	-	20	32	134	-	234	368
1992	10	-	12	22	106	-	242	348
1993	9	-	13	22	32	-	274	306
1994	9	-	12	21	44	-	215	259
1995	12	-	10	22	48	-	72	120
1996	26	-	10	36	192	-	77	269
1997	21	-	6	27	194	-	154	348
1998	20	-	6	26	213	-	81	294
1999	19	-	9	28	141	-	151	292
2000	16	-	9	25	126	-	229	355
2001	16	-	8	24	197	-	251	448
2002	17	-	10	27	257	-	146	403
2003	21	-	11	32	555	-	219	774
2004	14	-	10	24	114	-	248	362
2005	12	-	3	15	284	-	69	353
2006	6	-	5	11	141	-	76	217
2007	12	-	4	16	108	-	27	135
2008	10	4	-	14	239	47	-	286
2009	11	3	-	14	103	37	-	140
2010	10	4	-	14	78	97	-	175
2011	8	5	-	13	129	74	-	203
2012	11	6	-	17	183	88	-	271
2013	12	6	-	18	245	55	-	300
2014	13	6	-	19	188	18	-	206

	Catches (kg)			
Fishing year	**TCEPR**	**TCER**	**CELR**	**Total**
1990	51	-	229	280
1991	841	-	503	1 345
1992	547	-	396	943
1993	137	-	172	309
1994	164	-	353	517
1995	52	-	103	155
1996	1 199	-	103	1 301
1997	817	-	973	1 790
1998	1 300	-	371	1 671
1999	765	-	1 329	2 094
2000	599	-	1 822	2 421
2001	1 658	-	760	2 418
2002	2 806	-	225	3 031
2003	6 460	-	1 006	7 466
2004	1 370	-	927	2 297
2005	4 683	-	50	4 733
2006	1 137	-	57	1 194
2007	1 001	-	63	1 064
2008	2 302	40	-	2 342
2009	1 117	29	-	1 146
2010	600	138	-	738
2011	1 504	152	-	1 657
2012	2 355	175	-	2 530
2013	3 284	110	-	3 394
2014	2 758	38	-	2 796

Table A1e: Number of Sub-Antarctic vessels, tows and catch for all vessels by fishing year. Data source is un-groomed non-zero TCEPR, TCER, and CELR tows catching hoki. 'CELR trawl' includes mid-water and bottom trawl tows reported on the CELR form only.

	Number of vessels				Number of tows			
Fishing year	TCEPR	TCER	CELR	Total	TCEPR	TCER	CELR	Total
1990	64	-	-	64	2 787	-	-	2 787
1991	66	-	-	66	4 617	-	-	4 617
1992	76	-	-	76	7 025	-	-	7 025
1993	63	-	2	65	6 143	-	4	6 147
1994	65	-	-	65	3 718	-	-	3 718
1995	62	-	-	62	3 585	-	-	3 585
1996	68	-	1	69	4 170	-	2	4 172
1997	74	-	-	74	5 003	-	-	5 003
1998	68	-	1	69	5 419	-	4	5 423
1999	68	-	-	68	5 145	-	-	5 145
2000	56	-	1	57	7 677	-	3	7 680
2001	56	-	-	56	7 401	-	-	7 401
2002	55	-	1	56	8 443	-	25	8 468
2003	50	-	3	53	5 689	-	10	5 699
2004	46	-	-	46	3 850	-	-	3 850
2005	43	-	-	43	2 638	-	-	2 638
2006	41	-	-	41	2 507	-	-	2 507
2007	36	-	-	36	3 004	-	-	3 004
2008	35	-	-	35	2 731	-	-	2 731
2009	32	1	-	33	2 914	1	-	2 915
2010	34	2	-	36	3 171	2	-	3 173
2011	35	1	-	36	2 931	1	-	2 932
2012	34	3	-	37	2 731	3	-	2 734
2013	35	1	-	36	2 844	1	-	2 845
2014	30	1	-	31	3 385	2	-	3 387

	Catches (kg)			
Fishing year	TCEPR	TCER	CELR	Total
1990	11 748	-	-	11 748
1991	16 669	-	-	16 669
1992	30 688	-	-	30 688
1993	24 836	-	-	24 836
1994	11 636	-	-	11 636
1995	13 128	-	-	13 128
1996	14 269	-	1	14 270
1997	21 771	-	-	21 771
1998	25 129	-	1	25 129
1999	23 753	-	-	23 753
2000	33 772	-	-	33 772
2001	30 076	-	-	30 076
2002	30 175	-	-	30 175
2003	20 194	-	5	20 199
2004	11 635	-	-	11 635
2005	6 337	-	-	6 337
2006	6 961	-	-	6 961
2007	7 661	-	-	7 661
2008	8 708	-	-	8 708
2009	9 807	-	-	9 807
2010	12 275	-	-	12 275
2011	12 655	-	-	12 655
2012	15 743	-	-	15 743
2013	14 099	-	-	14 099
2014	19 925	1	-	19 925

Table A1f: Number of Puysegur vessels, tows and catch for all vessels by year for the spawning season. Data source is un-groomed non-zero TCEPR, TCER, and CELR tows catching hoki. Year defined as June to December. 'CELR trawl' includes mid-water and bottom trawl tows reported on the CELR form only. There were no October to December data available for 2014.

	Number of vessels				Number of tows			
Fishing year	**TCEPR**	**TCER**	**CELR**	**Total**	**TCEPR**	**TCER**	**CELR**	**Total**
1990	44	-	-	44	992	-	-	992
1991	41	-	-	41	780	-	-	780
1992	40	-	-	40	918	-	-	918
1993	28	-	2	30	385	-	10	395
1994	38	-	2	40	407	-	16	423
1995	28	-	2	30	422	-	6	428
1996	29	-	-	29	609	-	-	609
1997	39	-	-	39	799	-	-	799
1998	32	-	-	32	539	-	-	539
1999	30	-	1	31	535	-	3	538
2000	25	-	1	26	584	-	29	613
2001	37	-	1	38	856	-	8	864
2002	27	-	2	29	555	-	16	571
2003	31	-	1	32	493	-	10	503
2004	16	-	1	17	213	-	20	233
2005	24	-	1	25	468	-	12	480
2006	21	-	1	22	361	-	23	384
2007	14	-	2	16	191	-	21	212
2008	16	-	-	16	212	-	-	212
2009	8	1	-	9	146	12	-	158
2010	12	1	-	13	108	1	-	109
2011	13	4	-	17	178	13	-	191
2012	15	3	-	18	215	22	-	237
2013	15	2	-	17	130	6	-	136
2014	11	2	-	13	137	18	-	155

	Catches (kg)			
Fishing year	**TCEPR**	**TCER**	**CELR**	**Total**
1990	7 378	-	-	7 378
1991	4 870	-	-	4 870
1992	4 744	-	-	4 744
1993	2 039	-	-	2 039
1994	2 382	-	-	2 382
1995	1 413	-	-	1 413
1996	2 401	-	-	2 401
1997	5 847	-	-	5 847
1998	2 137	-	-	2 137
1999	2 867	-	4	2 871
2000	2 757	-	-	2 757
2001	6 586	-	1	6 587
2002	5 222	-	7	5 229
2003	5 821	-	16	5 837
2004	1 124	-	5	1 129
2005	5 480	-	-	5 481
2006	1 321	-	6	1 327
2007	376	-	9	385
2008	304	-	-	304
2009	198	4	-	203
2010	198	2	-	200
2011	1 155	2	-	1 157
2012	1 144	1	-	1 145
2013	647	-	-	648
2014	647	7	-	654

Table A2a: Number of tows, vessels, median tow duration, catch per tow, and catch per hour for all WCSI vessels by year. Year defined as June to October. There were no October data available for 2014. Data are non-zero catches for TCEPR midwater tows.

MW tows (all target species):

Fishing year	Number of vessels	Total catch (t)	Number of tows	Median tow duration (h)	Median catch per tow (t)	Median catch per hour (t/h)
1990	69	149 295	6 780	4.2	10.3	2.6
1991	66	118 323	6 744	4.0	10.2	2.6
1992	61	92 024	5 193	3.6	12.4	3.5
1993	57	82 529	5 263	3.2	10.3	3.7
1994	63	105 195	7 139	3.0	8.9	3.2
1995	59	75 148	7 408	3.5	4.9	1.4
1996	59	64 802	5 171	3.5	6.8	1.9
1997	76	82 639	6 611	3.8	7.4	2.0
1998	66	95 864	6 695	3.5	10.4	2.8
1999	56	76 767	5 256	3.1	10.3	3.3
2000	52	79 535	5 316	2.8	12.0	4.3
2001	62	78 853	5 879	2.6	9.0	3.4
2002	56	61 528	4 654	2.3	9.8	4.1
2003	51	51 751	4 312	3.0	8.1	2.4
2004	51	32 049	4 230	2.4	4.6	1.5
2005	37	19 682	2 365	2.5	5.1	1.8
2006	36	21 067	2 015	3.0	6.7	2.5
2007	31	21 093	1 432	3.5	9.3	3.5
2008	15	12 047	886	1.8	6.4	3.8
2009	23	12 590	887	3.2	8.9	3.1
2010	26	23 033	1 216	2.6	15.3	5.2
2011	24	29 603	1 514	2.0	17.2	8.4
2012	27	30 122	1 567	2.1	16.3	7.9
2013	24	33 858	1 811	2.6	15.4	6.2
2014	26	43 802	2 317	2.8	15.1	5.9
All years	240	1 493 202	102 661	3.2	9.3	2.9

MW tows (Target hoki tows):

Fishing year	Number of vessels	Total catch (t)	Number of tows	Median tow duration (h)	Median catch per tow (t)	Median catch per hour (t/h)
1990	69	149 263	6 736	4.2	10.3	2.6
1991	66	118 202	6 727	4.0	10.2	2.6
1992	60	91 904	5 141	3.6	12.4	3.6
1993	56	82 133	5 030	3.1	10.5	4.1
1994	62	105 007	6 978	3.0	9.5	3.3
1995	59	74 715	7 145	3.5	4.9	1.4
1996	59	64 735	5 115	3.5	6.8	1.9
1997	76	82 222	6 505	3.8	7.9	2.1
1998	66	95 670	6 630	3.5	10.4	2.8
1999	56	76 532	5 142	3.1	10.3	3.4
2000	51	79 269	5 194	2.7	12.0	4.5
2001	62	78 512	5 726	2.6	9.3	3.6
2002	56	61 336	4 579	2.3	9.8	4.3
2003	51	51 466	4 208	3.0	8.1	2.5
2004	51	31 874	4 152	2.3	4.9	1.6
2005	37	19 620	2 266	2.4	5.7	2.0
2006	34	20 729	1 734	2.6	8.5	3.2
2007	31	20 786	1 136	2.8	15.0	5.5
2008	13	11 841	806	1.7	7.3	4.7
2009	15	12 367	685	2.7	14.2	5.0
2010	23	22 884	1 172	2.5	17.1	5.5
2011	24	29 468	1 495	2.0	17.4	8.5
2012	27	30 071	1 559	2.1	16.3	7.9
2013	24	33 705	1 793	2.6	15.4	6.2
2014	26	43 767	2 298	2.8	15.2	6.0
All years	240	1 488 080	99 952	3.2	9.7	3.0

Table A2b: Number of tows, vessels, median tow duration, catch per tow, and catch per hour for all WCSI vessels by year. Year defined as June to October. There were no October data available for 2014. Data are non-zero catches for TCEPR bottom tows.

All target species BT tows:

Fishing year	Number of vessels	Total catch (t)	Number of tows	Median tow duration (h)	Median catch per tow (t)	Median catch per hour (t/h)
1990	41	10 737	1 292	4.0	3.2	0.8
1991	36	10 951	1 458	4.0	3.6	0.9
1992	38	9 334	1 036	4.1	4.1	1.0
1993	33	13 656	1 727	3.8	5.2	1.4
1994	32	9 703	1 468	4.2	3.7	0.8
1995	27	5 809	1 331	4.5	2.5	0.5
1996	38	4 914	1 586	4.7	2.1	0.4
1997	47	5 145	1 442	5.0	2.2	0.5
1998	40	5 925	1 308	5.2	2.9	0.5
1999	39	12 894	1 835	4.7	4.1	0.8
2000	34	17 487	2 064	4.5	6.0	1.2
2001	40	18 238	2 399	4.5	5.0	0.9
2002	35	26 993	3 005	5.0	5.2	1.0
2003	39	17 057	3 197	5.3	2.3	0.4
2004	35	8 174	2 154	6.0	1.5	0.3
2005	30	10 708	1 801	6.6	2.5	0.4
2006	26	14 723	2 145	8.3	2.8	0.4
2007	22	10 252	1 344	7.1	3.1	0.4
2008	17	8 179	1 472	9.0	2.4	0.3
2009	18	6 735	1 083	9.2	3.0	0.3
2010	21	11 116	1 171	7.2	4.9	0.8
2011	21	15 075	1 565	6.1	6.2	1.0
2012	23	20 353	1 656	5.2	9.9	1.9
2013	18	17 777	1 427	5.1	10.8	2.3
2014	17	19 315	1 523	5.2	10.2	1.8
All years	144	311 248	42 489	5.0	3.6	0.7

Target hoki BT tows:

Fishing year	Number of vessels	Total catch (t)	Number of tows	Median tow duration (h)	Median catch per tow (t)	Median catch per hour (t/h)
1990	34	10 597	1 129	4.2	4.1	1.1
1991	31	10 877	1 321	4.0	4.1	1.1
1992	28	9 152	791	4.0	7.0	1.7
1993	29	13 611	1 588	3.8	5.9	1.6
1994	29	9 679	1 369	4.3	4.2	0.9
1995	24	5 794	1 290	4.5	2.5	0.5
1996	37	4 885	1 544	4.7	2.1	0.4
1997	42	5 115	1 354	5.0	2.5	0.5
1998	34	5 888	1 217	5.3	3.1	0.5
1999	35	12 856	1 689	4.7	5.1	1.0
2000	32	17 417	1 903	4.4	6.3	1.4
2001	37	18 216	2 314	4.6	5.0	1.0
2002	34	26 724	2 839	5.0	5.9	1.1
2003	39	16 793	2 791	5.1	3.0	0.6
2004	34	7 911	1 799	5.7	2.0	0.4
2005	27	9 732	1 240	5.6	4.5	0.8
2006	24	13 087	1 405	7.0	5.0	0.8
2007	20	8 874	731	4.8	9.3	1.7
2008	13	5 246	480	5.0	8.6	1.7
2009	13	4 460	350	4.5	11.2	2.6
2010	19	9 214	611	3.2	13.5	4.7
2011	17	11 707	908	4.1	11.4	2.9
2012	20	18 853	1 184	3.8	15.0	4.1
2013	16	16 064	996	3.5	15.6	4.8
2014	15	17 202	1 075	3.9	15.3	3.8
All years	130	289 954	33 918	4.6	5.0	1.0

Table A2c: Number of tows, vessels, median tow duration, catch per tow, and catch per hour for all Cook Strait vessels by year. Year defined as June to October. There were no October data available for 2014. Data are non-zero catches for TCEPR midwater tows.

All target species tows:

Fishing year	Number of vessels	Total catch (t)	Number of tows	Median tow duration (h)	Median catch per tow (t)	Median catch per hour (t/h)
1990	17	11 894	1 048	1.2	9.1	7.4
1991	22	21 976	2 069	1.5	8.2	5.0
1992	22	19 345	1 642	1.2	8.3	6.5
1993	20	16 977	1 499	1.0	8.3	7.0
1994	29	25 106	1 810	1.0	11.8	11.8
1995	24	24 376	2 162	1.0	8.3	9.9
1996	36	41 820	3 087	0.8	11.1	16.7
1997	34	43 248	3 592	1.0	10.6	11.2
1998	28	30 711	2 373	1.0	11.4	11.7
1999	21	28 084	2 037	1.0	12.7	14.8
2000	21	27 935	1 989	0.7	12.0	19.3
2001	25	23 581	1 842	0.8	11.0	14.0
2002	15	17 147	1 068	1.0	14.9	17.2
2003	20	26 979	1 816	1.0	12.6	16.2
2004	19	27 712	1 793	1.0	12.2	14.2
2005	13	18 166	1 344	1.0	13.0	16.9
2006	11	16 330	1 015	0.8	15.1	20.5
2007	7	12 444	952	1.0	11.0	13.8
2008	6	7 558	404	0.8	18.4	23.3
2009	8	9 095	740	0.6	10.1	18.2
2010	8	10 839	820	0.8	11.2	14.9
2011	6	7 346	527	0.8	11.3	16.7
2012	9	9 778	759	0.9	10.7	13.7
2013	9	11 682	865	0.7	11.6	17.0
2014	9	11 162	871	1.0	11.2	12.3
All years	71	501 294	38 124	1.0	10.6	12.4

Target hoki tows:

Fishing year	Number of vessels	Total catch (t)	Number of tows	Median tow duration (h)	Median catch per tow (t)	Median catch per hour (t/h)
1990	17	11 894	1 048	1.2	9.1	7.4
1991	22	21 976	2 069	1.5	8.2	5.0
1992	22	19 345	1 642	1.2	8.3	6.5
1993	18	16 957	1 493	1.0	8.3	7.0
1994	29	25 065	1 804	1.0	11.8	11.9
1995	24	24 320	2 158	1.0	8.3	9.9
1996	36	41 744	3 076	0.8	11.2	16.7
1997	34	43 179	3 585	1.0	10.6	11.2
1998	28	30 674	2 371	1.0	11.4	11.7
1999	21	28 081	2 036	1.0	12.7	14.8
2000	21	27 935	1 989	0.7	12.0	19.3
2001	25	23 553	1 839	0.8	11.0	14.0
2002	15	17 147	1 068	1.0	14.9	17.2
2003	20	26 979	1 814	1.0	12.6	16.3
2004	19	27 712	1 791	1.0	12.2	14.2
2005	13	18 162	1 343	1.0	13.0	16.9
2006	11	16 330	1 014	0.8	15.1	20.5
2007	7	12 396	949	1.0	10.9	13.8
2008	5	7 555	397	0.8	18.8	24.3
2009	8	9 083	739	0.6	10.1	18.2
2010	8	10 783	818	0.8	11.2	14.8
2011	6	7 346	527	0.8	11.3	16.7
2012	9	9 778	759	0.9	10.7	13.7
2013	9	11 682	865	0.7	11.6	17.0
2014	9	11 162	871	1.0	11.2	12.3
All years	71	500 839	38 065	1.0	10.6	12.5

A2d: Number of Chatham Rise and ECSI non-zero hoki bottom tows and vessels, total catches, median tow duration, median catch per tow, and median catch per hour by fishing year. Data source is un-groomed bottom non-zero TCEPR tows catching hoki. Chatham Rise data includes data from October to September, and ECSI data includes data from October to May.

All target species tows:

Fishing year	Number of vessels	Total catch (t)	Number of tows	Median tow duration (h)	Median catch per tow (t)	Median catch per hour (t/h)
1990	47	13 001	3 297	4.0	1.5	0.5
1991	59	18 080	4 787	4.0	2.0	0.5
1992	72	43 456	8 169	4.0	3.1	0.8
1993	61	39 238	7 523	3.9	3.4	1.0
1994	64	18 125	5 305	3.5	2.1	0.7
1995	70	30 585	7 914	3.8	3.0	0.9
1996	84	37 620	9 294	3.6	2.9	0.9
1997	96	42 898	10 330	3.7	3.2	0.9
1998	82	55 824	12 479	4.0	3.3	0.9
1999	77	61 528	12 620	4.0	4.1	1.0
2000	60	44 753	10 746	4.1	3.0	0.8
2001	60	46 150	11 429	4.5	3.0	0.7
2002	55	36 271	9 491	4.5	2.9	0.7
2003	62	37 415	10 912	4.7	2.5	0.5
2004	58	31 656	9 131	5.0	2.3	0.5
2005	50	28 914	7 048	5.0	2.8	0.6
2006	50	34 077	7 145	4.8	3.5	0.8
2007	46	37 640	7 267	4.6	3.5	0.8
2008	38	37 375	6 890	4.8	3.6	0.8
2009	37	38 956	6 186	4.3	4.6	1.1
2010	38	38 454	5 833	4.5	5.3	1.2
2011	38	38 136	5 286	4.7	5.9	1.2
2012	35	38 818	5 428	4.8	5.7	1.3
2013	35	35 093	5 181	4.8	5.6	1.2
2014	32	32 606	5 170	4.8	5.0	1.1
All years	199	916 670	194 861	4.2	3.1	0.8

Target hoki tows:

Fishing year	Number of vessels	Total catch (t)	Number of tows	Median tow duration (h)	Median catch per tow (t)	Median catch per hour (t/h)
1990	31	11 788	1 902	4.0	3.8	1.0
1991	41	16 761	3 285	4.0	3.5	0.9
1992	47	42 305	5 408	3.8	5.7	1.6
1993	40	38 354	5 169	3.5	5.7	1.6
1994	36	17 525	3 372	3.2	4.2	1.3
1995	42	30 097	6 485	3.5	3.9	1.1
1996	58	37 177	7 969	3.5	3.2	1.0
1997	73	42 380	8 988	3.5	3.7	1.1
1998	63	55 315	11 159	4.0	4.2	1.0
1999	46	60 838	11 244	4.0	4.4	1.1
2000	34	44 113	9 413	4.1	3.7	0.9
2001	40	44 928	9 762	4.5	3.5	0.8
2002	31	35 087	7 773	4.4	3.4	0.8
2003	32	36 051	9 196	4.8	3.0	0.6
2004	28	30 207	7 142	4.9	3.0	0.6
2005	21	27 472	4 973	5.0	4.1	0.8
2006	20	32 329	4 997	4.8	5.0	1.0
2007	21	34 746	4 733	4.5	5.8	1.2
2008	22	33 527	4 187	4.8	6.6	1.4
2009	21	33 645	3 896	4.2	7.3	1.7
2010	21	35 151	4 349	4.6	6.9	1.5
2011	23	34 811	4 056	4.8	7.2	1.5
2012	24	37 639	4 380	4.8	7.2	1.6
2013	22	33 926	4 160	4.8	6.7	1.4
2014	18	31 883	3 958	4.9	6.6	1.4
All years	164	878 056	151 956	4.1	4.2	1.0

Table A2e: Number of ECSI non-zero hoki midwater or bottom tows and vessels, total catches, median tow duration, median catch per tow, and median catch per hour by year. Data source is un-groomed midwater or bottom non-zero TCEPR tows catching hoki. Year defined as June to October. There were no October data available for 2014. Data are not shown for MW vessels in 2009 or 2010 as there was only one vessel.

All target species mid-water tows:

Fishing year	Number of vessels	Total catch (t)	Number of tows	Median tow duration (h)	Median catch per tow (t)	Median catch per hour (t/h)
2000	7	289	24	2.7	7.5	2.4
2001	15	1 264	123	2.4	6.0	2.2
2002	10	2 003	145	2.2	10.9	4.2
2003	18	4 453	301	2.1	13.1	5.2
2004	5	1 438	85	2.2	10.4	6.0
2005	6	4 037	221	2.0	15.0	8.4
2006	4	485	41	1.5	10.0	5.7
2007	4	299	26	1.1	8.7	8.8
2008	3	263	-	-	-	-
2009	1	462	-	-	-	-
2010	1	28	7	1.9	3.1	1.4
2011	4	879	57	1.0	14.7	10.8
2012	8	1 686	117	1.6	10.3	5.2
2013	10	2 945	191	2.0	14.2	6.6
2014	10	2 548	128	2.2	17.1	8.4
All years	34	23 082	1 521	2.0	12.5	5.7

Target hoki mid-water tows:

Fishing year	Number of vessels	Total catch (t)	Number of tows	Median tow duration (h)	Median catch per tow (t)	Median catch per hour (t/h)
2000	7	289	24	2.7	7.5	2.4
2001	15	1 264	123	2.4	6.0	2.2
2002	10	2 003	145	2.2	10.9	4.2
2003	18	4 453	301	2.1	13.1	5.2
2004	5	1 438	85	2.2	10.4	6.0
2005	6	4 037	221	2.0	15.0	8.4
2006	4	485	41	1.5	10.0	5.7
2007	4	299	26	1.1	8.7	8.8
2008	3	263	28	3.0	8.1	2.7
2009	1	462	-	-	-	-
2010	1	28	-	-	-	-
2011	4	879	57	1.0	14.7	10.8
2012	8	1 686	117	1.6	10.3	5.2
2013	10	2 945	191	2.0	14.2	6.6
2014	10	2 548	128	2.2	17.1	8.4
All years	34	22 746	1 501	2.0	12.4	5.6

Table A2e ECSI ctd.

All target bottom tows:

Fishing year	Number of vessels	Total catch (t)	Number of tows	Median tow duration (h)	Median catch per tow (t)	Median catch per hour (t/h)
2000	10	250	69	2.5	2.5	1.0
2001	13	441	85	2.7	3.5	1.2
2002	16	828	126	2.6	3.9	1.5
2003	16	2 081	255	2.9	5.4	1.9
2004	7	250	44	2.4	3.1	1.0
2005	8	717	98	3.0	4.1	1.8
2006	7	163	31	2.1	2.1	1.6
2007	11	666	81	2.0	6.2	2.9
2008	12	2 112	215	2.8	7.5	2.5
2009	8	635	76	2.8	6.2	2.4
2010	8	533	70	2.8	7.3	2.1
2011	6	592	56	3.5	10.8	3.0
2012	9	753	89	2.5	7.2	2.4
2013	10	302	48	2.9	3.6	1.4
2014	10	158	41	2.3	2.5	0.9
All years	38	10 551	1 426	2.8	4.9	1.9

Target hoki bottom tows:

Fishing year	Number of vessels	Total catch (t)	Number of tows	Median tow duration (h)	Median catch per tow (t)	Median catch per hour (t/h)
2000	10	250	69	2.5	2.5	1.0
2001	13	441	85	2.7	3.5	1.2
2002	16	828	126	2.6	3.9	1.5
2003	16	2 081	255	2.9	5.4	1.9
2004	7	250	44	2.4	3.1	1.0
2005	8	717	98	3.0	4.1	1.8
2006	7	163	31	2.1	2.1	1.6
2007	11	666	81	2.0	6.2	2.9
2008	12	2 112	215	2.8	7.5	2.5
2009	8	635	76	2.8	6.2	2.4
2010	8	533	70	2.8	7.3	2.1
2011	6	592	56	3.5	10.8	3.0
2012	9	753	89	2.5	7.2	2.4
2013	10	302	48	2.9	3.6	1.4
2014	10	158	41	2.3	2.5	0.9
All years	28	10 082	1 292	2.8	5.1	2.0

Table A2f: Number of Sub-Antarctic non-zero hoki bottom tows and vessels, total catches, median tow duration, median catch per tow, and median catch per hour for all vessels by fishing year. Data source is un-groomed non-zero TCEPR bottom tows catching hoki.

All target species tows:

Fishing year	Number of vessels	Total catch (t)	Number of tows	Median tow duration (h)	Median catch per tow (t)	Median catch per hour (t/h)
1990	36	11 542	2 589	4.0	2.6	0.6
1991	43	16 177	4 420	4.3	2.6	0.6
1992	58	29 688	6 877	4.2	3.1	0.8
1993	39	22 304	5 647	4.0	3.1	0.8
1994	45	9 051	3 163	4.2	1.6	0.4
1995	42	11 716	3 223	4.3	2.2	0.6
1996	46	10 889	3 483	4.2	1.9	0.5
1997	58	19 288	4 522	4.5	3.2	0.7
1998	49	24 217	5 192	4.3	3.3	0.8
1999	49	20 966	4 673	4.5	2.9	0.7
2000	43	31 576	7 155	4.2	3.0	0.8
2001	46	26 222	6 669	4.5	2.7	0.6
2002	47	29 568	8 093	4.4	2.1	0.6
2003	44	19 870	5 556	4.9	2.4	0.5
2004	41	11 168	3 728	5.0	2.0	0.4
2005	40	6 148	2 542	5.3	1.0	0.2
2006	34	6 491	2 360	5.3	0.7	0.1
2007	31	7 420	2 878	5.2	0.8	0.2
2008	29	8 015	2 625	5.5	1.0	0.2
2009	25	9 195	2 807	5.0	1.0	0.2
2010	29	11 551	3 023	5.4	1.0	0.2
2011	28	10 973	2 689	5.0	1.5	0.3
2012	28	13 665	2 580	5.0	2.2	0.5
2013	29	14 054	2 773	4.8	2.6	0.5
2014	22	19 784	3 211	5.0	3.6	0.7
All years	165	401 537	102 478	4.5	2.2	0.5

Hoki target tows:

Fishing year	Number of vessels	Total catch (t)	Number of tows	Median tow duration (h)	Median catch per tow (t)	Median catch per hour (t/h)
1990	20	10 922	2 048	4.0	3.6	0.9
1991	30	15 229	3 862	4.4	2.8	0.6
1992	33	28 278	5 314	4.1	4.1	1.0
1993	24	21 359	4 817	3.8	3.6	0.9
1994	22	8 748	1 977	4.0	3.2	0.9
1995	25	11 453	2 297	4.0	3.9	1.0
1996	25	10 628	2 437	4.0	3.1	0.9
1997	42	18 919	3 293	4.2	4.6	1.1
1998	34	23 669	4 267	4.2	4.2	1.0
1999	33	20 391	3 563	4.2	4.1	1.1
2000	30	30 884	5 806	4.0	3.9	1.0
2001	31	25 397	5 324	4.2	3.5	0.8
2002	33	28 612	6 253	4.2	2.9	0.8
2003	33	19 101	4 322	4.8	3.0	0.7
2004	26	10 815	2 864	4.9	3.0	0.6
2005	25	5 151	1 351	5.1	2.5	0.5
2006	16	4 636	720	5.0	4.0	0.8
2007	20	5 143	1 136	4.5	2.2	0.5
2008	13	5 828	909	4.8	4.5	0.9
2009	12	6 883	918	4.4	5.1	1.2
2010	12	9 687	1 231	4.5	6.1	1.3
2011	15	9 210	1 237	4.5	5.5	1.2
2012	17	11 538	1 193	4.6	7.6	1.6
2013	16	11 706	1 363	4.3	6.2	1.5
2014	13	17 216	1 864	4.5	7.1	1.6
All years	109	371 401	70 366	4.2	3.8	0.9

Table A2g: Number of Puysegur non-zero hoki bottom and midwater median tow duration, median catch per tow, and median catch per hour for all vessels by year. Data source is un-groomed midwater or bottom non-zero TCEPR tows catching hoki. Year defined as June to December. There were no October to December data available for 2014. Data have been removed where there is one or two vessels only.

All target species tows:

Fishing year	Number of vessels	Total catch (t)	Number of tows	Median tow duration (h)	Median catch per tow (t)	Median catch per hour (t/h)
1990	36	11 542	2 589	4.0	2.6	0.6
1991	43	16 177	4 420	4.3	2.6	0.6
1992	58	29 688	6 877	4.2	3.1	0.8
1993	39	22 304	5 647	4.0	3.1	0.8
1994	45	9 051	3 163	4.2	1.6	0.4
1995	42	11 716	3 223	4.3	2.2	0.6
1996	46	10 889	3 483	4.2	1.9	0.5
1997	58	19 288	4 522	4.5	3.2	0.7
1998	49	24 217	5 192	4.3	3.3	0.8
1999	49	20 966	4 673	4.5	2.9	0.7
2000	43	31 576	7 155	4.2	3.0	0.8
2001	46	26 222	6 669	4.5	2.7	0.6
2002	47	29 568	8 093	4.4	2.1	0.6
2003	44	19 870	5 556	4.9	2.4	0.5
2004	41	11 168	3 728	5.0	2.0	0.4
2005	40	6 148	2 542	5.3	1.0	0.2
2006	34	6 491	2 360	5.3	0.7	0.1
2007	31	7 420	2 878	5.2	0.8	0.2
2008	29	8 015	2 625	5.5	1.0	0.2
2009	25	9 195	2 807	5.0	1.0	0.2
2010	29	11 551	3 023	5.4	1.0	0.2
2011	28	10 973	2 689	5.0	1.5	0.3
2012	28	13 665	2 580	5.0	2.2	0.5
2013	29	14 054	2 773	4.8	2.6	0.5
2014	22	19 784	3 211	5.0	3.6	0.7
All years	165	401 537	102 478	4.5	2.2	0.5

Hoki target tows:

Fishing year	Number of vessels	Total catch (t)	Number of tows	Median tow duration (h)	Median catch per tow (t)	Median catch per hour (t/h)
1990	20	10 922	2 048	4.0	3.6	0.9
1991	30	15 229	3 862	4.4	2.8	0.6
1992	33	28 278	5 314	4.1	4.1	1.0
1993	24	21 359	4 817	3.8	3.6	0.9
1994	22	8 748	1 977	4.0	3.2	0.9
1995	25	11 453	2 297	4.0	3.9	1.0
1996	25	10 628	2 437	4.0	3.1	0.9
1997	42	18 919	3 293	4.2	4.6	1.1
1998	34	23 669	4 267	4.2	4.2	1.0
1999	33	20 391	3 563	4.2	4.1	1.1
2000	30	30 884	5 806	4.0	3.9	1.0
2001	31	25 397	5 324	4.2	3.5	0.8
2002	33	28 612	6 253	4.2	2.9	0.8
2003	33	19 101	4 322	4.8	3.0	0.7
2004	26	10 815	2 864	4.9	3.0	0.6
2005	25	5 151	1 351	5.1	2.5	0.5
2006	16	4 636	720	5.0	4.0	0.8
2007	20	5 143	1 136	4.5	2.2	0.5
2008	13	5 828	909	4.8	4.5	0.9
2009	12	6 883	918	4.4	5.1	1.2
2010	12	9 687	1 231	4.5	6.1	1.3
2011	15	9 210	1 237	4.5	5.5	1.2
2012	17	11 538	1 193	4.6	7.6	1.6
2013	16	11 706	1 363	4.3	6.2	1.5
2014	13	17 216	1 864	4.5	7.1	1.6
All years	109	371 401	70 366	4.2	3.8	0.9

Table A2g ctd.: Puysegur.

All target species bottom tows:

Fishing year	Number of vessels	Total catch (t)	Number of tows	Median tow duration (h)	Median catch per tow (t)	Median catch per hour (t/h)
1990	15	104	207	3.3	0.2	0.1
1991	24	1 663	372	4.3	3.1	0.8
1992	30	4 012	842	4.3	3.0	0.6
1993	12	1 044	220	4.2	3.4	0.8
1994	20	394	175	4.2	1.1	0.3
1995	12	252	200	5.8	0.5	0.1
1996	16	955	354	4.3	1.0	0.2
1997	25	1 162	336	5.5	0.8	0.2
1998	19	1 295	252	4.8	2.8	0.6
1999	22	966	265	5.2	1.1	0.2
2000	20	849	273	5.4	1.0	0.2
2001	24	919	221	4.2	2.0	0.5
2002	18	1 852	193	3.8	6.5	1.5
2003	20	796	181	4.5	1.8	0.4
2004	14	198	81	4.8	0.6	0.1
2005	21	582	291	5.8	0.9	0.1
2006	16	1 002	256	4.0	1.0	0.3
2007	13	253	118	5.0	0.7	0.1
2008	6	134	56	4.8	1.4	0.3
2009	7	126	57	3.1	1.0	0.3
2010	7	121	110	4.8	0.5	0.1
2011	11	208	108	4.5	1.0	0.2
2012	7	163	59	3.7	1.0	0.4
2013	9	395	79	4.2	3.1	0.6
2014	6	395	64	3.6	4.1	1.1
All years	95	19 841	5 370	4.5	1.5	0.3

Hoki target bottom tows:

Fishing year	Number of vessels	Total catch (t)	Number of tows	Median tow duration (h)	Median catch per tow (t)	Median catch per hour (t/h)
1990	8	22	20	3.5	0.7	0.2
1991	20	1 541	310	4.1	4.1	0.9
1992	26	3 778	701	4.2	3.1	0.8
1993	11	1 019	201	4.0	4.0	0.9
1994	16	356	138	4.4	1.1	0.3
1995	9	217	144	5.8	0.6	0.1
1996	16	892	272	4.1	1.5	0.3
1997	22	983	295	5.3	0.9	0.2
1998	18	1 262	237	4.8	3.0	0.7
1999	21	931	238	5.1	1.2	0.2
2000	18	817	224	5.0	1.6	0.3
2001	22	910	198	4.2	2.5	0.6
2002	16	1 836	184	3.8	7.0	1.7
2003	14	774	135	4.5	3.0	0.7
2004	5	152	24	3.3	4.2	1.2
2005	8	240	51	3.2	2.2	0.9
2006	6	707	79	3.5	6.0	2.1
2007	2	57	14	3.8	2.1	0.5
2008	1	-	-	-	-	-
2009	1	-	-	-	-	-
2010	1	-	-	-	-	-
2011	1	-	-	-	-	-
2012	1	-	-	-	-	-
2013	4	221	21	3.9	11.5	2.7
2014	3	241	33	3.5	4.1	1.1
All years	78	17 054	3 532	4.3	2.5	0.6

Table A3: CPUE datasets for all vessels and for core (TCEPR) or final (observer) vessels for each year (1990–2014) for main hoki areas. Prop. zeros: proportion of zeros.

WCSI: TCEPR tow-by-tow, target hoki

	All vessels					Core vessels				
Fishing year	No. vessels	Catch	Effort	Prop. zeros	CPUE	No. vessels	Catch	Effort	Prop. zeros	CPUE
1990	76	114 865.5	7 424	0.04	15.47	20	45 703.3	2 342	0.02	19.51
1991	73	104 310.3	7 709	0.04	13.53	28	56 589.3	2 813	0.02	20.12
1992	66	88 465.8	5 787	0.06	15.29	29	46 377.0	2 568	0.03	18.06
1993	60	86 525.0	6 448	0.06	13.42	35	54 625.5	3 799	0.05	14.38
1994	66	99 164.0	8 162	0.09	12.15	41	72 321.7	5 449	0.08	13.27
1995	62	67 746.1	8 241	0.10	8.22	43	51 623.4	6 057	0.09	8.52
1996	61	59 507.6	6 536	0.07	9.10	42	53 129.2	5 300	0.07	10.02
1997	76	78 705.7	7 654	0.07	10.28	50	67 412.1	6 195	0.07	10.88
1998	68	91 522.6	7 680	0.04	11.92	55	85 700.4	7 137	0.04	12.01
1999	59	82 908.7	6 711	0.03	12.35	51	82 530.6	6 658	0.03	12.40
2000	51	93 697.0	6 999	0.02	13.39	44	92 875.7	6 908	0.02	13.44
2001	63	93 775.8	7 972	0.02	11.76	48	89 975.2	7 494	0.02	12.01
2002	56	85 316.3	7 277	0.02	11.72	47	82 110.1	6 963	0.02	11.79
2003	51	68 096.1	6 958	0.02	9.79	45	67 823.0	6 901	0.02	9.83
2004	51	39 675.1	5 922	0.02	6.70	41	35 211.4	5 408	0.02	6.51
2005	37	29 243.2	3 491	0.02	8.38	36	28 714.9	3 439	0.02	8.35
2006	36	33 620.2	3 113	0.01	10.80	31	32 916.3	3 018	0.01	10.91
2007	32	29 194.3	1 818	0.01	16.06	28	28 401.8	1 776	0.01	15.99
2008	22	16 956.9	1 277	0.01	13.28	15	16 126.4	1 213	0.01	13.29
2009	20	16 786.1	1 030	0.01	16.30	13	15 785.3	966	0.01	16.34
2010	27	31 982.6	1 774	0.01	18.03	24	31 674.0	1 760	0.01	18
2011	27	41 002.0	2 390	0.01	17.16	24	40 564.6	2 356	0.01	17.22
2012	30	48 759.8	2 731	0.01	17.85	29	48 701.2	2 723	0.01	17.89
2013	26	49 496.3	2 770	0.01	17.87	23	49 026.9	2 741	0.01	17.89
2014	26	60 566.4	3 343	0.00	18.12	23	55 697.9	3 116	0.00	17.87

WCSI: Observer catch for target hoki

	All vessels					Final vessels				
Fishing year	No. vessels	Catch	Effort	Prop. zeros	CPUE	No. vessels	Catch	Effort	Prop. zeros	CPUE
1990	14	47 607.1	1 512	0.02	31.49	5	9 290.8	482	0.02	19.28
1991	14	28 132.4	1 228	0.02	22.91	5	11 583.2	493	0.02	23.50
1992	10	18 562.5	754	0.03	24.62	6	6 486.6	252	0.01	25.74
1993	15	17 298.0	1 020	0.02	16.96	12	8 401.6	694	0.01	12.11
1994	15	32 398.4	1 549	0.02	20.92	11	16 566.4	985	0.01	16.82
1995	9	25 689.7	797	0.01	32.23	6	6 411.4	401	0.01	15.99
1996	15	17 676.5	1 030	0.03	17.16	10	9 999.4	768	0.02	13.02
1997	12	14 180.4	674	0.02	21.04	11	9 651.2	601	0.02	16.06
1998	16	18 622.0	896	0.01	20.78	14	13 560.6	803	0.01	16.89
1999	14	17 313.0	1 073	0.02	16.14	14	14 234.6	1 050	0.02	13.56
2000	17	18 525.3	1 154	0.00	16.05	16	17 662.3	1 141	0.00	15.48
2001	21	15 344.9	1 007	0.01	15.24	21	14 648.9	998	0.01	14.68
2002	16	16 461.8	1 303	0.01	12.63	15	16 090.9	1 275	0.01	12.62
2003	13	10 106.2	912	0.01	11.08	13	10 094.2	909	0.01	11.10
2004	16	8 397.7	1 299	0.01	6.46	14	7 564.0	1 186	0.01	6.38
2005	13	7 178.2	974	0.00	7.37	12	7 125.9	961	0.00	7.42
2006	13	9 522.3	780	0.00	12.21	13	9 519.6	778	0.00	12.24
2007	16	9 782.3	514	0.00	19.03	16	9 284.9	461	0.00	20.14
2008	11	7 054.5	426	0.00	16.56	11	7 020.8	422	0.00	16.64
2009	12	7 325.8	367	0.00	19.96	11	7 121.5	346	0.00	20.58
2010	14	9 163.6	543	0.02	16.88	13	8 102.0	468	0.02	17.31
2011	11	9 122.6	536	0.01	17.02	11	8 637.5	492	0.01	17.56
2012	15	16 707.3	881	0.01	18.96	13	14 579.3	757	0.01	19.26
2013	17	30 077.1	1 669	0.00	18.02	17	29 295.6	1 613	0.00	18.16
2014	17	28 194.2	1 557	0.01	18.11	15	26 204.6	1 436	0.01	18.25

Table A3 ctd.

Cook Strait: TCEPR MW tow-by-tow, target hoki

	All vessels					Final vessels				
Fishing year	No. vessels	Catch	Effort	Prop. zeros	CPUE	No. vessels	Catch	Effort	Prop. zeros	CPUE
1990	17	11 751.7	1 040	0.03	11.30	11	8 595.4	772	0.03	11.13
1991	22	21 708.2	2 040	0.02	10.64	17	19 123.3	1 793	0.02	10.67
1992	22	17 839.8	1 567	0.03	11.38	16	15 069.1	1 307	0.03	11.53
1993	18	16 317.6	1 430	0.04	11.41	14	15 547.5	1 336	0.04	11.64
1994	28	23 871.0	1 722	0.04	13.86	15	19 143.1	1 308	0.03	14.64
1995	24	21 556.8	1 922	0.02	11.22	17	18 117.2	1 353	0.02	13.39
1996	36	34 736.3	2 587	0.03	13.43	22	27 531.7	1 927	0.03	14.29
1997	34	37 320.1	3 036	0.04	12.29	22	29 626.0	2 413	0.03	12.28
1998	28	26 455.7	2 034	0.03	13.01	19	23 767.8	1 815	0.02	13.10
1999	20	25 780.9	1 821	0.02	14.16	19	25 529.3	1 809	0.02	14.11
2000	21	22 193.8	1 584	0.02	14.01	19	21 895.7	1 553	0.02	14.10
2001	25	20 249.3	1 593	0.03	12.71	20	19 232.3	1 504	0.02	12.79
2002	15	15 274.8	917	0.01	16.66	9	13 892.6	822	0.01	16.90
2003	19	22 949.7	1 532	0.03	14.98	12	21 651.6	1 408	0.03	15.38
2004	19	25 280.6	1 626	0.01	15.55	14	23 476.4	1 533	0.01	15.31
2005	12	15 571.9	1 141	0.01	13.65	9	14 981.2	1 104	0.01	13.57
2006	11	13 928.3	883	0.01	15.77	9	13 709.5	865	0.01	15.85
2007	7	10 773.4	843	0.01	12.78	6	10 611.5	832	0.01	12.75
2008	5	6 239.5	324	0.01	19.26	3	6 147.6	315	0.01	19.52
2009	8	6 856.9	589	0.01	11.64	6	6 491.2	555	0.01	11.70
2010	8	9 423.8	729	0.01	12.93	5	9 301.3	719	0.01	12.94
2011	6	6 202.5	453	0.01	13.69	5	6 184.9	450	0.01	13.74
2012	9	8 854.8	698	0.01	12.69	6	8 686.9	686	0.01	12.66
2013	9	9 020.4	712	0.00	12.67	5	8 799.3	679	0.00	12.96
2014	9	9 361.0	780	0.01	12	8	8 971.2	750	0.01	11.96

CSTR: Observer catch for target hoki

	All vessels					Final vessels				
Fishing year	No. vessels	Catch	Effort	Prop. zeros	CPUE	No. vessels	Catch	Effort	Prop. zeros	CPUE
1998	11	3 355.4	197	0.05	17.03	9	2 429.5	141	0.03	17.23
1999	10	3 458.1	212	0.01	16.31	8	2 518.0	152	0.01	16.57
2000	7	3 016.9	151	0.01	19.98	7	2 236.5	111	0.00	20.15
2001	9	4 020.5	228	0.01	17.63	6	2 350.2	143	0.00	16.43
2002	9	1 989.8	135	0.04	14.74	5	1 052.5	75	0.00	14.03
2003	5	2 415.9	131	0.02	18.44	4	1 368.4	81	0.00	16.89
2004	7	2 482.5	126	0.03	19.70	6	1 726.0	90	0.02	19.18
2005	9	2 151.2	122	0.00	17.63	4	1 384.3	65	0.00	21.30
2006	5	1 079.8	65	0.00	16.61	4	831.3	47	0.00	17.69
2007	7	2 013.0	164	0.02	12.27	7	1 553.3	133	0.01	11.68
2008	6	3 409.2	198	0.02	17.22	5	2 611.1	145	0.01	18.01
2009	4	1 956.4	149	0.03	13.13	4	1 409.5	108	0.00	13.05
2010	9	3 181.6	229	0.01	13.89	7	2 378.2	183	0.01	13
2011	5	1 588.3	86	0.00	18.47	5	1 281.8	70	0.00	18.31
2012	7	1 516.1	141	0.03	10.75	7	1 298.1	122	0.04	10.64
2013	4	955.6	85	0.00	11.24	4	827.3	74	0.00	11.18
2014	4	2 288.5	187	0.01	12.24	4	1 984.7	175	0.01	11.34

Table A3 ctd.

Chatham Rise: TCEPR tow-by-tow, target hoki

	All vessels					Final vessels				
Fishing year	No. vessels	Catch	Effort	Prop. zeros	CPUE	No. vessels	Catch	Effort	Prop. zeros	CPUE
1992	39	31 885.7	4 408	0.02	7.23	4	6 544.3	1 028	0.01	6.37
1993	37	27 904.8	4 054	0.01	6.88	3	9 829.4	1 842	0.01	5.34
1994	29	13 998.7	2 872	0.02	4.87	4	9 022.5	1 874	0.01	4.81
1995	35	20 268.9	4 404	0.03	4.60	8	15 174.6	3 272	0.02	4.64
1996	45	28 473.7	6 104	0.03	4.66	9	23 465.7	4 081	0.02	5.75
1997	63	34 656.4	7 253	0.03	4.78	10	27 635.0	4 773	0.02	5.79
1998	61	43 226.4	8 731	0.02	4.95	16	40 579.7	7 614	0.02	5.33
1999	44	54 455.4	9 735	0.01	5.59	15	53 190.8	9 216	0.01	5.77
2000	33	38 013.7	8 126	0.01	4.68	15	37 579.1	7 873	0.01	4.77
2001	38	37 590.9	8 361	0.01	4.50	15	35 758.1	7 849	0.01	4.56
2002	29	28 745.8	6 584	0.01	4.37	14	27 412.3	6 134	0.00	4.47
2003	29	28 990.5	7 699	0.01	3.77	15	26 922.9	7 081	0.01	3.80
2004	27	19 357.0	5 280	0.01	3.67	12	18 161.4	4 887	0.01	3.72
2005	23	21 196.3	3 982	0.01	5.32	10	20 061.3	3 621	0.01	5.54
2006	17	26 831.9	4 217	0.00	6.36	11	25 218.4	3 904	0.00	6.46
2007	17	27 518.0	3 805	0.01	7.23	9	25 735.8	3 508	0.01	7.34
2008	22	25 856.1	3 252	0.00	7.95	8	23 421.4	2 866	0.00	8.17
2009	19	27 248.2	3 195	0.00	8.53	7	23 632.9	2 714	0.00	8.71
2010	20	29 668.8	3 718	0.00	7.98	8	27 726.2	3 428	0.00	8.09
2011	21	30 551.1	3 619	0.00	8.44	8	27 263.6	3 208	0.00	8.50
2012	24	31 571.8	3 699	0.00	8.54	8	28 685.5	3 238	0.00	8.86
2013	20	28 413.9	3 619	0.00	7.85	7	25 936.5	3 238	0.00	8.01
2014	17	28 513.9	3 487	0.00	8.18	8	27 030.5	3 104	0.00	8.71

Chatham Rise: Observer catch for target hoki

	All vessels					Final vessels				
Fishing year	No. vessels	Catch	Effort	No. zeros	CPUE	No. vessels	Catch	Effort	No. zeros	CPUE
1994	5	2 915.8	568	0.01	5.13	2	1 246.8	252	0.00	4.95
1995	3	1 098.9	268	0.01	4.10	2	1 095.9	264	0.01	4.15
1996	4	1 560.7	274	0.01	5.70	2	1 376.0	225	0.00	6.12
1997	6	756.3	186	0.01	4.07	2	278.3	78	0.03	3.57
1998	13	4 334.7	864	0.01	5.02	12	4 248.8	837	0.01	5.08
1999	12	7 291.4	1 125	0.01	6.48	12	7 258.6	1 118	0.01	6.49
2000	16	2 948.8	536	0.60	5.50	6	2 934.6	522	0.02	5.62
2001	13	3 135.0	765	0.09	4.10	11	3 104.7	752	0.09	4.13
2002	10	4 224.9	921	0.00	4.59	9	4 224.0	919	0.00	4.60
2003	9	1 677.1	615	0.00	2.73	8	1 676.6	613	0.00	2.74
2004	6	1 306.8	298	0.07	4.39	4	1 298.7	289	0.01	4.49
2005	7	3 902.6	629	0.00	6.20	5	3 839.8	614	0.00	6.25
2006	8	3 393.3	461	0.00	7.36	7	3 381.9	452	0.00	7.48
2007	8	5 121.8	736	0.00	6.96	6	5 081.9	730	0.00	6.96
2008	7	4 832.6	642	0.00	7.53	7	4 662.4	600	0.00	7.77
2009	10	3 548.5	449	0.02	7.90	8	3 306.9	392	0.02	8.44
2010	9	5 379.0	577	0.00	9.32	9	2 804.5	344	0.01	8.15
2011	10	5 497.9	668	0.01	8.23	8	4 275.6	514	0.00	8.32
2012	8	6 622.9	791	0.01	8.37	6	5 234.2	649	0.01	8.07
2013	15	8 889.0	1 295	0.01	6.86	11	7 382.0	1 083	0.01	6.82
2014	11	8 657.4	1 096	0.01	7.90	9	7 513.4	939	0.01	8

Table A3 ctd.

Sub-Antarctic: TCEPR tow-by-tow, target hoki

Fishing year	All vessels					Core vessels				
	No. vessels	Catch	Effort	Prop. zeros	CPUE	No. vessels	Catch	Effort	Prop. zeros	CPUE
1992	25	21 855.6	4 085	0.02	5.35	4	7 422.2	1 355	0.01	5.48
1993	23	18 731.0	4 187	0.02	4.47	4	8 119.1	1 739	0.01	4.67
1994	15	6 974.4	1 481	0.02	4.71	3	4 288.2	925	0.01	4.64
1995	24	10 308.1	2 012	0.03	5.12	6	6 406.1	1 391	0.03	4.61
1996	22	9 155.4	2 039	0.06	4.49	6	5 996.6	1 304	0.02	4.60
1997	37	12 362.3	2 173	0.03	5.69	13	11 411.6	1 829	0.03	6.24
1998	35	18 571.1	3 391	0.02	5.48	14	17 785.1	3 126	0.02	5.69
1999	30	15 982.1	2 775	0.02	5.76	12	13 590.3	2 268	0.02	5.99
2000	26	23 440.4	4 821	0.02	4.86	16	22 683.2	4 480	0.02	5.06
2001	31	17 463.0	4 033	0.02	4.33	15	16 589.9	3 715	0.02	4.47
2002	32	20 901.3	5 021	0.03	4.16	16	20 007.0	4 633	0.02	4.32
2003	29	15 929.1	3 727	0.02	4.27	15	15 311.0	3 474	0.01	4.41
2004	23	8 302.4	2 393	0.06	3.47	10	7 946.9	2 229	0.05	3.57
2005	25	4 524.9	1 216	0.06	3.72	7	4 150.1	1 026	0.05	4.04
2006	15	3 336.7	525	0.03	6.36	6	3 062.3	450	0.02	6.81
2007	20	3 431.3	802	0.05	4.28	9	3 078.8	721	0.03	4.27
2008	13	4 742.6	751	0.01	6.32	5	4 675.3	720	0.01	6.49
2009	12	5 696.0	743	0.01	7.67	4	5 616.0	723	0.01	7.77
2010	12	7 912.1	961	0.02	8.23	5	7 562.7	911	0.01	8.30
2011	15	8 032.7	1 112	0.01	7.22	5	7 329.4	1 021	0.01	7.18
2012	17	10 275.7	1 032	0.00	9.96	7	9 306.7	954	0.00	9.76
2013	16	9 798.3	1 134	0.01	8.64	6	9 505.1	1 082	0.01	8.78
2014	13	15 054.9	1 564	0.00	9.63	6	14 722.6	1 492	0.00	9.87

Sub-Antarctic: Observer catch for target hoki

Fishing year	All vessels					Final vessels				
	No. vessels	Catch	Effort	Prop. zeros	CPUE	No. vessels	Catch	Effort	Prop. zeros	CPUE
1998	6	1 304.4	219	0.00	5.96	4	1 246.6	201	0.00	6.20
1999	9	4 546.2	686	0.02	6.63	7	4 436.0	658	0.01	6.74
2000	8	3 374.0	809	0.01	4.17	7	3 370.9	803	0.01	4.20
2001	13	1 546.4	355	0.01	4.36	5	1 402.5	298	0.00	4.71
2002	7	3 035.5	628	0.00	4.83	5	2 998.5	616	0.00	4.87
2003	9	1 311.6	349	0.01	3.76	6	1 307.0	344	0.01	3.80
2004	7	443.4	156	0.17	2.84	3	413.7	144	0.15	2.87
2005	3	354.0	88	0.03	4.02	3	354.0	88	0.03	4.02
2006	4	797.2	92	0.00	8.67	3	762.1	80	0.00	9.53
2007	6	875.2	154	0.00	5.68	4	849.6	152	0.00	5.59
2008	5	1 898.6	317	0.01	5.99	3	1 612.9	213	0.00	7.57
2009	4	2 644.1	364	0.01	7.26	3	2 621.6	360	0.01	7.28
2010	6	2 311.8	280	0.07	8.26	4	2 023.8	238	0.03	8.50
2011	8	2 006.8	274	0.02	7.32	3	1 466.5	197	0.02	7.44
2012	5	1 631.3	192	0.00	8.50	3	1 154.5	136	0.00	8.49
2013	14	4 264.5	587	0.01	7.26	7	3 813.4	517	0.00	7.38
2014	12	4 257.2	539	0.01	7.90	5	3 256.1	374	0.00	8.71

Table A4: Lognormal CPUE standardised indices, and binomial, and combined CPUE indices (with 95% confidence intervals).

WCSI: TCEPR tow-by-tow, target hoki

Year	Index	CI
1990	1.12	1.07 – 1.18
1991	1.20	1.15 – 1.25
1992	1.19	1.14 – 1.24
1993	1.03	1.00 – 1.07
1994	0.98	0.95 – 1.01
1995	0.63	0.61 – 0.65
1996	0.74	0.72 – 0.76
1997	0.76	0.74 – 0.78
1998	0.93	0.90 – 0.95
1999	0.97	0.94 – 0.99
2000	1.09	1.07 – 1.12
2001	0.80	0.78 – 0.82
2002	0.78	0.76 – 0.80
2003	0.61	0.60 – 0.63
2004	0.39	0.38 – 0.40
2005	0.48	0.46 – 0.49
2006	0.71	0.69 – 0.74
2007	1.21	1.15 – 1.26
2008	1.17	1.11 – 1.24
2009	1.61	1.51 – 1.72
2010	1.56	1.48 – 1.63
2011	1.55	1.49 – 1.61
2012	1.81	1.74 – 1.89
2013	2.00	1.93 – 2.08
2014	1.76	1.70 – 1.83

WCSI: Observer catch, target hoki

Year	Index	CI
1990	1.03	0.89 – 1.19
1991	1.07	0.95 – 1.20
1992	1.18	1.01 – 1.39
1993	0.96	0.86 – 1.07
1994	1.00	0.92 – 1.08
1995	0.73	0.64 – 0.82
1996	0.75	0.68 – 0.82
1997	0.85	0.77 – 0.94
1998	0.96	0.89 – 1.04
1999	0.84	0.78 – 0.91
2000	1.10	1.03 – 1.18
2001	0.73	0.68 – 0.79
2002	0.84	0.79 – 0.90
2003	0.50	0.47 – 0.55
2004	0.31	0.29 – 0.33
2005	0.46	0.43 – 0.49
2006	0.80	0.74 – 0.87
2007	1.37	1.25 – 1.51
2008	1.14	1.03 – 1.26
2009	1.69	1.51 – 1.88
2010	1.47	1.33 – 1.62
2011	1.81	1.65 – 2.00
2012	1.97	1.82 – 2.14
2013	2.06	1.94 – 2.19
2014	1.88	1.77 – 2.00

Cook Strait: TCEPR MW tow-by-tow, target hoki

Year	Index	CI
1990	1.18	1.09 – 1.27
1991	0.99	0.93 – 1.04
1992	1.12	1.05 – 1.19
1993	1.02	0.96 – 1.09
1994	1.25	1.18 – 1.33
1995	1.25	1.18 – 1.33
1996	1.10	1.05 – 1.16
1997	0.95	0.91 – 0.99
1998	1.02	0.97 – 1.07
1999	1.00	0.95 – 1.05
2000	1.00	0.95 – 1.06
2001	0.83	0.79 – 0.87
2002	1.25	1.17 – 1.34
2003	1.01	0.95 – 1.06
2004	0.92	0.87 – 0.96
2005	0.85	0.80 – 0.90
2006	1.00	0.94 – 1.07
2007	0.77	0.72 – 0.83
2008	1.17	1.04 – 1.30
2009	0.77	0.71 – 0.84
2010	0.97	0.90 – 1.04
2011	1.16	1.06 – 1.28
2012	0.84	0.77 – 0.90
2013	0.95	0.88 – 1.03
2014	0.88	0.82 – 0.95

Cook Strait: Observer catch, target hoki

Year	Index	CI
1998	0.99	0.81 – 1.20
1999	1.06	0.88 – 1.28
2000	1.01	0.82 – 1.26
2001	0.83	0.67 – 1.02
2002	0.78	0.60 – 1.01
2003	0.68	0.51 – 0.90
2004	1.28	1.02 – 1.60
2005	1.59	1.22 – 2.08
2006	1.21	0.90 – 1.63
2007	0.63	0.52 – 0.76
2008	1.17	0.97 – 1.40
2009	0.72	0.58 – 0.90
2010	0.99	0.83 – 1.19
2011	1.40	1.10 – 1.80
2012	0.93	0.76 – 1.15
2013	1.08	0.84 – 1.39
2014	1.17	0.97 – 1.41

Table A4: ctd.

Chatham Rise: TCEPR tow-by-tow, target hoki

Year	Index	CI
1992	1.10	1.03 – 1.17
1993	1.03	0.99 – 1.09
1994	1.00	0.96 – 1.05
1995	0.87	0.84 – 0.90
1996	1.05	1.01 – 1.08
1997	0.96	0.93 – 0.99
1998	0.88	0.86 – 0.91
1999	1.00	0.98 – 1.03
2000	0.80	0.79 – 0.82
2001	0.76	0.74 – 0.78
2002	0.75	0.74 – 0.78
2003	0.58	0.57 – 0.59
2004	0.55	0.53 – 0.57
2005	0.78	0.76 – 0.81
2006	1.03	0.99 – 1.06
2007	1.06	1.03 – 1.10
2008	1.31	1.26 – 1.36
2009	1.46	1.40 – 1.51
2010	1.27	1.23 – 1.31
2011	1.35	1.30 – 1.40
2012	1.45	1.40 – 1.51
2013	1.32	1.28 – 1.37
2014	1.43	1.38 – 1.48

Chatham Rise: Observer catch, target hoki

Year	Index	CI
1994	1.29	1.12 – 1.49
1995	0.79	0.68 – 0.92
1996	1.03	0.88 – 1.19
1997	0.47	0.36 – 0.61
1998	0.78	0.72 – 0.84
1999	0.96	0.89 – 1.04
2000	0.91	0.82 – 1.01
2001	0.63	0.58 – 0.69
2002	0.76	0.70 – 0.82
2003	0.52	0.47 – 0.57
2004	0.81	0.68 – 0.97
2005	0.90	0.82 – 0.99
2006	1.23	1.10 – 1.38
2007	1.17	1.08 – 1.27
2008	1.38	1.26 – 1.51
2009	1.49	1.33 – 1.67
2010	1.56	1.39 – 1.77
2011	1.30	1.18 – 1.44
2012	1.39	1.26 – 1.52
2013	1.27	1.18 – 1.38
2014	1.54	1.42 – 1.68

Sub-Antarctic: TCEPR tow-by-tow, target hoki

Year	Index	CI
1992	1.00	0.94 – 1.07
1993	0.94	0.88 – 0.99
1994	1.10	1.02 – 1.19
1995	0.90	0.85 – 0.96
1996	0.94	0.89 – 1.00
1997	1.23	1.17 – 1.30
1998	1.06	1.02 – 1.10
1999	0.96	0.92 – 1.01
2000	0.89	0.86 – 0.92
2001	0.80	0.77 – 0.83
2002	0.78	0.75 – 0.80
2003	0.76	0.73 – 0.79
2004	0.54	0.51 – 0.57
2005	0.58	0.54 – 0.62
2006	0.80	0.73 – 0.88
2007	0.66	0.61 – 0.71
2008	1.13	1.05 – 1.22
2009	1.40	1.30 – 1.50
2010	1.45	1.35 – 1.55
2011	1.34	1.26 – 1.43
2012	1.71	1.60 – 1.83
2013	1.50	1.41 – 1.60
2014	1.66	1.57 – 1.75

Sub-Antarctic: Observer catch, target hoki

Year	Index	CI
1998	1.16	0.94 – 1.43
1999	1.06	0.94 – 1.18
2000	0.70	0.63 – 0.79
2001	1.11	0.94 – 1.30
2002	0.67	0.59 – 0.76
2003	0.56	0.49 – 0.65
2004	0.87	0.71 – 1.07
2005	0.58	0.46 – 0.73
2006	1.14	0.87 – 1.49
2007	1.01	0.81 – 1.27
2008	1.43	1.23 – 1.67
2009	1.11	0.96 – 1.29
2010	1.31	1.11 – 1.53
2011	1.36	1.14 – 1.62
2012	0.97	0.79 – 1.19
2013	1.11	0.98 – 1.26
2014	1.56	1.39 – 1.76