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Catches, size, and age structure of the 2011-12 hoki fishery, and a summary of input data used for the 2013 stock assessment
New Zealand Fisheries Assessment Report 2014/05
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This report summarises the catch by area and presents the length and age structure of hoki caught commercially during the 2011-12 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 2013.

The total reported hoki catch in 2011-12 was 130105 t , about 105 t above the TACC of 130000 t , and 11300 t higher than the catch in 2010-11. Catches in 2011-12 increased in all areas except for the east coast North Island. With the increase in the western catch allocation to 70000 t in 2011-12, the catch from the west coast South Island (WCSI) increased to 54540 t , and was the largest New Zealand hoki fishery for the second year in succession. In the non-spawning areas, the Chatham Rise was the second largest fishery, with 39200 t taken, and the Sub-Antarctic catch increased to 15800 t in 2011-12. The catch from the spawning fishery in Cook Strait increased slightly to 15900 t , the second lowest catch taken from this fishery since 1989-90. About 71600 t of the total catch was taken from western areas in 2011-12 and 58500 t was taken from eastern areas.

Length frequencies and catch-at-age results from the commercial fishery show that most of the catch in 2011-12 was fish from 55 to 90 cm (mainly 2005-09 year-classes, aged 3-7 years The percentage of small fish in the catch in 2011-12 decreased due to relatively few 2 year olds ( 2010 year-class) being caught. Large hoki were taken from the WCSI, Sub-Antarctic and Cook Strait in 2011-12.

The relative biomass index for all hoki from the 2013 Chatham Rise trawl survey increased by $42 \%$ relative to the 2012 survey, with an increase of $29 \%$ in estimated biomass of recruited hoki (aged 3 and older). The 2011 year-class (age $1+$ ) was the strongest in the Chatham Rise time series, but the abundance estimate from the 2010 year class (age 2+) was low. The estimated biomass from the 2012 Sub-Antarctic trawl survey was $17 \%$ higher than that in 2011. The first survey of the WCSI since 2000 was carried out in winter 2012. The WCSI survey followed a new design, with an acoustic survey over the entire hoki spawning area and a random trawl survey north of Hokitika Canyon. Hoki abundance was estimated from the 2012 acoustic survey using the same methodology that was used for the eight previous surveys in the acoustic time-series (1988-2000). The 2012 acoustic index was similar to that in 2000 and was included in the hoki assessment. The trawl estimate of hoki biomass in 2012 was much higher than the biomass estimated from daytime random trawls in the equivalent strata in the 2000 WCSI survey, but trawl estimates of hoki were not included in assessment as the reliability of these indices has yet to be evaluated.

## 1. INTRODUCTION

This report provides data relevant to the 2013 hoki stock assessment. Catch statistics and data from commercial sampling during the 2011-12 fishing year are presented and results from other research programmes since March 2012 are summarised. These include results of the trawl surveys of the Chatham Rise in January 2013, and Sub-Antarctic in November-December 2012, and a combined trawl and acoustic survey of the WCSI in July-August 2012. Details of model structure, results, and yield estimates from the hoki stock assessment carried out in 2013 will be published separately.

This report provides the final reporting requirement for Objective 2 of DEE2010/02HOKB ("Provide descriptive analysis of the hoki fishery in 2011-12 fishing year"), and Objectives 1,2 and 7 of MID2010/01C (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 2011-12 year"; 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 2011-12 year"; and 7, "To determine the age and size structure of hoki from the trawl surveys").

### 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, the hoki stock assessment model had two variants which were associated with different stock structure hypotheses (Francis 2007, 2008). The original hypothesis (used before 2006 and from 2008 to 2012) 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 2011. These problems are now resolved and model runs which do not assume natal fidelity were included as sensitivity runs in the 2012 (McKenzie 2013) and 2013 assessments.

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. 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 yearold 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).

### 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 $300-700 \mathrm{~m}$ 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 $300-800 \mathrm{~m}$. 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 (now 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 2011-12 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 100000 t in 1977, but dropped to less than 10000 t in 1978 when the 200 n. mile Exclusive Economic Zone (EEZ) was declared and a quota limit of 60000 t was introduced (Figure 1). Hoki remained a relatively small fishery of up to 50000 t a year until 1986, when the TACC was increased. The fishery expanded to an estimated catch in 1987-88 of about 255000 t (Table 2). Reported annual catches ranged between 175000 and 215000 t from 1988-89 to 1995-96, increasing to 246000 t in 1996-97, and peaking at 269000 t in 1997-98, when the TACC was over-caught by 19000 t . The TACC was reduced to 90000 t in 2007-08 and catches declined accordingly (Table 2). In 2009-10 and 2010-11 the TACC increased to 110000 t and 120000 t respectively, and catches increased. The TACC was further increased to 130000 t from 1 October 2011.

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 90000 and 107000 t from 1996-97 until 2001-02, then dropped sharply to a low of 20500 t in 2008-09. The WCSI catch increased again to $36^{\circ} 400 \mathrm{t}$ in 2009-10, to 48300 t in 2010-11, and to 54500 t in 2011-12. This was about $42 \%$ of the total hoki catch in 2011-12, making the WCSI the largest fishery in New Zealand for the two most recent years (Table 3). In Cook Strait, catches peaked at 67000 t in 1995-96, but have declined to 14900 t in 2010-11 and 15900 t in 2011-12, the lowest levels since 1989-90. Non-spawning catches on the Chatham Rise peaked at about 75000 t in 1997-98 and 1998-99, then decreased to a low of 30700 t in 2004-05, before increasing again to 39000 t from 2008-09 to 2011-12. The Chatham Rise was the largest hoki fishery from $2006-07$ to 2009-10 and contributed about $30 \%$ of the total catch in 2011-12. Catches from the SubAntarctic peaked at over 30000 t in 1999-00 to 2001-02, declined to a low of 6200 t in 2004-05 before increasing slowly to 15000 t by 2011-12. Catches from Puysegur increased from 1200 t in 2010-11 to 1300 t in 2011-12; ECSI increased from 1600 t to 2500 t ; and ECNI decreased from 1600 t to 900 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 25000 t within the overall TACC of 90000 t . This target was exceeded in both 2007-08 and 2008-09, with about 30000 t taken from western areas. In 2009-10, the target catch from the western fishing grounds was increased to 50000 t within the overall TACC of 110000 t , and catches were at about the industry-agreed catch split. The target catch from the western fishing grounds was further increased to $60^{\circ} 000 \mathrm{t}$ in 2010-11 (within the overall TACC of 120000 t ) and 70000 t in 2011-12 (within the overall TACC of 130000 t ). Western catches in 2010-11 and 2011-12 were 2000 t and 1600 t respectively above industry agreed targets. In the current fishing year (2012-13), the target catch from the western fishing grounds is the same as in 2011-12 at 70000 t within the overall TACC of 130000 t .

### 1.4 Recent hoki research

The importance of the hoki fishery and the complexity of the life cycle have resulted in a high level of research activity for over two decades. This was summarised in a recent book chapter (Livingston et al. in press). Research results presented in the past year are summarised here.

McKenzie (2013) reported the stock assessment carried out in 2012, 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 Hoki Working Group agreed on a single base run, with four sensitivities to the base run. In the base model run the problem of the lack of old fish in both fishery-based and survey-based observations was dealt with by allowing natural mortality to be age dependent. In one of the sensitivity runs this problem was dealt with by the alternative solution of having domed selectivities for the spawning fishery. Two other sensitivity runs were carried out in which instead of giving additional weight to the Sub-Antarctic trawl series, two catchabilities were fitted to this series instead of just one. In the final sensitivity model run natal fidelity was not assumed, in contrast to the other model runs. Both the eastern and western hoki stocks were estimated to be increasing after reaching their lowest levels in about 2005. The western stock was estimated to be $41-60 \% \mathrm{~B}_{0}$ and the eastern stock $47-52 \% \mathrm{~B}_{0}$. The western stock experienced an extended period of poor recruitment from 1995 to 2001, but recruitment has been near or above average in the last five years, except for in 2010 where it was below average (McKenzie 2013).

Recent work by Kloser et al. (2011) on the acoustic target strength (TS) of hoki (blue grenadier) in Australia raises concern that New Zealand acoustic estimates based on the TS-length relationship of Macaulay (2006) may overestimate hoki biomass. Kloser et al. (2011) collected optically verified in situ measurements of hoki and found that the TS was considerably higher than that predicted by Macaulay (2006). O'Driscoll (2012) reported abundance estimates for Cook Strait based on TS predicted from Kloser et al. (2011) which were only $25-30 \%$ of those currently used in stock assessment. However, O'Driscoll (2012) notes that the choice of the TS-length relationship has relatively little impact on relative acoustic abundance indices. The implication for stock assessment of adopting the new TS-fish length relationship of Kloser et al. (2011) would be a change in the estimate of the acoustic catchability $(q)$. This would also force us to reconsider our interpretation of, and priors on, $q$ because in some years (e.g., 1996, 1998) the catch from Cook Strait exceeded the acoustic abundance estimate using the Kloser et al. (2011) TS (O'Driscoll 2012). This would only be possible if the turnover of fish on the spawning grounds is much quicker than currently estimated (Harley 2002). Target strength experiments on hoki using the acoustic-optical system (AOS) carried out in July-August 2012 on the WCSI survey (O'Driscoll et al. in press) should help to reconcile the very large difference in TS estimates for hoki.

New fisheries-independent estimates of hoki abundance since the 2012 hoki assessment were trawl surveys of the Sub-Antarctic in November-December 2012, and of the Chatham Rise in January 2013, and a combined trawl and acoustic survey carried out on the WCSI in July-August 2012. Results from these surveys are summarised in Section 3.1. An extensive review of Sub-Antarctic trawl surveys from 1991-2009, including biomass trends, and spatial and depth distributions for 134 species (including hoki) was published in 2013 (Bagley et al. 2013).

## 2. HOKI FISHERY, 2011-12

### 2.1 Catch and effort information

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

In the 2011-12 fishing year the TACC for HOK1 was 130000 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 70000 t of the TACC should be taken from western stock 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 130105 t was about 11300 t higher than the catch in $2010-11$ and about 100 t higher 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-effortreturn (TCER), lining-trip-catch-effort-return (LTCER), tuna-long-lining-catch-effort-return (TLCER), and trawl-catch-effort-and-processing-return (TCEPR) data was 126164 t . As the data extraction was done in mid-December 2012, 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 130105 t .

Relative to 2010-11, catches in 2011-12 increased in all areas except for the ECNI (Figure 2a, Table 3). This was expected, given the increase in the target catch from western areas from 60000 t in 2010-11 to 70000 t in 2011-12. The WCSI was the largest fishery for the second time in six years, with the catch increasing by 6000 t to 54540 t in 2011-12. Catches inside the 25 n . mile line made up $15 \%$ of the total WCSI catch in 2011-12, a similar percentage to 2010-11, but down from a peak of $41 \%$ of the catch in 2003-04 (Table A1a). The Chatham Rise was the second largest hoki fishery for the second year, with 39200 t taken from this area in 2011-12. The catch from Cook Strait of 15900 t was up by about 900 t from that in 2010-11, and the second lowest catch since 1989-90. The catch from the Sub-Antarctic of 15800 t in 2011-12 was about 3000 t higher than in 2010-11 (see Table 3). Catches from Puysegur and ECSI increased by 200 t to 1300 t , and by 900 t to 2500 t respectively, and the ECNI catch decreased by 700 t to 900 t in 2011-12. Overall, about 71600 t of the total catch in 2011-12 was taken from western areas (Figure 2a), 1600 t above the level of the industry-agreed catch split.

Most hoki catch was recorded on the TCEPR form (123 000 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 was taken by bottom trawling on the Chatham Rise and Sub-Antarctic (Figure 2b).

Up until 2003-04 almost all of the hoki catch was from target hoki tows. Hoki targeting 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 also increased, and in 2011-12, $95.6 \%$ of the overall catch was taken from hoki target tows $(97 \%$ of the hoki catch on the WCSI, $86.5 \%$ on the Sub-Antarctic, and $97 \%$ on the Chatham Rise). Since then there has been a decrease in the percentage of hoki catches from tows targeting hake on the WCSI and Chatham Rise, ling on the Sub-Antarctic and Chatham Rise, and silver warehou on the WCSI and Sub-Antarctic. Cook Strait has remained almost exclusively a hoki target fishery.

A high proportion of the hoki catch in 2011-12 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 mid-August. In Cook Strait, peak catches were from midJuly to mid-September, and about 3000 t was caught outside the spawning season (Figure 5). Fishing during the spawning season on the ECSI occurred mainly in July and September and at Puysegur mainly in June (Figure 5). Outside the spawning season, most of the catch was taken from October 2011 to June 2012 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 and Figure 6, and standardised CPUE analyses for the WCSI, Cook Strait, Chatham Rise, and Sub-Antarctic were also
carried out. 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 does not provide tow-by-tow effort data), or the TCER forms (which have been in use for only four years). It also did not include data from the LCER, LTCER, TLCER or NCELR forms. 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 2013). Changes in fleet structure (e.g., increased use of twin trawls), fishing practices (particularly target fishing), 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.

A lognormal linear model was used for all standardised analyses model following Dunn (2002). A forward stepwise Generalised Linear Model (Chambers \& Hastie 1991) implemented in R code ( R Development Core Team 2012) 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, target species, 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 $\times$ 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 used. The dependent variable was the log-transformed estimated catch per tow with positive catches retained and zeros excluded.

A vessel variable was incorporated into the CPUE standardisation to allow for differences in fishing power between vessels. For consistency $80 \%$ of the catch was chosen for each analysis with vessels not involved in the fishery for a certain number of years (varied by analysis) excluded because they provided little information for the standardisations, which could result in model over-fitting (Francis 2001). Data were investigated for level of catch and effort for different years of vessel participation in the fishery, and thus CPUE analyses were undertaken for "core" vessels that reported approximately $80 \%$ of positive hoki catches in the defined fishery and were involved in the fishery for a certain number of years and tows in a year.

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 c.v.s 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).

For the WCSI, lognormal CPUE models were run for core vessels with either all target species or target hoki only tows; for Cook Strait, lognormal CPUE models were run for core vessel midwater tows that targeted hoki; for the Chatham Rise and ECSI, and Sub-Antarctic, lognormal CPUE models were run for core vessel bottom tows with either all target species or target hoki tows. A January CPUE model was also run for the Chatham Rise dataset, and a November-December Snares Shelf CPUE model for the Sub-Antarctic dataset, to correspond to the timing of the trawl surveys in these two areas. Selected explanatory variables for each run 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 $60 \%$ of the total spawning season catch on the WCSI in 2011-12. The unstandardised catch rate from all non-zero midwater tows in 2011-12 decreased slightly and was the second highest in the series, with a median catch of 7.9 t per hour, and a median tow duration of 2.1 hours. Catch rates and median tow duration were the same for target hoki tows. Catch rates in bottom trawls on the WCSI were lower than in midwater trawls, with a median catch rate of 1.9 t per hour for all non-zero hoki catches and 4.1 t per hour for target hoki tows. Median tow duration of bottom trawls decreased to 5.2 hours for all target species, and 3.8 hours for target hoki only tows, in 2011-12. From 1999-2000 to 2003-04, standardised catch rates from all non-zero tows showed a similar decline to nonstandardised catch rates. However, standardised indices have increased at a much higher rate than unstandardised indices since 2003-04 (Figure 6a). Core datasets for all target species or target hoki showed similar trends although the index in 2008-09 was higher for target hoki only tows and the 201011 index was lower (Figure 6b).

Midwater trawl catches accounted for more than $99.9 \%$ of the spawning season catch of 9658 t reported on TCEPR forms from Cook Strait in 2011-12. A further 3192 t of catch was reported on TCER forms (see Figure 2b). Non-standardised catch rates continued to be high in Cook Strait, with a decrease in median catch rate to 15.1 t per hour in non-zero mid-water tows in 2011-12, and an increase in median tow duration to 0.9 hours (equivalent to a median catch of 11.5 t per tow). Overall the non-standardised catch rates showed a slight increase from 1989-90 to 2011-12, whereas standardised catch rates showed a flat trend (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 $99 \%$ of the Chatham Rise catch in 2011-12 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 2011-12. The median nonstandardised catch rate in bottom trawls on the Chatham Rise in 2011-12 of 1.3 t per hour was the highest catch rate in the series. The catch rate in hoki target trawls increased from 0.6 t per hour in 200203 to 1.7 t per hour in 2008-09, and decreased slightly to 1.5 t per hour in 2009-10 and 2010-11, and 1.6 t per hour in 2011-12. Standardised catch rates generally decreased from 1991-92 to 2003-04, increased to 2008-09, decreased in 2009-10, and then increased again to 2011-12 (Figure 6a). Similar trends were observed for core vessels targeting hoki and core vessels in January (Figure 6b).

Bottom trawl catches reported on TCEPR forms accounted for $89 \%$ of the catch taken from the SubAntarctic in 2011-12 (see Figure 2b). Median tow duration in 2011-12 remained the same as 2010-11 at 5.0 hours and non-standardised catch rates in bottom trawls were slightly higher at 0.5 t per hour in 2011-12. Catch rates for hoki target bottom trawls were much higher than those for all target trawls ( 1.6 t per hour in 2011-12) and were the same as those on the Chatham Rise in 2011-12. Standardised catch rates generally decreased from 1996-97 to 2003-04 and increased to 2009-10, with a slight decrease in 2010-11, and an increase in 2011-12 (Figure 6a). Core vessels targeting hoki showed similar trends (Figure 6b), although core vessels on the Snares Shelf in November-December showed a steeper decline to 2005-06.

Spawning season catches from the ECSI were mainly reported on TCEPR (see Figure 2b). Midwater tow catch rates in 2011-12 were 6.2 t per hour, and bottom tow catch rates were 2.9 t per hour. Spawning season catches from Puysegur were also mainly reported on TCEPR (see Figure 2b), with midwater catch rates in 2011-12 at 1.5 t per hour and bottom tow catch at 0.3 t per hour.

Standardised CPUE indices for WCSI, Chatham Rise, and Sub-Antarctic all showed overall similar trends: decreasing from 1991-92 to 2003-04 and increasing to 2011-12 (Figure 6).

### 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 2011-12 represent about $42 \%$ of vessels, $8.8 \%$ of tows, and $13.4 \%$ of the total catch (Table 5). The bycatch rate (defined as the percentage of the hoki catch) was estimated for hake, ling, silver warehou, and spiny dogfish (Table 6), and also included white warehou, javelinfish and rattails on the Chatham Rise, ECSI, and Sub-Antarctic, and southern blue whiting in the Sub-Antarctic. 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 in Table 6 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 2000-01 to 2006-07 is provided by Ballara et al. (2010).

Bycatch rates in the spawning areas in 2011-12 were generally low (less than $2 \%$ ) for all species. The observed bycatch in the WCSI fishery in 2011-12 showed decreases in bycatch rates for hake (1.6\%), ling $(1.8 \%)$, and silver warehou ( $0.5 \%$ ), but showed an increase for spiny dogfish $(1.3 \%)$. As in the past, there was very little bycatch in Cook Strait, with spiny dogfish having the largest observed bycatch rate (1.7\%).

In the non-spawning areas, bycatch rates in 2011-12 were also low for most species. On the Chatham Rise, ling ( $2.3 \%$ ), hake ( $0.5 \%$ ), silver warehou ( $3.0 \%$ ), javelinfish ( $4.2 \%$ ), and rattails ( $4.4 \%$ ) showed small decreases in bycatch rates from 2010-11, whereas spiny dogfish ( $1.4 \%$ ) showed an increase. Of the main Sub-Antarctic bycatch species, bycatch rates increased for hake (13.4\%), and ling ( $1.5 \%$ ), but decreased for silver warehou ( $0.1 \%$ ), spiny dogfish $(1.5 \%$ ), southern blue whiting $(0.4 \%)$, white warehou (1.0\%), and rattails (1.5\%), and remained the same for javelinfish ( $2.0 \%$ ).

### 2.2 Size and age composition of commercial catches

Data to estimate length frequencies in 2011-12 were available from the Ministry for Primary Industries' Observer Programme (OP). No shed sampling of landed fish was carried out by NIWA in 2011-12. 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 2011-12 are shown in Figure 7 with the observed position of all tows sampled for hoki length frequency distributions by the OP shown in the TCEPR plot. Hoki were measured by OP observers in 1192 tows, of which 429 came from the WCSI, 88 from Cook Strait, 373 from the Chatham Rise, 257 from the Sub-Antarctic, 13 from the ECSI, 29 from Puysegur, 3 from ECNI, and 1 from the WCNI. Tables 7 and 8 describe observer trip timing in greater detail for the main areas sampled.

Length frequencies 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. Data from outside the line were split into weekly time periods throughout the season, although adjacent weeks were combined if there were fewer than 10 OP length samples available. As there were 19 length frequencies from inside the line at the beginning of June, and no samples from outside the line, the June inside the line samples were scaled up to the total June catch (Table 8). Length frequencies from Cook Strait are normally stratified by month, island of landing, and vessel size. However, in 2012, with no market samples taken, Cook Strait stratification was
by month periods as there was no data for large vessels for July-September (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 from WCSI 2012 trawl survey samples on Tangaroa (O'Driscoll et al. in press). All available OP otoliths (767) from Cook Strait and a sub-sample of 793 otoliths from the WCSI ( 706 trawl survey, and 87 OP samples) 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 the tails of the length distribution were represented. The chosen sample sizes approximated those necessary to produce mean weighted c.v.s 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 to produce an age frequency for the catch for 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 (2001) 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 c.v. of 0.20 in some years.

On the Chatham Rise in 2011-12, 1219 otoliths (including 463 males and 756 females) out of 2501 otoliths collected from 250 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 otoliths from each tow.
3. For tows catching between 3 t and 4 t of hoki select at random 2 otoliths from each tow.
4. For tows catching between 4 t and 7 t of hoki select at random 4 otoliths from each tow.
5. For tows catching more than 7 t of hoki select at random 6 otoliths from each tow.

On the Sub-Antarctic in 2011-12, 1246 otoliths (including 507 males and 739 females) out of 1966 otoliths collected from 151 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 2 t of hoki select at random 4 otoliths from each tow.
3. For tows catching between $2 t$ and $6 t$ of hoki select at random 7 otoliths from each tow.
4. For tows catching between 6 t and 12 t of hoki select at random 9 otoliths from each tow.
5. For tows catching more than 12 t of hoki select at random 12 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 are 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 2012 catch from the WCSI fishery was of fish from 55 to 100 cm (Figure 8) from the 2003-09 year-classes (ages 3-9) (Figure 9). The main length mode for female hoki was from 70-105 cm (Figure 8), and was made up of hoki aged 4 (2008 year-class) and older. Female hoki from the 2009 year class formed a smaller mode centred at 60 cm (Figures 8 and 9). The male modes for different year-classes were more distinct: the 2008 year-class was centred at 70 cm , and the 2009 year-class at 60 cm . The 2010 year-class, at 54 cm (females) and 49 cm (males), was poorly represented. A few small ( $30-35 \mathrm{~cm}$ ) male and female hoki from the 2011 year-class were caught (Figures 8 and 9).

From 2000 to 2004, the sex ratio of the WCSI catch was highly skewed (Figure 10a), with many more females caught than males. In 2005-11, as the catch of younger fish increased, the sex ratio has reversed with more males than females caught, and in 2012, the catch contained about $50 \%$ males and females (Figure 10a). 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 to $37 \%$ in $2011-12$ (Figure 10b). However, there is still female dominance in the catch from the WCSI at older ages (Figure 10a). 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 $13 \%$ in 2011-12 (Figure 10b). Many of these small fish are spawning: $23 \%$ of the female fish less than 55 cm (i.e., mostly 2 year-olds from the 2010 year-class) were in spawning condition, compared to $45 \%$ 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 of market samples in previous years show that there were differences in the length frequencies from shed samples of fish 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 2012). In 2012, the observer data from inside the line in early June had very large fish (Figure 11), although these cannot be directly compared as all observer data from outside the line was collected from late June (see Table 8).

The overall mean length of hoki from the WCSI during the 2012 spawning season showed a decreasing trend to mid-August (Figure 12). 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 12).

The mean length at age for hoki aged from $3-10$ on the WCSI has increased since the start of the fishery, but may now be decreasing (Figure 13).

The OP data used to estimate catch-at-age was reasonably representative of the overall spatial, depth, and temporal distribution of the catch in 2011-12, although vessels less than 60 m were not well sampled (Figure 14).

## Cook Strait

The length distribution of female hoki from Cook Strait in 2012 mainly ranged from 60 to 110 cm , while males were $55-95 \mathrm{~cm}$ (see Figure 15). There was a broad age distribution of females from ages 3 to 13, while most males were ages $3-10$ (see Figure 16). The modal age was 5 (2007 year-class) for males and 7 (2005 year-class) for females (see Figure 16). Few fish from the 2010 year-class (age 2) were caught in Cook Strait, and only $2.9 \%$ of the catch was fish less than 60 cm in 2012 , although $13.3 \%$ of the catch was fish less than 65 cm (see Figure 10b).

In 2012, 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 large vessels (Figure 17, see Table 8). For vessels larger than 40 m there were samples taken in June but none from July to September 2012 (Figure 18). Therefore, length frequencies by month were applied to catches for that month without stratifying by vessel size (Table 8).

Length frequencies by month showed that the size distribution of the catch was broadly similar across the months, although smaller fish increased in proportion in August and September especially for the females (Figure 19), and in all months there were more males measured than females. The sex ratio of the Cook Strait catch was skewed towards females from $2001-05$, then reversed as the percentage of males sampled from 2006-09 increased to $62 \%$, and then decreased in 2010 and 2011 to $49 \%$ and $39 \%$, but in 2012 rose sharply to $63 \%$ (see Figure 10a). The apparent change in sex ratio may be related to a sampling bias, as there is some evidence that larger vessels (which were poorly sampled in 2012) catch a higher proportion of female hoki in Cook Strait (e.g., O’Driscoll 2012). There was no clear trend in the mean length of male hoki over the season, although females showed a slight decreasing trend from August (Figure 20). As on the WCSI, the mean length at age has increased over time in the Cook Strait fishery (Figure 21), although there is now a slight decreasing trend especially at ages 6 and 7.

The Cook Strait catch-at-age for 2012 was not used in the 2013 hoki stock assessment model, except as a sensitivity, as it was not considered representative of the commercial catch in 2012 due to poor observer coverage and the rapidly changing sex ratio.

## Puysegur

In 2011-12, 23 samples were collected from Puysegur during the spawning season, and these were mainly fish of 55-100 cm (Figure 22), from the 2006-09 year classes, with no 2 year old fish (2010 year class) present.

## East coast South Island

Twelve samples were collected from the ECSI during the 2012 spawning season. Fish from this area (Figure 23) were larger than those observed in the non-spawning fishery on the Chatham Rise, and similar to the length distribution observed in Cook Strait.

### 2.2.2 Size and age composition in non-spawning fisheries

## Chatham Rise

About $97 \%$ of the commercial catch, $89 \%$ of length frequencies, and $94 \%$ of the available otoliths came from the hoki target fishery in 2011-12 (Figure 24). The remainder of otoliths were from tows targeting barracouta, alfonsino, ling, hapuka, smooth oreo, silver warehou, and white warehou. The tree-based regression split the OP data from the Chatham Rise fishery into three strata based on depth and longitude (Table 10). The mean length of hoki on the Chatham Rise was shorter in shallower water, and to the west.

The length distribution of hoki from the Chatham Rise in 2011-12 was unimodal and similar for males and females (Figure 25). The catch was dominated by hoki of $45-90 \mathrm{~cm}$ from the 2006-08 year-classes (ages 3-5), with few fish from the 2010 year class (age $1+$ ) and few larger, older fish caught (Figure 26). The modal age of the females was $4+$ (2007 year-class), and for the males was $3+$ and $4+(2008$ and 2007 year classes). More females than males were caught in 2011-12, with males comprising $41 \%$ of the catch (see Figure 10a). There was a lower proportion of large old fish (males and females) in the Chatham Rise than in other areas, with only $11 \%$ of the catch aged 7 years or older (see Figure 10b), and only $22 \%$ of these being male (see Figure 10a). About $27 \%$ of the catch by number was less than 65 cm in 2011-12, a large decrease from 2010-11 (53\%), mainly due to the lack of age $1+$ and $2+$ fish in the catch (see Figure 10b).

The OP data used to estimate catch-at-age was reasonably representative of the overall spatial and temporal distribution of the catch in 2011-12 (Figure 27), although coverage was lower than ideal in some months, especially January, April and July, and on the northern Chatham Rise. The western side of the Chatham Rise (statistical areas 020, 021, 022, and 023) was well sampled, as was the southern Chatham Rise (statistical areas 407-409), but the coverage was poor on the northern Chatham Rise (statistical areas 401-404) (Figure 27).

## Sub-Antarctic

About $87 \%$ of the commercial catch, $47 \%$ of length frequencies, and $71 \%$ of the available otoliths came from the hoki target fishery in 2011-12 (Figure 28). The remainder of otoliths were from tows targeting black oreo, hake, ling, 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 latitude, longitude, and time (Table 10). Smaller fish were found on the Snares Shelf, especially in shallower water, and the southern strata had larger fish early on in the season.

The catch in 2011-12 consisted mainly of $45-105 \mathrm{~cm}$ fish, with the males having a slightly narrower length range than females (Figure 29). Catch-at-age estimates showed that the Sub-Antarctic catch, like that from the other areas, consisted mainly of fish from the 2007-09 year-classes. The modal age of females and males was $3+$ (2008 year-class). There was a higher proportion of old fish caught in the Sub-Antarctic than on the Chatham Rise (Figure 30) and the catch of fish less than 65 cm decreased markedly from $42 \%$ in 2009-10 to $28-30 \%$ in 2010-11 and 2011-12 (see Figure 10b). About $50 \%$ of the fish caught in the Sub-Antarctic in 2011-12 were males (see Figure 10a).

The OP sampling in the Sub-Antarctic was not very representative of the overall spatial or temporal distribution of the catch (Figure 31), with good sampling in October, and some sampling from November to May, and September (see Table 7). Coverage was good on the Snares Shelf and to the east of the Auckland Islands, but poor in other areas.

## 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, but tended to select smaller fish on the Chatham Rise in 2011-12 (Figure 32). This introduces a bias into the age estimates which is difficult to correct. Improved training of observers is required to ensure that otoliths are taken randomly. Electronic aids now being used to help Observers take random samples for otoliths may solve this problem.

### 2.2.3 Comparison of size and age composition between main areas

Length distributions from the main fisheries in 2011-12 are compared in Figure 33. The catch in all areas was dominated by fish from 55 to 90 cm (mainly 2006-09 year-classes, aged 3-6 years), with very few from the 2010 year class, hence the percentage of small fish in the catch in each area was lower (see Figure 10b). Most fish on the Chatham Rise were less than 80 cm . Large female fish (over 90 cm ) were proportionately more abundant in Cook Strait, ECSI, Sub-Antarctic, and WCSI.

## 3. HOKI RESEARCH

### 3.1 Resource surveys

### 3.1.1 Trawl surveys

## Chatham Rise

The twenty-second annual trawl survey of the Chatham Rise was completed between 2 and 26 January 2013, with 93 tows used for biomass estimation. The total biomass of all hoki in 2013 increased by $42 \%$ to 124100 t (Table 11). There was a $29 \%$ increase in the biomass estimate for recruited hoki ( 3 years and older) from 55900 t in 2012 to 72100 t in 2013. The biomass estimate for age $2+$ ( 2010 year-class) of 1000 t was the lowest in the series, and the estimate for age $1+$ (2011 year-class) of 50900 t was the highest in the series (Table 11).

Hoki size and age frequencies from the 2013 Chatham Rise survey were dominated by $1+(33-48 \mathrm{~cm})$, and 3+ ( $55-85 \mathrm{~cm}$ ) hoki, with few 2+ hoki, and few larger fish (Figures 34 and 35).

The 2013 Chatham Rise trawl survey included additional deepwater strata from $800-1300 \mathrm{~m}$. 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 proportion (1.4\%) of the total hoki biomass.

## Sub-Antarctic

The fifteenth survey in the Tangaroa summer trawl time series was carried out from 25 November to 23 December 2012, with 80 successful tows. Previous surveys in the summer series were in NovemberDecember 1991-93, and 2000-09, and 2011. An autumn series has also been carried out in the same area in March-June 1992, 1993, 1996, and 1998. The abundance estimate of hoki in core 300-800 m strata from the 2012 survey was 55738 t (Table 12), 17\% higher than the 2011 survey. The estimated biomass in 2012 was lower than that in 2009, slightly higher than that seen in 2007 and 2008, but only about two thirds of the biomass estimated in the early 1990s.

Hoki length frequencies in 2012 ranged from $30-110 \mathrm{~cm}$ (Figure 36). The main adult mode consisted of fish from the 2009-04 year-classes at ages 3-8, with some larger older fish (Figure 37). There were very few fish in the $49-55 \mathrm{~cm}$ range due to the lack of the $2+$ hoki ( 2010 year class). The mode at $32-50 \mathrm{~cm}$ corresponds to hoki from the 2011 year-class (Figure 37) and these small fish were mainly caught at Puysegur and on the Stewart-Snares shelf.

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. In the 2011 and 2012 stock assessments, model sensitivities were run in which two catchabilities were fitted for the series, instead of just one, and these were found to improve the model fit substantially (McKenzie 2013). In 2013, three base models were run, two of which fitted two catchabilities to the Sub-Antarctic summer trawl series.

## West Coast South Island

A combined trawl and acoustic survey of the west coast South Island (WCSI) was carried out using Tangaroa from 20 July to 19 August 2012. This was the ninth in a series of acoustic surveys of WCSI hoki spawning areas, but the first since 2000. The survey was also the second in a new time series of trawl estimates for middle depth species from the WCSI, with results that are comparable to the random trawl component from the 2000 WCSI survey.

A total of 63 successful random trawl survey tows were completed in the area north of Hokitika Canyon.

The 2012 trawl abundance estimate for hoki was 32602 t (c.v. $24 \%$ ). This was much higher than the abundance estimated from daytime random tows in the equivalent strata in the 2000 WCSI survey, and trawl biomass estimates of hoki were not included in the 2013 assessment as the reliability of the indices had not been evaluated.

Several modes were present in the hoki scaled length frequency from the 2012 WCSI survey (Figure 38) including small ( 1 -year old) hoki at $25-35 \mathrm{~cm}$. Most male hoki were between 50 and 80 cm , and most females were $60-100 \mathrm{~cm}$. The modal length of hoki caught in 2012 was smaller than the modal length from the equivalent survey area in 2000 and that there were fewer small (less than 40 cm ) hoki caught in 2000 (Figure 38). The modal age of hoki in the 2012 survey was age 3 years ( 2009 year-class) with few males older than age 7 and few females older than age 10 (Figure 39). Hoki were not aged from the 2000 survey.

### 3.1.2 Acoustic surveys

## West coast South Island

As described above, a combined trawl and acoustic survey of spawning hoki abundance on the WCSI was carried out using Tangaroa from 20 July to 19 August 2012 (O'Driscoll et al. in press). Three acoustic snapshots of the main WCSI hoki spawning areas were completed, with 27 targeted tows to identify acoustic marks and collect biological samples. Moored cameras were also used to study species composition on untrawlable ground. Acoustic estimates of hoki abundance were sensitive to the choice of hoki TS, sound absorption, stratum areas, and the method used to correct for species composition in mixed marks. 'Old' acoustic estimates were calculated using the same methods as previous surveys in the time series (O'Driscoll 2002). These estimates ranged from 348000 t in the first snapshot to 478000 t in the second snapshot, with an average across all three snapshots of 412000 t (Table 13). This was $4 \%$ higher than the equivalent acoustic index from 2000 and slightly above the long-term average of the timeseries (Table 14). The acoustic survey weighting (expressed as a proportional coefficient of variation, c.v.), which includes uncertainty associated with survey timing, sampling precision, mark identification, calibration, and target strength was 0.51 .

## 4. CONCLUSIONS

The total reported hoki catch in 2010-11 was 130105 t , about 105 t above the TACC of 130000 t , and 11000 t higher than the catch in 2010-11. Relative to 2010-11, catches in 2011-12 increased in all areas except for the ECNI. With the increase in the western catch allocation to 70000 t , the catch on the WCSI increased by nearly 6000 t to 54540 t , and, for the second time in six years, was the largest hoki fishery. The Chatham Rise was the second largest fishery, with 39200 t taken, and the Sub-Antarctic catch increased to 15800 t in 2011-12. The catch from Cook Strait increased slightly to 15900 t , and was the second lowest catch from this fishery since 1989-90.

Length frequencies and catch-at-age results from the commercial fishery show that most of the catch in 2011-12 was fish from 55 to 90 cm (mainly 2005-09 year-classes, aged 3-7 years). The percentage of small fish in the catch in 2011-12 decreased, mainly due to the lack of 2 year old hoki from the 2010 year-class. The largest hoki came from the WCSI, Sub-Antarctic and Cook Strait in 2011-12.

The relative biomass index for all hoki from the 2013 Chatham Rise trawl survey increased by $42 \%$, with an increase of $29 \%$ in estimated biomass of recruited hoki (aged 3 and older). The 2011 year-class (age $1+$ ) was the strongest in the Chatham Rise time series, but the abundance estimate from the 2010 year class (age 2+) was low. The estimated biomass from the 2012 Sub-Antarctic trawl survey was $17 \%$ higher than that in 2011. The abundance index from an acoustic survey of the WCSI spawning grounds in 2012 was similar to that from a comparable survey in 2000.

## 5. ACKNOWLEDGMENTS

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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.

| Year | U.S.S.R. | Japan | South Korea | New Zealand |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  | Domestic | Chartered | Total |
| 1969 |  | 95 |  |  |  | 95 |
| 1970 |  | 414 |  |  |  | 414 |
| 1971 |  | 411 |  |  |  | 411 |
| 1972 | 7300 | 1636 |  |  |  | 8936 |
| 1973 | 3900 | 4758 |  |  |  | 8658 |
| 1974 | 13700 | 2160 |  | 125 |  | 15985 |
| 1975 | 36300 | 4748 |  | 62 |  | 41110 |
| 1976 | 41800 | 24830 |  | 142 |  | 66772 |
| 1977 | 33500 | 54168 | 9865 | 217 |  | 97750 |
| 1978* | $2028+$ | 1296 | 4580 | 678 |  | 8581 |
| 1979 | 4007 | 8550 | 1178 | 2395 | 7970 | 24100 |
| 1980 | 2516 | 6554 |  | 2658 | 16042 | 27770 |
| 1981 | 2718 | 9141 | 2 | 5284 | 15657 | 32802 |
| 1982 | 2251 | 7591 |  | 6982 | 15192 | 32018 |
| 1983 | 3853 | 7748 | 137 | 7706 | 20697 | 40141 |
| 1983-84 | 4520 | 7897 | 93 | 9229 | 28668 | 50407 |
| 1984-85 | 1547 | 6807 | 35 | 7213 | 28068 | 43670 |
| 1985-86 | 4056 | 6413 | 499 | 8280 | 80375 | 99623 |
| 1986-87 | 1845 | 4107 | 6 | 8091 | 153222 | 167271 |
| 1987-88 | 2412 | 4159 | 10 | 7078 | 216680 | 230339 |

* 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 1986-1987 to 2011-12. 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 |
| $1986-87$ | 175000 |  | 158171 | 250000 |
| $1987-88$ | 255000 |  | 216206 | 250000 |
| $1988-89$ | 210000 |  | 208500 | 250000 |
| $1989-90$ | 210000 |  | 208851 | 251884 |
| $1990-91$ | 215000 |  | 212720 | 201897 |
| $1991-92$ | 215000 |  | 212167 | 201897 |
| $1992-93$ | 195000 |  | 191994 | 202155 |
| $1993-94$ | 190000 |  | 192385 | 202155 |
| $1994-95$ | 168000 |  | 176787 | 220350 |
| $1995-96$ | 194000 |  | 209639 | 240000 |
| $1996-97$ | 230000 |  | 246756 | 250000 |
| $1997-98$ | 261000 |  | 269239 | 250000 |
| $1998-99$ | 234000 |  | 244528 | 250000 |
| $1999-00$ | 237000 |  | 242423 | 250000 |
| $2000-01$ | 230625 |  | 229862 | 250000 |
| $2001-02$ | 200054 | 195492 | 195506 | 200000 |
| $2002-03$ | 182560 | 184659 | 184668 | 200000 |
| $2003-04$ | 133764 | 135784 | 135787 | 180000 |
| $2004-05$ | 102885 | 104364 | 106189 | 100000 |
| $2005-06$ | 101984 | 104385 | 105965 | 100000 |
| $2006-07$ | 97790 | 101009 | 102861 | 100000 |
| $2007-08$ | 87815 | 89318 | 91045 | 90000 |
| $2008-09$ | 87598 | 88805 | 89475 | 90000 |
| $2009-10$ | 105105 | 107209 | 107209 | 110000 |
| $2010-11$ | 115782 | 118805 | 118805 | 120000 |
| $2011-12$ | 126164 | 130106 | 130106 | 130000 |

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 HOKET catches (catches outside the EEZ).

Table 3: Estimated total catch ( $t$ ) of hoki by area ${ }^{1}$, 1988-89 to 2011-12. 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).

| Fishing | Spawning fisheries |  |  |  |  |  | Non-spawning fisheries |  |  | Total catch |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Cook |  | Sub- | Chatham |  |  |  |  |
| Year | WCSI | Puysegur | Strait | ECSI | Antarctic | Rise | ECNI | WCNI | Other ${ }^{2}$ |  |
| 1988-89 | 188000 | 3500 | 7000 | - | 5000 | 5000 | - | - | - | 208500 |
| 1989-90 | 165000 | 8000 | 14000 | - | 10000 | 13000 | - | - | - | 210000 |
| 1990-91 | 154000 | 4000 | 26500 | 1000 | 18000 | 11500 | - | - | - | 215000 |
| 1991-92 | 105000 | 5000 | 25000 | 500 | 34000 | 45500 | - | - | - | 215000 |
| 1992-93 | 98000 | 2000 | 21000 | - | 26000 | 43000 | 2000 | - | 3000 | 195000 |
| 1993-94 | 113000 | 2000 | 37000 | - | 12000 | 24000 | 2000 | - | 1000 | 191000 |
| 1994-95 | 80000 | 1000 | 40000 | - | 13000 | 39000 | 1000 | - | - | 174000 |
| 1995-96 | 73000 | 3000 | 67000 | 1000 | 12000 | 49000 | 3000 | - | 2000 | 210000 |
| 1996-97 | 91000 | 5000 | 61000 | 1500 | 25000 | 56500 | 5000 | - | 1000 | 246000 |
| 1997-98 | 107000 | 2000 | 53000 | 1000 | 24000 | 75000 | 4000 | - | 3000 | 269000 |
| 1998-99 | 94562 | 2883 | 45252 | 1977 | 23753 | 73594 | 2315 | 94 | 97 | 244527 |
| 1999-00 | 102721 | 2880 | 43192 | 2351 | 33772 | 56014 | 1387 | 98 | 4 | 242419 |
| 2000-01 | 102234 | 6798 | 36298 | 2411 | 30076 | 49847 | 2035 | 147 | - | 229846 |
| 2001-02 | 92716 | 5322 | 23976 | 2971 | 30175 | 39151 | 1147 | 39 | - | 195497 |
| 2002-03 | 73860 | 5948 | 36713 | 7382 | 20199 | 39092 | 929 | 532 | 4 | 184659 |
| 2003-04 | 45112 | 1158 | 41034 | 2140 | 11635 | 33650 | 880 | 126 | - | 135735 |
| 2004-05 | 32647 | 5501 | 24485 | 4259 | 6337 | 30434 | 516 | 36 | - | 104215 |
| 2005-06 | 38281 | 1457 | 21405 | 653 | 6961 | 34944 | 673 | 8 | - | 104382 |
| 2006-07 | 33328 | 408 | 20113 | 1006 | 7661 | 37813 | 667 | 8 | - | 101004 |
| 2007-08 | 20928 | 308 | 18470 | 2323 | 8708 | 37920 | 640 | 19 | - | 89316 |
| 2008-09 | 20548 | 233 | 17535 | 1054 | 9807 | 39011 | 588 | 25 | - | 88801 |
| 2009-10 | 36349 | 272 | 17880 | 669 | 12275 | 39138 | 618 | 7 | - | 107208 |
| 2010-11 | 48373 | 1176 | 14937 | 1625 | 12655 | 38447 | 1588 | 2 | - | 118803 |
| 2011-12 | 54540 | 1308 | 15861 | 2531 | 15745 | 39231 | 858 | 31 | - | 130105 |

1 Estimated catches by area from TCEPR, CELR, LCER, NCELR, and TCER adjusted pro rata to the total reported (QMR or MHR) catches (excluding HOKET 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 model for each area and the corresponding total $R^{2}$ value.

|  | All target species |  | Target hoki |
| :--- | ---: | :--- | ---: |
| Variable | $\mathrm{R}^{2}$ | Variable | $\mathrm{R}^{2}$ |
| WCSI spawning, core vessels |  |  |  |
| Year | 5.1 | Year | 5.5 |
| Day of year | 19.4 | Day of year | 16.5 |
| Vessel | 26.8 | Vessel | 24.7 |
| Target species | 32.7 | Mid time | 27.9 |
| Mid time | 35.3 |  |  |
| Cook Strait spawning, core MW vessels |  |  |  |
|  |  | Fishing year | 2.4 |
|  | Day of fishing year | 17.7 |  |
|  |  | Vessel | 23.3 |
| Chatham Rise and ECSI Non-spawning, core BT vessels |  |  |  |
| Fishing year | 5.3 | Fishing year |  |
| Vessel | 32.9 | Vessel | 8.9 |
| Target species | 36.1 | Start time of tow | 13.9 |
| Start time of tow | 38.1 | Duration of tow | 16.9 |
| Duration of tow | 40.1 | Month | 19.9 |
|  |  |  | 21.2 |
| Sub-Antarctic non-spawning, core BT vessels |  |  |  |
| Fishing year | 8.7 | Fishing year |  |
| Target species | 42.1 | Month |  |
| Month | Start time of tow |  |  |
| Start time of tow | 45.0 | Vessel | 9.7 |
| Vessel | 47.5 | Statistical area | 13.5 |
| Distance 2 | 49.3 | Duration of tow | 16.5 |
|  |  | Depth of net | 19.0 |
|  |  | 20.5 |  |
|  |  | 21.6 |  |

Table 5: Observer coverage 2011-12 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

| Area | Number of vessels |  |  | Number of tows |  |  | Catch (t) |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All | Observed | Percent | All | Observed | Percent | All | Observed | Percent |
| Chatham Rise | 50 | 14 | 28.0 | 5826 | 373 | 6.4 | 39226 | 3596 | 9.2 |
| Cook Strait | 28 | 7 | 25.0 | 1119 | 75 | 6.7 | 12877 | 1081 | 8.4 |
| ECNI | 50 | 2 | 4.0 | 2451 | 3 | 0.1 | 852 | 6 | 0.7 |
| ECSI | 16 | 3 | 18.8 | 268 | 12 | 4.5 | 2526 | 263 | 10.4 |
| Macquarie | 1 | 1 | 100.0 | 4 | 1 | 25.0 | - | - | - |
| Puysegur | 20 | 5 | 25.0 | 252 | 29 | 11.5 | 1308 | 227 | 17.4 |
| Sub-Antarctic | 37 | 17 | 45.9 | 2732 | 257 | 9.4 | 15745 | 2350 | 14.9 |
| WCNI | 18 | 1 | 5.6 | 115 | 1 | 0.9 | 31 | - | 1.6 |
| WCSI | 44 | 16 | 36.4 | 3747 | 423 | 11.3 | 54228 | 9638 | 17.8 |
| All areas combined | 111 | 33 | 29.7 | 17867 | 1192 | 6.7 | 130089 | 17322 | 13.3 |

(b) Target hoki tows

| Area | Number of vessels |  |  | Number of tows |  |  | Catch (t) |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | All | Observed | Percent | All | Observed | Percent | All | Observed | Percent |
| Chatham Rise | 29 | 10 | 34.5 | 4471 | 331 | 7.4 | 38038 | 3343 | 8.8 |
| Cook Strait | 22 | 7 | 31.8 | 1034 | 75 | 7.3 | 12863 | 1081 | 8.4 |
| ECSI | 15 | 1 | 6.7 | 332 | 1 | 0.3 | 561 | 4 | 0.8 |
|  | 12 | 3 | 25.0 | 219 | 12 | 5.5 | 2468 | 263 | 10.7 |
| Macquarie | 5 | 1 | 20.0 | 97 | 21 | 21.6 | 1000 | 196 | 19.6 |
| Puysegur | 21 | 7 | 33.3 | 1262 | 119 | 9.4 | 13612 | 2066 | 15.2 |
| Sub-Antarctic WCNI | 5 | 1 | 20.0 | 12 | 1 | 8.3 | 22 | - | 2.2 |
|  | 37 | 15 | 40.5 | 3171 | 406 | 12.8 | 52616 | 9565 | 18.2 |
|  | 64 | 27 | 42.2 | 11253 | 985 | 8.8 | 124400 | 16680 | 13.4 |

Table 6: Bycatch rates on vessels with Observer Programme observers in the hoki fishery for tows targeting hoki from 1990-91 to 2011-12. The WCSI, Cook Strait, and ECSI data cover the spawning season (JuneSeptember) only. -, less than 0.1 t (except for Cook Strait 1994-95 and 1996-97, Puysegur 1997-98 to 200809, 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 include: HAK, Hake; HOK, Hoki; JAV, Javelinfish; LIN, Ling; RAT, Rattails; SBW, Southern blue whiting; SPD, Spiny dogfish; SWA, Silver warehou, and WWA, White warehou.
(a) WCSI

|  |  |  |  |  | Catch in t (\% of hoki catch) |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Fishing year | HOK |  | HAK | LIN |  | SWA |  | SPD |
| 1990-91 | 28670 | 1574 | (5.5) | 243 (0.8) | 465 | (1.6) | 43 | (0.1) |
| 1991-92 | 18674 | 152 | (0.8) | 141 (0.8) | 156 | (0.8) | 98 | (0.5) |
| 1992-93 | 19095 | 370 | (1.9) | 182 (1.0) | 138 | (0.7) | 56 | (0.3) |
| 1993-94 | 32568 | 217 | (0.7) | 167 (0.5) | 614 | (1.9) | 215 | (0.7) |
| 1994-95 | 25721 | 840 | (3.3) | 221 (0.9) | 162 | (0.6) | 192 | (0.7) |
| 1995-96 | 17706 | 1409 | (8.0) | 279 (1.6) | 472 | (2.7) | 315 | (1.8) |
| 1996-97 | 14283 | 648 | (4.5) | 131 (0.9) | 422 | (3.0) | 59 | (0.4) |
| 1997-98 | 18655 | 1077 | (5.8) | 327 (1.8) | 445 | (2.4) | 245 | (1.3) |
| 1998-99 | 17428 | 1026 | (5.9) | 290 (1.7) | 220 | (1.3) | 219 | (1.3) |
| 1999-00 | 18762 | 1081 | (5.8) | 291 (1.6) | 384 | (2.0) | 110 | (0.6) |
| 2000-01 | 16433 | 514 | (3.1) | 262 (1.6) | 295 | (1.8) | 82 | (0.5) |
| 2001-02 | 16668 | 1460 | (8.8) | 513 (3.1) | 124 | (0.7) | 119 | (0.7) |
| 2002-03 | 10191 | 528 | (5.2) | 191 (1.9) | 96 | (0.9) | 41 | (0.4) |
| 2003-04 | 8431 | 817 | (9.7) | 507 (6.0) | 269 | (3.2) | 51 | (0.6) |
| 2004-05 | 7178 | 344 | (4.8) | 281 (3.9) | 99 | (1.4) | 38 | (0.5) |
| 2005-06 | 9525 | 404 | (4.2) | 232 (2.4) | 97 | (1.0) | 62 | (0.7) |
| 2006-07 | 9740 | 112 | (1.1) | 79 (0.8) | 80 | (0.8) | 30 | (0.3) |
| 2007-08 | 7774 | 47 | (0.6) | 73 (0.9) | 53 | (0.7) | 48 | (0.6) |
| 2008-09 | 9418 | 84 | (0.9) | 88 (0.9) | 68 | (0.7) | 32 | (0.3) |
| 2009-10 | 11619 | 85 | (0.7) | 162 (1.4) | 65 | (0.6) | 79 | (0.7) |
| 2010-11 | 9556 | 231 | (2.4) | 189 (2.0) | 99 | (1.0) | 61 | (0.6) |
| 2011-12 | 18435 | 301 | (1.6) | 334 (1.8) | 90 | (0.5) | 244 | (1.3) |

## (b) Cook Strait

| Fishing year | Catch in t (\% of hoki catch) |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | HOK | HAK | LIN | SWA |  | SPD |
| 1992-93 | 107 | - (-) | - (-) | - (-) | 1 | (0.9) |
| 1993-94 | 495 | - (-) | 6 (1.2) | - (-) | 1 | (0.2) |
| 1995-96 | 734 | - (-) | 2 (0.3) | - (-) | 13 | (1.8) |
| 1997-98 | 3435 | - (-) | 7 (0.2) | - (-) | 55 | (1.6) |
| 1998-99 | 4881 | 1 (-) | 19 (0.4) | - (-) | 97 | (2.0) |
| 1999-00 | 3243 | - (-) | 10 (0.3) | - (-) | 106 | (3.3) |
| 2000-01 | 4361 | - (-) | 16 (0.4) | 1 (-) | 87 | (2.0) |
| 2001-02 | 2032 | - (-) | 6 (0.3) | - (-) | 45 | (2.2) |
| 2002-03 | 2436 | - (-) | 6 (0.2) | - (-) | 104 | (4.3) |
| 2003-04 | 2486 | - (-) | 4 (0.2) | - (-) | 39 | (1.6) |
| 2004-05 | 2176 | - (-) | 4 (0.2) | 2 (0.1) | 38 | (1.7) |
| 2005-06 | 1080 | - (-) | 2 (0.2) | - (-) | 15 | (1.4) |
| 2006-07 | 2124 | - (-) | 11 (0.5) | 2 (0.1) | 84 | (4.0) |
| 2007-08 | 3437 | - (-) | 8 (0.2) | $1(-)$ | 63 | (1.8) |
| 2008-09 | 2290 | - (-) | 3 (0.1) | - (-) | 27 | (1.2) |
| 2009-10 | 3393 | - (-) | 5 (0.1) | - (-) | 28 | (0.8) |
| 2010-11 | 1637 | - (-) | - (-) | 2 (0.1) | 13 | (0.8) |
| 2011-12 | 1551 | - (-) | 4 (0.3) | 7 (0.5) | 27 | (1.7) |

## Table 6: continued.

## (c) Puysegur

| Fishing year | Catch in t (\% of hoki catch) |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | HOK |  | HAK | LIN |  | SWA |  | SPD |
| 1990-91 | 986 | 3 | (0.3) | 25 (2.5) | 1 | (0.1) | 1 | (0.1) |
| 1991-92 | 1025 | 27 | (2.6) | 431 (42.0) | 2 | (0.2) | 4 | (0.4) |
| 1992-93 | 231 | 2 | (0.9) | 60 (26.0) | - | (-) | - | (-) |
| 1993-94 | 938 | - |  | 8 (0.9) | 7 | (0.7) | 6 | (0.6) |
| 1994-95 | 226 | - |  | 8 (3.5) | - | (-) | - | (-) |
| 1995-96 | 719 | 2 | (0.3) | 33 (4.6) | 3 | (0.4) | 2 | (0.3) |
| 1996-97 | 454 | - |  | 6 (1.3) | 3 | (0.7) | 3 | (0.7) |
| 1998-99 | 226 | 4 | (1.8) | 25 (11.1) | 6 | (2.7) |  | (4.0) |
| 1999-00 | 369 | - | (-) | 25 (6.8) | 17 | (4.6) | 7 | (1.9) |
| 2000-01 | 573 | 5 | (0.9) | 18 (3.1) | 211 | (36.8) | 6 | (1.0) |
| 2001-02 | 561 | - |  | 20 (3.6) | 34 | (6.1) | 1 | (0.2) |
| 2002-03 | 527 | 2 | (0.4) | 28 (5.3) | 16 | (3.0) | 2 | (0.4) |
| 2003-04 | 549 | - |  | 32 (5.8) | 14 | (2.6) | 2 | (0.4) |
| 2004-05 | 1237 | 1 | (0.1) | 20 (1.6) | 1 | (0.1) | 11 | (0.9) |
| 2005-06 | 372 | 2 |  | 104 (28.0) | - | (-) | 1 | (0.3) |
| 2006-07 | 10 | - | (-) | 4 (40.0) | - | (-) | - | (-) |
| 2009-10 | 31 | - |  | - (-) | 1 | (3.2) | - | (-) |
| 2010-11 | 1 | - | (-) | - (-) | - | (-) | - | (-) |
| 2011-12 | 301 |  | (2.0) | 19 (6.3) | 5 | (1.7) | - | (-) |

## (d) Sub-Antarctic

| Fishing year | Catch in t (\% of hoki catch) |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | HOK | HAK | LIN | SWA | SPD | JAV | RAT | SBW | WWA |
| 1990-91 | 1960 | 203 (10.4) | 90 (4.6) | (-) | 3 (0.2) | 16 (0.8) | 14 (0.7) | 1 (0.1) | 3 (0.2) |
| 1991-92 | 3562 | 332 (9.3) | 249 (7.0) | (0.3) | 15 (0.4) | 47 (1.3) | 39 (1.1) | 6 (0.2) | 35 (1.0) |
| 1992-93 | 3468 | 676 (19.5) | 252 (7.3) | 5 (0.1) | 10 (0.3) | 30 (0.9) | 21 (0.6) | - (-) | 22 (0.6) |
| 1993-94 | 1929 | 226 (11.7) | 171 (8.9) | 11 (0.6) | 15 (0.8) | 11 (0.6) | 10 (0.5) | (-) | 5 (0.3) |
| 1994-95 | 882 | 24 (2.7) | 64 (7.3) | (-) | 15 (1.7) | 14 (1.6) | 12 (1.4) | 3 (0.3) | 8 (0.9) |
| 1995-96 | 1080 | 32 (3.0) | 146 (13.5) | 8 (0.7) | 6 (0.6) | 9 (0.8) | 15 (1.4) | - (-) | 22 (2.0) |
| 1996-97 | 717 | 10 (1.4) | 25 (3.5) | 1 (0.1) | (-) | 4 (0.6) | 3 (0.4) | (-) | (-) |
| 1997-98 | 1893 | 127 (6.7) | 190 (10.0) | 3 (0.2) | 20 (1.1) | 66 (3.5) | 59 (3.1) | 1 (0.1) | 28 (1.5) |
| 1998-99 | 4784 | 134 (2.8) | 257 (5.4) | 26 (0.5) | 20 (0.4) | 74 (1.5) | 78 (1.6) | (-) | 18 (0.4) |
| 1999-00 | 5470 | 213 (3.9) | 340 (6.2) | 162 (3.0) | 47 (0.9) | 186 (3.4) | 65 (1.2) | 5 (0.1) | 25 (0.5) |
| 2000-01 | 4286 | 99 (2.3) | 439 (10.2) | 237 (5.5) | 58 (1.4) | 78 (1.8) | 50 (1.2) | 9 (0.2) | 26 (0.6) |
| 2001-02 | 3908 | 154 (3.9) | 194 (5.0) | 35 (0.9) | 97 (2.5) | 308 (7.9) | 94 (2.4) | 35 (0.9) | 27 (0.7) |
| 2002-03 | 2032 | 83 (4.1) | 373 (18.4) | 22 (1.1) | 81 (4.0) | 99 (4.9) | 47 (2.3) | 21 (1.0) | 20 (1.0) |
| 2003-04 | 781 | 37 (4.7) | 326 (41.7) | 54 (6.9) | 171 (21.9) | 36 (4.6) | 16 (2.0) | 16 (2.0) | 14 (1.8) |
| 2004-05 | 391 | 24 (6.1) | 189 (48.3) | 5 (1.3) | 6 (1.5) | 71 (18.2) | 15 (3.8) | 1 (0.3) | 10 (2.6) |
| 2005-06 | 1172 | 14 (1.2) | 118 (10.1) | 68 (5.8) | 63 (5.4) | 29 (2.5) | 14 (1.2) | - (-) | 70 (6.0) |
| 2006-07 | 1225 | 16 (1.3) | 225 (18.4) | 82 (6.7) | 85 (6.9) | 50 (4.1) | 18 (1.5) | 1 (0.1) | 85 (6.9) |
| 2007-08 | 3105 | 101 (3.3) | 1004 (32.3) | 13 (0.4) | 30 (1.0) | 176 (5.7) | 28 (0.9) | 61 (2.0) | 76 (2.4) |
| 2008-09 | 3070 | 93 (3.0) | 361 (11.8) | 52 (1.7) | 83 (2.7) | 130 (4.2) | 40 (1.3) | 37 (1.2) | 39 (1.3) |
| 2009-10 | 3260 | 73 (2.2) | 309 (9.5) | 26 (0.8) | 73 (2.2) | 166 (5.1) | 93 (2.9) | 7 (0.2) | 37 (1.1) |
| 2010-11 | 2981 | 34 (1.1) | 221 (7.4) | 58 (1.9) | 105 (3.5) | 61 (2.0) | 58 (1.9) | 40 (1.3) | 56 (1.9) |
| 2011-12 | 3172 | 46 (1.5) | 424 (13.4) | 2 (0.1) | 46 (1.5) | 64 (2.0) | 48 (1.5) | 12 (0.4) | 31 (1.0) |

## Table 6: continued.

(e) Chatham Rise and ECSI (excluding ECSI from June-September).

|  | Catch in t (\% of hoki catch) |  |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Fishing year | HOK | HAK | LIN |  | SWA | SPD |  | JAV |  | RAT |  | WWA |
| 1990-91 | 3328 | 132 (4.0) | 157 (4.7) | 210 | (6.3) | 24 (0.7) | 142 | (4.3) | 102 | (3.1) | 2 | (0.1) |
| 1991-92 | 5011 | 64 (1.3) | 145 (2.9) | 28 | (0.6) | 5 (0.1) | 70 | (1.4) | 129 | (2.6) | 16 | (0.3) |
| 1992-93 | 1321 | 59 (4.5) | 12 (0.9) | 9 | (0.7) | 3 (0.2) | 38 | (2.9) | 11 | (0.8) | 2 | (0.2) |
| 1993-94 | 4835 | 162 (3.4) | 124 (2.6) | 16 | (0.3) | 18 (0.4) | 85 | (1.8) | 115 | (2.4) | 6 | (0.1) |
| 1994-95 | 2156 | 36 (1.7) | 75 (3.5) | 22 | (1.0) | 14 (0.6) | 65 | (3.0) | 66 | (3.1) | 2 | (0.1) |
| 1995-96 | 5331 | 136 (2.6) | 146 (2.7) | 128 | (2.4) | 49 (0.9) | 118 | (2.2) | 197 | (3.7) | 23 | (0.4) |
| 1996-97 | 1762 | 112 (6.4) | 75 (4.3) | 11 | (6.6) | 10 (0.6) | 87 | (4.9) | 130 | (7.4) | 4 | (0.2) |
| 1997-98 | 8948 | 212 (2.4) | 243 (2.7) | 91 | (1.0) | 71 (0.8) | 439 | (4.9) | 315 | (3.5) | 24 | (0.3) |
| 1998-99 | 7713 | 99 (1.3) | 273 (3.5) | 81 | (1.1) | 129 (1.7) | 343 | (4.4) | 327 | (4.2) | 26 | (0.3) |
| 1999-00 | 3837 | 64 (1.7) | 114 (3.0) | 12 | (3.3) | 135 (3.5) | 222 | (5.8) | 159 | (4.1) | 23 | (0.6) |
| 2000-01 | 5476 | 143 (2.6) | 262 (4.8) | 217 | (4.0) | 97 (1.8) | 385 | (7.0) | 339 | (6.2) | 55 | (1.0) |
| 2001-02 | 4607 | 94 (2.0) | 221 (4.8) | 48 | (1.0) | 120 (2.6) | 382 | (8.3) | 381 | (8.3) | 32 | (0.7) |
| 2002-03 | 2356 | 68 (2.9) | 211 (9.0) | 138 | (5.9) | 47 (2.0) |  | (18.3) |  | 4.3) | 39 | (1.7) |
| 2003-04 | 2460 | 52 (2.1) | 157 (6.4) | 242 | (9.8) | 58 (2.4) | 250 | 10.2) | 26 | (10.8) | 51 | (2.1) |
| 2004-05 | 4820 | 52 (1.1) | 180 (3.7) | 134 | (2.8) | 106 (2.2) | 531 | (11.0) | 339 | (7.0) | 94 | (2.0) |
| 2005-06 | 5120 | 48 (0.9) | 131 (2.6) | 259 | (5.1) | 93 (1.8) | 394 | (7.7) | 315 | (6.2) | 104 | (2.0) |
| 2006-07 | 5535 | 80 (1.4) | 155 (2.8) | 195 | (3.5) | 39 (0.7) | 500 | (9.0) | 165 | (3.0) | 75 | (1.4) |
| 2007-08 | 5532 | 77 (1.4) | 120 (2.2) | 149 | (2.7) | 74 (1.3) | 405 | (7.3) | 319 | (5.8) | 35 | (0.6) |
| 2008-09 | 4376 | 49 (1.1) | 94 (2.1) | 71 | (1.6) | 45 (1.0) | 351 | (8.0) | 286 | (6.5) | 14 | (0.3) |
| 2009-10 | 5726 | 68 (1.2) | 134 (2.3) |  | (4.3) | 48 (0.8) | 541 | (9.4) | 429 | (7.5) | 22 | (0.4) |
| 2010-11 | 5973 | 52 (0.9) | 142 (2.4) | 221 | (3.7) | 46 (0.8) | 382 | (6.4) | 314 | (5.3) | 26 | (0.4) |
| 2011-12 | 7902 | 42 (0.5) | 185 (2.3) | 236 | (3.0) | 107 (1.4) | 329 | (4.2) | 351 | (4.4) | 31 | (0.4) |

## (f) ECSI, June-September.

| Fishing year | Catch in t (\% of hoki catch) |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | HOK | HAK | LIN | SWA | SPD | JAV | RAT |  | WWA |
| 2000-01 | 5 | - (-) | (-) | - (-) | - (-) | - (-) | (-) |  | (-) |
| 2001-02 | 97 | (-) | 1 (1.0) | (-) | - (-) | - (-) | 1 (1.0) |  | (-) |
| 2002-03 | 914 | 22 (2.4) | 8 (0.9) | 20 (2.2) | 5 (0.5) | 6 (0.7) | 18 (2.0) | 2 | (0.2) |
| 2003-04 | 939 | 2 (0.2) | 4 (0.4) | 1 (0.1) | 1 (0.1) | 4 (0.4) | 6 (0.6) | 2 | (0.2) |
| 2004-05 | 280 | - (-) | 1 (0.4) | - (-) | - (-) | 1 (0.4) | 2 (0.7) | - | (-) |
| 2005-06 | 505 | 5 (1.0) | - (-) | 35 (6.9) | 1 (0.2) | 1 (0.2) | 3 (0.6) |  | (-) |
| 2007-08 | 72 | 2 (2.8) | 1 (1.4) | 2 (2.8) | - (-) | 2 (2.8) | 9 (12.5) | 2 | (2.8) |
| 2008-09 | 311 | - (-) | - (-) | - (-) | - (-) | - (-) | 1 (0.3) |  | (-) |
| 2009-10 | 41 |  | 1 (2.4) | - (-) | - (-) | 1 (2.4) | 18 (43.9) | 2 | (4.9) |
| 2010-11 | 413 | 2 (0.5) | 1 (0.2) | - (-) | - (-) | - (-) | 4 (1.0) | 2 | (0.5) |
| 2011-12 | 355 | 1 (0.3) | 1 (0.3) | 10 (2.8) | - (-) | 2 (0.6) | 15 (4.2) | 3 | (0.8) |

Table 7: Number of 2011-12 hoki length frequencies and otoliths by observer trips, target species, and monthly timing. Length frequencies with errors, missing data or outide the sample period (e.g. non-spawning in a spawning area) have been removed.

## (a) WCSI observer samples

|  |  | Number of |  |  |
| :--- | :--- | :--- | ---: | ---: |
| Trip | Month | Target species | Length frequencies | Otoliths |
| 1 | Jun | BAR/HOK | 9 | - |
| 2 | Jun | HOK | 10 | - |
| 3 | Jul | HOK | 24 | - |
| 4 | Jun | HOK | 1 | - |
| 5 | Jun/Jul | HOK | 17 | 39 |
| 6 | Jun/Jul | HOK | 35 | - |
| 7 | Jun/Jul | HAK/HOK | 20 | 17 |
| 8 | Jul | HOK | 16 | 31 |
| 9 | Jul/Aug | HOK/LIN | 41 | - |
| 10 | Jul/Aug | HAK/HOK | 20 | - |
| 11 | Jul | HOK | 36 | - |
| 12 | Jul | HOK | 17 | - |
| 13 | Jul/Aug | HOK | 33 | - |
| 14 | Jul/Aug | HOK | 14 | - |
| 15 | Jul/Aug | HOK | 31 | - |
| 16 | Jul/Aug | HOK | 25 | - |
| 17 | Aug | HOK | 25 | - |
| 18 | Aug | HOK | 8 | - |
| 19 | Aug | HOK | 10 | - |
| 20 | Aug | HOK | 18 | - |
| 21 | Aug/Sep | HAK/HOK | 8 | - |
| 22 | Sep | BAR/HAK | 2 | - |
| 23 | Sep | HAK | 3 | - |
| TAN1210 | - | - | - | 706 |
| Total | - | - | 423 | 793 |

## (b) Cook Strait observer samples

|  |  |  |  |  | Month | Total |  |
| :--- | :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| Data set | Stratum |  |  | Sun | Jul | Aug | Sep |
| Observer tows | Nelson/Picton vessel $<30 \mathrm{~m}$ | - | 11 | 36 | 11 | 58 |  |
|  | Nelson/Picton vessel $30-40 \mathrm{~m}$ | 2 | - | - | - | 2 |  |
|  | Nelson/Picton vessel $>40 \mathrm{~m}$ | 15 | - | - | - | 15 |  |

Table 7: continued.
(c) Chatham Rise and ECSI observer data; Chatham Rise includes ECSI non-spawning data.

|  |  |  | Number of length frequencies |  |  |
| :--- | :--- | :--- | ---: | :--- | ---: |
| Trip | Month | Target species | Chatham Rise ECSI spawning | Number of otoliths |  |
| 1 | Oct | HOK | 4 | - | 22 |
| 2 | Oct | HOK/SWA/WWA | 5 | - | 10 |
| 3 | Oct/Nov | HOK | 6 | - | 24 |
| 4 | Nov | SSO | 1 | - | - |
| 5 | Nov/Dec | HOK | 3 | - | 6 |
| 6 | Oct/Nov/Dec | BYS/HOK | 64 | - | 280 |
| 7 | Nov | OEO/ORH/SSO | 9 | - | - |
| 8 | Dec | SSO | 1 | - | - |
| 9 | Nov/Dec | HOK | 73 | - | - |
| 10 | Dec/Jan | HOK | 31 | - | 168 |
| 11 | Feb | BAR | 3 | - | - |
| 12 | Feb/Mar | HOK/SWA/WWA | 29 | - | 140 |
| 13 | Feb/Mar | HOK | 44 | - | 251 |
| 14 | May | HOK | 17 | - | 96 |
| 15 | May | HOK | 16 | - | 70 |
| 16 | May | SWA | 1 | - | 4 |
| 17 | May/Jun | HOK/SWA | 19 | - | - |
| 18 | Jun | HOK | 4 | - | 11 |
| 19 | Jun | SWA | 2 | - | 3 |
| 20 | Aug | HOK | 5 | 2 | 28 |
| 21 | Aug/Sep | HOK | 8 | 9 | 29 |
| 22 | Sep | SWA | 1 | - | 6 |
| 23 | Sep | BAR/LIN/SWA | 7 | - | 11 |
| 24 | Sep | HOK | 4 | - | 22 |
| 25 | Sep | HOK | - | 1 | - |
| 26 | Sep | HOK | 6 | - | 29 |
| 27 | Sep | BAR/HOK/SWA | 10 | - | - |
| Total | - | - | 12 | 1210 |  |

## (d) Sub-Antarctic observer data

|  |  | Number of |  |  |
| :--- | :--- | :--- | ---: | ---: |
| Trip | Month | Target species | Length frequencies | Otoliths |
| 1 | Oct | HOK | 2 | 17 |
| 2 | Oct | HOK | 34 | 338 |
| 3 | Oct | LIN/WWA | 5 | 33 |
| 4 | Oct/Nov | HOK | 22 | 181 |
| 5 | Oct | LIN | 5 | - |
| 6 | Nov/Dec | BOE | 2 | 4 |
| 7 | Nov/Dec | HAK/LIN/WWA | 9 | 44 |
| 8 | Dec/Jan | HAK/LIN | 9 | 54 |
| 9 | Jan/Feb | HOK | 8 | 74 |
| 10 | Jan/Feb | HAK/WWA | 4 | 26 |
| 11 | Feb | SQU | 8 | 5 |
| 12 | Mar | HOK | 11 | 92 |
| 13 | Feb | HOK | 1 | - |
| 14 | Mar/Apr | SQU | 5 | 7 |
| 15 | Feb | SQU | 1 | - |
| 16 | Mar | SQU | 1 | - |
| 17 | Apr | SQU | 3 | 7 |
| 18 | Mar/Apr | SQU | 6 | 4 |
| 19 | Apr | SQU | 2 | - |
| 20 | Mar | SQU | 1 | - |
| 21 | Apr | SQU | 2 | - |
| 22 | Apr/May | SQU/SWA | 11 | 71 |
| 23 | May | HOK | 2 | 14 |
| 24 | May | HOK | 20 | - |
| 25 | Jul | LIN/WWA | 12 | 100 |
| 26 | Sep | SBW | 24 | - |
| 27 | Sep | SBW | 2 | - |
| 28 | Sep | HOK/LIN | 16 | 119 |
| 29 | Sep | SBW | 2 | - |
| 30 | Sep | SBW | 12 | - |
| 31 | Sep | HOK | 4 | 39 |
| 32 | Sep | SBW | 2 | - |
| 33 | Sep | SBW | 8 | - |
| Total | - | - | 256 | 1229 |
|  |  |  |  |  |

Table 8: Stratification for the 2012 WCSI and Cook Strait length frequencies.
(a) Number of WCSI hoki length frequency data and catch by week from inside and outside the $\mathbf{2 5} \mathbf{n}$. mile line.

| Week | Date | Number of length frequencies |  |  |  | Catch $(\mathrm{t})$ |
| :--- | :--- | ---: | ---: | ---: | ---: | ---: |
|  |  | Inside | Outside |  | Inside | Outside |
| 22 | 1-2 Jun | 2 | - | 109.2 | - |  |
| 23 | 3-9 Jun | 10 | 1 |  | 430.7 | 51.5 |
| 24 | 10-16 Jun | 7 | - | 557.4 | 252.1 |  |
| 25 | 17-23 Jun | - | - | 525.9 | 538.5 |  |
| 26 | 24-30 Jun | - | 10 | 549.8 | 1084.5 |  |
| 27 | 1-7 Jul | - | 44 | 124.4 | 4461.0 |  |
| 28 | 8-14 Jul | - | 41 | 938.4 | 5210.1 |  |
| 29 | 15-21 Jul | - | 62 | 858.2 | 7071.3 |  |
| 30 | 22-28 Jul | - | 66 | 927.6 | 6305.3 |  |
| 31 | 29 Jul-4 Aug | - | 64 | 681.7 | 6779.0 |  |
| 32 | 5-11 Aug | - | 55 | 245.9 | 6531.2 |  |
| 33 | 12-18 Aug | - | 22 | 552.4 | 2908.3 |  |
| 34 | 19-25 Aug | - | 24 | 313.4 | 2846.0 |  |
| 35 | 26 Aug-1 Sep | - | 7 | 258.4 | 1085.2 |  |
| 36 | 2-8 Sep | - | 1 | 107.5 | 614.9 |  |
| 37 | 9-15 Sep | - | 2 | 58.3 | 167.3 |  |
| 38 | 16-22 Sep | - | 5 | 0.2 | 58.6 |  |
| 39 | 23-29 Sep | - | - | 4.9 |  |  |

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

|  | Length frequencies |  |  | Catch |  |
| :--- | :--- | ---: | :--- | ---: | ---: |
| Stratum | Description | Number |  | Description | Catch (t) |
|  |  |  |  |  |  |
| 1 | 1-23 Jun; Inside line |  |  | 1-23 Jun | 2483.8 |
| 2 | 24-30 Jun; Outside line | 11 |  | 24-30 Jun | 1634.4 |
| 3 | 1-7 Jul; Outside line | 44 |  | 1-7 Jul | 5585.5 |
| 4 | 8-14 Jul; Outside line | 41 |  | 8-14 Jul | 6148.6 |
| 5 | 15-21 Jul; Outside line | 62 |  | 15-21 Jul | 7929.6 |
| 6 | 22-28 Jul; Outside line | 66 |  | 22-28 Jul | 7232.9 |
| 7 | 29 Jul-4 Aug; Outside line | 64 |  | 29 Jul-4 Aug | 7460.8 |
| 8 | 5-11 Aug; Outside line | 55 |  | 5-11 Aug | 6777.1 |
| 9 | 12-18 Aug; Outside line | 22 |  | 12-18 Aug | 3460.8 |
| 10 | 19-25 Aug; Outside line | 24 |  | 19-25 Aug | 3159.4 |
| 11 | 26 Aug-1 Sep; Outside line | 7 |  | 26 Aug-1 Sep | 1343.6 |
| 12 | 2-22 Sep; Outside line | 8 |  | 2-30 Sep | 1011.5 |

(c) Cook Strait

|  |  |  | Number of |
| :--- | :--- | ---: | ---: |
| Stratum | Month | Catch $(\mathrm{t})$ | Observer samples |
| 1 | Jun | 612 | 17 |
| 2 | Jul | 1857 | 11 |
| 3 | Aug | 612 | 11 |
| 4 | Sep | 612 | 17 |

Table 9: Percentage of female hoki by observer stages on the WCSI for female fish less than or equal to 55 $\mathrm{cm}(\mathrm{n}=395)$ and female fish greater than $55 \mathrm{~cm}(\mathrm{n}=20635)$ for the 2012 spawning season.

|  | Females $\leq 55 \mathrm{~cm}$ | Females $>55 \mathrm{~cm}$ |
| :--- | ---: | ---: |
| Immature and resting | 22.3 | 2.8 |
| Ripening | 52.2 | 46.8 |
| Ripe | 21.0 | 38.5 |
| Running ripe | 2.5 | 6.6 |
| Spent | 2.0 | 5.3 |

Table 10: Strata for the 2011-12 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

| Stratum | Splitting variable |  | Mean length (cm) | Hoki catch (t) |  | No. of tows sampled |  | No. of otoliths | No. of fish Measured |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Depth of net | Longitude |  | TCEPR | OP | TCEPR | OP |  |  |
| 1 | $<646.5 \mathrm{~m}$ | $<177.9^{\circ}$ | 68.5 | 22642 | 1849 | 3130 | 165 | 619 | 16672 |
| 2 | $<646.5 \mathrm{~m}$ | $\geq 177.9^{\circ}$ | 72.0 | 14173 | 1465 | 1989 | 178 | 443 | 17972 |
| 3 | $\geq 646.5 \mathrm{~m}$ | - | 82.7 | 2410 | 210 | 719 | 28 | 81 | 1832 |

(b) Sub-Antarctic

|  |  |  | Splitting variables | Mean <br> length | Hoki catch (t) |  | No. of tows sampled |  | No. of otoliths | No. of fish |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Stratum | Latitude | Longitude | Dates | (cm) | TCEPR | OP | TCEPR | OP |  |  |
| 1 | north of $48.9^{\circ} \mathrm{S}$ | - | - | 67.8 | 9370 | 1606 | 1315 | 110 | 750 | 10184 |
| 2 | south of $48.9^{\circ} \mathrm{S}$ | west of $168.3^{\circ}$ | Oct 2011-25 Jun 2012 | 74.9 | 3793 | 359 | 982 | 63 | 155 | 4135 |
| 3 | south of $48.9^{\circ} \mathrm{S}$ | west of $168.3^{\circ}$ | 26 Jun - 25 Oct 2012 | 87.4 | 612 | 211 | 115 | 17 | 147 | 1964 |
| 4 | south of $48.9^{\circ} \mathrm{S}$ | east of $168.3^{\circ}$ | - | 89.6 | 1969 | 132 | 328 | 65 | 101 | 1745 |

Table 11: Relative biomass estimates of hoki on the Chatham Rise from Tangaroa trawl surveys, January 1992-2013. The c.v. is the coefficient of variation as \% (in parentheses).


Table 12: Relative biomass estimates ( $t$ in thousands) of hoki in $300-800 \mathrm{~m}$ depths from Sub-Antarctic November-December Tangaroa trawl surveys. (c.v. coefficient of variation; 3++ all hoki aged 3 years and older.)

| Survey | 1+ hoki |  |  |  | $2+$ hoki |  | $3++$ hoki |  | Total hoki |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 1+ year class | t | c.v. | 2+ year class | t | c.v. | t | c.v. | t | c.v. |
| 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 | 0.0 | (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 | 0.0 | (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 | 0.0 | (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) |
| Dec07 | 2006 | 1.0 | (54) | 2005 | 1.9 | (42) | 43.0 | (17) | 45.9 | (16) |
| Dec08 | 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 | 0.0 | (100) | 2009 | 2.3 | (21) | 43.8 | (15) | 46.1 | (15) |
| Dec 12 | 2011 | 0.9 | (44) | 2010 | 0.2 | (60) | 54.6 | (15) | 55.7 | (15) |

Table 13: Hoki acoustic abundance estimates from the 2012 WCSI by snapshot and stratum using the 'old' analysis method (see O'Driscoll et al. in press for details).


Table 14: Acoustic abundance indices for WCSI. Indices were calculated using 'old' method updated from O’Driscoll (2002).

| Year | Biomass ('000 t) | c.v. |
| ---: | ---: | ---: |
| 1988 | 417 | 0.60 |
| 1989 | 249 | 0.38 |
| 1990 | 255 | 0.40 |
| 1991 | 341 | 0.73 |
| 1992 | 345 | 0.49 |
| 1993 | 549 | 0.38 |
| 1997 | 655 | 0.60 |
| 2000 | 397 | 0.60 |
| 2012 | 412 | 0.51 |

## 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 2011-12.


Figure 2a: Estimated total catch ( $t$ ) of hoki by 'stock' area (upper panel) and fishing area (lower panel) from 1988-89 (1989) to 2011-12 (2012). "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.

## (a)


(b)


Figure 3: (a) Distribution of hoki catch by target species, and (b) percentage of hoki catch by hoki, hake, ling, and silver warehou target tows for the 1989-90 to 2011-12 fishing years.

(b)


Figure 4: (a) Hoki catch by month and area (maximum circle size is 25000 t) and (b) distribution of hoki catch (in 5 day bins) by area in the 2011-12 fishing year.


Figure 5: Distribution of hoki catch by month and area for the 1989-90 to 2011-12 fishing years.


Figure 5 ctd.


Figure 6a: Model catch, and unstandardised geometric and standardised CPUE indices by area for core data hoki tows for 1990-2012. Datasets for Chatham Rise and ECSI, and Sub-Antarctic included only bottom tows, and Cook Strait included only midwater tows.



Figure 6a ctd.


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


Figure 7: Density plots of all commercial TCEPR and TCER trawls where hoki was caught in the 201112 fishing year. TCEPR plot also shows observed positions as black dots.


Figure 8: Length frequency 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 8 ctd. Length frequency 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 8 ctd. Length frequency 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 8 ctd. Length frequency of hoki in commercial catches from the west coast South Island spawning fishery from 2010 to 2012. In 2010, Observer Programme data are combined with samples of landings from inside the 25 n . mile line sampled by NIWA, and in 2011 and 2012 there is only Observer data outside the 25 n . mile line. 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 9: Catch at age of hoki in commercial catches from the west coast South Island spawning fishery from 1988 to 2012. 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 9 ctd.


Figure 9 ctd.


Figure 10a: Percentage of males in the catch, percentage of all fish aged 7 and older in the catch, and percentage of male fish (of those over age 7) in the catch, by area and fishing year.


Figure 10b: Percentage of small fish in the catch by area and fishing year.


Figure 11: Comparison of length frequencies from inside and outside the 25 n . mile line sampled by sampled at sea by the Observer Programme in 2012. n, number of landings or tows sampled; no., number of fish sampled.


Figure 12: 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 12 ctd.


Figure 13: Mean length at age of female and male hoki taken in commercial catches from the west coast South Island spawning fishery 1988-2012 sampled at sea by the Observer Programme. Lines are a loess fit. Points with fewer than ten records are excluded.


Figure 14: Comparison of WCSI 2011-12 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 15: Length frequency of hoki in commercial catches from the Cook Strait spawning fishery from 1991 to 2012 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 15 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 15 ctd.: 2009 data includes shed samples (vessels less than 40 m ) and observer samples (vessels at least $\mathbf{4 0} \mathrm{m}$ ), 2010 data includes shed samples (vessels less than $\mathbf{4 0} \mathrm{m}$ ) and shed and observer samples (vessels at least 40 m ) and 2011 and 2012 data comprise only observer samples. 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 16: Catch at age of hoki in commercial catches from the Cook Strait spawning fishery from 1988 to 2010 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 $\mathbf{4 0} \mathbf{m}$ ) and tows sampled at sea by the Observer Programme (vessels at least $\mathbf{4 0} \mathbf{~ m}$ ), 2010 data includes shed samples (vessels less than $\mathbf{4 0} \mathbf{m}$ ) and shed and observer samples (vessels at least 40 m ), and 2011 and 2012 data includes observer samples only from vessels longer and shorter than $40 \mathrm{~m} . \mathrm{n}$, 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 16 ctd.


Figure 16 ctd.


Figure 17: Comparison of Cook Strait 2011-12 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 18: Cook Strait 2011-12 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).


Figure 19: Comparison of Observer Programme length frequencies of hoki taken in commercial catches from Cook Strait during 2012 by month strata. n, number of tows sampled; no., number of fish sampled.


Figure 20: Mean length of female (black) and male (blue) hoki taken in commercial catches from the Cook Strait spawning fishery 1989-2011 from landings sampled by the Observer Programme. Lines are a loess fit.


Figure 20 ctd.


Figure 21: Mean length at age of female and male hoki taken in commercial catches from the Cook Strait spawning fishery 1988-2012 sampled at sea by the Observer Programme. Lines are a loess fit. Points with fewer than ten records are excluded.


Figure 22: Length frequency of hoki in commercial catches from the Puysegur spawning fishery from 1989 to 1997, and 1999 to 2012 sampled at sea by the Observer Programme. n, number of tows sampled; no., number of fish sampled.


Figure 22 ctd.


Figure 22 ctd.


Figure 23: Length frequency of hoki taken in commercial catches from the ECSI spawning fishery from 2001 to 2012 sampled by the Scientific Observer Programme (2001-2006, 2008-2012) and combined with Hoki Management Company data (2001 to 2005). There were no samples in 2007. N, number of tows sampled; no., number of fish sampled.


Fishing year

Figure 24: Percentage of hoki TCEPR, CELR and TCER catch, hoki length frequencies and hoki otoliths collected by the Observer Programme, by target species for the Chatham Rise fishery from 2000-01 to 2011-12. 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 25: Length frequency of hoki taken in commercial catches from the Chatham Rise fishery from 1990-91 to 2011-12 sampled by the Observer Programme (and combined with Hoki Management Company data in 2000-01 to 2003-04). 2006-07 data includes only target hoki and hake tows. n, number of tows sampled; no., number of fish sampled.

Females


Figure 25 ctd.

Females


Figure 25 ctd.


Figure 26: Proportions at age and sex in the catch from the Chatham Rise fishery as estimated by direct ageing of otoliths from 2000-01 to 2011-12. Dark grey bars show 1997-99 year-classes; black bars show 2000-02 year-classes; light grey bars show 2003-2005 year-classes.


Figure 27: Comparison of Chatham Rise 2011-12 Observer Programme catch coverage with TCEPR catches by day of year, depth, latitude and longitude. If sampling is representative of the fishery, then blue lines (observed catches) should overlay black lines (TCEPR catch).


Fishing year

Figure 28: Percentages of hoki TCEPR, TCER and CELR catch, hoki length frequencies, and hoki otoliths collected by the Observer Programme, by target species for the Sub-Antarctic fishery from 200001 to 2011-12. 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 29: Length frequency of hoki taken in commercial catches from the Sub-Antarctic fishery from 1990-91 to 2011-12 sampled by the Observer Programme (and combined with Hoki Management Company data in 2000-01 to 2004-05). 2006-07 data includes only target hoki and ling tows. n, number of tows sampled; no., number of fish sampled.


Figure 29 ctd.


Figure 29 ctd.


Figure 30: Proportions at age and sex in the catch from the Sub-Antarctic fishery as estimated by direct ageing of otoliths from 2000-01 to 2011-12. Dark grey bars show 1997-99 year-classes; black bars show 2000-02 year-classes; light grey bars show 2003-2005 year-classes.


Figure 31: Comparison of Sub-Antarctic 2011-12 Observer Programme catch coverage with TCEPR catches by day of year, depth, latitude and longitude. If sampling is representative of the fishery, then blue lines (observed catches) should overlay black lines (TCEPR catch).



Figure 32: Histograms of ranks of the lengths that yielded 2011-12 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 33: Length frequency of female and male hoki taken in commercial catches from different areas during the 2011-12 fishing year. All areas sampled by the Observer Programme.


Figure 34: Scaled length frequency for hoki from Chatham Rise Tangaroa trawl surveys. n, population numbers of fish; c.v., coefficients of variation; no., number of fish measured.


Figure 34 ctd.


Figure 35: Scaled age frequency for hoki from Chatham Rise Tangaroa trawl surveys 1992-2011.


Figure 35 ctd.


Figure 36: Scaled length frequency for hoki from all Sub-Antarctic Tangaroa trawl surveys for the core $300-800 \mathrm{~m}$ survey area. $n$, population numbers of fish; c.v., coefficients of variation.

Females


Figure 36 ctd.


Figure 37: Scaled age frequency for hoki from all Sub-Antarctic Tangaroa trawl surveys for the core 300800 m survey area. Number of fish aged ( $n f$ female and nm male values) are given with c.v.s in parentheses. Black bars show the 1991-94 year-classes.


Figure 37 ctd.


Figure 38: Scaled length frequency for male and female hoki in core strata from WCSI Tangaroa trawl surveys in 2000 (TAN0007) and 2012 (TAN1210). n, number of fish measured; no., population numbers of fish; c.v., coefficients of variation.


Figure 39: Scaled age frequency for hoki from core strata in the 2012 WCSI Tangaroa trawl survey. Number of fish aged ( $n$ values) are given with c.v.s in parentheses. Hoki were not aged from the 2000 survey.

## 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 2012. 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 | $\begin{aligned} & \text { TCER } \\ & \text { Outside } \end{aligned}$ | TCEPR <br> Inside | TCER <br> Inside | CELR | TCEPR <br> Outside | $\begin{gathered} \text { TCER } \\ \text { Outside } \end{gathered}$ | TCEPR <br> Inside | TCER <br> Inside | CELR |
| 1990 | 79 | - | 37 | - | 13 | 7989 | - | 83 | - | 196 |
| 1991 | 75 | - | 41 | - | 17 | 8135 | - | 68 | - | 302 |
| 1992 | 71 | - | 25 | - | 17 | 6171 | - | 47 | - | 358 |
| 1993 | 64 | - | 22 | - | 18 | 6886 | - | 108 | - | 511 |
| 1994 | 69 | - | 30 | - | 18 | 8463 | - | 137 | - | 425 |
| 1995 | 65 | - | 36 | - | 21 | 8521 | - | 189 | - | 319 |
| 1996 | 59 | - | 27 | - | 23 | 6631 | - | 157 | - | 583 |
| 1997 | 73 | - | 45 | - | 23 | 7597 | - | 440 | - | 747 |
| 1998 | 67 | - | 35 | - | 23 | 7609 | - | 365 | - | 449 |
| 1999 | 53 | - | 34 | - | 18 | 6835 | - | 280 | - | 624 |
| 2000 | 47 | - | 28 | - | 15 | 6624 | - | 725 | - | 855 |
| 2001 | 52 | - | 45 | - | 16 | 6960 | - | 1380 | - | 819 |
| 2002 | 47 | - | 37 | - | 13 | 6401 | - | 1253 | - | 563 |
| 2003 | 44 | - | 29 | - | 8 | 6619 | - | 829 | - | 680 |
| 2004 | 42 | - | 31 | - | 10 | 5133 | - | 1271 | - | 748 |
| 2005 | 37 | - | 15 | - | 10 | 3623 | - | 530 | - | 464 |
| 2006 | 35 | - | 20 | - | 5 | 3993 | - | 210 | - | 348 |
| 2007 | 30 | - | 9 | - | 6 | 2620 | - | 146 | - | 253 |
| 2008 | 24 | 5 | 8 | 9 | - | 2335 | 18 | 45 | 155 | - |
| 2009 | 25 | 6 | 3 | 11 | - | 1961 | 15 | 3 | 253 | - |
| 2010 | 28 | 5 | 8 | 12 | - | 2318 | 13 | 56 | 313 | - |
| 2011 | 29 | 6 | 9 | 16 | - | 2802 | 40 | 298 | 474 | - |
| 2012 | 29 | 9 | 12 | 14 | - | 2848 | 54 | 379 | 488 | - |

Table A1a ctd.

|  |  |  |  |  |  |  | Catches (kg) |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Fishing year | TCEPR Outside | TCER Outside | Total Outside | TCEPR Inside | TCER <br> Inside | CELR | Total Inside | Total Overall | Percent Inside |
| 1990 | 158447 | - | 158447 | 1585 | - | 339 | 1924 | 160371 | 1 |
| 1991 | 128259 | - | 128259 | 1015 | - | 222 | 1237 | 129496 | 1 |
| 1992 | 100507 | - | 100507 | 849 | - | 184 | 1033 | 101540 | 1 |
| 1993 | 95402 | - | 95402 | 737 | - | 522 | 1259 | 96661 | 1 |
| 1994 | 113833 | - | 113833 | 1110 | - | 693 | 1803 | 115636 | 1 |
| 1995 | 79083 | - | 79083 | 1851 | - | 747 | 2598 | 81681 | 3 |
| 1996 | 67247 | - | 67247 | 2492 | - | 1908 | 4400 | 71647 | 3 |
| 1997 | 82141 | - | 82141 | 5637 | - | 2360 | 7997 | 90138 | 6 |
| 1998 | 96144 | - | 96144 | 5522 | - | 2610 | 8132 | 104276 | 5 |
| 1999 | 85486 | - | 85486 | 4295 | - | 3846 | 8141 | 93627 | 5 |
| 2000 | 87547 | - | 87547 | 9443 | - | 4719 | 14162 | 101709 | 9 |
| 2001 | 80508 | - | 80508 | 16627 | - | 4979 | 21606 | 102114 | 16 |
| 2002 | 70674 | - | 70674 | 17846 | - | 4180 | 22026 | 92700 | 19 |
| 2003 | 57211 | - | 57211 | 11583 | - | 4944 | 16527 | 73738 | 16 |
| 2004 | 26287 | - | 26287 | 13922 | - | 4885 | 18807 | 45094 | 31 |
| 2005 | 24820 | - | 24820 | 5574 | - | 2223 | 7797 | 32617 | 17 |
| 2006 | 33131 | - | 33131 | 2681 | - | 2438 | 5119 | 38250 | 7 |
| 2007 | 30192 | - | 30192 | 1128 | - | 1962 | 3090 | 33282 | 3 |
| 2008 | 19926 | 32 | 19958 | 327 | 567 | - | 894 | 20852 | 4 |
| 2009 | 19285 | 23 | 19308 | 36 | 1102 | - | 1138 | 20446 | 6 |
| 2010 | 33178 | 36 | 33214 | 951 | 1983 | - | 2934 | 36148 | 8 |
| 2011 | 40653 | 168 | 40821 | 4047 | 3441 | - | 7488 | 48309 | 16 |
| 2012 | 45844 | 148 | 45992 | 4642 | 3598 | - | 8240 | 54232 | 15 |

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 2012.

|  | Number of vessels |  |  |  | Number of tows |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Fishing year | TCEPR | TCER | CELR | Total | TCEPR | TCER | CELR | Total |
| 1990 | 18 | - | 30 | 48 | 1071 | - | 568 | 1639 |
| 1991 | 22 | - | 41 | 63 | 2097 | - | 1510 | 3607 |
| 1992 | 24 | - | 31 | 55 | 1684 | - | 845 | 2529 |
| 1993 | 20 | - | 30 | 50 | 1532 | - | 934 | 2466 |
| 1994 | 31 | - | 39 | 70 | 1957 | - | 1377 | 3334 |
| 1995 | 26 | - | 33 | 59 | 2291 | - | 1266 | 3557 |
| 1996 | 42 | - | 37 | 79 | 4699 | - | 1485 | 6184 |
| 1997 | 40 | - | 28 | 68 | 4921 | - | 1061 | 5982 |
| 1998 | 31 | - | 28 | 59 | 3022 | - | 1317 | 4339 |
| 1999 | 21 | - | 28 | 49 | 2656 | - | 942 | 3598 |
| 2000 | 22 | - | 32 | 54 | 2372 | - | 1157 | 3529 |
| 2001 | 25 | - | 23 | 48 | 2042 | - | 981 | 3023 |
| 2002 | 19 | - | 22 | 41 | 1127 | - | 531 | 1658 |
| 2003 | 21 | - | 25 | 46 | 1933 | - | 998 | 2931 |
| 2004 | 20 | - | 31 | 51 | 1863 | - | 1134 | 2997 |
| 2005 | 15 | - | 15 | 30 | 1454 | - | 476 | 1930 |
| 2006 | 13 | - | 13 | 26 | 1067 | - | 328 | 1395 |
| 2007 | 8 | - | 14 | 22 | 980 | - | 491 | 1471 |
| 2008 | 7 | 20 | - | 27 | 668 | 581 | - | 1249 |
| 2009 | 10 | 21 | 1 | 32 | 878 | 551 | 1 | 1430 |
| 2010 | 8 | 18 | - | 26 | 841 | 523 | - | 1364 |
| 2011 | 7 | 20 | - | 27 | 519 | 571 | - | 1090 |
| 2012 | 9 | 20 | - | 29 | 779 | 401 | - | 1180 |


|  |  | Catches (kg) |  |  |
| :--- | ---: | ---: | ---: | ---: |
| Fishing year | TCEPR | TCER | CELR | Total |
| 1990 | 12109 | - | 2596 | 14705 |
| 1991 | 22153 | - | 7013 | 29166 |
| 1992 | 19583 | - | 4973 | 24556 |
| 1993 | 17533 | - | 4199 | 21732 |
| 1994 | 26785 | - | 9071 | 35856 |
| 1995 | 26600 | - | 7361 | 33962 |
| 1996 | 50982 | - | 8018 | 59001 |
| 1997 | 49946 | - | 6562 | 56508 |
| 1998 | 36308 | - | 9408 | 45716 |
| 1999 | 34040 | - | 6222 | 40262 |
| 2000 | 30603 | - | 8986 | 39588 |
| 2001 | 24630 | - | 8188 | 32818 |
| 2002 | 17628 | - | 4104 | 21732 |
| 2003 | 27341 | - | 7271 | 34613 |
| 2004 | 28509 | - | 10520 | 39030 |
| 2005 | 18482 | - | 4369 | 22851 |
| 2006 | 16670 | - | 3035 | 19704 |
| 2007 | 12594 | - | 5403 | 17997 |
| 2008 | 9215 | 6661 | - | 15876 |
| 2009 | 10044 | 5112 | - | 15156 |
| 2010 | 10916 | 4875 | - | 15791 |
| 2011 | 7315 | 4519 | - | 11834 |
| 2012 | 10000 | 3155 | - | 13154 |

Table A1c: Number of Chatham Rise and ECSI vessels, tows and catch for all vessels by year for the nonspawning 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 |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Year | TCEPR | TCER | CELR | Total | TCEPR | TCER | CELR | Total |
| 1990 | 47 | - | 23 | 70 | 3325 | - | 529 | 3854 |
| 1991 | 69 | - | 38 | 107 | 5724 | - | 900 | 6624 |
| 1992 | 76 | - | 30 | 106 | 8601 | - | 539 | 9140 |
| 1993 | 75 | - | 29 | 104 | 8575 | - | 512 | 9087 |
| 1994 | 78 | - | 26 | 104 | 6447 | - | 525 | 6972 |
| 1995 | 87 | - | 31 | 118 | 10028 | - | 675 | 10703 |
| 1996 | 102 | - | 26 | 128 | 11652 | - | 405 | 12057 |
| 1997 | 105 | - | 18 | 123 | 12609 | - | 303 | 12912 |
| 1998 | 97 | - | 18 | 115 | 16176 | - | 212 | 16388 |
| 1999 | 87 | - | 24 | 111 | 14984 | - | 421 | 15405 |
| 2000 | 70 | - | 16 | 86 | 13432 | - | 330 | 13762 |
| 2001 | 68 | - | 11 | 79 | 12360 | - | 373 | 12733 |
| 2002 | 60 | - | 14 | 74 | 10343 | - | 280 | 10623 |
| 2003 | 63 | - | 15 | 78 | 11400 | - | 255 | 11655 |
| 2004 | 59 | - | 11 | 70 | 9511 | - | 211 | 9722 |
| 2005 | 51 | - | 12 | 63 | 7418 | - | 132 | 7550 |
| 2006 | 52 | - | 14 | 66 | 7314 | - | 134 | 7448 |
| 2007 | 47 | - | 11 | 58 | 7324 | - | 153 | 7477 |
| 2008 | 42 | 11 | - | 53 | 7012 | 65 | - | 7077 |
| 2009 | 37 | 12 | 1 | 50 | 6227 | 79 | 2 | 6308 |
| 2010 | 39 | 16 | - | 55 | 6003 | 278 | - | 6281 |
| 2011 | 39 | 14 | - | 53 | 5446 | 140 | - | 5586 |
| 2012 | 37 | 13 | - | 50 | 5636 | 190 | - | 5826 |


|  |  | Catches (kg) |  |  |
| ---: | ---: | ---: | ---: | ---: |
| Year | TCEPR | TCER | CELR | Total |
| 1990 | 13091 | - | 71 | 13161 |
| 1991 | 29965 | - | 162 | 30126 |
| 1992 | 48036 | - | 99 | 48134 |
| 1993 | 44169 | - | 63 | 44231 |
| 1994 | 22662 | - | 63 | 22725 |
| 1995 | 38991 | - | 182 | 39173 |
| 1996 | 50287 | - | 86 | 50372 |
| 1997 | 55726 | - | 93 | 55819 |
| 1998 | 77105 | - | 93 | 77197 |
| 1999 | 72656 | - | 929 | 73585 |
| 2000 | 55912 | - | 98 | 56010 |
| 2001 | 49307 | - | 532 | 49840 |
| 2002 | 39105 | - | 38 | 39144 |
| 2003 | 39071 | - | 17 | 39088 |
| 2004 | 33608 | - | 39 | 33647 |
| 2005 | 30423 | - | 8 | 30432 |
| 2006 | 34934 | - | 6 | 34941 |
| 2007 | 37797 | - | 10 | 37806 |
| 2008 | 37855 | 60 | - | 37915 |
| 2009 | 38997 | 8 | - | 39005 |
| 2010 | 39086 | 47 | - | 39133 |
| 2011 | 38402 | 40 | - | 38442 |
| 2012 | 39153 | 72 | - | 39226 |

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 2012.

| Fishing year | Number of vessels |  |  |  | Number of tows |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 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 |


|  |  | Catches (kg) |  |  |
| :--- | ---: | ---: | ---: | ---: |
| Fishing year | TCEPR | TCER | CELR | Total |
| 1990 | 51 | - | 229 | 280 |
| 1991 | 841 | - | 503 | 1345 |
| 1992 | 547 | - | 396 | 943 |
| 1993 | 137 | - | 172 | 309 |
| 1994 | 164 | - | 353 | 517 |
| 1995 | 52 | - | 103 | 155 |
| 1996 | 1199 | - | 103 | 1301 |
| 1997 | 817 | - | 973 | 1790 |
| 1998 | 1300 | - | 371 | 1671 |
| 1999 | 765 | - | 1329 | 2094 |
| 2000 | 599 | - | 1822 | 2421 |
| 2001 | 1658 | - | 760 | 2418 |
| 2002 | 2806 | - | 225 | 3031 |
| 2003 | 6460 | - | 1006 | 7466 |
| 2004 | 1370 | - | 927 | 2297 |
| 2005 | 4683 | - | 50 | 4733 |
| 2006 | 1137 | - | 57 | 1194 |
| 2007 | 1001 | - | 63 | 1064 |
| 2008 | 2302 | 40 | - | 2342 |
| 2009 | 1117 | 29 | - | 1146 |
| 2010 | 600 | 138 | - | 738 |
| 2011 | 1504 | 152 | - | 1657 |
| 2012 | 2355 | 175 | - | 2530 |

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.

| Fishing year | Number of vessels |  |  |  | Number of tows |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | TCEPR | TCER | CELR | Total | TCEPR | TCER | CELR | Total |
| 1990 | 64 | - | - | 64 | 2787 | - | - | 2787 |
| 1991 | 66 | - | - | 66 | 4617 | - | - | 4617 |
| 1992 | 76 | - | - | 76 | 7025 | - | - | 7025 |
| 1993 | 63 | - | 2 | 65 | 6143 | - | 4 | 6147 |
| 1994 | 65 | - | - | 65 | 3718 | - | - | 3718 |
| 1995 | 62 | - | - | 62 | 3585 | - | - | 3585 |
| 1996 | 68 | - | 1 | 69 | 4170 | - | 2 | 4172 |
| 1997 | 74 | - | - | 74 | 5003 | - | - | 5003 |
| 1998 | 68 | - | 1 | 69 | 5419 | - | 4 | 5423 |
| 1999 | 68 | - | - | 68 | 5145 | - | - | 5145 |
| 2000 | 56 | - | 1 | 57 | 7677 | - | 3 | 7680 |
| 2001 | 56 | - | - | 56 | 7401 | - | - | 7401 |
| 2002 | 55 | - | 1 | 56 | 8443 | - | 25 | 8468 |
| 2003 | 50 | - | 3 | 53 | 5689 | - | 10 | 5699 |
| 2004 | 46 | - | - | 46 | 3850 | - | - | 3850 |
| 2005 | 43 | - | - | 43 | 2638 | - | - | 2638 |
| 2006 | 41 | - | - | 41 | 2507 | - | - | 2507 |
| 2007 | 36 | - | - | 36 | 3004 | - | - | 3004 |
| 2008 | 35 | - | - | 35 | 2731 | - | - | 2731 |
| 2009 | 32 | 1 | - | 33 | 2914 | 1 | - | 2915 |
| 2010 | 34 | 2 | - | 36 | 3171 | 2 | - | 3173 |
| 2011 | 35 | 1 | - | 36 | 2931 | 1 | - | 2932 |
| 2012 | 34 | 3 | - | 37 | 2729 | 3 | - | 2732 |


|  | Catches (kg) |  |  |  |
| :--- | ---: | ---: | ---: | ---: |
| Fishing year | TCEPR | TCER | CELR | Total |
| 1990 | 11748 | - | - | 11748 |
| 1991 | 16669 | - | - | 16669 |
| 1992 | 30688 | - | - | 30688 |
| 1993 | 24836 | - | - | 24836 |
| 1994 | 11636 | - | - | 11636 |
| 1995 | 13128 | - | - | 13128 |
| 1996 | 14269 | - | 1 | 14270 |
| 1997 | 21771 | - | - | 21771 |
| 1998 | 25129 | - | 1 | 25129 |
| 1999 | 23753 | - | - | 23753 |
| 2000 | 33772 | - | - | 33772 |
| 2001 | 30076 | - | - | 30076 |
| 2002 | 30175 | - | - | 30175 |
| 2003 | 20194 | - | 5 | 20199 |
| 2004 | 11635 | - | - | 11635 |
| 2005 | 6337 | - | - | 6337 |
| 2006 | 6961 | - | - | 6961 |
| 2007 | 7661 | - | - | 7661 |
| 2008 | 8708 | - | - | 8708 |
| 2009 | 9807 | - | - | 9807 |
| 2010 | 12275 | - | - | 12275 |
| 2011 | 12655 | - | - | 12655 |
| 2012 | 15745 | - | - | 15745 |

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 2012.

| Fishing year | Number of vessels |  |  |  | Number of tows |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 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 |


|  | Catches (kg) |  |  |  |
| :--- | ---: | ---: | ---: | ---: |
| Fishing year | TCEPR | TCER | CELR | Total |
| 1990 | 7378 | - | - | 7378 |
| 1991 | 4870 | - | - | 4870 |
| 1992 | 4744 | - | - | 4744 |
| 1993 | 2039 | - | - | 2039 |
| 1994 | 2382 | - | - | 2382 |
| 1995 | 1413 | - | - | 1413 |
| 1996 | 2401 | - | - | 2401 |
| 1997 | 5847 | - | - | 5847 |
| 1998 | 2137 | - | - | 2137 |
| 1999 | 2867 | - | 4 | 2871 |
| 2000 | 2757 | - | - | 2757 |
| 2001 | 6586 | - | 1 | 6587 |
| 2002 | 5222 | - | 7 | 5229 |
| 2003 | 5821 | - | 16 | 5837 |
| 2004 | 1124 | - | 5 | 1129 |
| 2005 | 5480 | - | - | 5481 |
| 2006 | 1321 | - | 6 | 1327 |
| 2007 | 376 | - | 9 | 385 |
| 2008 | 304 | - | - | 304 |
| 2009 | 198 | 4 | - | 203 |
| 2010 | 198 | 2 | - | 200 |
| 2011 | 1155 | 2 | - | 1157 |
| 2012 | 1144 | 1 | - | 1145 |

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 2012. Data are non-zero catches for TCEPR midwater tows.

All target species MW 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 ( $\mathrm{t} / \mathrm{h}$ ) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1990 | 69 | 149295 | 6780 | 4.2 | 10.3 | 2.6 |
| 1991 | 66 | 118323 | 6744 | 4.0 | 10.2 | 2.6 |
| 1992 | 61 | 92024 | 5193 | 3.6 | 12.4 | 3.5 |
| 1993 | 57 | 82529 | 5263 | 3.2 | 10.3 | 3.7 |
| 1994 | 63 | 105195 | 7139 | 3.0 | 8.9 | 3.2 |
| 1995 | 59 | 75148 | 7408 | 3.5 | 4.9 | 1.4 |
| 1996 | 59 | 64802 | 5171 | 3.5 | 6.8 | 1.9 |
| 1997 | 76 | 82639 | 6611 | 3.8 | 7.4 | 2.0 |
| 1998 | 66 | 95864 | 6695 | 3.5 | 10.4 | 2.8 |
| 1999 | 56 | 76767 | 5256 | 3.1 | 10.3 | 3.3 |
| 2000 | 52 | 79535 | 5316 | 2.8 | 12.0 | 4.3 |
| 2001 | 62 | 78853 | 5879 | 2.6 | 9.0 | 3.4 |
| 2002 | 56 | 61528 | 4654 | 2.3 | 9.8 | 4.1 |
| 2003 | 51 | 51751 | 4312 | 3.0 | 8.1 | 2.4 |
| 2004 | 51 | 32049 | 4230 | 2.4 | 4.6 | 1.5 |
| 2005 | 37 | 19682 | 2365 | 2.5 | 5.1 | 1.8 |
| 2006 | 36 | 21067 | 2015 | 3.0 | 6.7 | 2.5 |
| 2007 | 31 | 21093 | 1432 | 3.5 | 9.3 | 3.5 |
| 2008 | 15 | 12047 | 886 | 1.8 | 6.4 | 3.8 |
| 2009 | 23 | 12590 | 887 | 3.2 | 8.9 | 3.1 |
| 2010 | 26 | 23033 | 1216 | 2.6 | 15.3 | 5.2 |
| 2011 | 24 | 29603 | 1514 | 2.0 | 17.2 | 8.4 |
| 2012 | 27 | 30126 | 1567 | 2.1 | 16.3 | 7.9 |
| All years | 239 | 1415547 | 98533 | 3.2 | 9.0 | 2.8 |

## Target hoki MW tows:

| Fishing |  |
| :--- | ---: |
| year |  |
| 1990 | Number of <br> vessels |
| 1991 | 69 |
| 1992 | 66 |
| 1993 | 60 |
| 1994 | 56 |
| 1995 | 62 |
| 1996 | 59 |
| 1997 | 59 |
| 1998 | 76 |
| 1999 | 66 |
| 2000 | 56 |
| 2001 | 51 |
| 2002 | 62 |
| 2003 | 56 |
| 2004 | 51 |
| 2005 | 51 |
| 2006 | 37 |
| 2007 | 34 |
| 2008 | 31 |
| 2009 | 13 |
| 2010 | 15 |
| 2011 | 23 |
| 2012 | 24 |
| All years | 27 |
|  | 239 |


| Total <br> catch $(\mathrm{t})$ | Number of <br> tows |
| ---: | ---: |
| 149263 | 6736 |
| 118202 | 6727 |
| 91904 | 5141 |
| 82133 | 5030 |
| 105007 | 6978 |
| 74715 | 7145 |
| 64735 | 5115 |
| 82222 | 6505 |
| 95670 | 6630 |
| 76532 | 5142 |
| 79269 | 5194 |
| 78512 | 5726 |
| 61336 | 4579 |
| 51466 | 4208 |
| 31874 | 4152 |
| 19620 | 2266 |
| 20729 | 1734 |
| 20786 | 1136 |
| 11841 | 806 |
| 12367 | 685 |
| 22884 | 1172 |
| 29468 | 1495 |
| 30076 | 1559 |
| 1410612 | 95861 |


| Median tow <br> duration $(\mathrm{h})$ | Median catch per <br> tow $(\mathrm{t})$ | Median catch per <br> hour $(\mathrm{t} / \mathrm{h})$ |
| ---: | ---: | ---: |
| 4.2 | 10.3 | 2.6 |
| 4.0 | 10.2 | 2.6 |
| 3.6 | 12.4 | 3.6 |
| 3.1 | 10.5 | 4.1 |
| 3.0 | 9.5 | 3.3 |
| 3.5 | 4.9 | 1.4 |
| 3.5 | 6.8 | 1.9 |
| 3.8 | 7.9 | 2.1 |
| 3.5 | 10.4 | 2.8 |
| 3.1 | 10.3 | 3.4 |
| 2.7 | 12.0 | 4.5 |
| 2.6 | 9.3 | 3.6 |
| 2.3 | 9.8 | 4.3 |
| 3.0 | 8.1 | 2.5 |
| 2.3 | 4.9 | 1.6 |
| 2.4 | 5.7 | 2.0 |
| 2.6 | 8.5 | 3.2 |
| 2.8 | 15.0 | 5.5 |
| 1.7 | 7.3 | 4.7 |
| 2.7 | 14.2 | 5.0 |
| 2.5 | 17.1 | 5.5 |
| 2.0 | 17.4 | 8.5 |
| 2.1 | 16.3 | 7.9 |
| 3.2 | 9.4 | 2.9 |

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 2012. 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 ( $\mathrm{t} / \mathrm{h}$ ) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1990 | 41 | 10737 | 1292 | 4.0 | 3.2 | 0.8 |
| 1991 | 36 | 10951 | 1458 | 4.0 | 3.6 | 0.9 |
| 1992 | 38 | 9334 | 1036 | 4.1 | 4.1 | 1.0 |
| 1993 | 33 | 13656 | 1727 | 3.8 | 5.2 | 1.4 |
| 1994 | 32 | 9703 | 1468 | 4.2 | 3.7 | 0.8 |
| 1995 | 27 | 5809 | 1331 | 4.5 | 2.5 | 0.5 |
| 1996 | 38 | 4914 | 1586 | 4.7 | 2.1 | 0.4 |
| 1997 | 47 | 5145 | 1442 | 5.0 | 2.2 | 0.5 |
| 1998 | 40 | 5925 | 1308 | 5.2 | 2.9 | 0.5 |
| 1999 | 39 | 12894 | 1835 | 4.7 | 4.1 | 0.8 |
| 2000 | 34 | 17487 | 2064 | 4.5 | 6.0 | 1.2 |
| 2001 | 40 | 18238 | 2399 | 4.5 | 5.0 | 0.9 |
| 2002 | 35 | 26993 | 3005 | 5.0 | 5.2 | 1.0 |
| 2003 | 39 | 17057 | 3197 | 5.3 | 2.3 | 0.4 |
| 2004 | 35 | 8174 | 2154 | 6.0 | 1.5 | 0.3 |
| 2005 | 30 | 10708 | 1801 | 6.6 | 2.5 | 0.4 |
| 2006 | 26 | 14723 | 2145 | 8.3 | 2.8 | 0.4 |
| 2007 | 22 | 10252 | 1344 | 7.1 | 3.1 | 0.4 |
| 2008 | 17 | 8179 | 1472 | 9.0 | 2.4 | 0.3 |
| 2009 | 18 | 6735 | 1083 | 9.2 | 3.0 | 0.3 |
| 2010 | 21 | 11116 | 1171 | 7.2 | 4.9 | 0.8 |
| 2011 | 21 | 15075 | 1565 | 6.1 | 6.2 | 1.0 |
| 2012 | 23 | 20356 | 1656 | 5.2 | 9.9 | 1.9 |
| All years | 144 | 274159 | 39539 | 5.0 | 3.3 | 0.6 |

## Target hoki BT tows:

| Fishing <br> year | Number of <br> vessels | Total <br> catch $(t)$ | Number of <br> tows |
| :--- | ---: | ---: | ---: |
| 1990 | 34 | 10597 | 1129 |
| 1991 | 31 | 10877 | 1321 |
| 1992 | 28 | 9152 | 791 |
| 1993 | 29 | 13611 | 1588 |
| 1994 | 29 | 9679 | 1369 |
| 1995 | 24 | 5794 | 1290 |
| 1996 | 37 | 4885 | 1544 |
| 1997 | 42 | 5115 | 1354 |
| 1998 | 34 | 5888 | 1217 |
| 1999 | 35 | 12856 | 1689 |
| 2000 | 32 | 17417 | 1903 |
| 2001 | 37 | 18216 | 2314 |
| 2002 | 34 | 26724 | 2839 |
| 2003 | 39 | 16793 | 2791 |
| 2004 | 34 | 7911 | 1799 |
| 2005 | 27 | 9732 | 1240 |
| 2006 | 24 | 13087 | 1405 |
| 2007 | 20 | 8874 | 731 |
| 2008 | 13 | 5246 | 480 |
| 2009 | 13 | 4460 | 350 |
| 2010 | 19 | 9214 | 611 |
| 2011 | 17 | 11707 | 908 |
| 2012 | 20 | 18856 | 1184 |
| All years | 130 | 256691 | 31847 |


| Median tow <br> duration $(\mathrm{h})$ | Median catch per <br> tow $(\mathrm{t})$ | Median catch per <br> hour $(\mathrm{t} / \mathrm{h})$ |
| ---: | ---: | ---: |
| 4.2 | 4.1 | 1.1 |
| 4.0 | 4.1 | 1.1 |
| 4.0 | 7.0 | 1.7 |
| 3.8 | 5.9 | 1.6 |
| 4.3 | 4.2 | 0.9 |
| 4.5 | 2.5 | 0.5 |
| 4.7 | 2.1 | 0.4 |
| 5.0 | 2.5 | 0.5 |
| 5.3 | 3.1 | 0.5 |
| 4.7 | 5.1 | 1.0 |
| 4.4 | 6.3 | 1.4 |
| 4.6 | 5.0 | 1.0 |
| 5.0 | 5.9 | 1.1 |
| 5.1 | 3.0 | 0.6 |
| 5.7 | 2.0 | 0.4 |
| 5.6 | 4.5 | 0.8 |
| 7.0 | 5.0 | 0.8 |
| 4.8 | 9.3 | 1.7 |
| 5.0 | 8.6 | 1.7 |
| 4.5 | 11.2 | 2.6 |
| 3.2 | 13.5 | 4.7 |
| 4.1 | 11.4 | 2.9 |
| 3.8 | 15.0 | 4.1 |
| 4.7 | 4.5 | 0.9 |

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 2012. Data are non-zero catches for TCEPR midwater tows.

All target species tows:

| Fishing <br> year | Number of <br> vessels | Total <br> catch $(\mathrm{t})$ | Number of <br> tows |
| :--- | ---: | ---: | ---: |
| 1990 | 17 | 11894 | 1048 |
| 1991 | 22 | 21976 | 2069 |
| 1992 | 22 | 19345 | 1642 |
| 1993 | 20 | 16977 | 1499 |
| 1994 | 29 | 25106 | 1810 |
| 1995 | 24 | 24376 | 2162 |
| 1996 | 36 | 41820 | 3087 |
| 1997 | 34 | 43248 | 3592 |
| 1998 | 28 | 30711 | 2373 |
| 1999 | 21 | 28084 | 2037 |
| 2000 | 21 | 27935 | 1989 |
| 2001 | 25 | 23581 | 1842 |
| 2002 | 15 | 17147 | 1068 |
| 2003 | 20 | 26979 | 1816 |
| 2004 | 19 | 27712 | 1793 |
| 2005 | 13 | 18166 | 1344 |
| 2006 | 11 | 16330 | 1015 |
| 2007 | 7 | 12444 | 952 |
| 2008 | 6 | 7558 | 404 |
| 2009 | 8 | 9095 | 740 |
| 2010 | 8 | 10839 | 820 |
| 2011 | 6 | 7346 | 527 |
| 2012 | 9 | 9658 | 719 |
| All years | 71 | 478329 | 36348 |

Target hoki tows:

| Fishing <br> year | Number of <br> vessels | Total <br> catch $(\mathrm{t})$ | Number of <br> tows | Median tow <br> duration $(\mathrm{h})$ | Median catch per <br> tow $(\mathrm{t})$ | Median catch per <br> hour $(\mathrm{t} / \mathrm{h})$ |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| 1990 | 17 | 11894 | 1048 | 1.2 | 9.1 | 7.4 |
| 1991 | 22 | 21976 | 2069 | 1.5 | 8.2 | 5.0 |
| 1992 | 22 | 19345 | 1642 | 1.2 | 8.3 | 6.5 |
| 1993 | 18 | 16957 | 1493 | 1.0 | 8.3 | 7.0 |
| 1994 | 29 | 25065 | 1804 | 1.0 | 11.8 | 11.9 |
| 1995 | 24 | 24320 | 2158 | 1.0 | 8.3 | 9.9 |
| 1996 | 36 | 41744 | 3076 | 0.8 | 11.2 | 16.7 |
| 1997 | 34 | 43179 | 3585 | 1.0 | 10.6 | 11.2 |
| 1998 | 28 | 30674 | 2371 | 1.0 | 11.4 | 11.7 |
| 1999 | 21 | 28081 | 2036 | 1.0 | 12.7 | 14.8 |
| 2000 | 21 | 27935 | 1989 | 0.7 | 12.0 | 19.3 |
| 2001 | 25 | 23553 | 1839 | 0.8 | 11.0 | 14.0 |
| 2002 | 15 | 17147 | 1068 | 1.0 | 14.9 | 17.2 |
| 2003 | 20 | 26979 | 1814 | 1.0 | 12.6 | 16.3 |
| 2004 | 19 | 27712 | 1791 | 1.0 | 12.2 | 14.2 |
| 2005 | 13 | 18162 | 1343 | 1.0 | 13.0 | 16.9 |
| 2006 | 11 | 16330 | 1014 | 0.8 | 15.1 | 20.5 |
| 2007 | 7 | 12396 | 949 | 1.0 | 10.9 | 13.8 |
| 2008 | 5 | 7555 | 397 | 0.8 | 18.8 | 24.3 |
| 2009 | 8 | 9083 | 739 | 0.6 | 10.1 | 18.2 |
| 2010 | 8 | 10783 | 818 | 0.8 | 11.2 | 14.8 |
| 2011 | 6 | 7346 | 527 | 719 | 0.8 | 11.3 |

Table 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 bottom tows:

| Fishing <br> year | Number of <br> vessels | Total <br> catch $(t)$ | Number of <br> tows |
| :--- | ---: | ---: | ---: |
| 1990 | 47 | 13001 | 3297 |
| 1991 | 59 | 18080 | 4787 |
| 1992 | 72 | 43456 | 8169 |
| 1993 | 61 | 39238 | 7523 |
| 1994 | 64 | 18125 | 5305 |
| 1995 | 70 | 30585 | 7914 |
| 1996 | 84 | 37624 | 9295 |
| 1997 | 96 | 42898 | 10330 |
| 1998 | 82 | 55824 | 12479 |
| 1999 | 77 | 61528 | 12620 |
| 2000 | 60 | 44753 | 10746 |
| 2001 | 60 | 46150 | 11429 |
| 2002 | 55 | 36271 | 9491 |
| 2003 | 62 | 37415 | 10912 |
| 2004 | 58 | 31656 | 9131 |
| 2005 | 50 | 28914 | 7048 |
| 2006 | 50 | 34077 | 7145 |
| 2007 | 46 | 37640 | 7267 |
| 2008 | 38 | 37375 | 6890 |
| 2009 | 37 | 38956 | 6186 |
| 2010 | 38 | 38454 | 5833 |
| 2011 | 38 | 38136 | 5286 |
| 2012 | 35 | 38803 | 5417 |
| All years | 199 | 848959 | 184500 |


| Median tow <br> duration $(\mathrm{h})$ | Median catch per <br> tow $(\mathrm{t})$ | Median catch per <br> hour $(\mathrm{t} / \mathrm{h})$ |
| ---: | ---: | ---: |
| 4.0 | 1.5 | 0.5 |
| 4.0 | 2.0 | 0.5 |
| 4.0 | 3.1 | 0.8 |
| 3.9 | 3.4 | 1.0 |
| 3.5 | 2.1 | 0.7 |
| 3.8 | 3.0 | 0.9 |
| 3.6 | 3.0 | 0.9 |
| 3.7 | 3.2 | 0.9 |
| 4.0 | 3.3 | 0.9 |
| 4.0 | 4.1 | 1.0 |
| 4.1 | 3.0 | 0.8 |
| 4.5 | 3.0 | 0.7 |
| 4.5 | 2.9 | 0.7 |
| 4.7 | 2.5 | 0.5 |
| 5.0 | 2.3 | 0.5 |
| 5.0 | 2.8 | 0.6 |
| 4.8 | 3.5 | 0.8 |
| 4.6 | 3.5 | 0.8 |
| 4.8 | 3.6 | 0.8 |
| 4.3 | 4.6 | 1.1 |
| 4.5 | 5.3 | 1.2 |
| 4.7 | 5.9 | 1.2 |
| 4.8 | 5.7 | 1.3 |
| 4.2 | 3.1 | 0.8 |

Target hoki bottom tows:

| Fishing <br> year | Number of <br> vessels | Total <br> catch $(\mathrm{t})$ | Number of <br> tows |
| :--- | ---: | ---: | ---: |
| 1990 | 31 | 11788 | 1902 |
| 1991 | 41 | 16761 | 3285 |
| 1992 | 47 | 42305 | 5408 |
| 1993 | 40 | 38354 | 5169 |
| 1994 | 36 | 17525 | 3372 |
| 1995 | 42 | 30097 | 6485 |
| 1996 | 58 | 37181 | 7970 |
| 1997 | 73 | 42380 | 8988 |
| 1998 | 63 | 55315 | 11159 |
| 1999 | 46 | 60838 | 11244 |
| 2000 | 34 | 44113 | 9413 |
| 2001 | 40 | 44928 | 9762 |
| 2002 | 31 | 35087 | 7773 |
| 2003 | 32 | 36051 | 9196 |
| 2004 | 28 | 30207 | 7142 |
| 2005 | 21 | 27472 | 4973 |
| 2006 | 20 | 32329 | 4997 |
| 2007 | 21 | 34746 | 4733 |
| 2008 | 22 | 33527 | 4187 |
| 2009 | 21 | 33645 | 3896 |
| 2010 | 21 | 35151 | 4349 |
| 2011 | 23 | 34811 | 4056 |
| 2012 | 24 | 37644 | 4380 |
| All years | 163 | 812256 | 143839 |

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 2012. Data are not shown for MW vessels in 2009 or 2010 as there was only 1 vessel.

All target species mid-water tows:

| Fishing <br> year | Number of <br> vessels | Total <br> catch $(\mathrm{t})$ | Number of <br> tows |
| :--- | ---: | ---: | ---: |
| 2000 | 7 | 289 | 24 |
| 2001 | 15 | 1264 | 123 |
| 2002 | 10 | 2003 | 145 |
| 2003 | 18 | 4453 | 301 |
| 2004 | 5 | 1438 | 85 |
| 2005 | 6 | 4037 | 221 |
| 2006 | 4 | 485 | 41 |
| 2007 | 4 | 299 | 26 |
| 2008 | 3 | 263 | 28 |
| 2009 | 1 | 462 | 24 |
| 2010 | 1 | - | - |
| 2011 | 4 | 879 | 57 |
| 2012 | 8 | 1655 | 107 |

## Target hoki mid-water tows:

| Fishing |  |  |
| :--- | ---: | ---: |
| year | Number of <br> vessels | Total <br> catch $(\mathrm{t})$ |
| 2000 |  |  |
| 2001 | 7 | 289 |
| 2002 | 15 | 1264 |
| 2003 | 10 | 2003 |
| 2004 | 18 | 4421 |
| 2005 | 5 | 1438 |
| 2006 | 6 | 4037 |
| 2007 | 4 | 477 |
| 2008 | 4 | 299 |
| 2009 | 3 | 213 |
| 2010 | 1 | 304 |
| 2011 | 1 | - |
| 2012 | 4 | 879 |
|  | 8 | 1655 |

## All target species bottom tows:

| Fishing <br> year | Number of <br> vessels | Total <br> catch $(\mathrm{t})$ | Number of <br> tows |
| :--- | ---: | ---: | ---: |
| 2000 | 10 | 250 | 69 |
| 2001 | 13 | 441 | 85 |
| 2002 | 16 | 828 | 126 |
| 2003 | 16 | 2081 | 255 |
| 2004 | 7 | 250 | 44 |
| 2005 | 8 | 717 | 98 |
| 2006 | 7 | 163 | 31 |
| 2007 | 11 | 666 | 81 |
| 2008 | 12 | 2112 | 215 |
| 2009 | 8 | 635 | 76 |
| 2010 | 8 | 533 | 70 |
| 2011 | 6 | 592 | 56 |
| 2012 | 9 | 696 | 74 |


| Median tow <br> duration $(\mathrm{h})$ | Median catch per <br> tow $(\mathrm{t})$ | Median catch per <br> hour $(\mathrm{t} / \mathrm{h})$ |
| ---: | ---: | ---: |
| 2.5 | 2.5 | 1.0 |
| 2.7 | 3.5 | 1.2 |
| 2.6 | 3.9 | 1.5 |
| 2.9 | 5.4 | 1.9 |
| 2.4 | 3.1 | 1.0 |
| 3.0 | 4.1 | 1.8 |
| 2.1 | 2.1 | 1.6 |
| 2.0 | 6.2 | 2.9 |
| 2.8 | 7.5 | 2.5 |
| 2.8 | 6.2 | 2.4 |
| 2.8 | 7.3 | 2.1 |
| 3.5 | 10.8 | 3.0 |
| 2.3 | 8.0 | 2.9 |

## Table A2e ctd.

Target hoki bottom tows:

| Fishing <br> year | Number of <br> vessels | Total <br> catch $(\mathrm{t})$ | Number of <br> tows | Median tow <br> duration $(\mathrm{h})$ | Median catch per <br> tow $(\mathrm{t})$ | Median catch per <br> hour $(\mathrm{t} / \mathrm{h})$ |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| 2000 | 8 | 250 | 66 | 2.5 | 2.6 | 1.0 |
| 2001 | 12 | 441 | 84 | 2.7 | 3.5 | 1.2 |
| 2002 | 11 | 821 | 120 | 2.7 | 3.9 | 1.7 |
| 2003 | 13 | 2022 | 245 | 2.9 | 5.6 | 1.9 |
| 2004 | 4 | 249 | 40 | 2.8 | 3.5 | 1.1 |
| 2005 | 6 | 712 | 95 | 2.9 | 4.6 | 1.8 |
| 2006 | 4 | 105 | 21 | 2.1 | 2.9 | 1.6 |
| 2007 | 8 | 664 | 69 | 2.2 | 8.3 | 3.4 |
| 2008 | 8 | 1858 | 174 | 2.9 | 9.2 | 2.9 |
| 2009 | 6 | 612 | 67 | 2.9 | 8.2 | 2.4 |
| 2010 | 7 | 501 | 62 | 2.8 | 7.6 | 2.2 |
| 2011 | 6 | 592 | 55 | 3.5 | 10.9 | 3.0 |
| 2012 | 7 | 696 | 69 | 2.5 | 9.3 | 3.2 |

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 bottom tows:

| Fishing <br> year | Number of <br> vessels | Total <br> catch $(\mathrm{t})$ | Number of <br> tows |
| :--- | ---: | ---: | ---: |
| 1990 | 36 | 11542 | 2589 |
| 1991 | 43 | 16177 | 4420 |
| 1992 | 58 | 29688 | 6877 |
| 1993 | 39 | 22304 | 5647 |
| 1994 | 45 | 9051 | 3163 |
| 1995 | 42 | 11716 | 3223 |
| 1996 | 46 | 10889 | 3483 |
| 1997 | 58 | 19288 | 4522 |
| 1998 | 49 | 24217 | 5192 |
| 1999 | 49 | 20966 | 4673 |
| 2000 | 43 | 31576 | 7155 |
| 2001 | 46 | 26222 | 6669 |
| 2002 | 47 | 29568 | 8093 |
| 2003 | 44 | 19870 | 5556 |
| 2004 | 41 | 11168 | 3728 |
| 2005 | 40 | 6148 | 2542 |
| 2006 | 34 | 6491 | 2360 |
| 2007 | 31 | 7420 | 2878 |
| 2008 | 29 | 8015 | 2625 |
| 2009 | 25 | 9195 | 2807 |
| 2010 | 29 | 11551 | 3023 |
| 2011 | 28 | 10973 | 2689 |
| 2012 | 28 | 13667 | 2578 |
| All years | 165 | 367701 | 96492 |


| Median tow <br> duration $(\mathrm{h})$ | Median catch per <br> tow $(\mathrm{t})$ | Median catch per <br> hour $(\mathrm{t} / \mathrm{h})$ |
| ---: | ---: | ---: |
| 4.0 | 2.6 | 0.6 |
| 4.3 | 2.6 | 0.6 |
| 4.2 | 3.1 | 0.8 |
| 4.0 | 3.1 | 0.8 |
| 4.2 | 1.6 | 0.4 |
| 4.3 | 2.2 | 0.6 |
| 4.2 | 1.9 | 0.5 |
| 4.5 | 3.2 | 0.7 |
| 4.3 | 3.3 | 0.8 |
| 4.5 | 2.9 | 0.7 |
| 4.2 | 3.0 | 0.8 |
| 4.5 | 2.7 | 0.6 |
| 4.4 | 2.1 | 0.6 |
| 4.9 | 2.4 | 0.5 |
| 5.0 | 2.0 | 0.4 |
| 5.3 | 1.0 | 0.2 |
| 5.3 | 0.7 | 0.1 |
| 5.2 | 0.8 | 0.2 |
| 5.5 | 1.0 | 0.2 |
| 5.0 | 1.0 | 0.2 |
| 5.4 | 1.0 | 0.2 |
| 5.0 | 1.5 | 0.3 |
| 5.0 | 2.2 | 0.5 |
| 4.5 | 2.2 | 0.5 |

## Hoki target bottom tows:

| Fishing <br> year | Number of <br> vessels | Total <br> catch $(\mathrm{t})$ | Number of <br> tows | Median tow <br> duration $(\mathrm{h})$ | Median catch per <br> tow $(\mathrm{t})$ | Median catch per <br> hour $(\mathrm{t} / \mathrm{h})$ |
| :--- | ---: | ---: | ---: | ---: | ---: | ---: |
| 1990 | 20 | 10922 | 2048 | 4.0 | 3.6 | 0.9 |
| 1991 | 30 | 15229 | 3862 | 4.4 | 2.8 | 0.6 |
| 1992 | 33 | 28278 | 5314 | 4.1 | 4.1 | 1.0 |
| 1993 | 24 | 21359 | 4817 | 3.8 | 3.6 | 0.9 |
| 1994 | 22 | 8748 | 1977 | 4.0 | 3.2 | 0.9 |
| 1995 | 25 | 11453 | 2297 | 4.0 | 3.9 | 1.0 |
| 1996 | 25 | 10628 | 2437 | 4.0 | 3.1 | 0.9 |
| 1997 | 42 | 18919 | 3293 | 4.2 | 4.6 | 1.1 |
| 1998 | 34 | 23669 | 4267 | 4.2 | 4.2 | 1.0 |
| 1999 | 33 | 20391 | 3563 | 4.2 | 4.1 | 1.1 |
| 2000 | 30 | 30884 | 5806 | 4.0 | 3.9 | 1.0 |
| 2001 | 31 | 25397 | 5324 | 4.2 | 3.5 | 0.8 |
| 2002 | 33 | 28612 | 6253 | 4.2 | 2.9 | 0.8 |
| 2003 | 33 | 19101 | 4322 | 4.8 | 3.0 | 0.7 |
| 2004 | 26 | 10815 | 2864 | 4.9 | 3.0 | 0.6 |
| 2005 | 25 | 5151 | 1351 | 5.1 | 2.5 | 0.5 |
| 2006 | 16 | 4636 | 720 | 5.0 | 4.0 | 0.8 |
| 2007 | 20 | 5143 | 1136 | 4.5 | 2.2 | 0.5 |
| 2008 | 13 | 5828 | 909 | 4.8 | 4.5 | 0.9 |
| 2009 | 12 | 6883 | 918 | 4.4 | 5.1 | 1.2 |
| 2010 | 12 | 9687 | 1231 | 4.5 | 6.1 | 1.3 |
| 2011 | 15 | 9210 | 1237 | 4.5 | 1.2 |  |
| 2012 | 17 | 11540 | 1193 | 430 | 1.5 | 1.6 |
| All years | 109 | 342482 | 67139 | 4.6 | 4.6 | 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 2012. Data have been removed where there is one vessel only.

All target species midwater 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 ( $\mathrm{t} / \mathrm{h}$ ) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1990 | 25 | 7154 | 759 | 2.5 | 7.9 | 3.2 |
| 1991 | 16 | 3188 | 269 | 2.4 | 10.2 | 4.1 |
| 1992 | 13 | 1058 | 141 | 3.0 | 5.2 | 2.0 |
| 1993 | 8 | 660 | 71 | 2.0 | 6.2 | 2.8 |
| 1994 | 17 | 2209 | 266 | 3.0 | 3.9 | 1.1 |
| 1995 | 15 | 1015 | 163 | 2.3 | 3.0 | 1.4 |
| 1996 | 12 | 1447 | 155 | 2.7 | 7.1 | 2.9 |
| 1997 | 20 | 4742 | 410 | 3.5 | 8.5 | 2.5 |
| 1998 | 7 | 884 | 95 | 3.0 | 8.2 | 2.4 |
| 1999 | 16 | 1416 | 141 | 3.4 | 4.8 | 1.3 |
| 2000 | 13 | 2054 | 161 | 4.2 | 8.0 | 2.0 |
| 2001 | 22 | 5212 | 372 | 4.3 | 10.0 | 2.2 |
| 2002 | 19 | 3128 | 260 | 3.6 | 6.8 | 1.6 |
| 2003 | 20 | 5137 | 309 | 2.8 | 12.1 | 3.6 |
| 2004 | 4 | 574 | 33 | 3.7 | 12.2 | 3.0 |
| 2005 | 9 | 4953 | 220 | 2.1 | 22.0 | 9.6 |
| 2006 | 4 | 236 | 16 | 2.8 | 14.8 | 5.0 |
| 2007 | 1 | - | - | - | - | - |
| 2008 | 1 | - | - | - | - | - |
| 2009 | 1 | - | - | - | - | - |
| 2010 | 1 | - | - | - | - | - |
| 2011 | 2 | 1047 | 75 | 3.2 | 12.9 | 3.2 |
| 2012 | 2 | 818 | 87 | 3.1 | 4.6 | 1.5 |
| All years | 104 | 47096 | 4010 | 3.0 | 8.0 | 2.6 |

Hoki target 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 ( $\mathrm{t} / \mathrm{h}$ ) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1990 | 25 | 7149 | 758 | 2.5 | 7.9 | 3.2 |
| 1991 | 16 | 3173 | 268 | 2.4 | 10.2 | 4.1 |
| 1992 | 12 | 1027 | 129 | 3.0 | 5.2 | 2.0 |
| 1993 | 8 | 660 | 71 | 2.0 | 6.2 | 2.8 |
| 1994 | 17 | 2189 | 264 | 3.0 | 3.9 | 1.1 |
| 1995 | 15 | 1015 | 163 | 2.3 | 3.0 | 1.4 |
| 1996 | 12 | 1447 | 155 | 2.7 | 7.1 | 2.9 |
| 1997 | 20 | 4742 | 410 | 3.5 | 8.5 | 2.5 |
| 1998 | 7 | 884 | 95 | 3.0 | 8.2 | 2.4 |
| 1999 | 16 | 1416 | 141 | 3.4 | 4.8 | 1.3 |
| 2000 | 13 | 2054 | 161 | 4.2 | 8.0 | 2.0 |
| 2001 | 22 | 5206 | 371 | 4.3 | 10.0 | 2.2 |
| 2002 | 19 | 3128 | 260 | 3.6 | 6.8 | 1.6 |
| 2003 | 20 | 5137 | 309 | 2.8 | 12.1 | 3.6 |
| 2004 | 3 | 571 | 29 | 3.5 | 13.2 | 5.1 |
| 2005 | 8 | 4942 | 216 | 2.1 | 22.0 | 10.0 |
| 2006 | 4 | 236 | 16 | 2.8 | 14.8 | 5.0 |
| 2007 | 1 | - | - | - | - | - |
| 2008 | 1 | - | - | - | - | - |
| 2009 | 1 | - | - | - | - | - |
| 2010 | 1 | - | - | - | - | - |
| 2011 | 2 | 1047 | 75 | 3.2 | 12.9 | 3.2 |
| 2012 | 2 | 818 | 87 | 3.1 | 4.6 | 1.5 |
| All years | 102 | 47004 | 3985 | 3.0 | 8.0 | 2.6 |

Table A2g ctd.: Puysegur.
All target species bottom tows:

| Fishing <br> year | Number of <br> vessels | Total <br> catch $(\mathrm{t})$ | Number of <br> tows |
| :--- | ---: | ---: | ---: |
| 1990 | 15 | 104 | 207 |
| 1991 | 24 | 1663 | 372 |
| 1992 | 30 | 4012 | 842 |
| 1993 | 12 | 1044 | 220 |
| 1994 | 20 | 394 | 175 |
| 1995 | 12 | 252 | 200 |
| 1996 | 16 | 955 | 354 |
| 1997 | 25 | 1162 | 336 |
| 1998 | 19 | 1295 | 252 |
| 1999 | 22 | 966 | 265 |
| 2000 | 20 | 849 | 273 |
| 2001 | 24 | 919 | 221 |
| 2002 | 18 | 1852 | 193 |
| 2003 | 20 | 796 | 181 |
| 2004 | 14 | 198 | 81 |
| 2005 | 21 | 582 | 291 |
| 2006 | 16 | 1002 | 256 |
| 2007 | 13 | 253 | 118 |
| 2008 | 6 | 134 | 56 |
| 2009 | 7 | 126 | 57 |
| 2010 | 7 | 121 | 110 |
| 2011 | 11 | 208 | 108 |
| 2012 | 4 | 76 | 29 |
| All years | 95 | 18963 | 5197 |

Hoki target bottom tows:

| Fishing | Number of <br> vessels | Total <br> catch $(\mathrm{t})$ | Number of <br> tows |
| :--- | ---: | ---: | ---: |
| 1990 | 8 | 22 | 20 |
| 1991 | 20 | 1541 | 310 |
| 1992 | 26 | 3778 | 701 |
| 1993 | 11 | 1019 | 201 |
| 1994 | 16 | 356 | 138 |
| 1995 | 9 | 217 | 144 |
| 1996 | 16 | 892 | 272 |
| 1997 | 22 | 983 | 295 |
| 1998 | 18 | 1262 | 237 |
| 1999 | 21 | 931 | 238 |
| 2000 | 18 | 817 | 224 |
| 2001 | 22 | 910 | 198 |
| 2002 | 16 | 1836 | 184 |
| 2003 | 14 | 774 | 135 |
| 2004 | 5 | 152 | 24 |
| 2005 | 8 | 240 | 51 |
| 2006 | 6 | 707 | 79 |
| 2007 | 2 | 57 | 14 |
| 2008 | 1 | - | - |
| 2009 | 1 | - | - |
| 2010 | 1 | - | - |
| 2011 | 1 | - | - |
| 2012 | 1 | 592 | 378 |
| All years | 16 |  | - |


| Median tow <br> duration $(\mathrm{h})$ | Median catch per <br> tow $(\mathrm{t})$ | Median catch per <br> hour $(\mathrm{t} / \mathrm{h})$ |
| ---: | ---: | ---: |
| 3.3 | 0.2 | 0.1 |
| 4.3 | 3.1 | 0.8 |
| 4.3 | 3.0 | 0.6 |
| 4.2 | 3.4 | 0.8 |
| 4.2 | 1.1 | 0.3 |
| 5.8 | 0.5 | 0.1 |
| 4.3 | 1.0 | 0.2 |
| 5.5 | 0.8 | 0.2 |
| 4.8 | 2.8 | 0.6 |
| 5.2 | 1.1 | 0.2 |
| 5.4 | 1.0 | 0.2 |
| 4.2 | 2.0 | 0.5 |
| 3.8 | 6.5 | 1.5 |
| 4.5 | 1.8 | 0.4 |
| 4.8 | 0.6 | 0.1 |
| 5.8 | 0.9 | 0.1 |
| 4.0 | 1.0 | 0.3 |
| 5.0 | 0.7 | 0.1 |
| 4.8 | 1.4 | 0.3 |
| 3.1 | 1.0 | 0.3 |
| 4.8 | 0.5 | 0.1 |
| 4.5 | 1.0 | 0.2 |
| 3.7 | 0.6 | 0.3 |
| 4.5 | 1.4 | 0.3 |


| Median tow <br> duration $(\mathrm{h})$ | Median catch per <br> tow $(\mathrm{t})$ | Median catch per <br> hour $(\mathrm{t} / \mathrm{h})$ |
| ---: | ---: | ---: |
| 3.5 | 0.7 | 0.2 |
| 4.1 | 4.1 | 0.9 |
| 4.2 | 3.1 | 0.8 |
| 4.0 | 4.0 | 0.9 |
| 4.4 | 1.1 | 0.3 |
| 5.8 | 0.6 | 0.1 |
| 4.1 | 1.5 | 0.3 |
| 5.3 | 0.9 | 0.2 |
| 4.8 | 3.0 | 0.7 |
| 5.1 | 1.2 | 0.2 |
| 5.0 | 1.6 | 0.3 |
| 4.2 | 2.5 | 0.6 |
| 3.8 | 7.0 | 1.7 |
| 4.5 | 3.0 | 0.7 |
| 3.3 | 4.2 | 1.2 |
| 3.2 | 2.2 | 0.9 |
| 3.5 | 6.0 | 2.1 |
| 3.8 | 2.1 | 0.5 |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | - |
| - | - | 0.6 |

Table A3: CPUE datasets for all vessels and for core vessels for each year (1990-2012) for main hoki areas

WCSI: All target species

|  |  | All vessels |  |  |
| :--- | ---: | ---: | ---: | ---: |
| Fishing year | No. vessels | Catch | Effort | CPUE |
| 1990 | 79 | 116735.5 | 7580 | 15.40 |
| 1991 | 75 | 104129.9 | 7755 | 13.43 |
| 1992 | 69 | 87518.0 | 5905 | 14.82 |
| 1993 | 63 | 78751.4 | 6268 | 12.56 |
| 1994 | 67 | 97929.4 | 8290 | 11.81 |
| 1995 | 62 | 65943.8 | 8324 | 7.92 |
| 1996 | 62 | 59966.6 | 6624 | 9.05 |
| 1997 | 77 | 79448.9 | 7735 | 10.27 |
| 1998 | 67 | 91752.9 | 7702 | 11.91 |
| 1999 | 59 | 83534.8 | 6838 | 12.22 |
| 2000 | 52 | 93861.0 | 7188 | 13.06 |
| 2001 | 63 | 93648.2 | 8125 | 11.53 |
| 2002 | 56 | 84652.5 | 7394 | 11.45 |
| 2003 | 51 | 65973.7 | 7166 | 9.21 |
| 2004 | 51 | 39647.8 | 6205 | 6.39 |
| 2005 | 38 | 29275.1 | 4024 | 7.28 |
| 2006 | 37 | 31447.1 | 3795 | 8.29 |
| 2007 | 32 | 30129.1 | 2479 | 12.15 |
| 2008 | 25 | 19938.5 | 2314 | 8.62 |
| 2009 | 24 | 18969.1 | 1825 | 10.39 |
| 2010 | 28 | 31739.5 | 2240 | 14.17 |
| 2011 | 28 | 43890.6 | 2977 | 14.74 |
| 2012 | 30 | 50205.2 | 3179 | 15.79 |


|  |  | Core vessels |  |
| ---: | ---: | ---: | ---: |
| No. vessels | Catch | Effort | CPUE |
| 20 | 45522.1 | 2322 | 19.60 |
| 28 | 56687.1 | 2872 | 19.74 |
| 29 | 45502.8 | 2607 | 17.45 |
| 34 | 49926.0 | 3749 | 13.32 |
| 42 | 71331.9 | 5566 | 12.82 |
| 43 | 49747.7 | 6097 | 8.16 |
| 42 | 53003.0 | 5288 | 10.02 |
| 52 | 67923.2 | 6164 | 11.02 |
| 53 | 83867.3 | 6938 | 12.09 |
| 50 | 81005.8 | 6697 | 12.10 |
| 44 | 91025.3 | 6902 | 13.19 |
| 48 | 87025.4 | 7327 | 11.88 |
| 48 | 79789.1 | 6967 | 11.45 |
| 44 | 61623.2 | 6748 | 9.13 |
| 41 | 35064.7 | 5656 | 6.20 |
| 37 | 27339.0 | 3796 | 7.20 |
| 34 | 30318.4 | 3596 | 8.43 |
| 29 | 29411.1 | 2378 | 12.37 |
| 23 | 19629.6 | 2277 | 8.62 |
| 21 | 18875.1 | 1788 | 10.56 |
| 25 | 31654.9 | 2202 | 14.38 |
| 27 | 43816.3 | 2970 | 14.75 |
| 27 | 48125.7 | 3018 | 15.95 |

Cook Strait: Target hoki, June-October, mid-water tows

| Fishing year |  |  | All vessels |  | Core vessels |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | No. vessels | Catch | Effort | CPUE | No. vessels | Catch | Effort | CPUE |
| 1990 | 17 | 11751.7 | 1040 | 11.30 | 8 | 3682.2 | 318 | 11.58 |
| 1991 | 22 | 21708.2 | 2040 | 10.64 | 12 | 10732.6 | 1129 | 9.51 |
| 1992 | 22 | 17839.8 | 1567 | 11.38 | 15 | 10327.0 | 887 | 11.64 |
| 1993 | 18 | 16583.4 | 1459 | 11.37 | 11 | 10565.0 | 855 | 12.36 |
| 1994 | 28 | 23988.6 | 1731 | 13.86 | 16 | 16719.9 | 1073 | 15.58 |
| 1995 | 24 | 21918.2 | 1965 | 11.15 | 16 | 18205.4 | 1359 | 13.40 |
| 1996 | 36 | 35407.2 | 2647 | 13.38 | 22 | 21324.7 | 1517 | 14.06 |
| 1997 | 34 | 37778.0 | 3080 | 12.27 | 23 | 27853.3 | 2213 | 12.59 |
| 1998 | 28 | 27356.6 | 2106 | 12.99 | 20 | 22490.5 | 1759 | 12.79 |
| 1999 | 20 | 25908.3 | 1830 | 14.16 | 18 | 23961.1 | 1712 | 14 |
| 2000 | 21 | 22404.1 | 1601 | 13.99 | 20 | 21080.9 | 1492 | 14.13 |
| 2001 | 25 | 20493.3 | 1617 | 12.67 | 20 | 17947.9 | 1423 | 12.61 |
| 2002 | 15 | 15353.9 | 923 | 16.63 | 14 | 14350.2 | 862 | 16.65 |
| 2003 | 19 | 23308.6 | 1562 | 14.92 | 13 | 19978.9 | 1273 | 15.69 |
| 2004 | 19 | 25397.5 | 1640 | 15.49 | 15 | 23110.9 | 1481 | 15.60 |
| 2005 | 12 | 15647.1 | 1163 | 13.45 | 12 | 15401.3 | 1147 | 13.43 |
| 2006 | 11 | 13993.1 | 893 | 15.67 | 11 | 13651.0 | 865 | 15.78 |
| 2007 | 7 | 10829.0 | 852 | 12.71 | 6 | 10509.3 | 821 | 12.80 |
| 2008 | 5 | 6282.8 | 329 | 19.10 | 4 | 6199.5 | 321 | 19.31 |
| 2009 | 8 | 6891.4 | 592 | 11.64 | 6 | 6362.4 | 542 | 11.74 |
| 2010 | 8 | 9529.8 | 742 | 12.84 | 7 | 9481.3 | 733 | 12.93 |
| 2011 | 6 | 6442.6 | 471 | 13.68 | 6 | 6349.7 | 467 | 13.60 |
| 2012 | 9 | 8823.8 | 668 | 13.21 | 7 | 8325.4 | 608 | 13.69 |

## Table A3 ctd.

## Chatham Rise and ECSI non-spawning: All target species

|  |  |  | All vessels |  |
| :--- | ---: | ---: | ---: | ---: |
| Fishing year | No. vessels | Catch | Effort | CPUE |
| 1991 | 41 | 14889.5 | 3190 | 4.67 |
| 1992 | 59 | 38204.7 | 6284 | 6.08 |
| 1993 | 51 | 32184.3 | 6073 | 5.30 |
| 1994 | 53 | 13975.7 | 4184 | 3.34 |
| 1995 | 59 | 21328.3 | 5470 | 3.90 |
| 1996 | 64 | 28101.6 | 6594 | 4.26 |
| 1997 | 83 | 34697.5 | 7792 | 4.45 |
| 1998 | 77 | 43284.6 | 9340 | 4.63 |
| 1999 | 66 | 54739.7 | 10409 | 5.26 |
| 2000 | 52 | 38134.9 | 8797 | 4.33 |
| 2001 | 57 | 39052.7 | 9418 | 4.15 |
| 2002 | 51 | 29623.7 | 7565 | 3.92 |
| 2003 | 58 | 30037.3 | 8718 | 3.45 |
| 2004 | 55 | 20411.1 | 6594 | 3.10 |
| 2005 | 46 | 22140.3 | 5281 | 4.19 |
| 2006 | 43 | 28033.3 | 5340 | 5.25 |
| 2007 | 39 | 29508.8 | 5158 | 5.72 |
| 2008 | 33 | 28554.2 | 4916 | 5.81 |
| 2009 | 30 | 32067.8 | 4766 | 6.73 |
| 2010 | 33 | 32228.8 | 4546 | 7.09 |
| 2011 | 32 | 33082.9 | 4399 | 7.52 |
| 2012 | 31 | 32077.1 | 4235 | 7.57 |


|  |  | Core vessels |  |
| ---: | ---: | ---: | ---: |
| No. vessels | Catch | Effort | CPUE |
| 4 | 5483.0 | 886 | 6.19 |
| 7 | 11984.5 | 2124 | 5.64 |
| 7 | 14728.8 | 3000 | 4.91 |
| 5 | 8816.9 | 1813 | 4.86 |
| 11 | 15638.9 | 3228 | 4.84 |
| 10 | 23777.4 | 4152 | 5.73 |
| 13 | 26959.3 | 4791 | 5.63 |
| 15 | 36004.3 | 6638 | 5.42 |
| 18 | 50089.4 | 8779 | 5.71 |
| 15 | 35805.2 | 7478 | 4.79 |
| 16 | 36830.8 | 8109 | 4.54 |
| 17 | 27993.0 | 6394 | 4.38 |
| 18 | 27464.5 | 7371 | 3.73 |
| 18 | 19269.4 | 5474 | 3.52 |
| 17 | 21152.6 | 4246 | 4.98 |
| 14 | 25820.7 | 4142 | 6.23 |
| 13 | 26618.6 | 3854 | 6.91 |
| 13 | 24821.0 | 3387 | 7.33 |
| 12 | 26088.4 | 3433 | 7.60 |
| 13 | 29243.6 | 3755 | 7.79 |
| 9 | 27946.6 | 3306 | 8.45 |
| 10 | 27500.5 | 3057 | 9 |

## Sub-Antarctic: All target species

| Fishing year | All vessels |  |  |  | Core vessels |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | No. vessels | Catch | Effort | CPUE | No. vessels | Catch | Effort | CPUE |
| 1990 | 32 | 11382.8 | 2499 | 4.55 | 3 | 4576.2 | 852 | 5.37 |
| 1991 | 39 | 16080.8 | 4365 | 3.68 | 5 | 7003.2 | 1983 | 3.53 |
| 1992 | 55 | 29347.4 | 6775 | 4.33 | 8 | 20696.9 | 4125 | 5.02 |
| 1993 | 35 | 22226.5 | 5602 | 3.97 | 8 | 19659.7 | 4422 | 4.45 |
| 1994 | 41 | 9017.9 | 3126 | 2.88 | 5 | 7882.4 | 1718 | 4.59 |
| 1995 | 40 | 11700.0 | 3206 | 3.65 | 5 | 10479.8 | 1920 | 5.46 |
| 1996 | 43 | 10825.9 | 3336 | 3.25 | 5 | 6697.4 | 1461 | 4.58 |
| 1997 | 58 | 19111.9 | 4444 | 4.30 | 10 | 15777.3 | 2457 | 6.42 |
| 1998 | 48 | 23941.6 | 5145 | 4.65 | 10 | 21455.7 | 3654 | 5.87 |
| 1999 | 47 | 20550.2 | 4583 | 4.48 | 10 | 16577.4 | 2840 | 5.84 |
| 2000 | 39 | 31267.1 | 6948 | 4.50 | 13 | 27653.9 | 5054 | 5.47 |
| 2001 | 44 | 26063.6 | 6586 | 3.96 | 14 | 22089.9 | 4797 | 4.60 |
| 2002 | 46 | 29273.4 | 7976 | 3.67 | 15 | 25619.4 | 5763 | 4.45 |
| 2003 | 43 | 19797.7 | 5490 | 3.61 | 14 | 16455.3 | 3771 | 4.36 |
| 2004 | 39 | 11150.6 | 3682 | 3.03 | 10 | 9543.3 | 2546 | 3.75 |
| 2005 | 38 | 6135.9 | 2518 | 2.44 | 11 | 4328.6 | 1379 | 3.14 |
| 2006 | 33 | 6439.1 | 2265 | 2.84 | 8 | 4214.7 | 1261 | 3.34 |
| 2007 | 29 | 7342.4 | 2798 | 2.62 | 9 | 5039.1 | 1818 | 2.77 |
| 2008 | 28 | 7956.7 | 2566 | 3.10 | 9 | 7060.8 | 1896 | 3.72 |
| 2009 | 24 | 9172.8 | 2607 | 3.52 | 6 | 7907.9 | 1704 | 4.64 |
| 2010 | 27 | 11518.2 | 2880 | 4 | 6 | 9877.2 | 1758 | 5.62 |
| 2011 | 27 | 10950.3 | 2527 | 4.33 | 5 | 8529.2 | 1578 | 5.41 |
| 2012 | 27 | 13581.2 | 2408 | 5.64 | 8 | 10340.0 | 1435 | 7.21 |

Table A4: CPUE estimated values and 95\% confidence intervals by year for core vessels for main hoki areas.

|  | WCSI <br> All target species |  | WCSI <br> Target hoki |  | Cook Strait Target hoki, MW |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Year | Index | CI | Index | CI | Index | CI |
| 1990 | 1.15 | 1.10-1.20 | 1.15 | 1.10-1.21 | 1.15 | 1.03-1.29 |
| 1991 | 1.23 | 1.18-1.28 | 1.24 | 1.19-1.30 | 0.83 | 0.77-0.88 |
| 1992 | 1.22 | 1.17-1.27 | 1.23 | 1.18-1.28 | 1.03 | 0.96-1.11 |
| 1993 | 0.98 | 0.95-1.02 | 1.06 | 1.02-1.10 | 1.09 | 1.01-1.17 |
| 1994 | 0.99 | 0.96-1.01 | 0.99 | 0.96-1.02 | 1.22 | 1.15-1.30 |
| 1995 | 0.69 | 0.67-0.71 | 0.68 | 0.66-0.70 | 1.25 | 1.18-1.33 |
| 1996 | 0.76 | 0.74-0.78 | 0.76 | 0.73-0.78 | 1.01 | 0.96-1.07 |
| 1997 | 0.78 | 0.76-0.80 | 0.77 | 0.75-0.79 | 0.90 | 0.86-0.94 |
| 1998 | 0.96 | 0.94-0.98 | 0.97 | 0.94-0.99 | 0.96 | 0.91-1.01 |
| 1999 | 1.01 | 0.99-1.04 | 1.02 | 0.99-1.04 | 0.94 | 0.89-0.99 |
| 2000 | 1.19 | 1.16-1.22 | 1.19 | 1.16-1.22 | 0.98 | 0.93-1.04 |
| 2001 | 0.87 | 0.85-0.89 | 0.86 | 0.84-0.88 | 0.80 | 0.76-0.84 |
| 2002 | 0.87 | 0.84-0.89 | 0.85 | 0.83-0.87 | 1.26 | 1.18-1.35 |
| 2003 | 0.67 | 0.65-0.68 | 0.65 | 0.63-0.67 | 1.05 | 1.00-1.12 |
| 2004 | 0.45 | $0.43-0.46$ | 0.42 | 0.41-0.43 | 0.93 | 0.88-0.98 |
| 2005 | 0.55 | $0.53-0.57$ | 0.51 | 0.49-0.53 | 0.84 | 0.79-0.89 |
| 2006 | 0.79 | $0.77-0.82$ | 0.79 | 0.76-0.82 | 1.01 | 0.94-1.08 |
| 2007 | 1.18 | 1.13-1.22 | 1.26 | 1.21-1.33 | 0.77 | 0.71-0.82 |
| 2008 | 1.34 | 1.28-1.40 | 1.27 | $1.20-1.35$ | 1.20 | 1.08-1.34 |
| 2009 | 1.54 | $1.46-1.61$ | 1.74 | 1.64-1.85 | 0.82 | 0.75-0.89 |
| 2010 | 1.65 | 1.58-1.73 | 1.69 | 1.61-1.77 | 1.02 | 0.94-1.11 |
| 2011 | 1.75 | 1.69-1.82 | 1.63 | 1.56-1.70 | 1.24 | 1.13-1.36 |
| 2012 | 1.85 | 1.78-1.92 | 1.89 | 1.81-1.97 | 0.94 | 0.87-1.02 |


| Year | Chatham Rise <br> All target species, BT |  | Chatham Rise Target hoki, BT |  |
| :---: | :---: | :---: | :---: | :---: |
|  | Index | CI | Index | CI |
| 1991 | 0.96 | 0.90-1.03 | 0.87 | 0.81-0.94 |
| 1992 | 1.23 | 1.17-1.29 | 1.13 | 1.07-1.18 |
| 1993 | 1.10 | 1.06-1.15 | 1.06 | 1.02-1.11 |
| 1994 | 1.03 | 0.98-1.08 | 1.02 | 0.97-1.07 |
| 1995 | 1.01 | 0.98-1.05 | 0.99 | 0.95-1.02 |
| 1996 | 1.03 | 0.99-1.06 | 1.05 | 1.01-1.08 |
| 1997 | 0.93 | 0.91-0.96 | 0.94 | 0.91-0.97 |
| 1998 | 0.88 | 0.85-0.90 | 0.88 | 0.86-0.90 |
| 1999 | 1.01 | 0.98-1.03 | 1.03 | 1.00-1.05 |
| 2000 | 0.84 | 0.82-0.86 | 0.85 | 0.83-0.87 |
| 2001 | 0.80 | 0.78-0.82 | 0.80 | 0.78-0.82 |
| 2002 | 0.81 | 0.79-0.84 | 0.82 | 0.79-0.84 |
| 2003 | 0.60 | 0.59-0.62 | 0.61 | 0.59-0.62 |
| 2004 | 0.57 | 0.55-0.59 | 0.57 | 0.55-0.59 |
| 2005 | 0.81 | 0.79-0.84 | 0.83 | 0.80-0.86 |
| 2006 | 1.04 | 1.00-1.07 | 1.08 | 1.04-1.11 |
| 2007 | 1.08 | 1.05-1.12 | 1.08 | 1.05-1.12 |
| 2008 | 1.35 | 1.30-1.40 | 1.36 | 1.31-1.41 |
| 2009 | 1.44 | 1.39-1.49 | 1.53 | 1.47-1.59 |
| 2010 | 1.33 | 1.28-1.37 | 1.34 | 1.29-1.38 |
| 2011 | 1.38 | 1.33-1.43 | 1.39 | 1.34-1.44 |
| 2012 | 1.45 | $1.40-1.50$ | 1.50 | 1.44-1.56 |

Table A4 ctd.

Sub-Antarctic
All target species, BT

| Year | Index | CI |
| :---: | :---: | :---: |
| 1990 | 1.05 | 0.97-1.14 |
| 1991 | 0.71 | 0.67-0.76 |
| 1992 | 1.16 | 1.10-1.21 |
| 1993 | 1.02 | 0.97-1.07 |
| 1994 | 1.17 | 1.10-1.24 |
| 1995 | 1.27 | 1.20-1.34 |
| 1996 | 1.04 | 0.98-1.10 |
| 1997 | 1.30 | 1.24-1.36 |
| 1998 | 1.12 | 1.08-1.16 |
| 1999 | 1.00 | 0.95-1.04 |
| 2000 | 0.99 | 0.96-1.02 |
| 2001 | 0.90 | 0.87-0.93 |
| 2002 | 0.91 | 0.88-0.94 |
| 2003 | 0.83 | 0.80-0.86 |
| 2004 | 0.61 | 0.59-0.64 |
| 2005 | 0.59 | 0.56-0.63 |
| 2006 | 0.79 | 0.74-0.84 |
| 2007 | 0.85 | 0.80-0.90 |
| 2008 | 1.06 | 1.01-1.12 |
| 2009 | 1.15 | 1.09-1.21 |
| 2010 | 1.36 | 1.29-1.43 |
| 2011 | 1.16 | 1.10-1.23 |
| 2012 | 1.63 | 1.54-1.73 |

Sub-Antarctic
All target species, BT

| Index | CI |
| ---: | ---: |
| 1.05 | $0.96-1.14$ |
| 0.64 | $0.61-0.69$ |
| 1.11 | $1.06-1.17$ |
| 0.95 | $0.91-1.00$ |
| 1.19 | $1.12-1.26$ |
| 1.21 | $1.14-1.28$ |
| 1.02 | $0.96-1.08$ |
| 1.28 | $1.22-1.33$ |
| 1.11 | $1.07-1.16$ |
| 0.96 | $0.92-1.01$ |
| 0.97 | $0.93-1.00$ |
| 0.86 | $0.83-0.89$ |
| 0.86 | $0.83-0.89$ |
| 0.81 | $0.78-0.84$ |
| 0.62 | $0.59-0.65$ |
| 0.64 | $0.59-0.68$ |
| 0.92 | $0.83-1.02$ |
| 0.72 | $0.67-0.78$ |
| 1.16 | $1.09-1.25$ |
| 1.36 | $1.27-1.46$ |
| 1.39 | $1.31-1.49$ |
| 1.30 | $1.21-1.38$ |
| 1.61 | $1.50-1.72$ |

