Ministry for Primary Industries
Manatū Ahu Matua

Fish and invertebrate bycatch and discards in New Zealand arrow squid and scampi trawl fisheries from 2002–03 until 2015–16

New Zealand Aquatic Environment and Biodiversity Report No. 199

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ISSN 1179-6480 (online)
ISBN 978-1-77665-852-7 (online)

May 2018

New Zealand Government

Growing and Protecting New Zealand

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EXECUTIVE SUMMARY

Anderson, O.F.; Edwards, C.T.T. (2018). Fish and invertebrate bycatch and discards in New Zealand arrow squid and scampi trawl fisheries from 2002–03 until 2015–16.

New Zealand Aquatic Environment and Biodiversity Report No. 199. **135 p.**

Commercial catch-effort data and fisheries observer records of catch and discards by species provided by the Ministry for Primary Industries were used to estimate the rate and level of fish bycatch and discards in the arrow squid and scampi target trawl fisheries for each fishing year from 2002–03 to 2015–16. Separate estimates, along with estimates of precision, were made for three broad categories of catch and discards; all QMS species combined, all non-QMS fish species combined, and all non-QMS invertebrate species combined. Component species of each of these species groups were adjusted for each year to match the year-of-entry of individual species in the QMS system. In addition, separate estimates were made of annual catch for a range of the major individual bycatch species or species groups.

Annual bycatch and discard levels and associated uncertainty for each species category and fishery area were estimated from the observer and commercial fishery data using a statistical model, using a combination of standard areas, fishing years, net type, and meal plant usage as model covariates.

In the recent years of the arrow squid target trawl fishery, arrow squid have accounted for about 79% of the total estimated catch weight recorded by observers. The remainder of the observed catch comprised mainly the QMS species barracouta (9.1%), silver warehou (3.3%), spiny dogfish (1.7%), and red cod (1.2%), plus a range of other (mainly QMS) species including various species of rattails, deepwater dogfishes, and other sharks. Invertebrate species made up only a small fraction of the overall catch, with the non-QMS smooth red swimming crab (0.85%) by far the main species caught, followed by giant spider crabs (0.24%). Most of the remaining species or species groups recorded by observers each accounted for less than 0.01% of the observed catch during the period.

Total annual bycatch in the arrow squid fishery declined from about 26 000–40 000 t per year (between 2002–03 and 2005–06), to about 9000–18 000 t per year thereafter. Bycatch mostly comprised QMS species (over 85% in each year), with non-QMS fish species accounting for 300–2100 t per year and non-QMS invertebrate species accounting for about 300–1600 t per year. All groups showed a significant declining trend over time. Total annual discards also decreased over time, dropping from a high of about 16 000 t in 2002–03 to about 1000–3000 t after 2006–07. Target species discards (due to gear failure, product damage etc) were relatively low, less than 500 t in most years. Discard levels of QMS and non-QMS species were similar overall, but generally not in individual years, at about 400–5800 t per year and 300–15 000 t per year, respectively. Discards of invertebrates were generally a little lower, about 200–2000 t per year. The main individual species discarded were arrow squid, spiny dogfish, and smooth red swimming crabs.

In the recent years of the scampi target trawl fishery, scampi have accounted for about 19% of the total estimated catch weight recorded by observers. The remainder of the observed catch comprised mainly javelinfish (17.5%), other rattails (12.4%), and sea perch (10.2%), plus lesser amounts of the QMS species hoki (4.7%), ling (3.9%), and ghost shark (3%), along with a wide range of other bony fish and chondrichthyans. Invertebrate species bycatch mainly comprised unspecified crab species (0.9%), unspecified starfish species (0.8%), and arrow squid (0.7%), along with a range of other echinoderms, molluscs, and crustaceans.

Total annual bycatch in the scampi fishery was highly variable in the early part of the period, from a high of 5600 t in 2004–05 to a low of 2400 t the following year, but more stable thereafter with a range of 2400–4300 t. This pattern in total bycatch over time was partially matched by total effort in the fishery, the level of which became more stable over time. Total discards showed a similar pattern to total bycatch, but at a lower level, ranging from a low of 900 t in 2003–04 to a high of about 4100 t in the following year, and showing no trend over time. In this fishery, total discards mostly comprised non-QMS species (fish and

invertebrates), and while discards of scampi were generally estimated to be low or non-existent, they exceeded 10 t in two of the fourteen years. Discards of non-QMS species were variable and showed no trend, in most years ranging from 1300 t to 2500 t; discards of invertebrates were 250–550 t per year up to 2005–06 and less than 250 t per year in subsequent years. The main species discarded were also those caught in the greatest amounts, i.e., javelinfish, other rattails, and sea perch.

The bycatch fraction (kg of bycatch/kg of target species catch) in the arrow squid fishery ranged from 0.78 in 2002–03 to 0.23 in 2015–16, without clearly declining or showing any pattern at all. The discard fraction (kg of discards/kg of target species catch) was less variable, with annual values generally between 0.05 and 0.16, and also showed no clear pattern of change over time. This fraction is slightly higher than estimated previously for this fishery.

The bycatch fraction declined slightly throughout the period examined in the scampi fishery, from about 5–7 to about 3–6, indicating that restricting the catch to the target species has improved over time. The discard fraction varied over time, with no clear trend, and an overall value for the 14-year period of 3.6. This fraction is lower than estimated previously for this fishery, but remains substantially higher than in all other offshore fisheries for which estimates are available (Ministry for Primary Industries 2016a).

The annual catch of the 31 and 22 most commonly caught individual bycatch species in the arrow squid and scampi target trawl fisheries, respectively, were estimated using the same procedures as for the combined species categories, and trends examined. In the arrow squid fishery, five species showed a significant decreasing trend in bycatch levels over time and two species showed an increasing trend; in the scampi fishery, five species showed a significant decreasing trend and none showed a significant increasing trend in bycatch levels.

1. INTRODUCTION

The Ministry for Primary Industries (MPI) National Deepwater Plan includes the following Environment Outcome related management objective: MO2.4. Identify and avoid or minimise adverse effects of deepwater and middle-depth fisheries on incidental bycatch species. This report partially addresses that objective by providing estimates of the level of bycatch of species or groups of species not managed separately in the Quota Management System (QMS). To date the programme has produced assessments of the scampi (*Metanephrops challengeri*), arrow squid (*Nototodarus* spp.), hoki (*Macruronus novaezelandiae*)/hake (*Merluccius australis*)/ling (*Genypterus blacodes*), jack mackerel (*Trachurus* spp.), orange roughy (*Hoplostethus atlanticus*), and oreo (Oreosomatidae) trawl fisheries (Anderson 2012, 2013, Ballara & O'Driscoll 2015, Anderson et al. 2017a, Anderson et al. 2017b), and the ling bottom longline fishery (Anderson 2014). This report updates estimates of bycatch and discarding in the arrow squid and scampi target trawl fisheries for the fishing years following those covered in the earlier reports.

The New Zealand scampi fishery

The New Zealand scampi fishery is small in volume but valuable, with total landings in 2014–15 of about 875 t and export earnings in 2015 of NZ$21M (https://www.seafood.co.nz). Annual catches were restricted by a mixture of individual and competitive catch limits before the introduction of this species into the QMS on 1 October 2004. The main scampi fisheries are in the Bay of Plenty, off the Wairarapa coast, around the Chatham Rise, and in the Sub-Antarctic, in depths of 300–500 m (Ministry for Primary Industries 2016a). The high value of this species enables fishing to be economically viable despite relatively small catches per trawl, with the result that target catch tends to be outweighed by non-target catch. This bycatch frequently comprises non-QMS species of low or no commercial value which are discarded. The relatively fine mesh used by scampi trawlers also increases the potential for catching greater amounts of juvenile fish. The commercial scampi fishing industry have made efforts to reduce bycatch and various gear trials have been carried out, both in New Zealand and overseas (Hartill et al. 2006).

Scampi vessels are mainly 20–40 m long and use otter trawls, usually rigged with double or triple nets towed together using a sled between them to maintain net shape. This arrangement allows a wider total net width to be trawled, while minimising the headline height and therefore also unwanted bycatch. The exact configuration of each trawl deployed (i.e. the number of nets) is not recorded sufficiently well to allow this effect to be examined. A further, fleetwide, gear modification occurred between about 2002–03 and 2006–07 whereby a modification was made to the top of the trawl to allow unwanted bycatch to escape, allowing vessels to tow for longer (Tuck 2013). Doorspread can be used to model the variation in trawl configuration (and even estimate the number of nets used) but this is rarely recorded by observers (less than 5% of the time). Wingspread may be recorded more often; this was shown by Baird et al. (2011) to have remained constant over time in the scampi fishery, although tow duration and distance have increased.

The first assessment of bycatch and discards in the scampi trawl fishery used a trawl duration-based estimator and provided annual estimates of bycatch and discards from 1990–91 to 2000–01 (Anderson 2004). The second assessment used the same estimator and generated annual estimates of bycatch and discards from 1999–2000 to 2005–06 (Ballara & Anderson 2009). The most recent assessment provided new estimates for the entire history of the fishery, from 1990–91 up to 2009–10, using a per trawl-based estimator and breaking down total bycatch and discards into QMS, non-QMS, invertebrate, and other main species categories (Anderson 2012). In this assessment we provide estimates of bycatch and discards for the period 2002–03 to 2015–16, using a statistical model approach for the first time in this fishery.

Estimates of total annual bycatch in the scampi fishery for the period 1990–91 to 2009–10 ranged from about 2100 t to 9200 t and comprised a generally even mixture of QMS and non-QMS species, with invertebrate species accounting for about 7% of the total (Anderson 2012). Rattail fish species (mainly javelinfish, *Lepidorhynchus denticulatus*) accounted for 30–80% of the annual non-QMS bycatch. Sea perch (*Helicolenus* spp.), ling, and hoki were the main QMS bycatch species. Total bycatch showed a significant decrease over time. Estimates of total annual discards (about 75% of which comprised non-QMS species) ranged from about 1430 t to 6790 t and although steadily decreasing after 2000–01 showed no significant trend over the whole

time period. The rate of discarding increased from the previous assessment from about 3.5 kg of discards for every 1 kg of scampi landed (before 2005–06) to about 4.2 kg of discards for every 1 kg of scampi landed between 2006–07 and 2009–10. This is still considerably lower than earlier estimates for the Clyde Sea (Scotland) scampi (*Nephrops norvegicus*) fishery, using similar fishing gear, where the equivalent average discard rate was 9 kg (Bergmann et al. 2002). In that fishery, discards were shown to have a positive effect on marine scavenger populations, including seabirds, crabs, and starfish (Catchpole et al. 2006).

The New Zealand arrow squid fishery

The New Zealand arrow squid fishery is based on two closely related species: Sloan's arrow squid (*Nototodarus sloanii*) which occur mainly in or south of the Subtropical Front (STF) and Gould's arrow squid (*N. gouldi*) which occur north of the STF (Smith et al. 1987, Anderson et al. 1998). Both species are found over the continental shelf in depths of up to 1000 m, although they are more common in depths of less than 500 m and occur even in surface waters (Anderson et al. 1998). Most commercial trawling effort is at depths of 150–400 m and is centred on the December–May period. The fishery was mainly prosecuted by Korean and Ukrainian vessels under charter to New Zealand companies, but under a recent amendment to the Fisheries Act (1996) these Foreign Charter Vessels (FCVs) were required to be reflagged to New Zealand before 1 May 2016 in order to continue fishing here. Although large amounts of squid have been caught by jigging, especially in the 1980s and early 1990s, the trawl fishery has accounted for most of the squid catch in most years, especially since the mid to late 1990s (Ministry for Primary Industries 2016a). The main trawling areas include the waters around the Stewart-Snares shelf, the Auckland Islands, and Banks Peninsula. The principal bycatch species are barracouta (*Thyrsites atun*), jack mackerel, silver warehou (*Seriolella punctata*), and spiny dogfish (*Squalus acanthias*) (Anderson 2013).

The arrow squid fishery is relatively large and valuable, with total reported landings in the 2014–15 fishing year of about 16 000 t and export earnings in 2015 of NZ$41M (http://www.seafoodnewzealand.org.nz) making it New Zealand's eighth most valuable export fishery. Annual catches have been restricted by a TACC since 1986–87, with separate TACCs for the Auckland Islands trawl fishery (SQU 6T) and the remainder of the New Zealand EEZ excluding the Kermadecs (SQU 1T and SQU 1J). Landings have occasionally reached or exceeded the TACC in SQU 1T and SQU 6T, but not in SQU 1J, so that the overall TACC has always been well undercaught (Ministry for Primary Industries 2016a).

Bycatch and discards in the arrow squid fishery have been estimated in four earlier assessments; the first three used a target species catch-based estimator (Anderson et al. 2000) or trawl duration-based estimator (Anderson 2004, Ballara & Anderson 2009), while the most recent analysis (Anderson 2013) used a per trawl-based estimator and covered a longer period (1990–91 to 2010–11). Estimates of total annual bycatch have ranged from about 4500 t to about 25 000 t, and total annual discards from about 200 t to about 5500 t, both peaking in the early 2000s (Anderson 2013). The species discarded in the greatest amounts were spiny dogfish, redbait (*Emmelichthys nitidus*), rattails (Macrouridae), and silver dory (*Cyttus novaezealandiae*). Estimates of the rate of discarding peaked at a level of 0.13 kg of discarded fish for every 1 kg of arrow squid caught in the early 1990s and subsequently declined to 0.02–0.07 kg This analysis has used a statistical model approach for the first time in this fishery.

Objectives

This report was prepared as an output from the MPI project DAE201601 "Total catch composition in deepwater fisheries (Squid & Scampi)" which has the following objectives.

Overall objective:

To estimate the composition of catch (including non-target fish catch and discards of target and non-target fish species) in squid and scampi fisheries.

Specific objectives

1. To estimate the catch composition in the target fisheries for squid and scampi. This should include the quantity of non-target fish species caught, and the target and non-target fish species discarded, using data

from MPI Observers and commercial fishing returns to the end of the most recent complete fishing year in a format that meets management needs.
2. To compare estimated rates, amounts, and trends of bycatch and discards from this study with previous projects on bycatch in the squid and scampi fisheries.
3. To update any relevant sections of the Aquatic Environment and Biodiversity Annual Review and Environmental and Ecosystem considerations sections of the Fisheries Assessment Plenary documents with new results from this work.

This report addresses Objectives 1 and 2 only.

After subsequent discussions between project and MPI staff it was agreed that estimates of bycatch and discards would be made for only the fishing years since 2002–03. This date is subsequent to the introduction of observer logbooks (and the possibility to re-assign discard information to individual tows) and finer resolution MPI 3-letter taxon codes. In addition, for the scampi fishery, stratification of results will include a subdivision of the Chatham Rise at the boundary between SCI 3 and SCI 4A QMAs (180°).

Definitions
For this study *non-target fish species catch* is equivalent to *bycatch*, all fish caught that were not the stated target species for that trawl, whether or not they were discarded (McCaughran 1992). McCaughran's definition of *discarded catch* (or *discards*) as "all the fish, both target and non-target species, which are returned to the sea whole as a result of economic, legal, or personal considerations", is also adopted. *Discarded catch* in this report is defined to also include fish lost from the net at the surface, but excludes fish returned to the sea alive. The *target fisheries for squid and scampi* are defined as all fishing using trawling methods where the target species was recorded as arrow squid (MPI codes SQU, NOS, NOG, or ASQ) or scampi (SCI). Data are analysed by fishing year (1 October to 30 September), for convenience occasionally referred to in figures as, for example, 1991 for the 1990–91 fishing year.

2. METHODS

2.1 Observer data

MPI observers have been making detailed tow by tow records of catch by species or species groups for a portion of the arrow squid and scampi trawl fleet in each year since 1990–91. The allocation of observers on commercial vessels takes into account a range of data collection requirements and compliance issues for multiple fisheries, as well as the capacity of vessels to accommodate additional personnel. It has therefore not always been possible to achieve a perfectly representative or random spread of observer effort in each fishery.

There is a considerable amount of observer data available for this analysis, with about 150–800 observed trawls annually in the scampi fishery, and 600–2900 observed trawls annually in the arrow squid fishery. Some changes in recording and databasing of observer data occurred in the early 2000s with the result that discard information could more readily be assigned to individual tows, and improvements in taxonomic identification became possible with the introduction of a range of finer resolution 3-letter MPI codes. For these reasons it was agreed to restrict the calculation of bycatch and discards to the 2002–03 to 2015–16 period, as this corresponds to a period of greater consistency in the observer data. However, for many of the descriptive summaries and figures in this report the entire 1990–91 to 2015–16 period was examined.

2.1.1 Data preparation and grooming

For the analysis of the scampi and arrow squid trawl fisheries, a dataset was prepared from the MPI observer database *cod*, based on all observed trawls targeting these species for the entire period from 1990–91 to

2015–16. This dataset contains a complete set of catch by species for all relevant trawls. Catches in various categories not being considered in this analysis were removed from the initial extract; e.g., seaweed, birds, marine mammals, reptiles, and rubbish. Records in these categories comprised less than 2% of the total.

All records in the observer dataset were run through a set of checks and operations to ensure consistency, to correct or aid correction of erroneous values where possible, to remove records with missing values in critical fields, and to derive additional variables with the potential to describe patterns in variability of bycatch and discards.

Trawl distance was calculated from the recorded start and finish positions. Records in which a start or finish position was missing were identified and groomed using median imputation. This process substitutes the missing value with an approximate one calculated from the median latitude or longitude for other trawls by the same vessel on the same day, if any exist. Long tows (over 40 km for scampi or over 60 km for arrow squid, in each case approximately the 98$_{th}$ percentile of the distribution of observed trawl distances) were accepted only if in approximate agreement with the tow distance calculated from the recorded tow duration and trawling speed. Trawl distances were then recalculated from a combination of the corrected positions and values derived from the recorded duration and trawling speed.

Trawl durations were derived from the difference between the start and finish times, less the period (recorded by observers) between those times when the net was not fishing, e.g., when the net was lifted off the bottom to avoid foul ground, brought to the surface during turning, or was temporarily left hanging in the water due to equipment malfunction. These trawl durations were then cross-checked with estimates based on the recorded fishing speed and calculated trawl distance. Missing or unusual fishing speed values (outside of the range 2–3.5 knots for scampi, or 3–6 knots for arrow squid) were substituted with values estimated by median imputation. The longest duration trawls (those over 10 h) were replaced by values calculated from trawl distance and fishing speed if this value was less.

Fishing depth was calculated from the average of the recorded start and finish net depths where possible. Unusually shallow or deep fishing depth and bottom depth values were set to the average value for other trawls on the day where possible, and otherwise trimmed to minimums of 25 m (arrow squid) or 200 m (scampi) and a maximum of 800 m (both fisheries). For records where one or both of these values was not recorded, bottom depth was taken from the remaining value or from the seabed depth, if recorded. Less than 1% of scampi trawls were recorded as not being on the seabed at all times, presumably in error for this fishery. About 6% of arrow squid trawls were recorded as not being on the seabed at all times, most of the remainder being midwater or a combination of midwater and bottom trawling. According to the trawl-path codes recorded by observers, most trawls (scampi, 86%; arrow squid, 73%) followed a straight path or a constant depth contour; while 12% of scampi trawls and 25% of arrow squid trawls incorporated a U-turn or zigzag in the trawl path.

Losses of fish from the net can occur through a mixture of burst codends, burst windows/escape panels, and rips in the belly of the net. Observers estimate the amounts “total greenweight on surface” and “total greenweight on board”, and these would sometimes differ if fish were lost from the net, either at or below the surface, but also simply because the observer may have revised their estimate of the total catch once the net was aboard. Valid differences between these values were interpreted here as lost fish and included as part of the discards from the trawl, with corrections made for any obvious recording errors. For example, where the recorded value for “total greenweight on board” was greater than “total greenweight on surface” the weight of fish lost was set to zero unless it was clearly due to a transposition of the two values. These and any other differences in the two recorded values were interpreted as valid fish losses only if they were accompanied by an appropriate code identifying the cause of the loss. Genuine observed cases of lost fish were very rare in these fisheries, occurring in less than 1% of observed tows and accounting for only about 0.1% of the estimated amount of fish brought to the surface across both fisheries. The criteria used to identify erroneous records across a range of fields, and their frequency in the observer data, are given in Table 1.

Table 1: Criteria used to identify likely errors in the observer data, and the number of records that met those criteria for combined arrow squid and scampi target trawls for 1991–2016 fishing years. Missing or outlying values were replaced by values estimated from within the dataset and retained in the analyses.

Field (range)	Number of records
All rows	47 500
Missing/outlying start longitude (< 157° E or < 167° W)	9
Missing/outlying end longitude (< 157° E or < 167° W)	12
Missing/outlying start latitude (< 24° S or > 58° S)	8
Missing/outlying end latitude (< 24° S or > 58° S)	32
Calculated distance missing or > 50 km	1 966
Missing/outlying start gear depths (< 50 m or > 1000 m)	5 643
Missing/outlying start bottom depth (< 50 m or > 1000 m)	1 166
Missing/outlying fishing duration (> 15 h)	180
Missing/outlying fishing speed (< 1 knot or > 6 knots)	712
Fish lost at subsurface missing	1 236
Fish lost at surface missing	1 240

Observer data were available from 22 scampi trawlers and 104 arrow squid trawlers, with length ranges of 20–64 m and 23–106 m, respectively. Information as to whether each vessel operates a meal plant is available from the *cod* database, and this is included in the data extract. No fishing vessel or fishing company is identified in this report.

The weight of each species retained and discarded in each "processing group" was obtained from the observer databases. A processing group is a group of one or more tows for which data about the level of discards and processed catch is available. Usually this represents a single trawl, but because it is not always possible to keep track of the catch from individual trawls once they enter the factory or the processing area of the vessel, processing data from two or more trawls sometimes must be combined into a single processing group. To be able to use the discard information from processing groups comprising more than one tow, species discard weights in these groups were distributed among the composite tows in proportion to the recorded total catch for the relevant tows. Checks were made for records where the redistribution of discards, (and any overall differences in recorded catch and discard amounts), resulted in discard weights exceeding catch weights; where they did, the discard value was set to be equal to the catch.

A further issue in the observer catch data relates to the completeness of catch recording for each tow. Prior to the introduction of the new observer logbooks in 2007 observers would record whether the total catch was ascertained independently or whether a value from the vessel's catch-effort logbook was used. In addition, if the observer was only able to record details of part of the catch composition (e.g. excluding non-target species catch or non-QMS species catch or non-QMS discards) this was also recorded. The coding system for this was complex and examination of records showed that it was not always used correctly by observers, but nevertheless it is apparent that for a portion of the observed tows not all of the catch was accounted for in the two fisheries being examined here. With the introduction of the new observer logbooks recording of this information ceased, apparently due to a strict (and pre-existing) requirement that observer recording must encompass catch and discards for all species in the catch. In our analysis, any tow for which the entire catch was not recorded as having been accounted for in the observer records was excluded from the model input data (see Table 6).

Using the dataset described above, the weights of species caught and discarded in each tow were calculated for the following species categories.

- QMS: All QMS species combined, excluding either scampi or arrow squid depending on the target fishery. The composition of this category expanded over time as species were added to the QMS (Table C1); observers recorded 57 non-target QMS species in the scampi fishery and 88 non-target QMS species in the arrow squid fishery

- Non-QMS: All non QMS fish species combined. The composition of this category contracted over time as species were added to the QMS (Table C1); observers recorded 180 species (scampi fishery) and 223 species (arrow squid fishery) which were non-QMS species at some time

- INV: All non-QMS invertebrate species combined. The composition of this category contracted over time as species were added to the QMS (Table C1); observers recorded 248 INV species or species groups in the scampi fishery and 262 INV species or species groups in the arrow squid fishery

- Individual species/species complexes comprising the main observed bycatch species (defined as having a mean of over 3 t (arrow squid fishery) or 1 t (scampi fishery) observed annually) in each fishery (bycatch only)

  For the arrow squid fishery, this comprised the following 31 species codes, (see Table A1 for species names): BAR, SWA, SPD, RCO, HOK, JMA, WAR, LIN, RBT, SDO, RAT, GIZ, GSH, RSK, STU, HAP, SCH, WWA, JAV, RSO, BSK, SSK, RBM, CAR, SPE, FRO, SSI, NMP, GON, HPB, HAK

  For the scampi fishery, this comprised the following 22 species codes, (see Table B1 for species names): JAV, RAT, SPE, HOK, LIN, GSH, FHD, SPD, SSK, GIZ, RCO, SWA, CDO, RHY, SRH, SSI, HAK, RSK, RSO, BBE, LDO, TOA

The above abbreviations and group names (QMS, non-QMS, INV) are used throughout the remainder of this report along with standard MPI species codes (see http://marlin.niwa.co.nz). Bycatch and discards were estimated separately for each of the combined species categories, and bycatch was estimated for each of the individual species/species group codes.

Summaries of the observed catch and percentage discarded of individual species, broad taxa, and species categories are tabulated in Tables A1–A3, and B1–B3.

2.2 Commercial fishing return data

Catch-effort, daily processed, and landed data were obtained from the MPI catch-effort database "warehou" as extract 10899. The data consist of all fishing and landing events associated with a set of fishing trips that reported a positive catch or landing of scampi or arrow squid species (MPI codes SCI, SQU, NOS, NOG, or ASQ) between 1 October 1989 and 30 September 2016. This included all fishing recorded on Trawl Catch, Effort and Processing Returns (TCEPRs); Trawl Catch Effort returns (TCERs); Catch, Effort and Landing Returns (CELRs) and included high seas versions of these forms (HS-TCEPRs and or HS-CELRs). Data were groomed for errors using checking and imputation algorithms developed in R (R Core Team 2016). Tow positions, trawl length and duration, fishing speed, and depths were all groomed in this manner, primarily employing median imputation and range checks to identify and deal with missing or unlikely values and outliers, in a similar procedure to that used for observer data. The initial extract included all records from any trip which included any targeting of arrow squid or scampi; Table 2 summarises the trimming and grooming of these records to sets appropriate for the analyses. A combination of observer records and landings data was used to determine the use of meal plants on each vessel. All records were assigned to the area definitions as illustrated in Figure 1 using the recorded position coordinates or General Statistical Areas.

Table 2: Details of data corrections by record removal during the grooming process of commercial catch-effort data for the arrow squid and scampi target trawl fisheries combined. 'Records retained/ removed' are the number of unique records retained/removed at each step; 'Trips' is the number of unique trips; and 'Catch' is the total greenweight of all species remaining in the catch-effort dataset after each step in the grooming process.

			Effort	
Step	**Records retained**	**Records removed**	**Trips**	**Catch (t)**
Original extract	1 546 961	–	117 811	8 100 371
Remove 2017 data	1 535 687	11 274	117 379	8 052 447
Trawl (MW and BT) only	1 483 662	52 025	113 346	7 997 680
Target SQU or SCI only	304 977	1 178 685	8 511	1 426 558
Fishing years 2002–03 to 2015–16 only	133 042	171 935	3 990	769 934
Position info complete	133 035	7	3 990	769 854

It is possible to use these commercial catch data to directly estimate the total annual non-target catch in each fishery, as both the total catch and target species catch (unless it is outside of the top five species by weight and therefore generally small) are recorded for each tow or group of tows. Such estimates are provided here for comparison with the observer-based estimates and are somewhat appealing because, in contrast to the observer-based estimates, no scaling is required. However, a study of the New Zealand ling longline fishery, comparing commercial catch reports between observed and unobserved vessels, casts some doubt on the use of this approach. This study indicated that under-reporting and non-reporting of bycatch species had been common, in that fishery at least; for example, they found that only a quarter of the catch of the main bycatch species (spiny dogfish) was reported between 2001 and 2004 (Burns & Kerr 2008). This method also has the limitation that because only the top five or eight species by weight were recorded, it is not possible to properly estimate the bycatch of individual species or groups of species.

2.3 Stratification

Area as a predictor variable has proven to be an important driver of bycatch and discard rates in all of the offshore fisheries examined, and it is becoming increasingly useful for these analyses to also provide breakdowns for standardised fishery areas, as illustrated in the 2015 Aquatic Environment and Biodiversity Annual Review (Ministry for Primary Industries 2016b). For these reasons we selected fishing year and area as the primary strata for analyses of both the squid and scampi fisheries, with additional variables included as appropriate in the squid model structure. From empirical explorations of the data, it was clear that net type (mid-water versus bottom trawl) was an important determinant of bycatch and discards in the squid fishery, and whether or not a meal plant was present was important for the discard level. These covariates were therefore included in the models of bycatch and discard rates for squid. Area strata were adjusted slightly to separate the two major scampi fisheries on the Chatham Rise (Figure 1).

Each record in the observer and commercial effort datasets was assigned to an area as described above and illustrated in Figure 1. The number of observed trawls in each area over the 14 years examined is shown in Table 3.

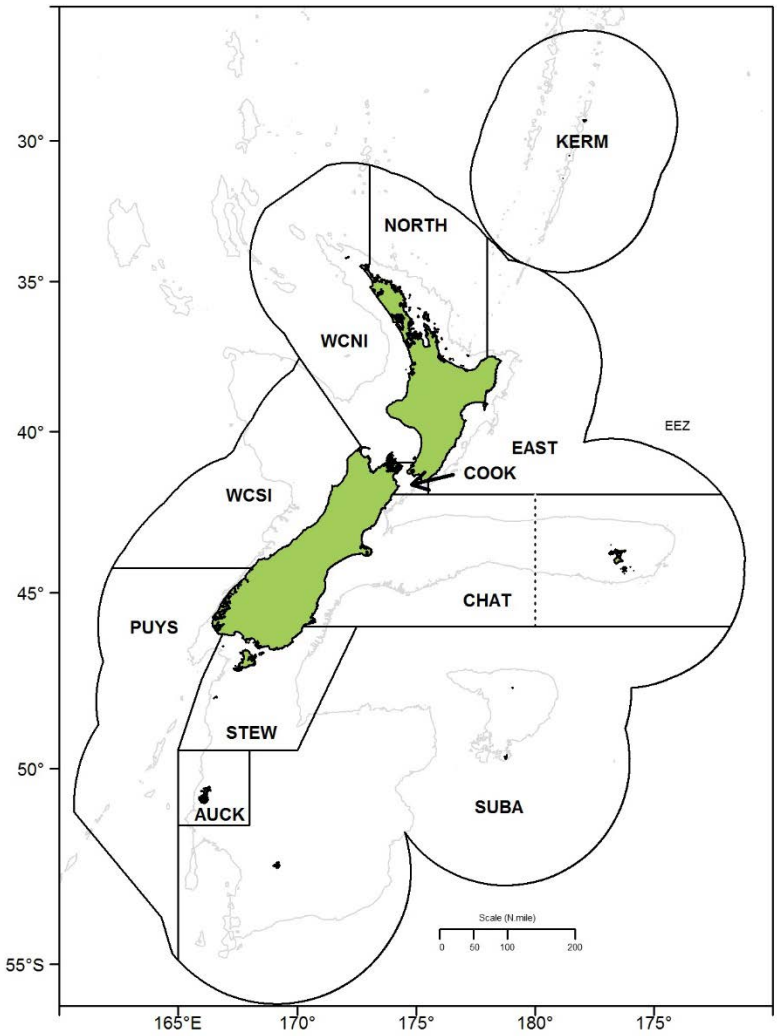


Figure 1: Standardised assessment areas for estimation of total non-protected fish and invertebrate bycatch in offshore fisheries: KERM, Kermadecs; NORTH, Northern North Island; WCNI, West Coast North Island; East, East Coast North Island; COOK, Cook Strait; WCSI, West Coast South Island; CHAT, Chatham Rise; PUYS, Puysegur; STEW, Stewart-Snares Shelf; AUCK, Auckland Islands; SUBA, sub-Antarctic. The grey lines indicate the 1000 m isobaths; the dashed line in area CHAT indicates the division between SCI 3 (at the western end of CHAT) and SCI 4A (at the eastern end of CHAT) QMAs used in the scampi analyses.

Table 3a: Number of observed trawls targeting arrow squid by standard area (see Figure 1 for area boundaries) and fishing year.

Fishing year	CHAT	NORTH	PUYS	AUCK	STEW	SUBA	WCNI	WCSI	Total
2002–03	51	0	309	413	495	20	2	0	1 290
2003–04	3	1	0	406	727	18	0	0	1 155
2004–05	57	0	62	780	1344	1	0	0	2 244
2005–06	9	1	6	674	626	0	0	0	1 316
2006–07	28	4	1	535	684	0	0	1	1 253
2007–08	1	0	0	588	853	2	0	0	1 444
2008–09	1	0	1	751	509	0	0	0	1 262
2009–10	1	0	1	299	747	1	0	0	1 049
2010–11	14	0	16	541	670	2	0	0	1 243
2011–12	4	0	1	540	762	2	0	0	1 309
2012–13	12	0	27	880	1 319	4	0	0	2 242
2013–14	4	0	79	612	1 071	1	0	0	1 767
2014–15	65	1	23	558	1 047	1	0	0	1 695
2015–16	119	0	57	1 259	922	2	0	0	2 359

Table 3b: Number of observed trawls targeting scampi by standard area (see Figure 1 for area boundaries) and fishing year.

Fishing year	CHAT3	CHAT4	COOK	EAST	NORTH	PUYS	AUCK	STEW	SUBA	WCNI	WCSI	Total
2002–03	256	70	0	29	0	2	150	1	0	0	0	508
2003–04	204	33	0	0	5	0	166	0	0	0	0	408
2004–05	62	14	0	15	51	0	0	0	0	0	0	142
2005–06	72	25	0	0	114	0	118	0	0	0	2	331
2006–07	107	45	1	29	106	0	101	0	0	0	0	389
2007–08	183	0	0	101	146	0	93	0	0	0	0	523
2008–09	203	0	0	39	88	0	60	0	0	0	0	390
2009–10	105	0	0	27	122	0	91	0	0	0	0	345
2010–11	115	0	0	63	150	0	207	0	0	0	0	535
2011–12	43	57	0	174	66	0	118	0	0	0	0	458
2012–13	113	5	0	16	0	0	136	0	0	0	0	270
2013–14	92	0	0	3	103	0	52	0	4	0	0	254
2014–15	255	84	0	0	0	0	0	0	0	0	0	339
2015–16	6	0	0	0	72	0	65	0	0	0	0	143

2.4 Calculation of bycatch and discards

2.4.1 Statistical model structure

The bycatch and discard data (observed values, y in kilogram units per observed tow) are characterised by a large number of zero catches. We therefore constructed a model using a zero-inflated statistical distribution:

$$f(y_i|x_i, \boldsymbol{\gamma}, \boldsymbol{\beta}) = f_B(0|x_i, \boldsymbol{\gamma}).I(y_i) + (1 - f_B(0|x_i, \boldsymbol{\gamma}))f_{LN}(y_i|y_i > 0, x_i, \boldsymbol{\beta})$$

where $f_B(0|z_i, \boldsymbol{\gamma}) = 1 - \pi$ is the Bernoulli probability of obtaining a zero catch, $f_{LN}(y_i|y_i > 0, x_i, \boldsymbol{\beta})$ is the log-Normal probability of observed non-zero value y, and $I(y)$ is an indicator function equal to one for a zero catch and zero otherwise (e.g. Zeileis et al. 2008). The regression equations for the Bernoulli probability and (unconditional) expected value respectively can be written as:

$$logit(\pi_i) = \gamma_0 + x_i'\boldsymbol{\gamma}$$

$$\mu_i = \pi_i \,.\exp(\beta_0 + x_i'\boldsymbol{\beta} + \sigma^2/2)$$

Parameterisation of the model therefore involved estimation of the intercept terms β_0 and γ_0, and coefficient vectors $\boldsymbol{\beta}$ and $\boldsymbol{\gamma}$, for observed values y and design matrix row vector x_i. In all cases the design matrix was the same for both model parts. The coefficient vectors included year and area effects (plus net type and meal plant for the squid model). However, because the species composition of the bycatch/discard categories has changed over time as species were added to the QMS, it was necessary to have separate area effects for each 'period' over which the species composition was constant. This was included in the model as an area-period interaction. Year and area-period coefficients were treated as normally distributed random effects with the σ terms estimated in a hierarchical framework. The log-Normal observation error term was also estimated. Other model covariates, specifically the net type and meal plant covariates for the squid models, were treated as fixed effects and given wide (non-informative) priors (i.e. the σ terms for these covariates were fixed at an arbitrarily large value). The priors can therefore be summarised as follows:

$$\{\gamma_0, \beta_0\} \sim Normal(0, 1000)$$

$$\{\boldsymbol{\gamma}, \boldsymbol{\beta}\} \sim N(0, \boldsymbol{\sigma}^2)$$

$$\boldsymbol{\sigma} \sim Cauchy(0, 1)$$

Bayesian estimation was performed in the R-package **rstan** (Stan Development Team, 2016). Estimated coefficients for year and area effects allowed us to predict the total catch per strata for a specified degree of commercial effort *E* in area-period strata *a, p* and year strata *t*. The residual commercial effort was first calculated for each area/year strata combination by subtracting the total observed effort from the total commercial effort for that same strata. The residual commercial catch (i.e. the predicted catch from unobserved commercial effort) is then:

$$\log\left(\hat{y}_{a,p,t}^{residual}\right) = \hat{\beta}_0 + \hat{\beta}_{a,p} + \hat{\beta}_t + \log\left(\frac{\exp\left(\hat{\gamma}_0 + \hat{\gamma}_{a,p} + \hat{\gamma}_t\right)}{1 + \exp\left(\hat{\gamma}_0 + \hat{\gamma}_{a,p} + \hat{\gamma}_t\right)}\right) + \log\left(E_{a,p,t}^{residual}\right) + \frac{\sigma^2}{2}$$

from which the total catch could be calculated:

$$\hat{y}_{a,p,t}^{total} = y_{a,p,t}^{observed} + \hat{y}_{a,p,t}^{residual}$$

If any strata contained no data, which was true for some areas, the regression coefficients could not be estimated and the priors were not updated. This is equivalent to setting that particular coefficient value to zero with some uncertainty for predictive purposes. The total bycatch per year was simply a summation across areas and periods:

$$\hat{y}_t^{total} = \sum_a \sum_p \hat{y}_{a,p,t}^{total}$$

All model runs were checked visually for convergence of the MCMC chain, and uncertainty was estimated as the 95% credibility interval of the posterior distribution of $\hat{y}_t^{total}$.

2.5 Analysis of temporal trends in bycatch and discards

Annual estimates of bycatch and discards in each species category and overall (with confidence intervals) were plotted for the whole time-series, for each fishery. In addition, annual bycatch of the major individual QMS and non-QMS species, as defined above (see Section 2.1.1), were also estimated; for this exercise, non-informative species codes (e.g., FIS, unidentified fish; UNI, unidentified; and MIX, mixed fish), in total accounting for less than 3 t of catch for the whole dataset, were not considered.

Locally weighted regression lines were calculated and shown on plots for the main categories to highlight overall patterns of change over time. In addition, to provide an indication as to the long-term trend in annual amounts, linear regressions (with lognormal errors) were also produced. The direction and steepness of the slopes of these lines were determined and the significance of the difference of these slopes from a slope of zero (indicating no trend) was tested.

3. RESULTS

3.1 Distribution and representativeness of observer data

For the 26-year period as a whole there has been a large amount of observer data collected in both fisheries. In the arrow squid fishery there have been more than 35 000 observed tows, by 104 vessels. The annual level of observer coverage in relation to the whole fishery has been variable but generally over 20% by catch weight and has increased since the 1990s, particularly from 2012–13 when 100% observer coverage has been sought for Foreign Charter Vessels (FCVs) which have been common in this fishery (Table 4). In the smaller

scampi fishery, there have been about 10 000 observed tows in the last 26 years, from 22 vessels. Observer coverage has been at a relatively lower level in this fishery, with an average of 8.5% of the total commercial catch observed during the period (Table 4). Low coverage may be partly due to difficulties in accommodating observers on the relatively small vessels, although the fraction of the scampi fishery associated with vessels that have never hosted an observer is no more than 4% in any of the five main areas (Table 5). The requirement for 100% coverage on FCVs may also have adversely affected observer availability in this fishery, where vessels are typically locally owned, with particularly low coverage in the most recent four years, including only 2.1% in 2015–16. The fraction of trips observed each year is not presented in Table 4, as an observer 'trip' is not necessarily equivalent to a 'trip' as recorded by the commercial catch-effort system and short trips may be less likely to be observed.

Table 4: Summary of effort and estimated catch in the target trawl fisheries for arrow squid and scampi, for observed tows and overall, by fishing year. Trips include those with any recorded target tows for arrow squid/scampi.

Arrow squid fishery

Fishing year	Number of trawls		Number of vessels		Number of trips		Arrow squid target catch		Percentage observed	
	Observed	All	Observed	All	Observed	All	Observed	All	Catch	Trawls
1990–91	1 163	11 483	9	62	9	175	3 230	27 566	11.7	10.1
1991–92	571	8 273	8	66	8	193	3 148	43 738	7.2	6.9
1992–93	1 563	8 277	14	61	16	177	5 746	28 900	19.9	18.9
1993–94	1 050	10 280	11	64	13	315	6 571	62 556	10.5	10.2
1994–95	715	11 005	7	70	7	284	3 776	61 216	6.2	6.5
1995–96	736	10 284	9	68	9	253	2 235	28 478	7.8	7.2
1996–97	1 184	10 370	17	62	17	237	5 032	40 985	12.3	11.4
1997–98	849	8 110	12	53	14	253	3 287	31 724	10.4	10.5
1998–99	983	8 017	16	62	17	277	2 848	22 100	12.9	12.3
1999–2000	859	5 655	12	43	13	217	3 466	17 392	19.9	15.2
2000–01	2 882	8 075	25	50	39	381	16 606	31 246	53.1	35.7
2001–02	1 470	7 475	12	47	15	302	11 567	43 303	26.7	19.7
2002–03	1 290	8 408	18	54	22	337	8 154	37 648	21.7	15.3
2003–04	1 155	8 336	20	45	20	281	15 250	76 661	19.9	13.9
2004–05	2 244	10 488	24	53	30	325	20 904	73 317	28.5	21.4
2005–06	1 316	8 537	22	53	22	333	11 262	62 169	18.1	15.4
2006–07	1 253	5 891	23	47	28	303	21 443	62 086	34.5	21.3
2007–08	1 445	4 236	20	34	26	204	20 563	51 136	40.2	34.1
2008–09	1 262	3 832	23	34	25	141	15 477	42 931	36.1	32.9
2009–10	1 049	3 783	16	37	24	173	8 229	29 214	28.2	27.7
2010–11	1 243	4 209	20	39	35	175	11 418	33 277	34.3	29.5
2011–12	1 309	3 489	15	36	33	177	11 877	30 828	38.5	37.5
2012–13	2 242	2 628	18	28	68	98	20 088	21 418	93.8	85.3
2013–14	1 767	2 051	15	21	62	79	11 970	13 341	89.7	86.2
2014–15	1 695	1 939	17	26	54	98	13 550	13 912	97.4	87.4
2015–16	2 359	2 851	20	37	59	171	37 485	39 291	95.4	82.7
All years	35 654	177 982	104	275	684	5 925	295 180	1 026 433	28.8	20.0

Table 4: Continued

Scampi fishery

Fishing year	Number of trawls		Number of vessels		Number of trips		Scampi target catch		Percentage observed	
	Observed	All	Observed	All	Observed	All	Observed	All	Catch	Trawls
1990–91	351	4 144	6	16	7	104	34	464	7.3	8.5
1991–92	547	5 800	7	16	7	115	153	900	17.0	9.4
1992–93	403	5 336	5	16	7	109	94	892	10.5	7.6
1993–94	804	5 194	7	15	14	96	132	924	14.3	15.5
1994–95	400	3 891	6	10	9	89	143	860	16.6	10.3
1995–96	272	3 529	3	10	4	73	66	877	7.5	7.7
1996–97	319	3 625	5	11	6	77	87	899	9.7	8.8
1997–98	289	3 522	6	11	7	85	89	928	9.6	8.2
1998–99	485	4 440	6	11	7	112	134	961	13.9	10.9
1999–2000	417	4 775	6	11	8	120	100	940	10.6	8.7
2000–01	265	4 987	5	12	6	127	48	915	5.2	5.3
2001–02	592	6 731	7	15	14	190	114	903	12.6	8.8
2002–03	508	5 133	8	19	8	148	136	783	17.4	9.9
2003–04	408	3 753	6	17	6	63	117	733	16.0	10.9
2004–05	142	4 646	3	9	3	84	32	840	3.8	3.1
2005–06	331	4 865	6	9	6	80	60	795	7.5	6.8
2006–07	389	5 135	6	10	8	81	56	773	7.2	7.6
2007–08	523	4 803	5	11	8	88	63	607	10.4	10.9
2008–09	390	3 973	5	9	5	63	67	550	12.2	9.8
2009–10	345	4 250	5	8	6	61	47	641	7.3	8.1
2010–11	535	4 443	6	8	9	69	82	689	11.9	12.0
2011–12	458	4 509	4	8	8	68	70	652	10.7	10.2
2012–13	270	4 538	3	9	4	78	42	641	6.6	5.9
2013–14	254	4 421	4	9	4	77	37	720	5.1	5.7
2014–15	339	4 423	3	10	4	86	73	813	9.0	7.7
2015–16	143	5 206	3	10	3	97	19	893	2.1	2.7
All years	10 179	120 072	22	46	169	2 367	2 096	20 593	10.2	8.5

Table 5: Summary statistics for the arrow squid and scampi target trawl fisheries, by area, including observer coverage and aspects of data quality for fishing years 2002–03 to 2015–16 (e.g. number of tows with positional data).

Arrow squid fishery

Area	Median vessel length (m)	Total effort: Number of tows	Total effort: Percent of tows observed	Percent of tows with position data	Percent of tows by vessels never observed
STEW	68.8	35 184	33.5	100	3.0
AUCK	74.5	20 810	42.5	100	2.2
CHAT	32.7	7 036	5.2	100	57.0
PUYS	61.0	2 518	23.2	100	1.8
SUBA	74.5	805	6.7	100	9.1
WCNI	42.4	158	1.3	100	86.1
WCSI	56.0	110	0.9	100	41.8
NORTH	26.5	60	11.7	100	40.0
COOK	32.8	2	0.0	100	100.0
EAST	42.7	2	0.0	100	0.0
Other	51.9	3 993	0.0	100	49.7

Table 5: Continued

Scampi fishery

Area	Median vessel length (m)	Total effort: Number of tows	Total effort: Percent of tows observed	Percent of tows with position data	Percent of tows by vessels never observed
CHAT3	25.0	20 718	8.8	100	2.8
AUCK	25.0	16 872	8.0	100	3.1
NORTH	23.7	11 591	8.8	98	3.5
EAST	25.0	9 427	5.3	99	2.9
CHAT4	25.3	4 470	7.4	100	1.1
WCSI	24.9	258	0.0	99	1.6
SUBA	25.0	210	1.9	100	6.2
STEW	25.0	159	0.6	29	71.1
PUYS	25.0	110	1.8	33	67.3
COOK	25.0	53	1.9	100	0.0
WCNI	25.0	13	0.0	100	0.0
Other	25.3	217	0.0	1	15.7

The spatial distribution of target trawl fishing effort for arrow squid fisheries between 1 October 2002 and 30 September 2016 is shown for all commercial tows and all observed tows in Figure 2. For the 14-year period as a whole, observer coverage was spread across the main arrow squid fisheries in areas AUCK, STEW, and PUYS, but there was relatively little coverage of the large fishery off the East Coast South Island and western end of the Chatham Rise (CHAT) and of the smaller fisheries around the North Island and west coast of the South Island. Fishing was sporadic in these smaller fisheries, however, and relatively low after 2006–07 when more complete spatial coverage of all fishery areas was achieved.

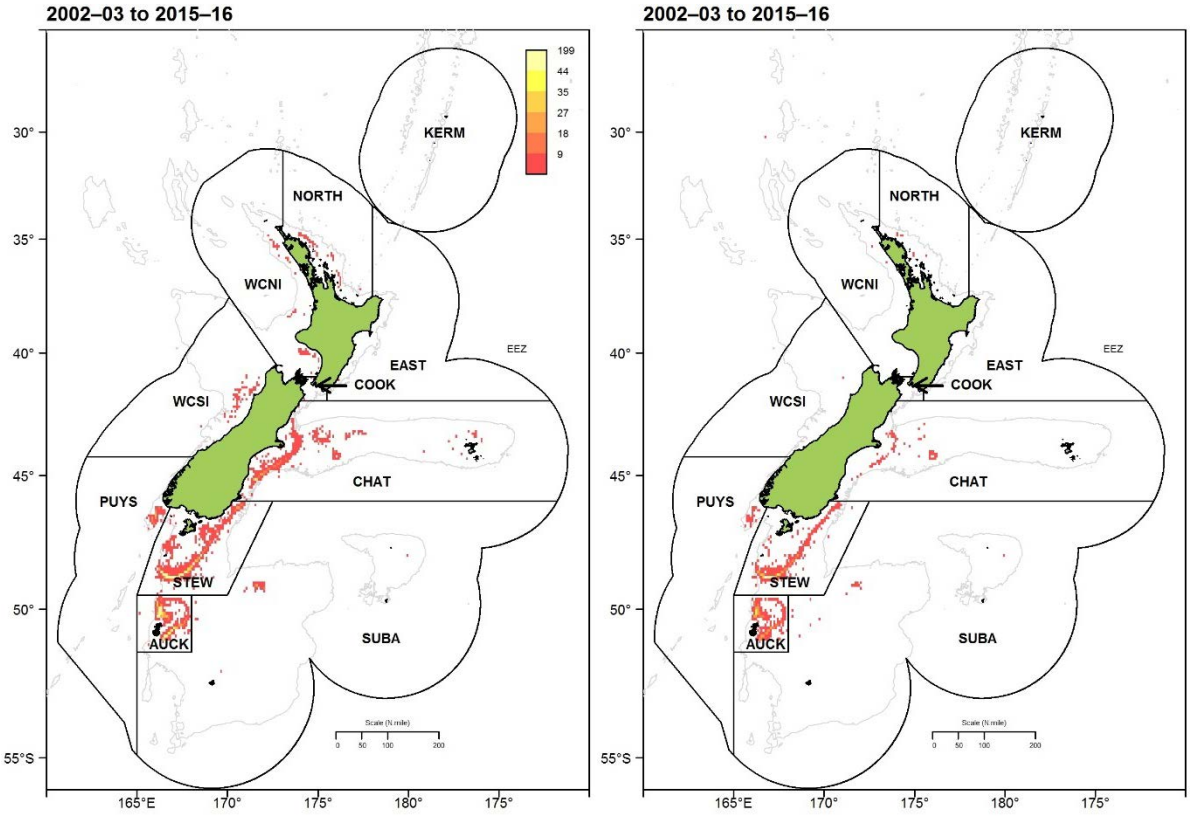


Figure 2a: Density plots showing the distribution of all commercial arrow squid tows with recorded position data (left) and all arrow squid tows recorded by observers (right), for fishing years 2002–03 to 2015–16. The legend indicates the average number of tows per year in each 0.1˚ cell; solid lines mark the boundary of the EEZ and areas used in the analyses; dashed lines indicate the approximate 1000 m isobaths.

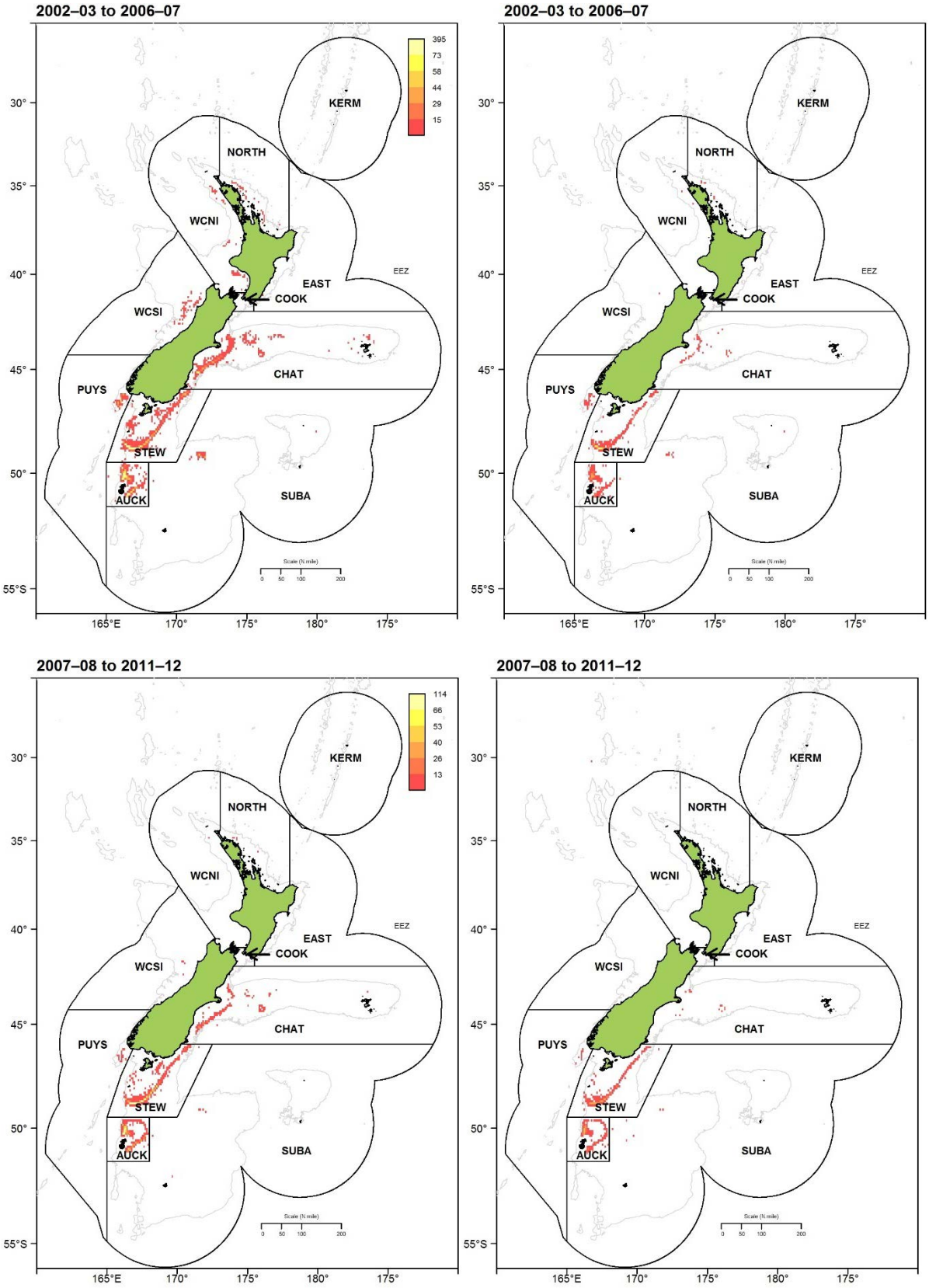


Figure 2b: Density plots showing the distribution of all commercial arrow squid tows with recorded position data (left) and all arrow squid tows recorded by observers (right), by blocks of years. The legend indicates the average number of tows per year in each 0.1˚ cell. See Figure 2a caption for more details.

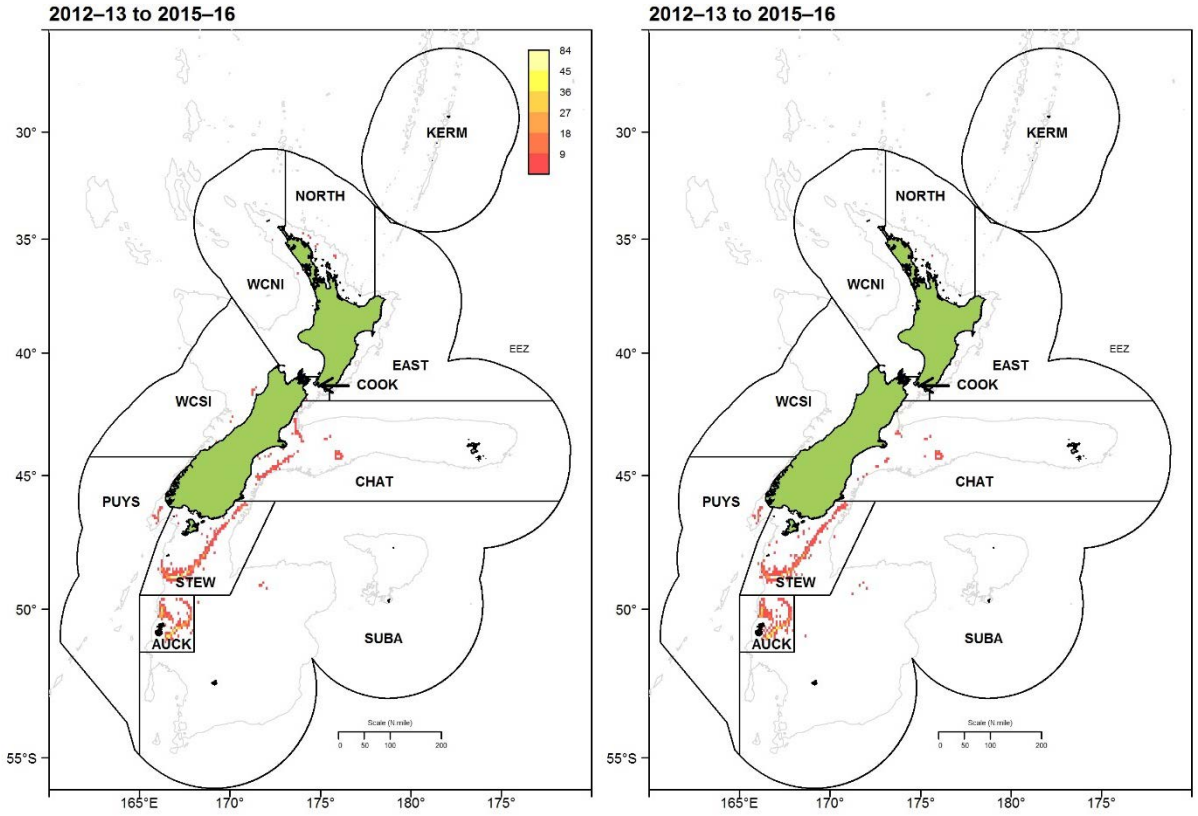


Figure 2b: continued.

The spatial distribution of target trawl fishing effort for scampi fisheries between 1 October 2002 and 30 September 2016 is shown for all commercial tows and all observed tows in Figure 3. Observer coverage for the entire period was well spread across the major scampi fisheries off the east coast of the North Island (areas NORTH and EAST), the western Chatham Rise (CHAT), and the Auckland Islands (AUCK), with smaller fisheries on the eastern Chatham Rise, in the southwest (PUYS), and off the west coast South Island in WCSI less well covered. These smaller fisheries have been more sporadically fished however, with observer coverage in approximate proportion to their importance, while all the main fisheries have been well observed in each of the 5-year periods examined (Figure 3).

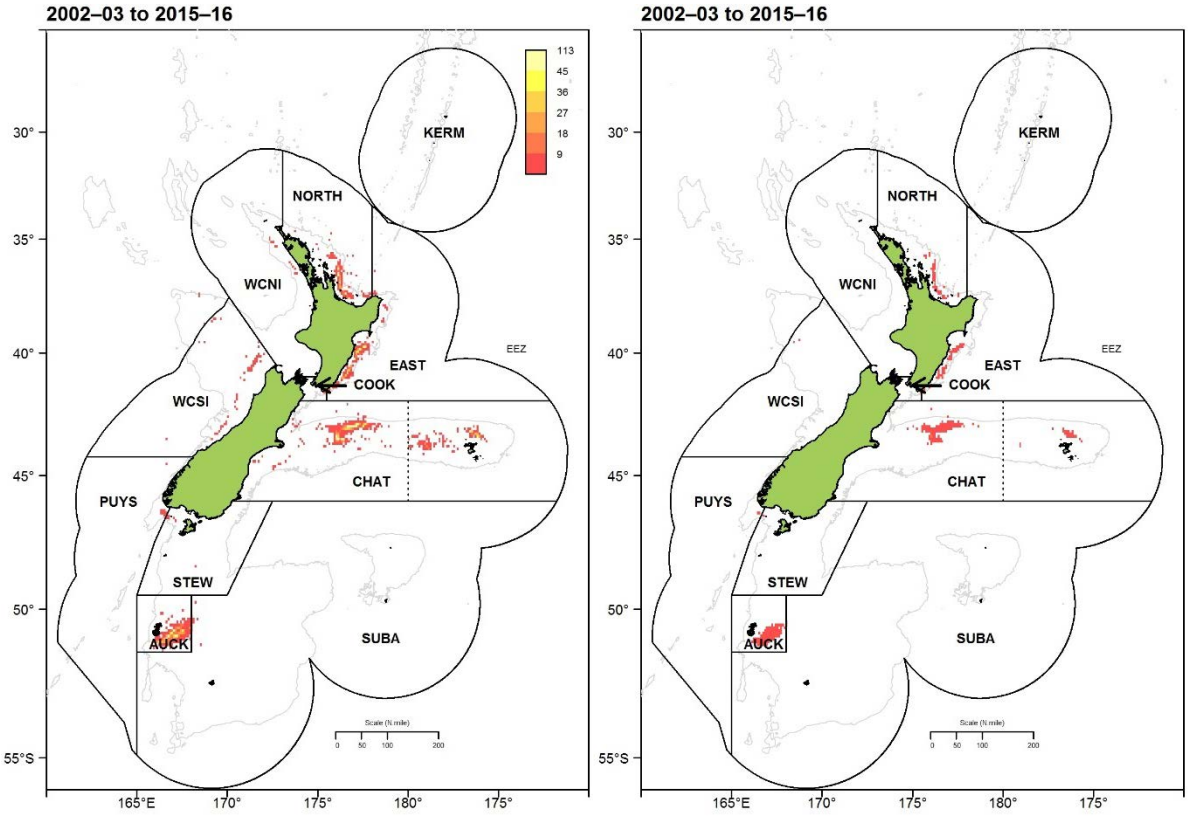


Figure 3a: Density plots showing the distribution of all commercial scampi tows with recorded position data (left) and all scampi tows recorded by observers (right), for fishing years 2002–03 to 2015–16. The legend indicates the average number of tows per year in each 0.1° cell; solid lines mark the boundary of the EEZ and areas used in the analyses (the dotted line on the Chatham Rise indicates the boundary between SCI 3 and SCI 4A QMAs); grey lines indicate the approximate 1000 m isobaths.

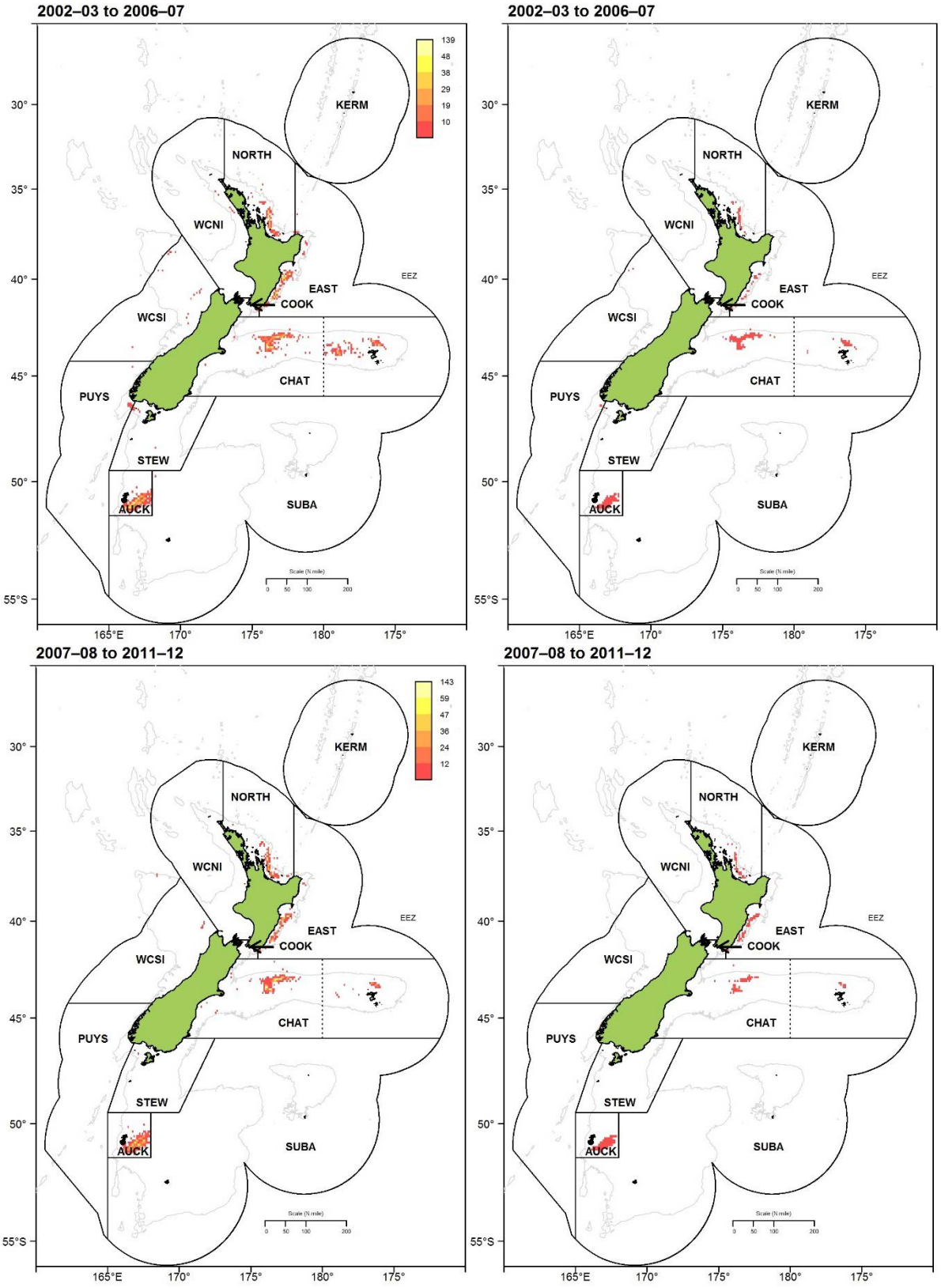


Figure 3b: Density plots showing the distribution of all commercial scampi tows with recorded position data (left) and all scampi tows recorded by observers (right), in blocks of years. The legend indicates the average number of tows per year in each 0.1° cell. See Figure 3a caption for more details.

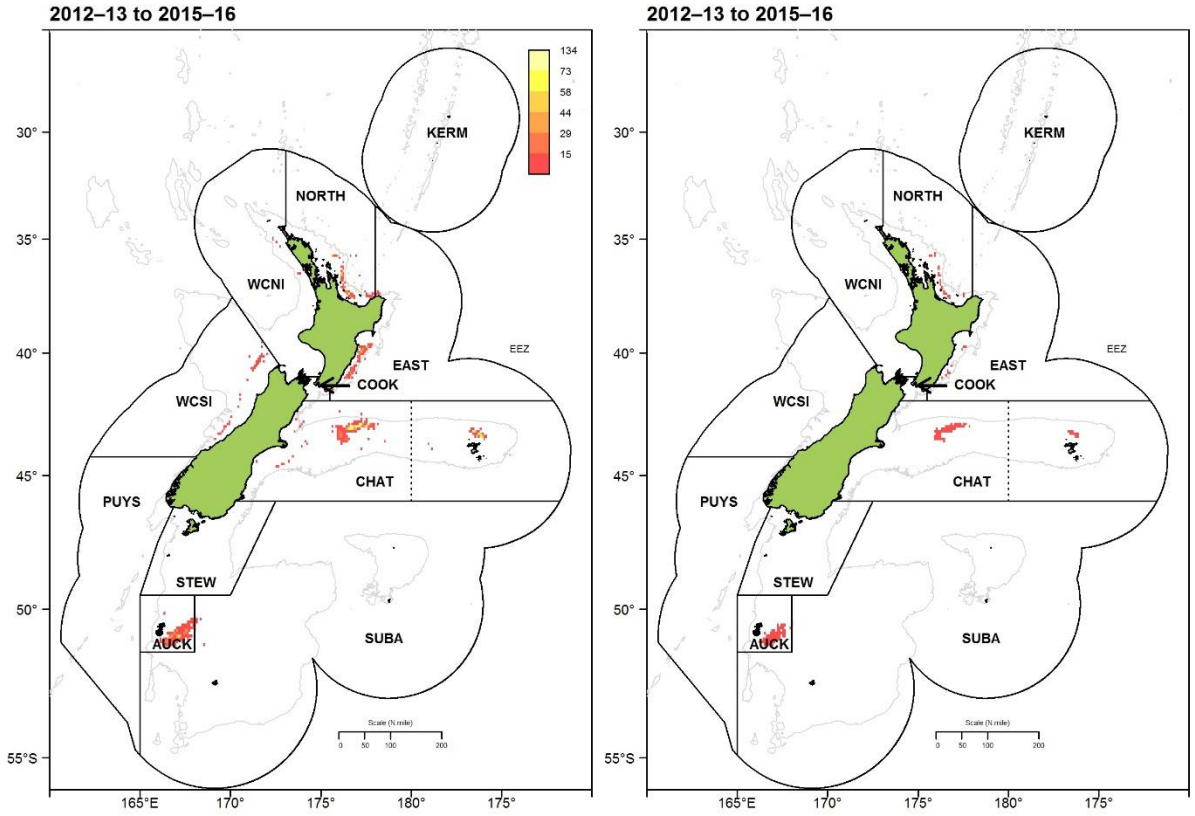


Figure 3b: continued.

To more objectively assess the spatial observer coverage, a comparison of the latitude and longitude of observed tows with all commercial tows recorded with position data was produced using density plots (Figures 4 and 5).

For arrow squid (Figure 4) the spread of observed trawls over the longitudinal and latitudinal extent of the fishery was very well matched in most years since 2002–03. A small level of oversampling is evident in southwestern areas centred around about 52° S (AUCK and STEW fisheries) up to 2009–10, but not in subsequent years when observer coverage was at its highest. A small amount of over-sampling in these southwestern fisheries and under-sampling in the east coast South Island fishery around 45° S (part of CHAT) is evident for the 14-year period as a whole.

For scampi (Figure 5) spatial observer coverage was well matched to all fishing effort over all years as well as in most individual years and periods, despite the relatively low level of coverage in this fishery. Poorer representation was achieved in some periods, however, especially 2004–05 to 2005–06, 2010–11 to 2011–12, and 2014–15 to 2015–16, when the main fisheries on the Chatham Rise (CHAT, centred on about 43° S), and at lower latitudes in Wairarapa (EAST), and Bay of Plenty (NORTH) were sometimes over-sampled or under-sampled, and the Auckland Islands fishery (AUCK, South of 50° S) was sometimes over-sampled.

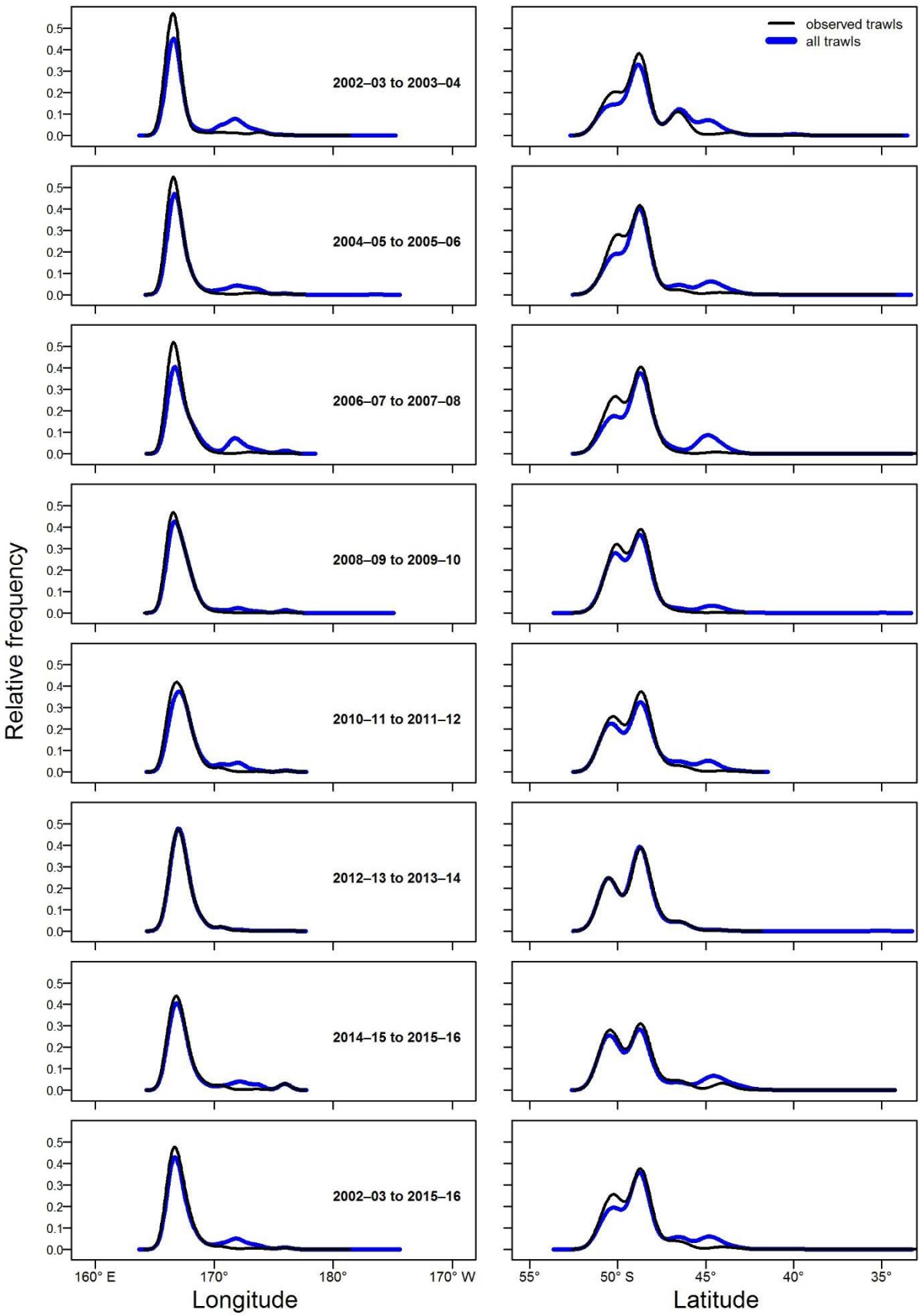


Figure 4: Comparison of start positions (latitude and longitude) of observed tows with those of all commercial tows in the target arrow squid trawl fishery, by blocks of two fishing years and for all years combined. The relative frequency was calculated from a density function which used linear approximation to estimate frequencies at a series of equally spaced points.

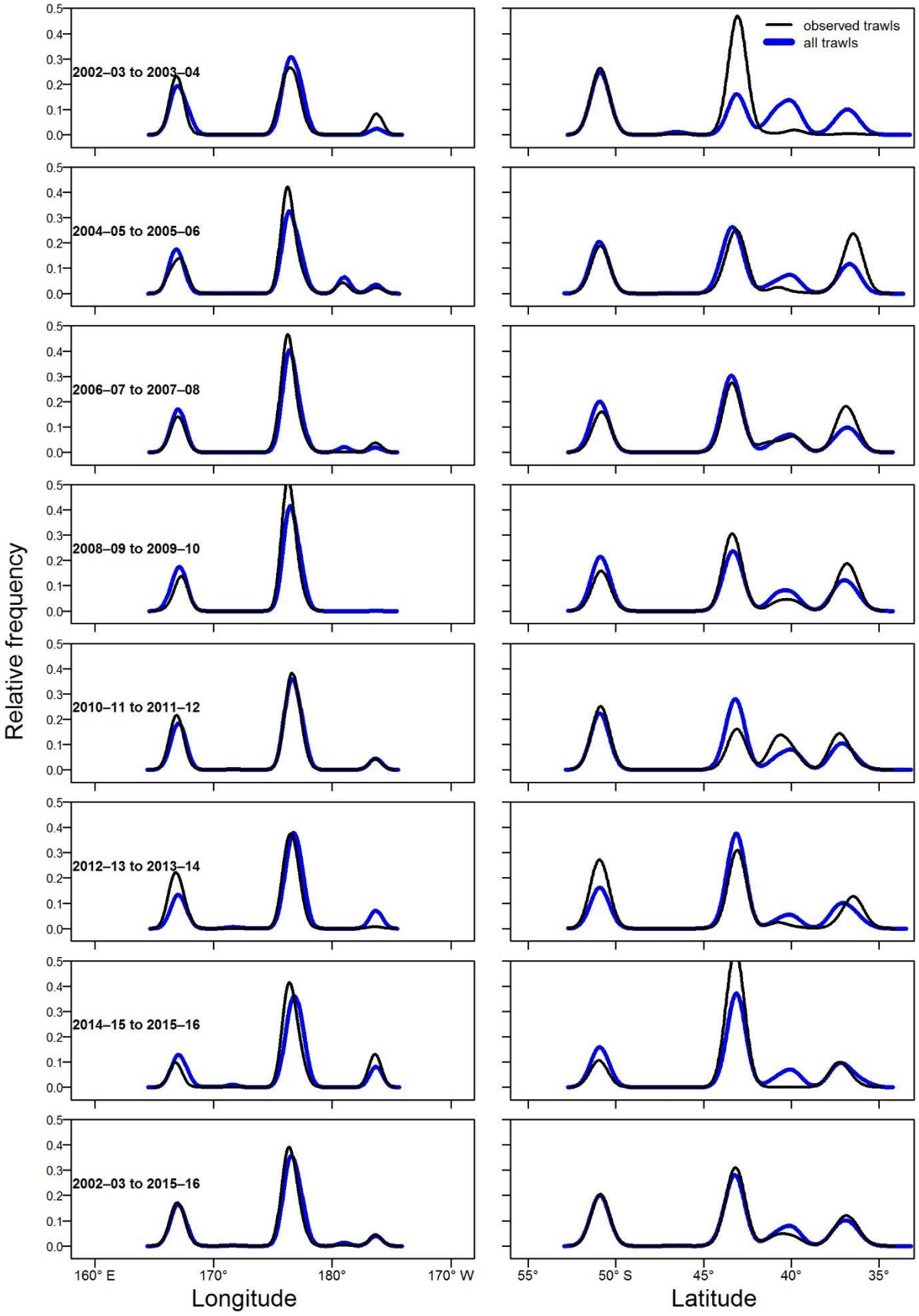


Figure 5: Comparison of start positions (latitude and longitude) of observed tows with those of all commercial tows in the target scampi trawl fishery, by blocks of two fishing years and for all years combined. The relative frequency was calculated from a density function which used linear approximation to estimate frequencies at a series of equally spaced points.

Comparisons made between vessel sizes in the commercial fleets and the observed portion (Figures 6 and 7) showed that, across all years, the full range of vessel sizes was well covered by observers in both fisheries.

There was a wide range of vessel sizes in the arrow squid fishery, ranging from about 200 t to 4400 t, with the bulk of the effort over the 26 years coming from vessels of 300–2500 t and 4400–4500 t. The largest vessels (mainly about 4400 t) were over-sampled compared with vessels of other sizes in many years, and for all years it was the smallest vessels (less than about 400 t) which were under-sampled (Figure 6). Vessel size is strongly linked to fishing area in this fishery; the largest vessels are mainly associated with the Auckland Islands fishery in areas AUCK, STEW, and SUBA whereas the smaller fisheries in CHAT, WCNI and WCSI are fished mainly by smaller vessels (see Table 5).

In the scampi fishery, the size range of vessels was much smaller than in the arrow squid fishery, most vessels falling within the 200–700 t range, with effort by larger vessels (about 1800 t) occurring in 2002–03 and 2003–04, coinciding with the period of competitive quotas in this fishery (see also Figure 9 and related text). The level of observer coverage over the range of vessel sizes was appropriate in most years, although there was some over-sampling of 500–700 t vessels between 2002–03 and 2004–05, and over-sampling of the largest vessels in 2003–04 (Figure 7). There is a link between vessel size and fishing area in the scampi fishery, with some smaller vessels better able to access fishing grounds in the Bay of Plenty (NRTH) and eastern North Island (EAST), although the larger vessels contribute more effort so that median vessel size across all tows differs only slightly among regions (see Table 5).

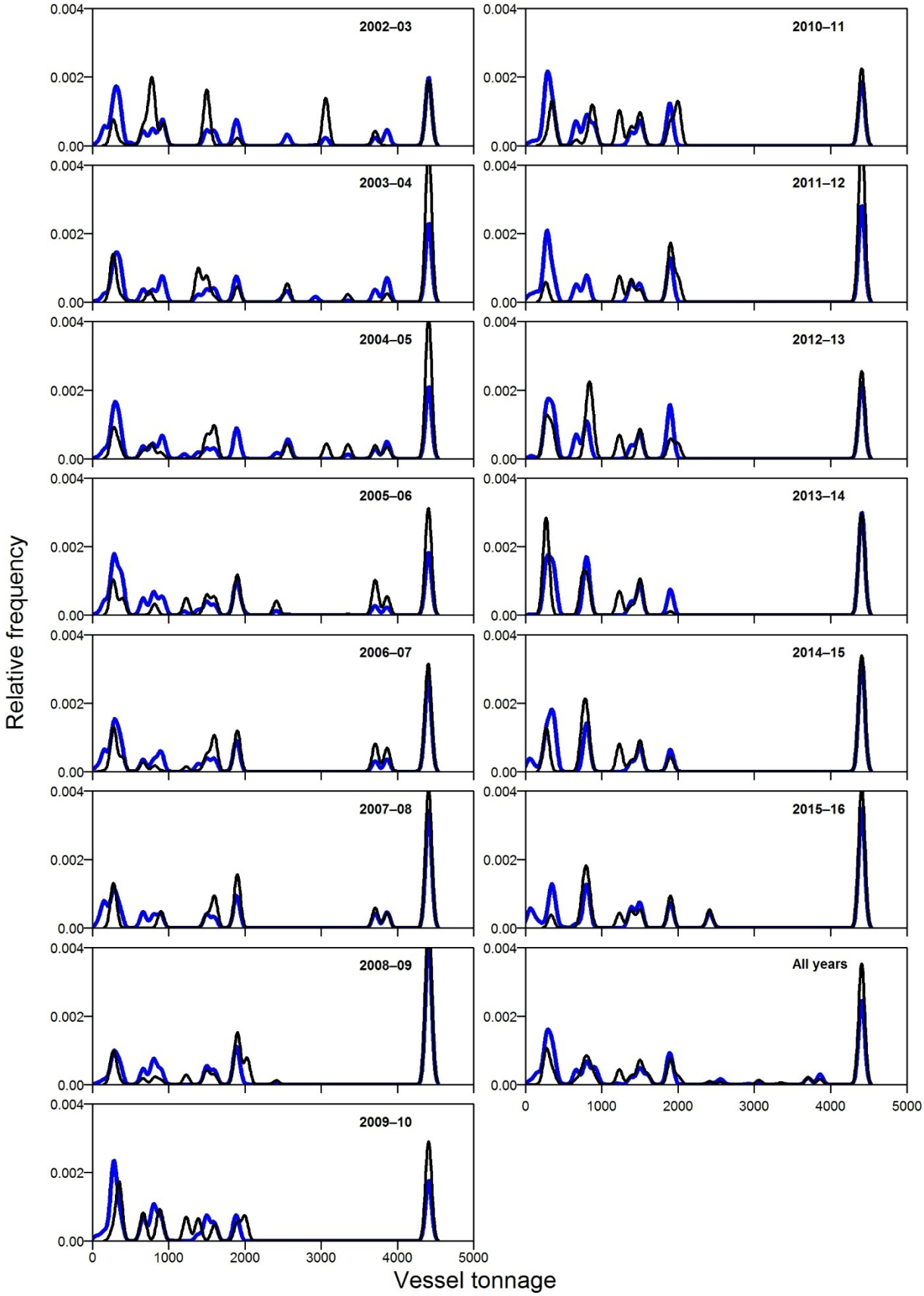


Figure 6: Comparison of vessel sizes (Gross Register Tonnage) in observed tows vs all recorded commercial tows for fishing years from 2002–03 to 2015–16 and for all years combined, in the arrow squid trawl fishery. The relative frequency of the numbers of tows was calculated from a density function which used linear approximation to estimate frequencies at a series of equally spaced points.

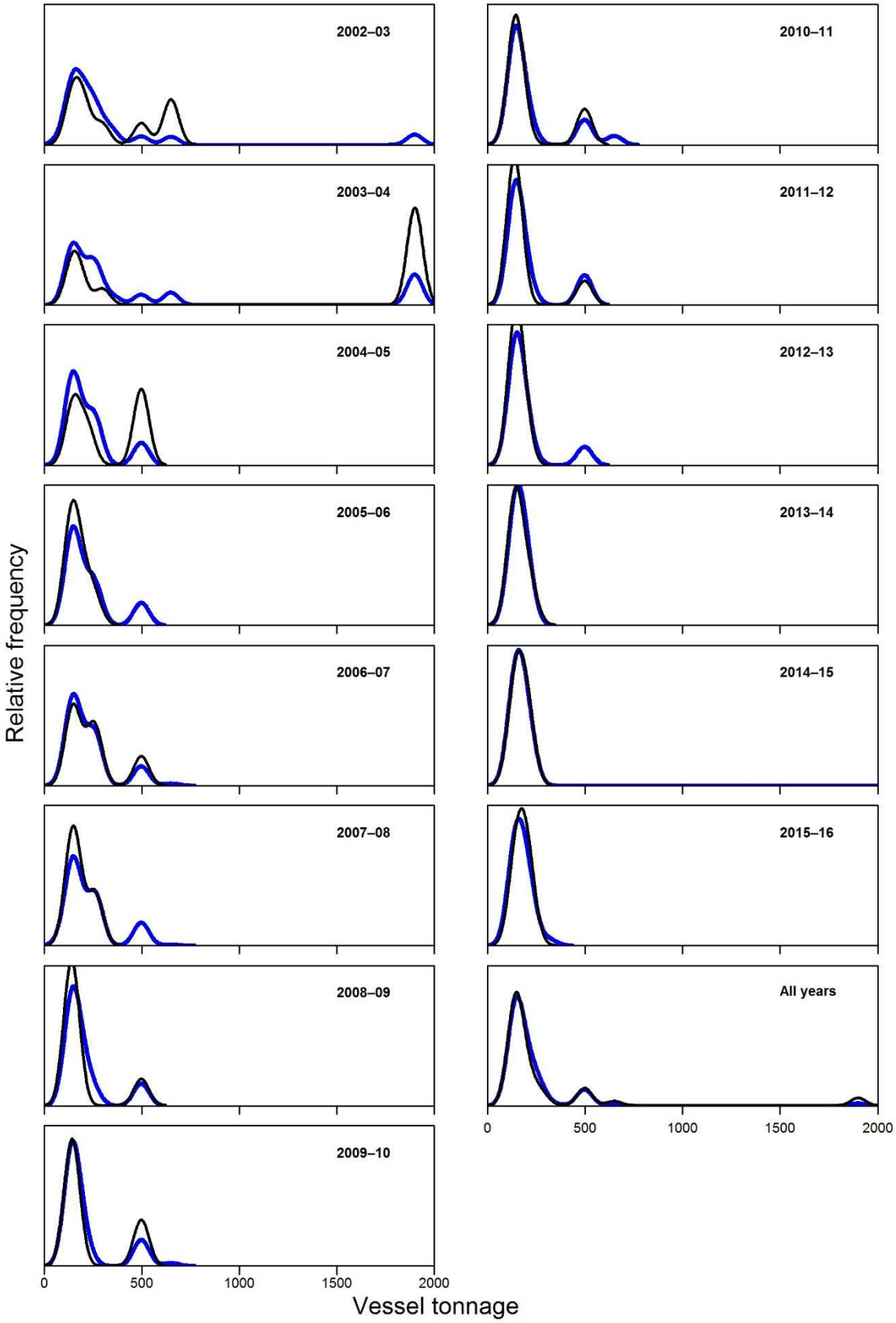


Figure 7: Comparison of vessel sizes (Gross Register Tonnage) in observed tows vs all recorded commercial tows for fishing years from 2002–03 to 2015–16 and for all years combined, in the scampi trawl fishery. The relative frequency of the numbers of tows was calculated from a density function which used linear approximation to estimate frequencies at a series of equally spaced points.

The spread of observer effort throughout each fishing year was compared with the spread of total effort in each fishery by applying a density function to the numbers of trawls per day (Figures 8 and 9).

Commercial fishing in the arrow squid trawl fishery is strongly seasonal (Figure 8), beginning in late December in most years and building to a peak of effort during February and March before tapering off slowly over the following three months. Observer effort has tended to be more focussed on the central period, with often very high level of coverage in February and March and under-sampling in other months, particularly January. Coverage has been ideal since about 2012–13, however, due to the greatly increased observer presence.

In contrast to the arrow squid fishery, effort in the scampi fishery has been relatively even throughout the year in most years (Figure 9). Notable exceptions to this occurred in 2002–03 and 2003–04 when effort was strongly concentrated into the first half of the fishing year, a situation influenced by the competitive quota system in place at this time. Observer effort was not so evenly spread, and was characterised in most years by short bursts of intense coverage, at variable times. Occasionally, e.g. in 2010–11, coverage was more evenly spread, with longer periods of observer coverage, but this was the exception. Considering all years combined, there was slight over-sampling of the early part of the fishing year followed by a period of slight under-sampling, then near ideal sampling effort over the second half of the fishing year.

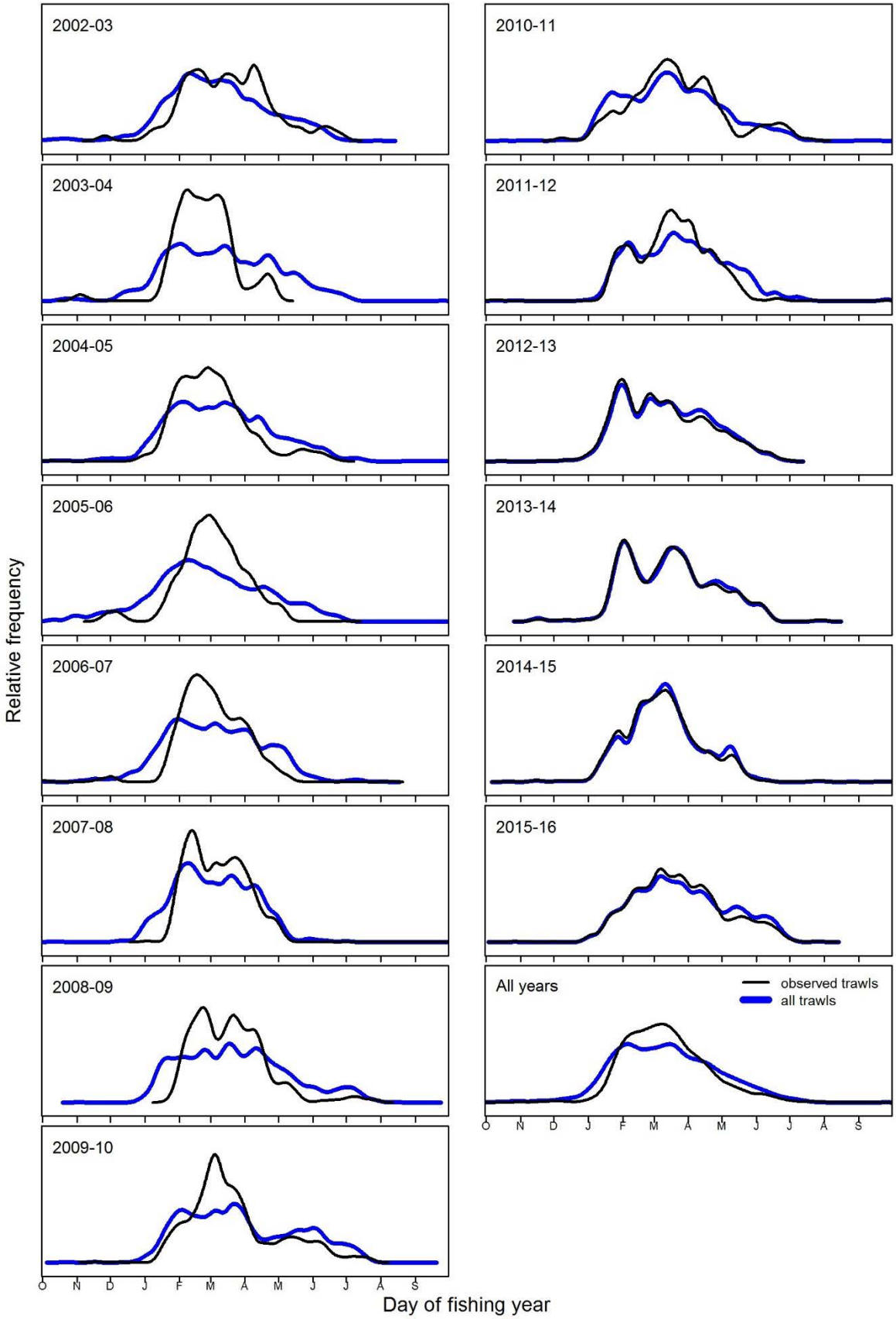


Figure 8: Comparison of the temporal spread of observed arrow squid tows with all arrow squid tows for fishing years from 2002–03 to 2015–16 and for all years combined. The relative frequency of the numbers of tows was calculated from a density function which used linear approximation to estimate frequencies at a series of equally spaced points.

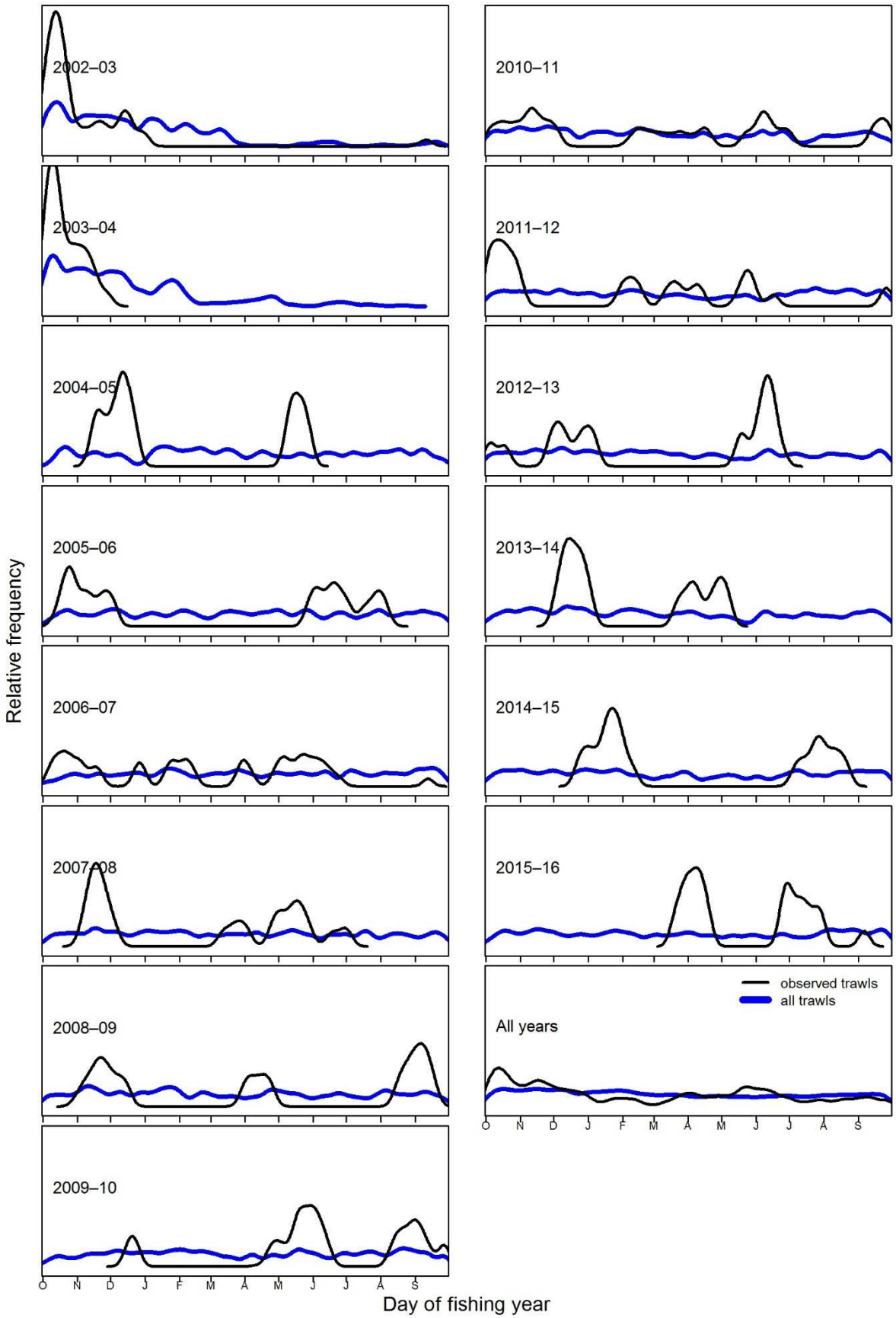


Figure 9: Comparison of the temporal spread of observed scampi tows with all scampi tows for fishing years from 2002–03 to 2015–16 and for all years combined. The relative frequency of the numbers of tows was calculated from a density function which used linear approximation to estimate frequencies at a series of equally spaced points.

3.2 Completeness of observer catch recording for individual tows

Prior to the introduction of new observer logbook forms in 2007, observers recorded the "*greenweight_method*" by which the contents of the trawl catch were accounted for. This code allowed for the possibility that for any individual trawl, not all of the various components of the catch (as separated by species and processing method) were recorded. This complex three-part code could indicate whether the recorded "total greenweight on board" was based on the observer's own records or the vessel's catch effort logbook, whether only the target species, or target species plus QMS species catch, was recorded, and whether processed, mealed, and discarded catch was accounted for. The estimation method and perceived reliability of the estimation were also incorporated into the code. The new observer logbook (2007) form dispensed with recording *greenweight_method* as it was believed that observers should always account for all of the catch from each trawl, and generally always have.

Examination of the *greenweight_method* codes used by observers in the arrow squid and scampi trawl fisheries showed that they were frequently used incorrectly, with many invalid codes. However, some interpretation and simplification of all codes that did not clearly indicate full catch and discard recording into a single category indicated that a substantial fraction of observed trawls in each fishery between 2002–03 and 2006–07 may not have fully accounted for all of the catch (Table 6).

To examine this further, the difference in the recorded total non-target catch between nominally "All recorded" and "Not all recorded" trawls was made for each fishery for the fishing years prior to 2007–08. A comparison of means (log transformed) showed a significant difference in both fisheries, but not in a consistent way. For the scampi fishery, the mean non-target catch was higher in "All recorded" trawls than in "Not all recorded" trawls, as may be expected if some catch data was not accounted for. However, in the arrow squid fishery the reverse was true, with the "Not all recorded" category having significantly greater catch. The analyses were then run with non-QMS catch in place of total catch, for each fishery, with the same outcomes.

In summary, the *greenweight_method* code does appear to have some influence on the degree of catch recording, but the results of these tests were equivocal, and may be confounded by different interpretations and use of these codes by individual observers. It may be that in some cases, e.g., for larger catches or catches with numerous bycatch species and processing streams, observers are aware that one or two very minor bycatch species have been missed and coded this appropriately, and in other cases observers have missed more of the catch and the record for the trawl is more seriously deficient.

To be conservative, all records for which not all details were recorded were excluded from the dataset used in the analyses of bycatch and discards, for both fisheries. This may, however, introduce some bias if the differences noted are real, but this would be countered if there had been a change in observer practice with introduction of the new forms in 2007 so that they more rigorously accounted for all catch and discards.

Table 6: Summary of "greenweight_method" recording practices by observers in the arrow squid and scampi fisheries. Observers either recorded all details of catch and discards for each trawl, or some component (e.g. non-QMS discards) was omitted. New observer logbooks forms, introduced in 2007, do not record this information as observers are instructed to record all aspects of catch and discards.

Scampi fishery														
Fishing year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
All catch/discard details recorded	344	302	62	177	297	0	0	0	0	0	0	0	0	0
Not all details recorded	164	106	80	154	34	0	0	0	0	0	0	0	0	0
Unknown	0	0	0	0	58	523	390	345	535	458	270	254	339	143
Total	508	408	142	331	389	523	390	345	535	458	270	254	339	143

Arrow squid fishery														
Fishing year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
All catch/discard details recorded	997	879	1 723	946	816	0	0	0	0	0	0	0	0	0
Not all details recorded	293	275	520	370	436	0	0	0	0	0	0	0	0	0
Unknown	0	1	1	0	1	1 445	1 262	1 049	1 243	1 309	2 242	1 767	1 695	2 359
Total	1 290	1 155	2 244	1 316	1 253	1 445	1 262	1 049	1 243	1 309	2 242	1 767	1 695	2 359

3.3 Bycatch data

3.3.1 Overview of raw bycatch data

Arrow squid fishery

Nearly 600 bycatch species or species groups were identified by observers in the arrow squid target trawl fishery, most being non-commercial species, including invertebrate species, caught in low numbers (see summaries in Tables A1–A3, and Figure 10). Arrow squid accounted for about 79% of the total estimated catch from all observed tows targeting arrow squid between 1 Oct 2001 and 30 Sep 2016. The main bycatch species were barracouta (9.1%), silver warehou (3.3%), spiny dogfish (1.7%), and red cod (*Pseudophycis bachus*) (1.2%) (Figure 10). Spiny dogfish was the fish species with the largest quantity of discarding in this fishery, with the majority discarded. Other species frequently caught and usually discarded included silver dory, giant spider crabs (*Jacquinotia edwardsii*), and rattails.

The smooth red swimming crab (*Nectocarcinus bennetti*) was the fifth most common bycatch species, by weight: these, along with the giant spider crab and unidentified crabs, were the only invertebrate groups in the top 30 bycatch taxa. All these crabs were mostly discarded. Of the other invertebrate groups, salps (Thaliacea), the hairy red swimming crab (*N. antarcticus*), and jellyfish (Scyphozoa) were also frequently caught, and discarded. Overall, crustaceans were the main invertebrate bycatch species group caught (1.2%), with other groups accounting for only a small fraction of the total catch (see Table A2 for a list of the main observed invertebrate bycatch species).

Many invertebrates, in particular corals, echinoderms, and crustaceans, were identified to species, especially in the more recent records. This is due to the continuously improving knowledge of the New Zealand marine invertebrate fauna, both in general and specifically by fisheries scientists and observers, and the availability of high quality invertebrate identification guides (e.g. Tracey et al. 2011). See Tables A1 and A2 for a list of the main observed bycatch species and Table A3 for a summary by higher taxonomic group.

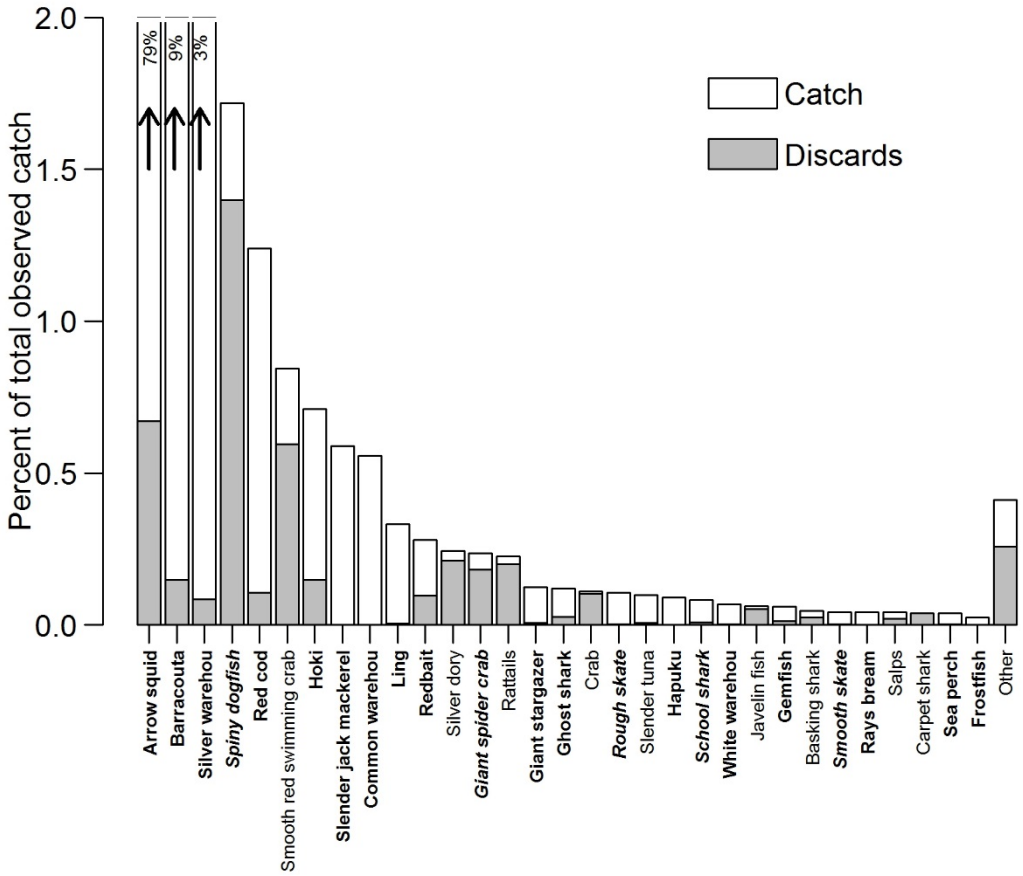


Figure 10: Percentage of the total catch contributed by the main bycatch species (those representing 0.02% or more of the total catch) in the observed portion of the target arrow squid trawl fishery for fishing years 2002–03 to 2015–16, and the percentage discarded. The Other category is the sum of all bycatch species representing less than 0.02% of the total catch. Names in bold are QMS species, names in italics are QMS species which can be legally discarded under Schedule 6 of the Fisheries Act (1996).

Exploratory plots were prepared to examine bycatch per tow (plotted on a log scale) with respect to other relevant available variables, including depth, duration, vessel, fishing year, month, area, nationality, trawl type, and start time (Figures 11–14). Plots were prepared using data from all fishing years (i.e. 2002–03 to 2015–16) and by species category (ALL species, QMS species, non-QMS species, and invertebrates).

Total bycatch per tow was highly variable between trawls, ranging from 0 to 85 t (Figure 11). Total bycatch per trawl increased with increasing trawl duration. Most tows (95%) were less than 10 hours in duration but longer tows were often made and the longest were over 15 h. Trawling was mostly (92%) between bottom depths of 150 m and 400 m but fishing to 600 m was not uncommon. Total bycatch increased slightly with increasing bottom depth, from medians of about 700 kg per trawl at a depth of 180 m to about 1.5 t per trawl at a depth of 450 m. There were large differences in bycatch between the 23 vessels represented by more than 250 records before tows with no bycatch were removed, with medians ranging from about 150 kg per trawl to about 2600 kg per trawl, but no clear difference in bycatch with vessel size. There was no overall change in total bycatch per tow from year to year through the series but variations in bycatch between months showed decreasing bycatch from the start of the season in December through to a minimum in March, followed by increasing bycatch after the end of the season. Japanese and Korean vessels had slightly greater bycatch than vessels of other nationalities, but this signal was not strong. There were larger differences in bycatch levels between the areas examined, median bycatch was lowest in AUCK (about 200 kg per trawl) and highest in the adjacent STEW (about 1200 kg per trawl). There was lower bycatch from midwater trawls than from bottom trawls, and bycatch was slightly greater in trawls where the completeness of catch recording

was unknown compared with trawls for which observers recorded that all catch and discarding was accounted for. The start time of the trawl had little discernible effect on total bycatch amounts.

Patterns of bycatch for QMS species in relation to these variables were similar to those for total bycatch (Figure 12), as the great majority of bycatch in this fishery comprises QMS species.

Bycatch of non-QMS species show similar patterns to total bycatch and QMS species bycatch, for most of the fishery parameters examined, but with much lower values (Figure 13). It is notable, however, that non-QMS bycatch decreased after 2002–03 when a number of bycatch species were added to the QMS.

Invertebrate species bycatch, the smallest bycatch category in terms of catch weight, shows some slightly different patterns to the other categories: catches decrease slightly with increasing depth, and the highest levels of invertebrate bycatch are in area AUCK (Figure 14).

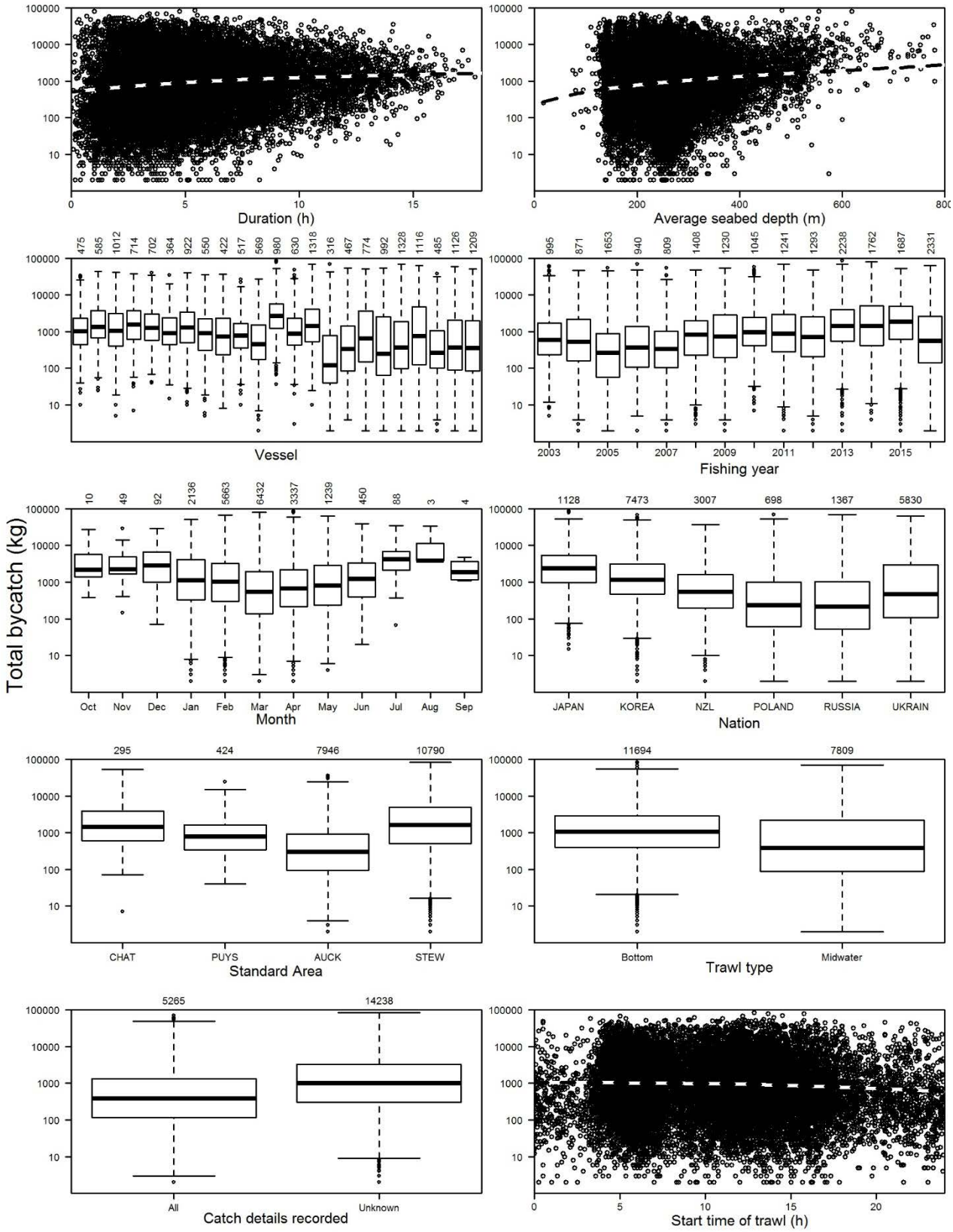


Figure 11: Total observed bycatch (all species) in kg per tow plotted against selected variables in the arrow squid trawl fishery for the fishing years 2002–03 to 2015–16, on a log scale. The dashed lines in the scatterplots represent mean fits (using a locally weighted regression smoother) to the data. The box and whisker plots show medians and lower and upper quartiles in the box, whiskers extending up to 1.5 × the interquartile range, and outliers individually plotted. The numbers above the plots indicate the number of records (tows) associated with that level of the variable. In the vessel plot, vessels are ordered by size, from shortest to longest. Average depth is the average of the start and finish depths of the tow. See Figure 1 for area codes.

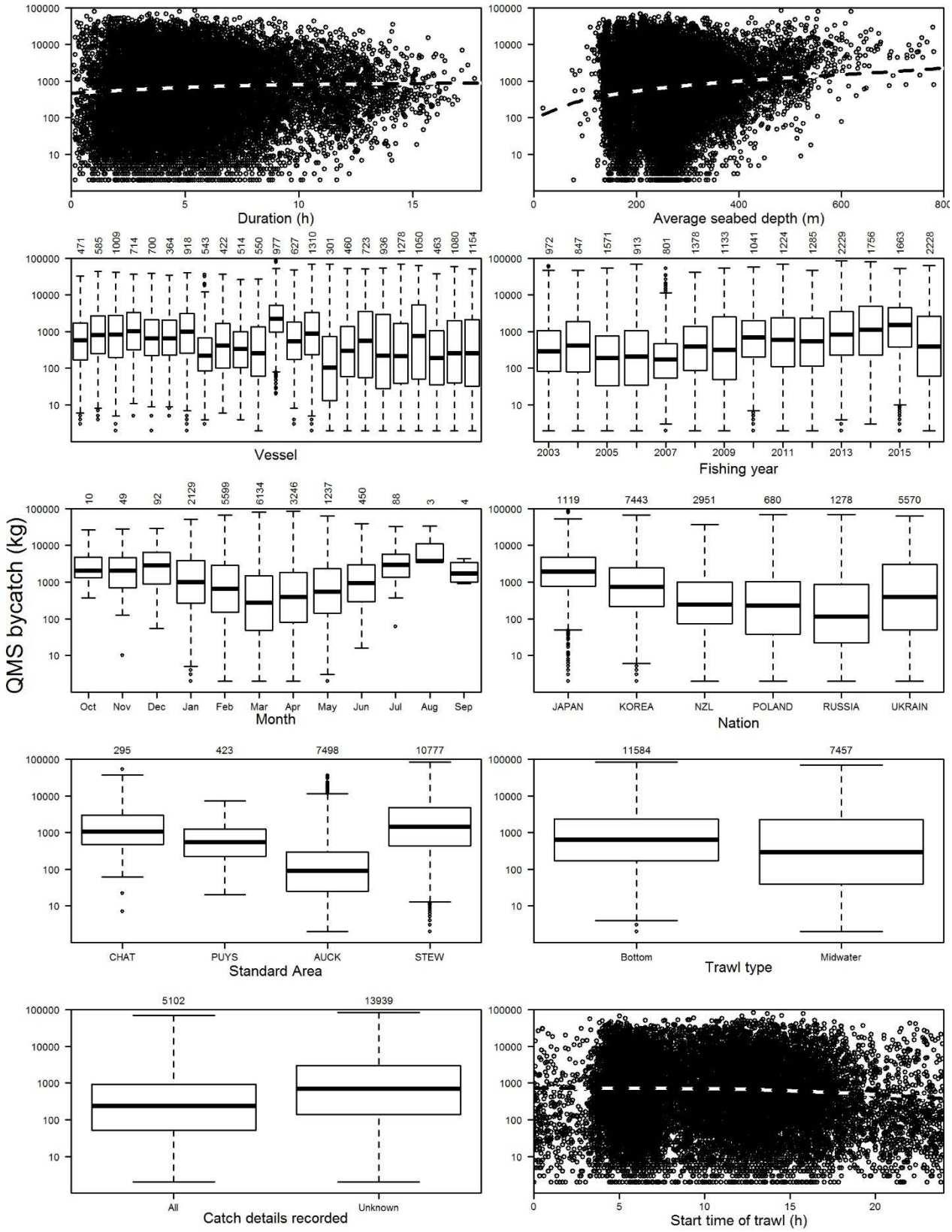


Figure 12: QMS species bycatch in tonnes per tow plotted against selected variables in the arrow squid trawl fishery for the fishing years 2002–03 to 2015–16, on a log scale. See Figure 11 for further details.

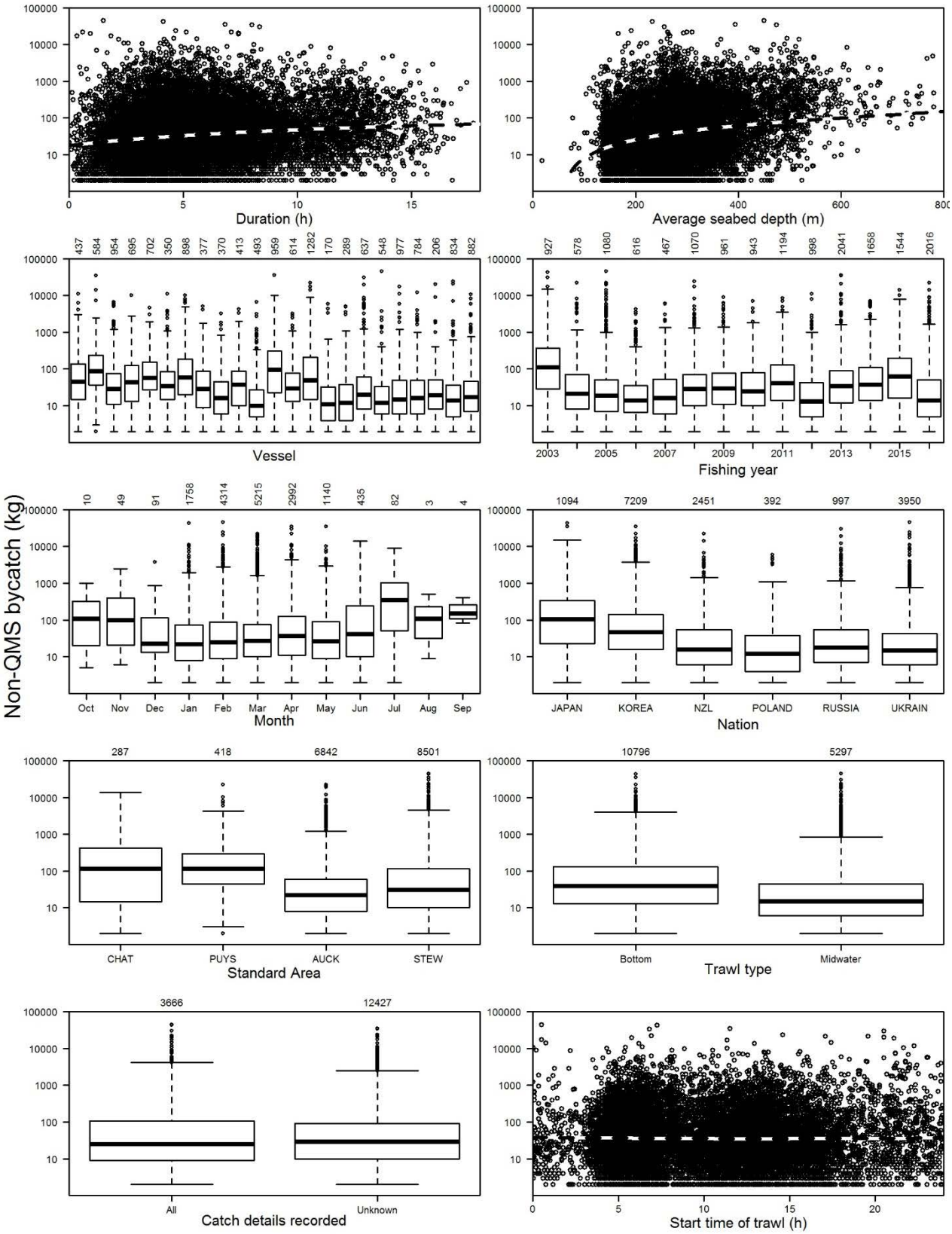


Figure 13: Non-QMS species bycatch in tonnes per tow plotted against selected variables in the arrow squid trawl fishery for the fishing years 2002–03 to 2015–16, on a log scale. See Figure 11 for further details.

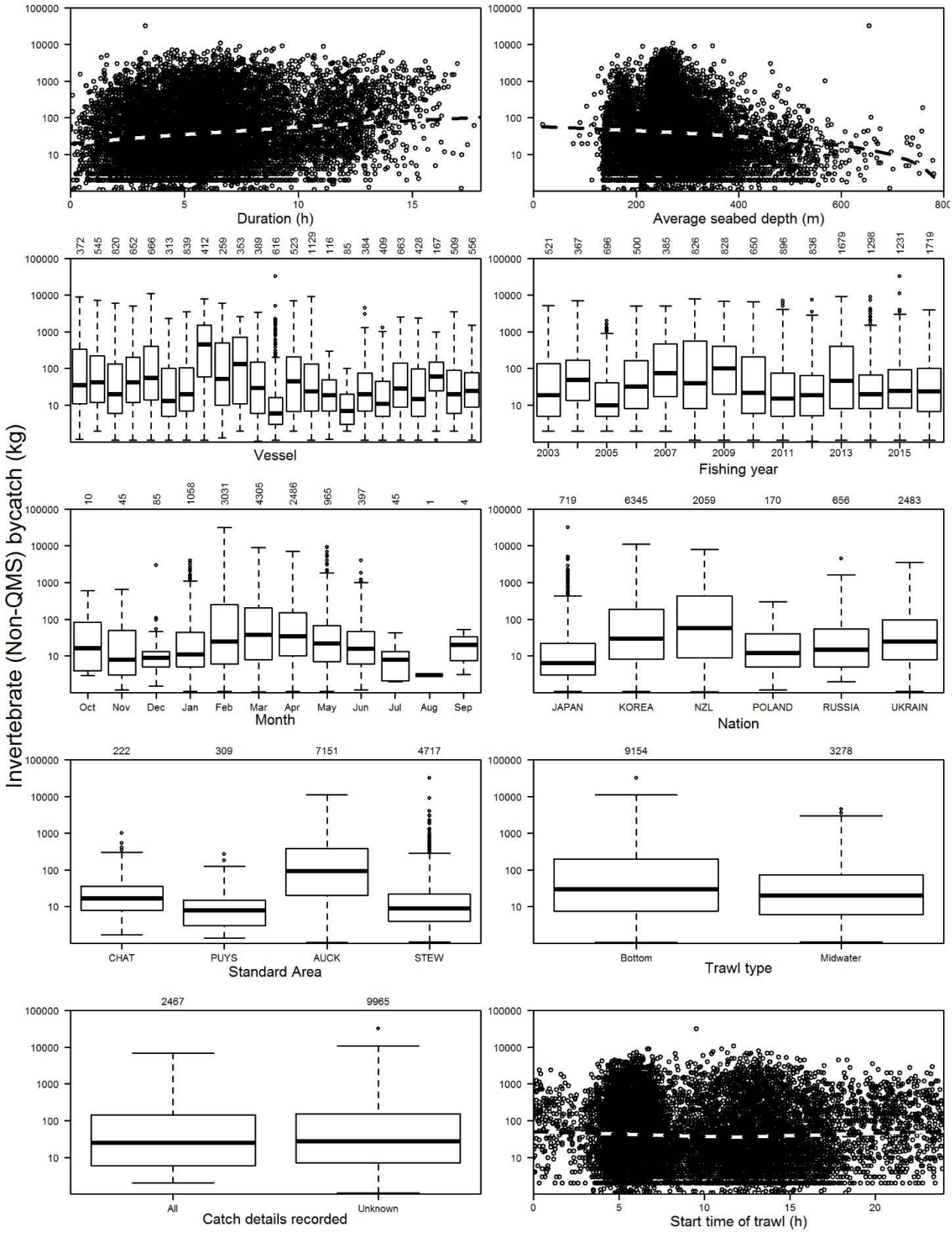


Figure 14: Invertebrate species bycatch in tonnes per tow plotted against selected variables in the arrow squid trawl fishery for the fishing years 2002–03 to 2015–16, on a log scale. See Figure 11 for further details.

Scampi fishery

Nearly 500 bycatch species or species groups were identified by observers in the scampi target trawl fishery and, as in the arrow squid fishery, most were non-commercial species, including many invertebrate species caught in low numbers (see summaries in Tables B1–B3, and Figure 15). Scampi accounted for about 19% of the total estimated catch from all observed tows targeting scampi between 1 Oct 2002 and 30 Sep 2016. Fish species bycatch comprised three main species; javelinfish (18%), rattails (12%), and sea perch (10%), which were all mostly discarded (Figure 15). Hoki (5%), ling (4%), dark ghost sharks (*Hydrolagus novaezealandiae)* (3%), deepsea flatheads (*Hoplichthys haswelli)* (2.5%), and spiny dogfish (2%) were also important, the latter two mostly discarded. It is notable that this fishery has a very mixed catch, with over a quarter of the total catch comprising species not included in these top nine groups.

As in the arrow squid fishery, numerous invertebrates were identified, the most common being unidentified crabs (0.9%), starfishes (0.8%), and arrow squid (0.7%), the first two of these groups being mostly discarded. Overall, crustaceans were the main invertebrate bycatch species group caught (3%), followed by echinoderms (2%) and squid (0.9%) (see Table B2 for a list of the main observed invertebrate bycatch species).

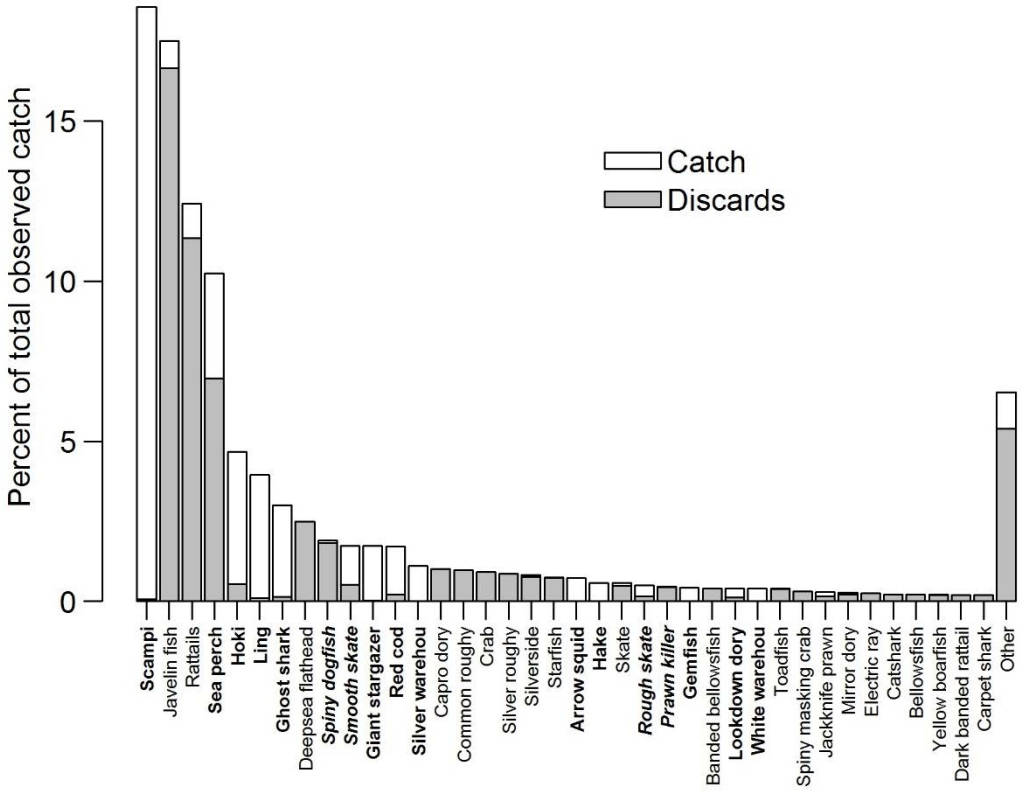


Figure 15: Percentage of the total catch contributed by the main bycatch species (those representing 0.2% or more of the total catch) in the observed portion of the target scampi trawl fishery for fishing years 2002–03 to 2015–16, and the percentage discarded. The Other category is the sum of all bycatch species representing less than 0.2% of the total catch. Names in bold are QMS species, names in italics are QMS species which can be legally discarded under Schedule 6 of the Fisheries Act (1996).

Exploratory plots showing bycatch per tow with respect to other variables, for the period 2002–03 to 2015–16, are shown in Figures 16–19; plots were prepared separately for ALL species, QMS species, non-QMS species, and invertebrate species.

Total bycatch per tow was highly variable between trawls and similar overall to the arrow squid fishery, with a maximum of about 7.8 t (Figure 16). Total bycatch per trawl decreased slightly with increasing trawl duration. Most tows were less than 9 hours in duration but longer tows were reasonably common and a few were over 10 h. Observed trawls were mostly at bottom depths of 500–750 m but a few were substantially outside of this range (including a small concentration of trawls in the 300–450 m range); there was little indication of any variation in the level of total bycatch with changing depth. There were large differences in bycatch between the 9 vessels represented by more than 100 records before tows with no bycatch were removed, with medians ranging from about 260 kg per trawl to about 1000 kg per trawl and a suggestion of increasing bycatch rate with increasing vessel size. Total bycatch per tow was variable through time, with the highest median values occurring in the first three years and the lowest median occurring in the most recent year, 2015–16. There was no obvious pattern of variability in bycatch among months, and there were only slight differences among the five main areas, with the highest bycatch levels in CHAT3. In contrast to the arrow squid fishery, bycatch was slightly lower in trawls where the completeness of catch recording was unknown compared with trawls for which observers recorded that all catch and discarding was accounted for. The start time of the trawl had little discernible effect on total bycatch amounts, although there is a suggestion in the plots that bycatch levels were slightly lower between about 8 pm and midnight.

Patterns of bycatch for QMS species in relation to these variables were similar to those for total bycatch, despite a considerable fraction of the total bycatch comprising non-QMS species; decreases in annual QMS species bycatch medians following the addition of species to the QMS are not as obvious in this fishery as in the arrow squid fishery (Figure 17).

Bycatch of non-QMS species show generally similar patterns to QMS species bycatch, for most of the fishery parameters examined, but with slightly greater values overall (Figure 18).

As in the arrow squid fishery, the smaller levels of invertebrate species bycatch show slightly different patterns to the other categories (Figure 19). Invertebrate catch increases rather than decreases with increasing duration, and also increases with depth; and the highest levels of invertebrate bycatch are in area AUCK and lowest in CHAT3 (opposite to the pattern observed in other catch categories).

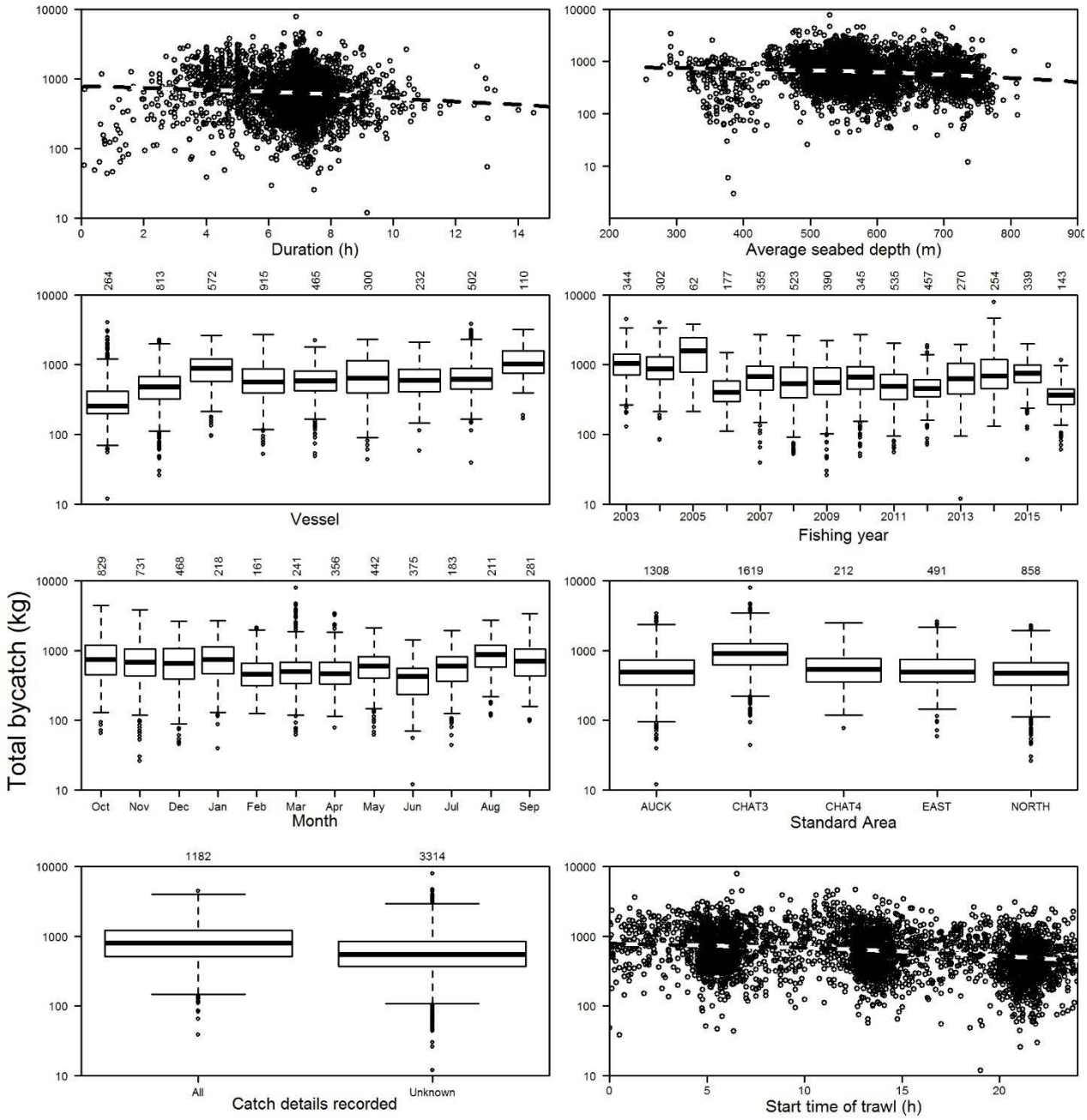


Figure 16: Total observed bycatch (all species) in kg per tow plotted against selected variables in the scampi trawl fishery for the fishing years 2002–03 to 2015–16, on a log scale. See Figure 11 for further details.

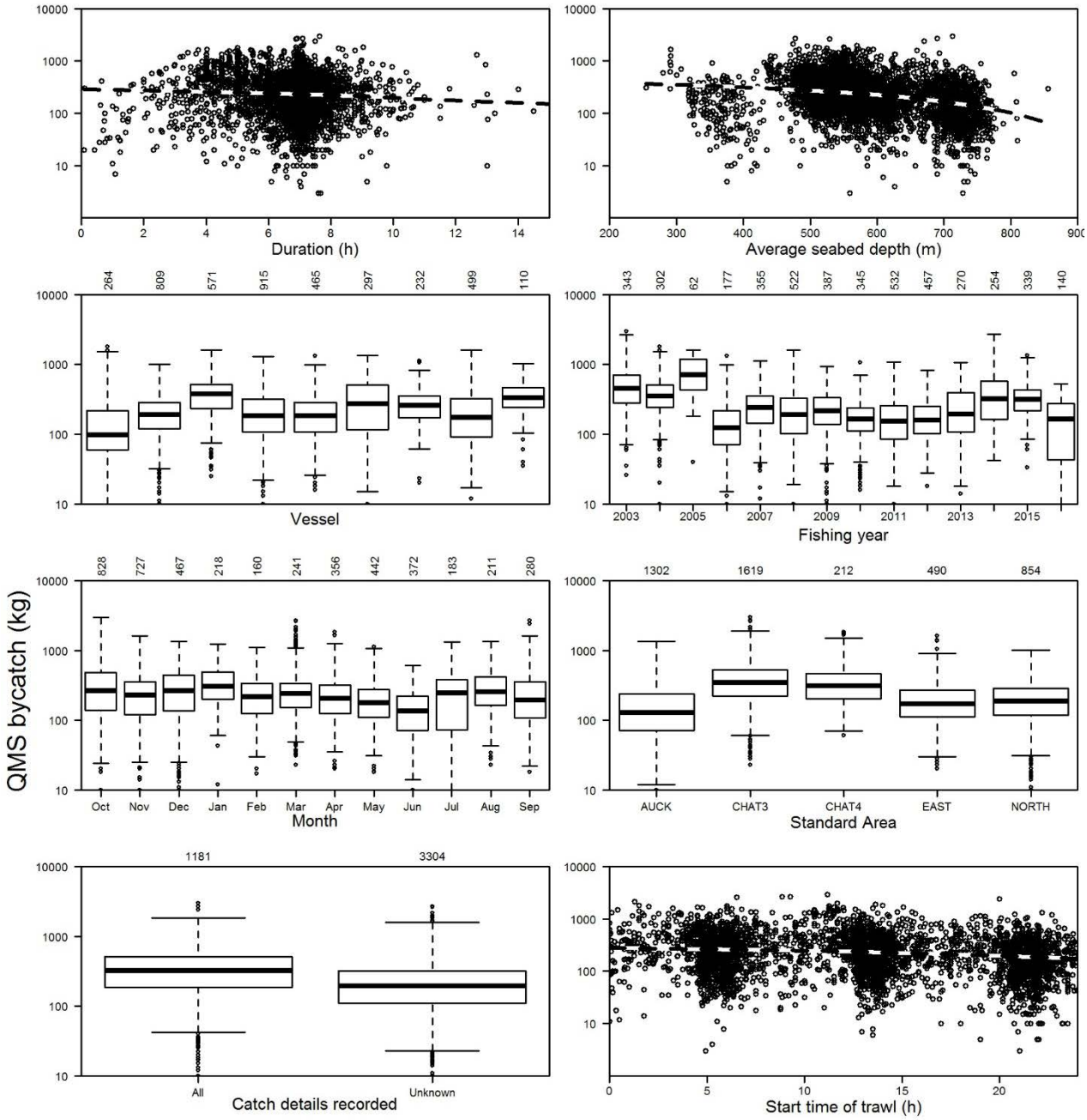


Figure 17: QMS species bycatch in tonnes per tow plotted against selected variables in the scampi trawl fishery for the fishing years 2002–03 to 2015–16, on a log scale. See Figure 11 for further details.

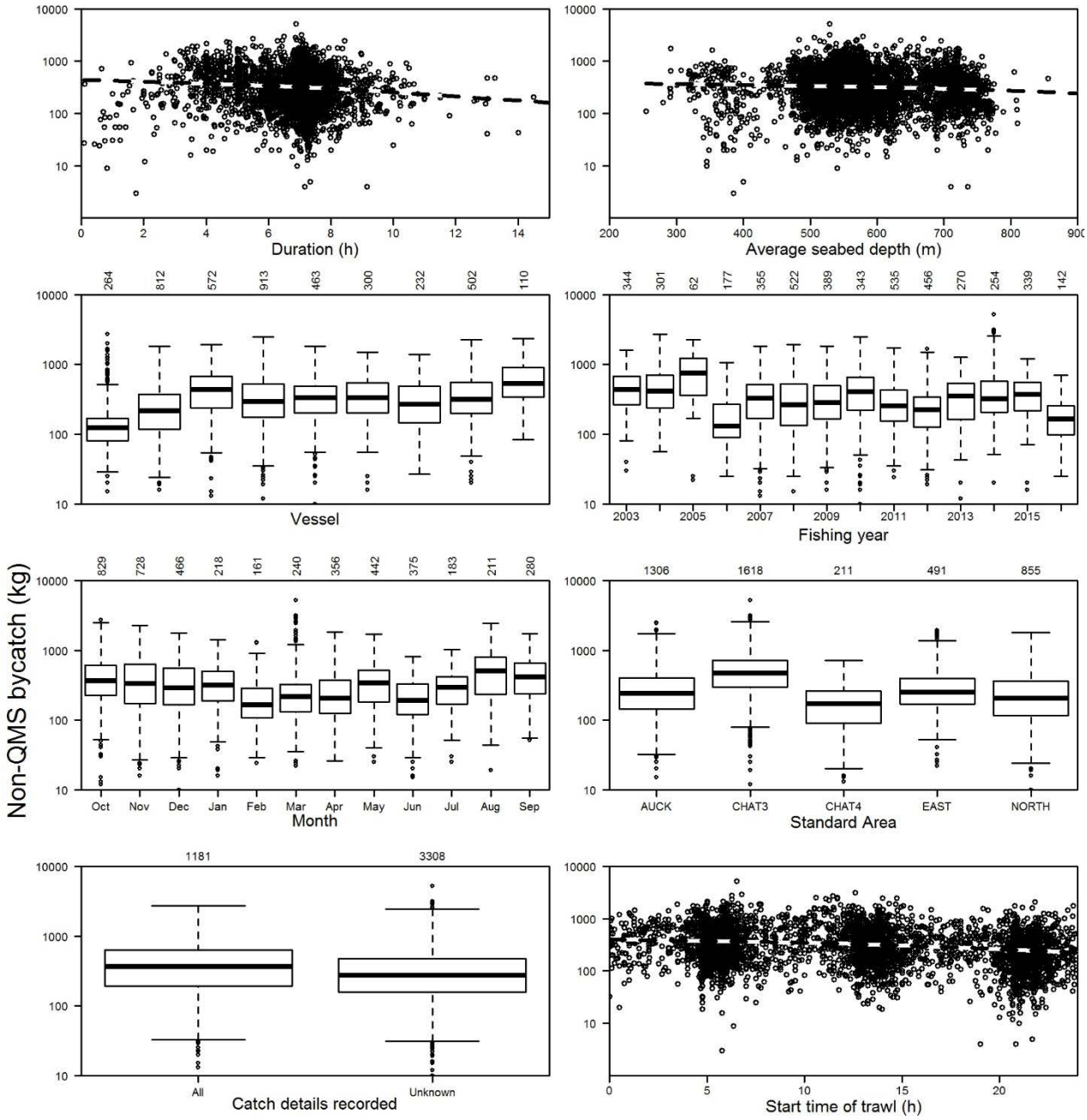


Figure 18: Non-QMS species bycatch in tonnes per tow plotted against selected variables in the scampi trawl fishery for the fishing years 2002–03 to 2015–16, on a log scale. See Figure 11 for further details.

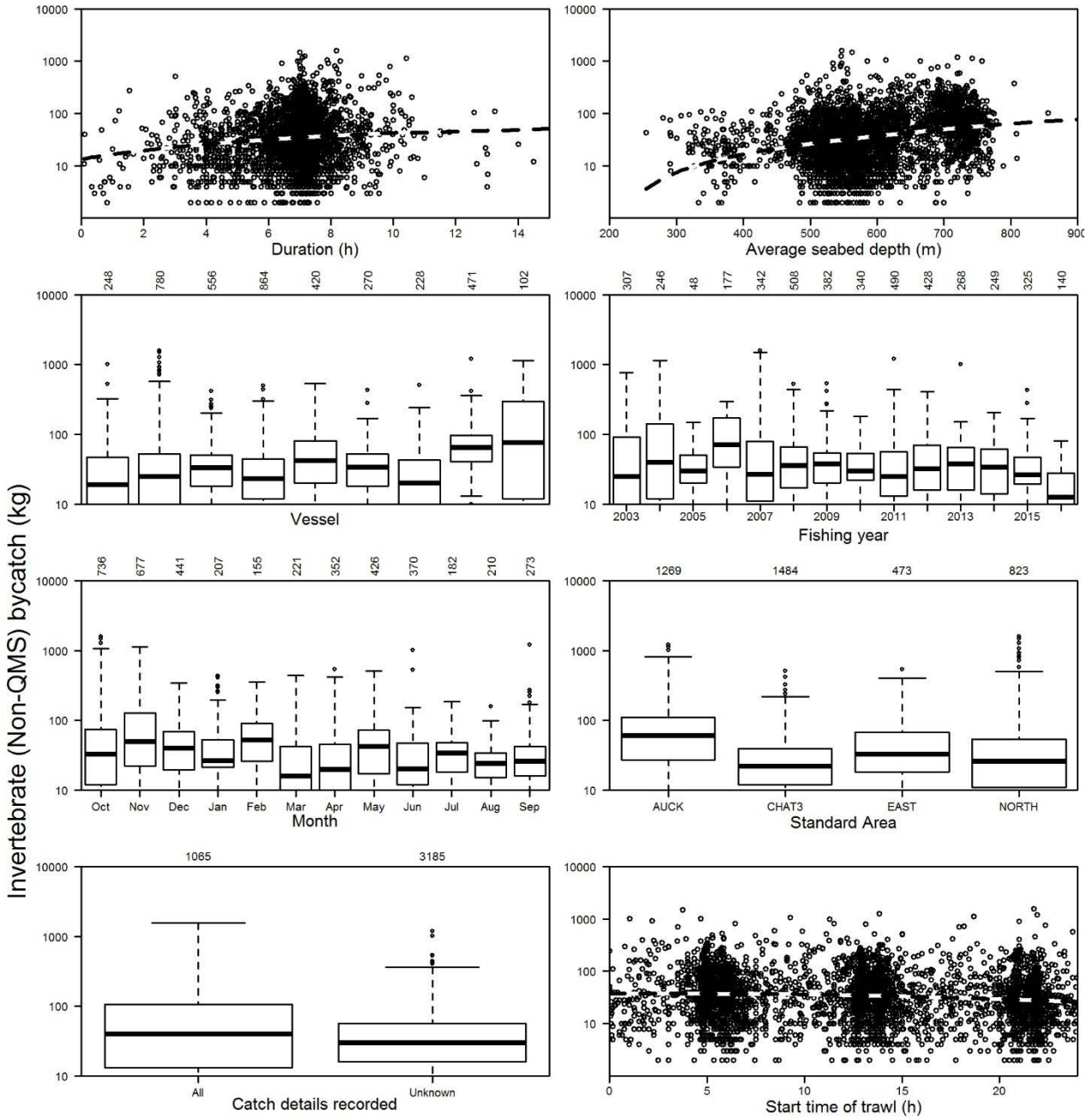


Figure 19: Invertebrate species bycatch in tonnes per tow plotted against selected variables in the scampi trawl fishery for the fishing years 2002–03 to 2015–16, on a log scale. See Figure 11 for further details.

3.4 Discard data

3.4.1 Overview of raw discard data

Arrow squid fishery

The bycatch species most discarded by volume in the arrow squid fishery was the spiny dogfish, the most commonly caught bycatch species after barracouta and silver warehou, and of which over 80% was recorded as discarded in the period since 1 October 2002 (Table A1, Figure 10). Surprisingly about 20% of hoki, the fifth most common bycatch species, was also discarded. Other groups to have been largely discarded were redbait (34%), silver dory (87%), and rattails (88%). Rattails were frequently not fully identified by observers, and this group is likely to include a range of species within the genera *Coryphaenoides* and *Coelorinchus*, among others. The javelinfish rattail is readily identified and the separate recording of this is likely to be relatively accurate, although it can be confused with hoki. Of the invertebrate species caught (predominantly crabs) most were discarded (see Table A2), and those with lower levels of discarding, e.g., sponges (6%) and anemones (4%) were likely to have been affected by poor recording in the processing section of the observer forms and, in reality, were more likely to have been 100% discarded.

The variability in the level of discards per tow for all species combined, QMS species, non-QMS species and all invertebrates, with respect to some of the available variables are explored in Figures 20–23. The level of total discards was highly variable between tows, ranging from 0 to 64 t per tow (Figure 20). As was shown for bycatch, the quantity of discards increased with increasing trawl duration, but the trend was much more pronounced. The relationship between discard levels and depth was also more pronounced than for bycatch, with a marked increase in discards with depth particularly through the shallower part of the fishery. Discards were highly variable between the 23 vessels with more than 100 records before discards were removed, with larger vessels discarding much less per tow than smaller vessels (possibly due to greater use of meal plants in large vessels). There was a trend of increasing discards over time, starting in about 2004–2005. As with bycatch, total discards lowered as the season progressed, with a minimum during the peak of the fishery between January and March. Differences among nations were more pronounced for discards, with higher discard rates for Japanese and Korean vessels than for Polish, Russian, and Ukranian vessels – New Zealand vessels showing intermediate levels. Median discard rates were lower in the larger fisheries (AUCK and STEW) than in the smaller fisheries in CHAT and PUYS. There were lower discard levels associated with midwater trawls than bottom trawls, higher discards where the completeness of observer catch recording was unknown, and lower discarding where meal processing was occurring.

Patterns of discards for QMS species were mostly similar to those for total discards (Figure 21), except that the increase in QMS discards in the early 2000s is much sharper due to the effect of several bycatch species (especially spiny dogfish) being added to the QMS from 2003–04. Patterns of discards for non-QMS species are also similar to those for total discards, and although the effect of the changes in species composition of this category with introduction of species to the QMS flattens out the increasing trend over time, it is still evident (Figure 22).

Discards of invertebrate species also increase with duration and depth, and decrease with vessel size and with the presence of meal plants, despite the lower suitability of most invertebrates for mealing (Figure 23).

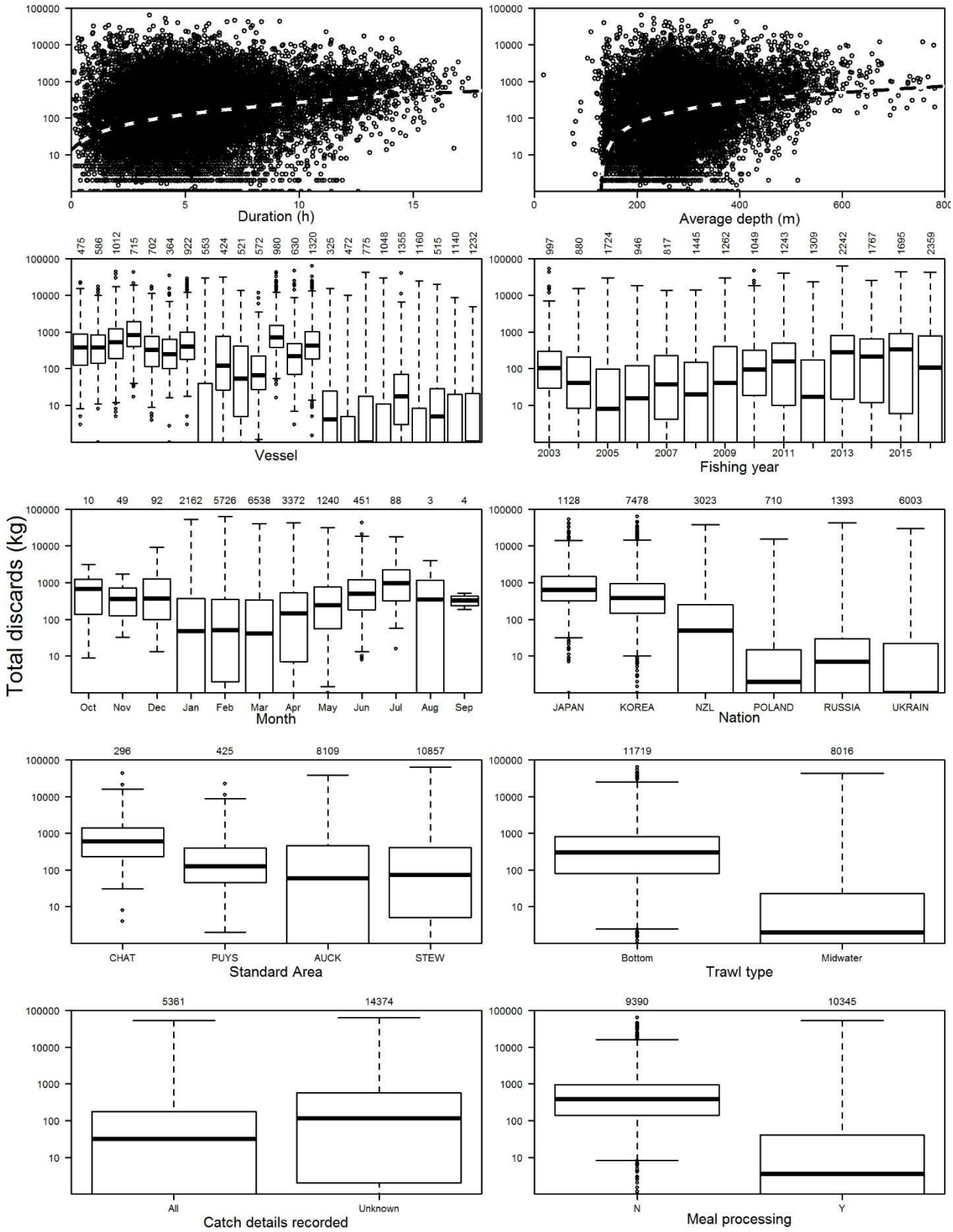


Figure 20: Total observed discards (all species) in tonnes per tow plotted against selected variables in the arrow squid trawl fishery for the fishing years 2002–03 to 2015–16, on a log scale. Figure 11 for further details.

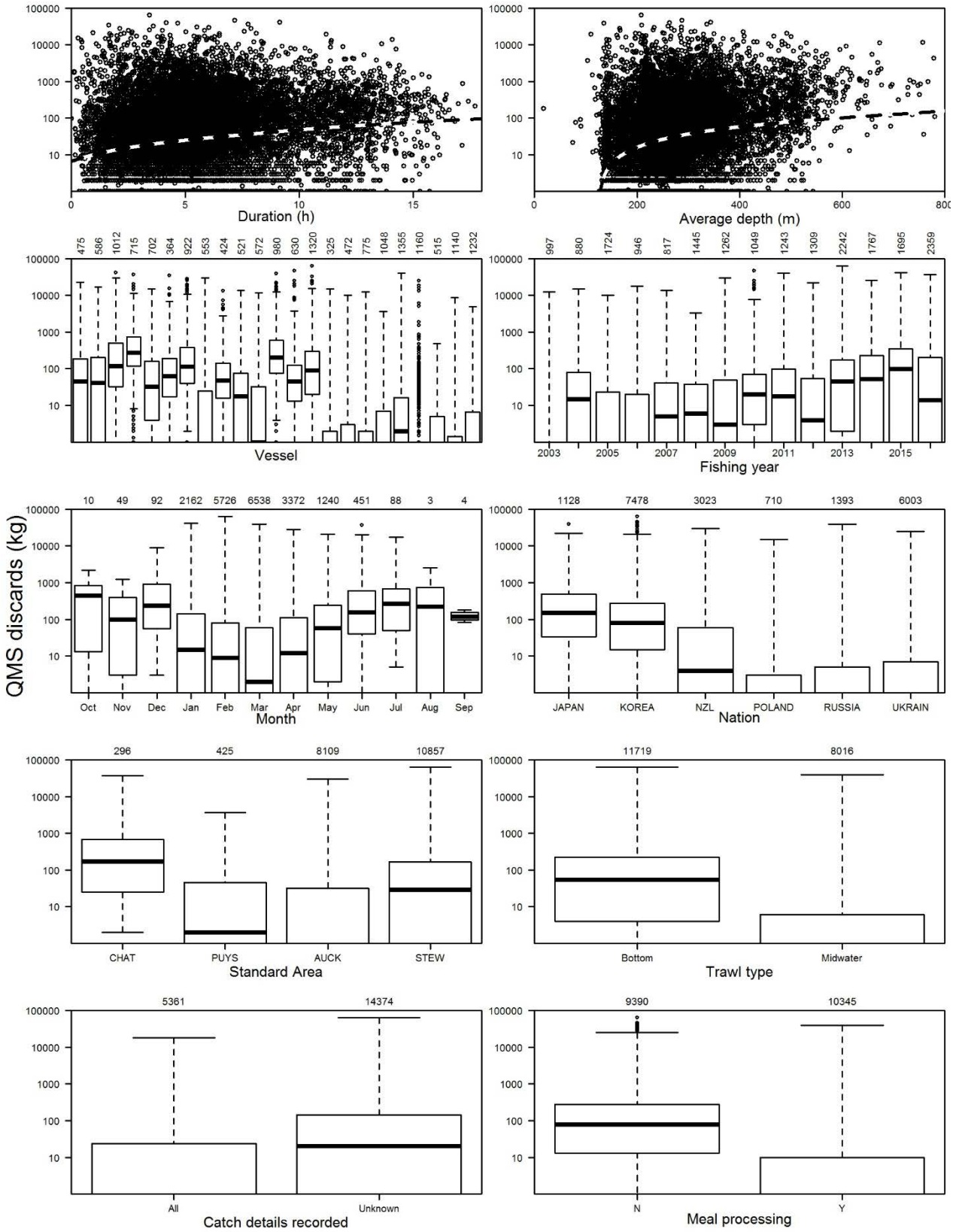


Figure 21: QMS species discards in tonnes per tow plotted against selected variables in the arrow squid trawl fishery for the fishing years 2002–03 to 2015–16, on a log scale. Figure 11 for further details.

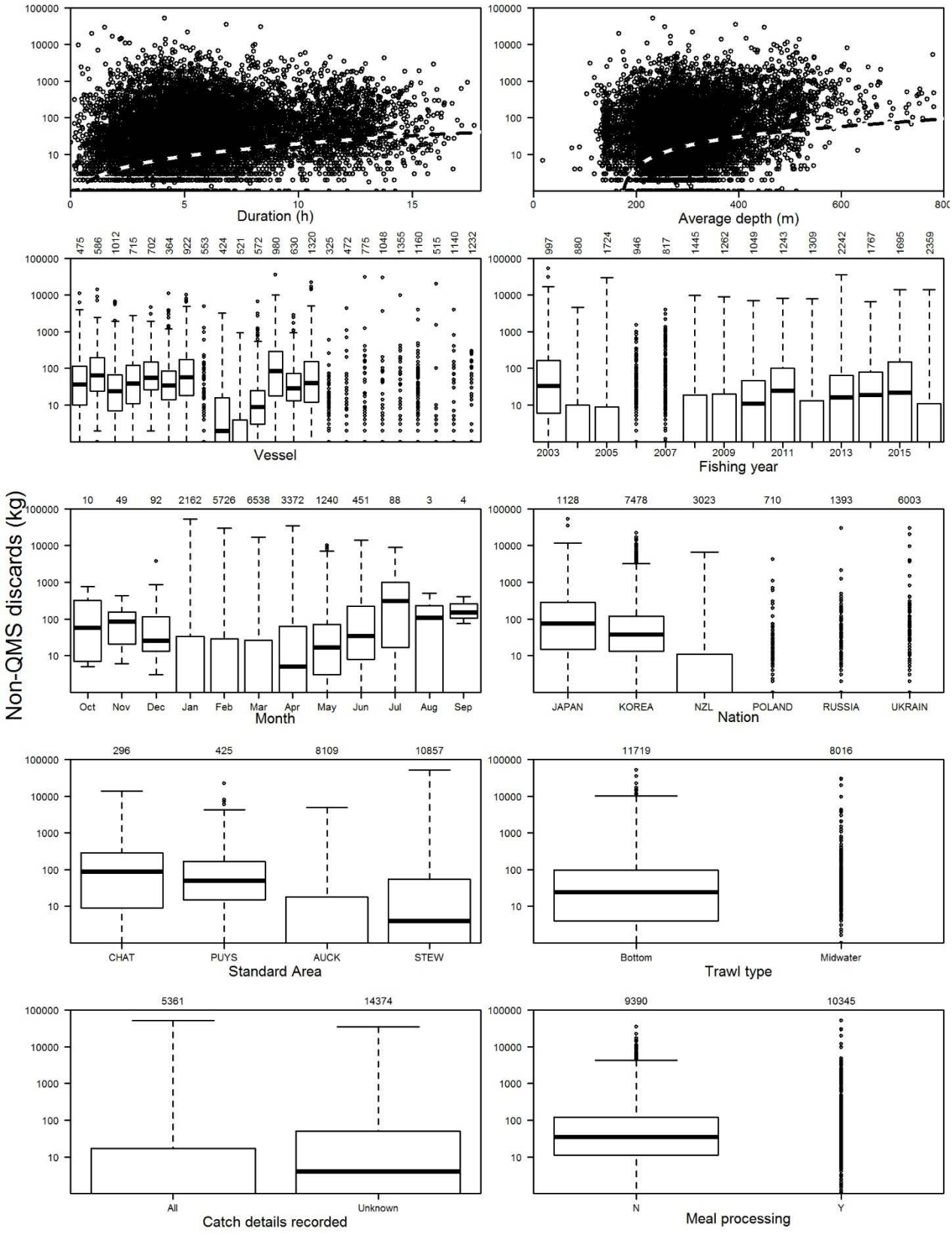


Figure 22: Non-QMS species discards in tonnes per tow plotted against selected variables in the arrow squid trawl fishery for the fishing years 2002–03 to 2015–16, on a log scale. Figure 11 for further details. Factors with medians and interquartile ranges less than 1.0 show as missing boxes in some plots.

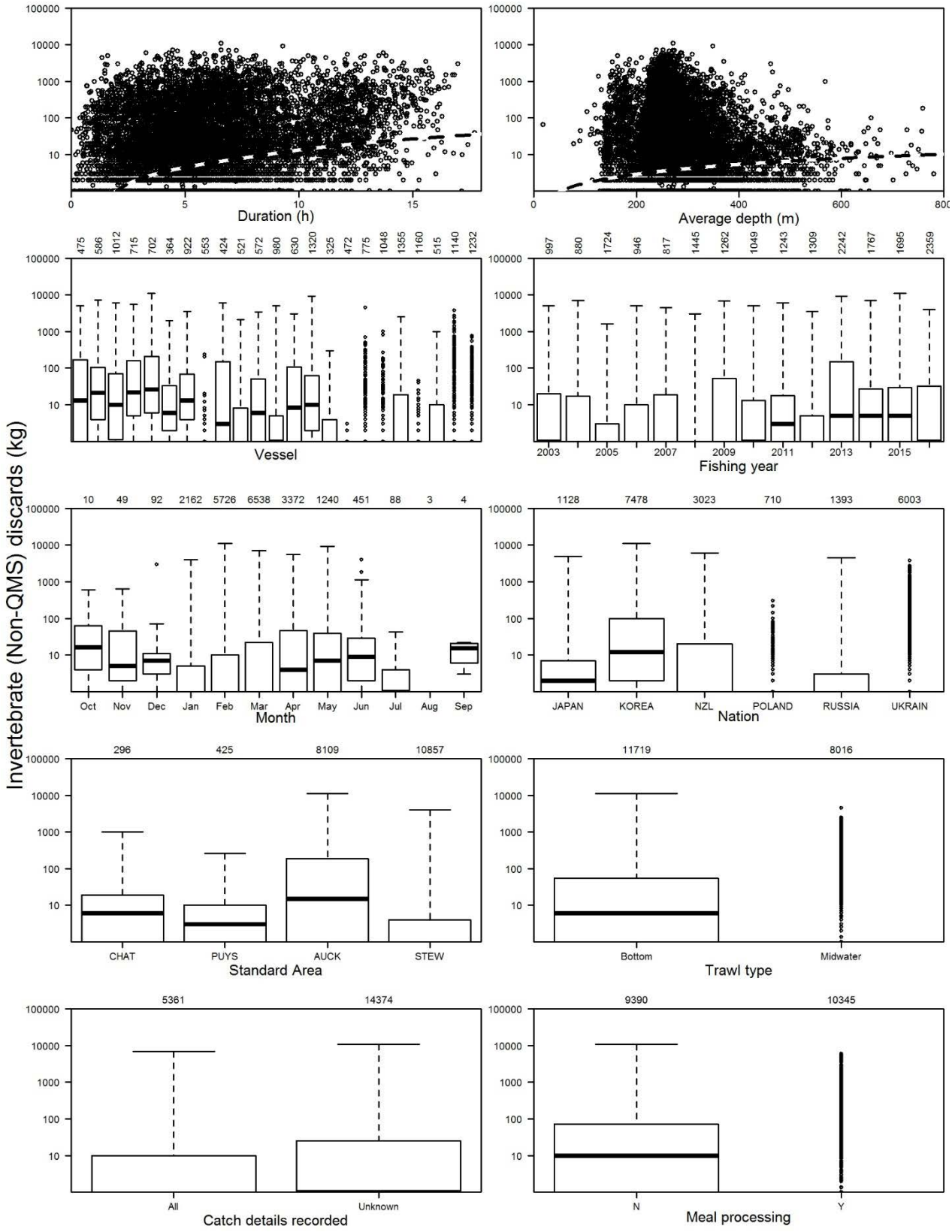


Figure 23: Invertebrate species discards in tonnes per tow plotted against selected variables in the arrow squid trawl fishery for the fishing years 2002–03 to 2015–16, on a log scale. Figure 11 for further details. Factors with medians and interquartile ranges less than 1.0 show as missing boxes in some plots.

Scampi fishery

In the scampi fishery, most of the observed catch of the three most common bycatch species was discarded. Javelinfish were the least wanted, with 95% recorded by observers as having been discarded (Table B1, Figure 15). Rattails followed closely as the second most observed bycatch species and 91% were discarded. Sea perch, a low-value QMS species, were retained more frequently but still about 68% were discarded. A low level of discarding was reported for the more valuable hoki, ling, and dark ghost sharks, but the next most commonly caught species, deepsea flathead and spiny dogfish, were 95–100% discarded. Following these, the catch of the non-QMS species capro dory (*Capromimus abbreviatus)*, common roughy (*Paratrachichthys trailli)*, and silver roughy (*Hoplostethus mediterraneus)* were each 100% discarded.

The variability in the level of discards per tow within each species category with respect to available variables are shown in Figures 24–27. The level of total discards was highly variable, ranging from 0 to 8.5 t per tow (Figure 24). There was little indication of discard levels increasing with longer tows or varying with depth and although there was substantial variability in median discard levels among vessels, there is no indication of changes with vessel size. Discard levels were highly variable early in the period, but medians were more stable from 2006–07. There was little difference among areas, although slightly greater in CHAT3 (western Chatham Rise) than in the four other main fishery areas. Completeness of observer catch recording made little difference to total discards and meal processing was uncommon on these vessels but was associated with lower discards where occurring.

Observed QMS species discards increased slightly with duration and decreased markedly with depth, there was a high variability in discards among years, and discards were higher when completeness of observer catch recording was unknown. Otherwise patterns of discarding were generally similar to those of total discards (Figure 25). Non-QMS species contributed much more to total discards than QMS species and therefore the patterns of non-QMS species discards are more similar to total discards, with no notable differences for any of the variables examined (Figure 26). Invertebrate discards were a little lower overall than non-QMS discards, increasing slightly with duration and depth, but otherwise no strong patterns were evident (Figure 27).

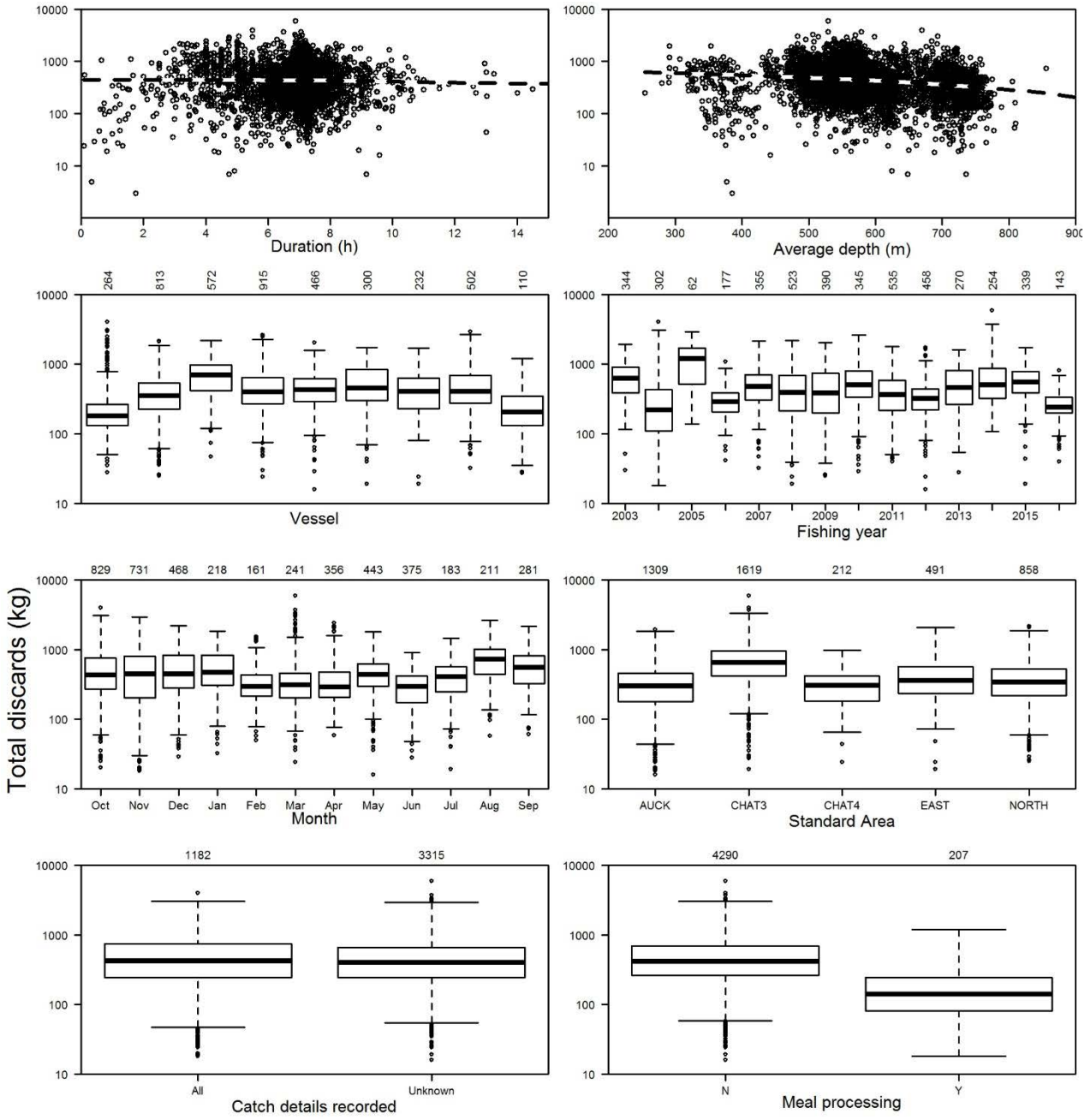


Figure 24: Total observed discards (all species) in tonnes per tow plotted against selected variables in the scampi trawl fishery for the fishing years 2002–03 to 2015–16, on a log scale. Figure 11 for further details.

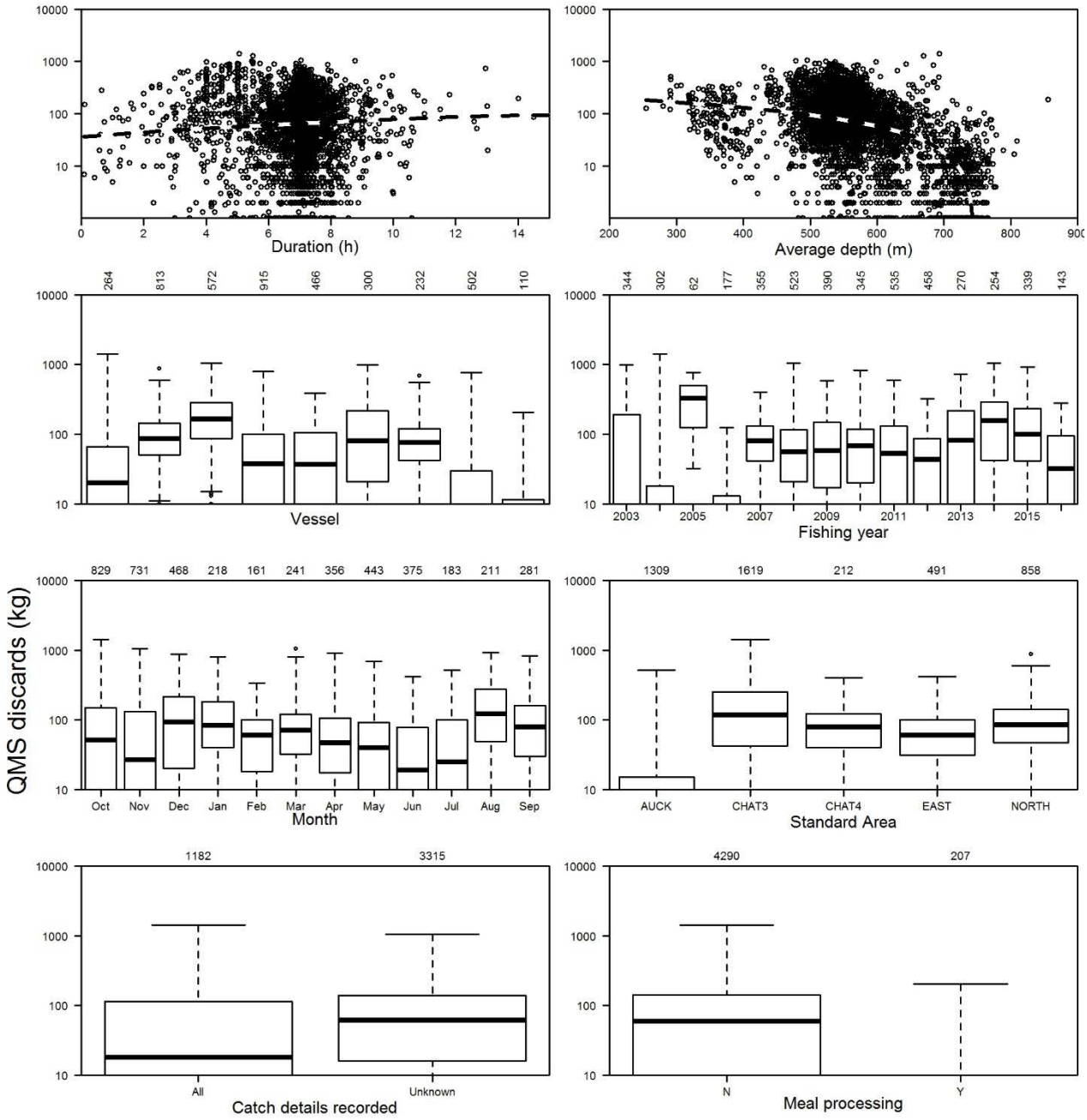


Figure 25: QMS species discards in tonnes per tow plotted against selected variables in the scampi trawl fishery for the fishing years 2002–03 to 2015–16, on a log scale. Figure 11 for further details.

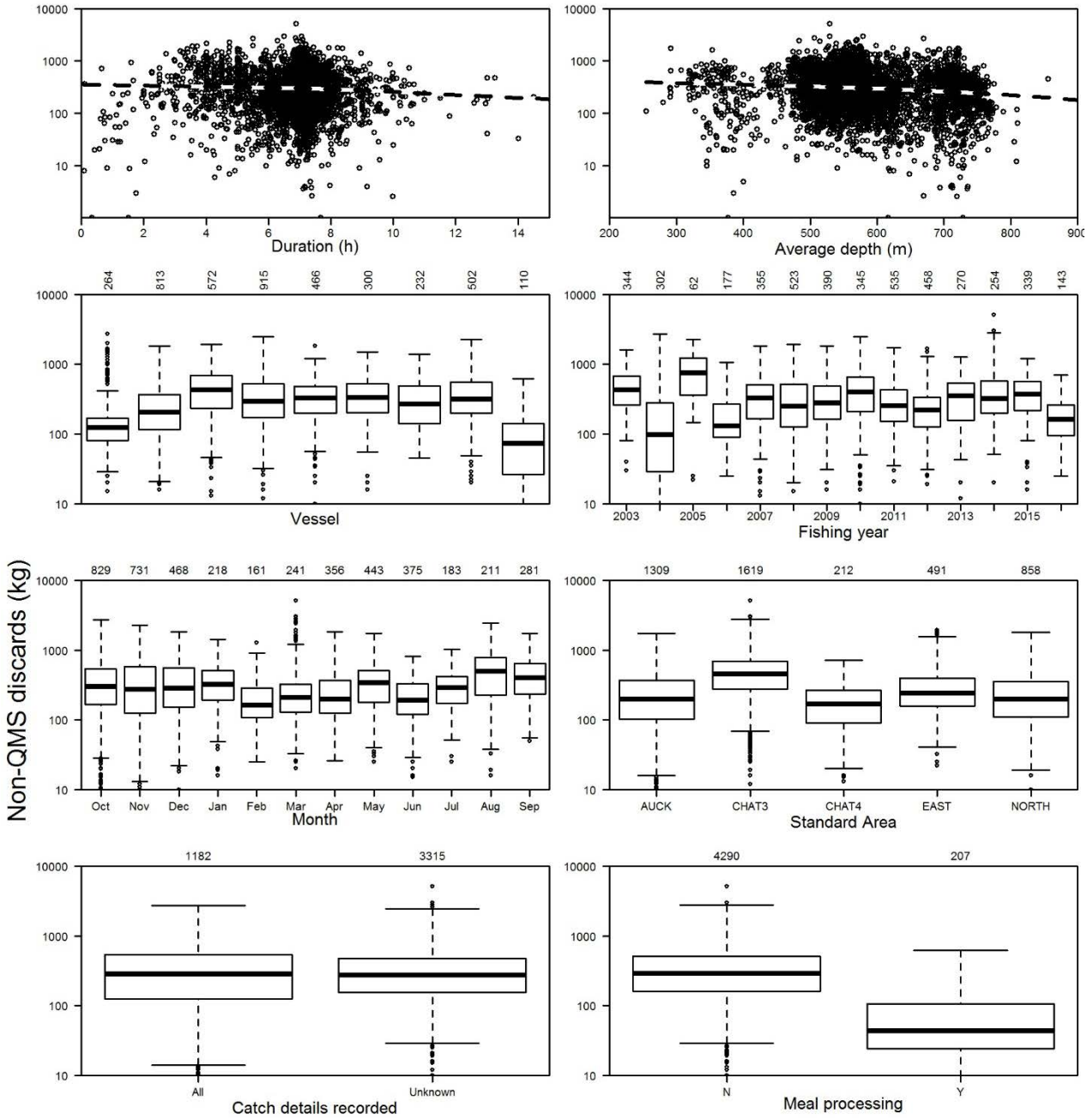


Figure 26: Non-QMS species discards in tonnes per tow plotted against selected variables in the scampi trawl fishery for the fishing years 2002–03 to 2015–16, on a log scale. Figure 11 for further details.

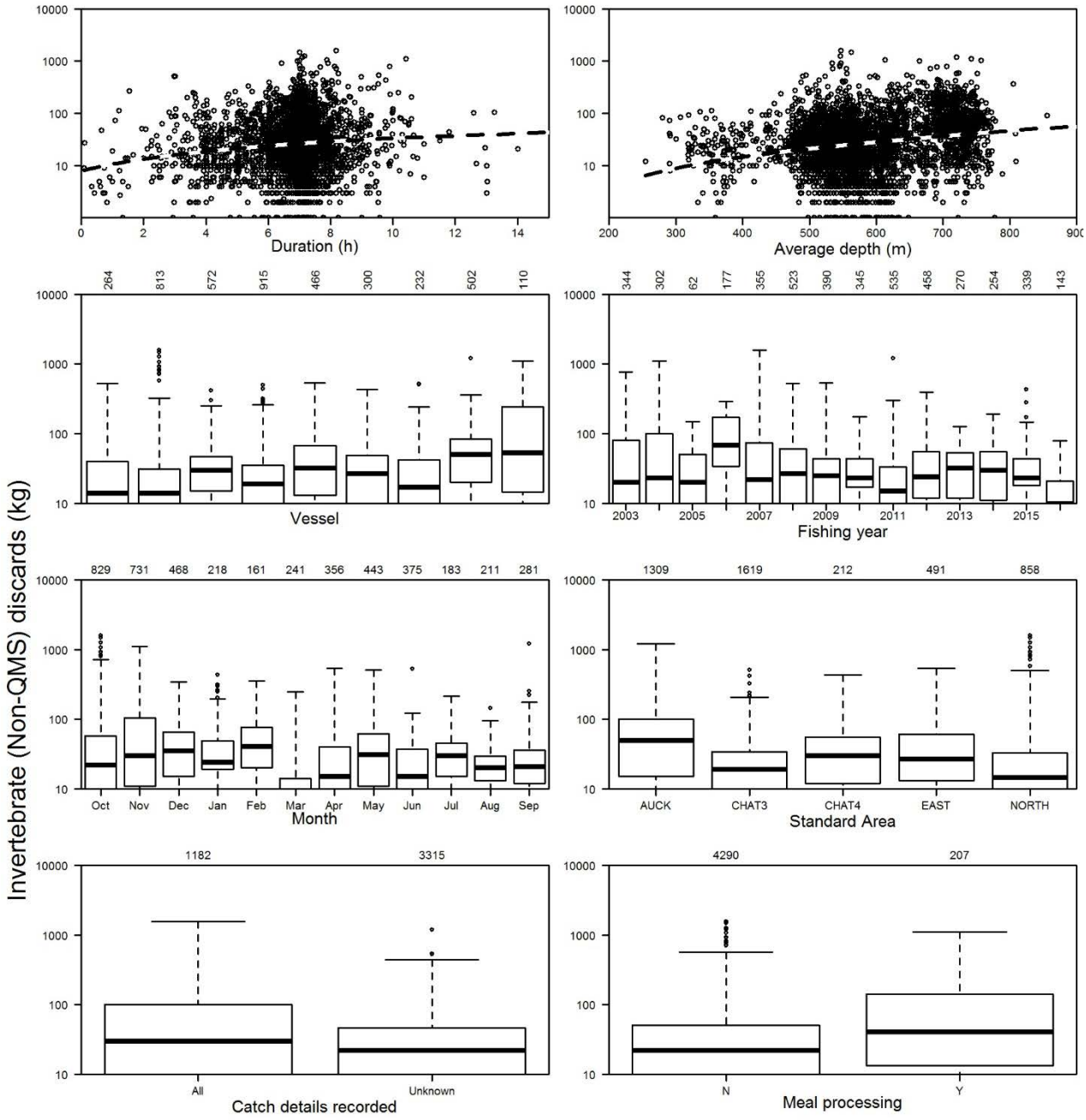


Figure 27: Invertebrate species discards in tonnes per tow plotted against selected variables in the scampi trawl fishery for the fishing years 2002–03 to 2015–16, on a log scale. Figure 11 for further details.

3.5 Estimation of bycatch

3.5.1 Annual bycatch levels

Negative slopes in the linear regressions on bycatch levels over time indicate that the bycatch of all species categories generally decreased over time in both fisheries. These declines were more marked for the arrow squid fishery, where they were all statistically significant, than for the scampi fishery, where none were highly statistically significant (Tables 8 and 11).

Arrow squid fishery

The estimated annual bycatch of QMS species ranged from a high of nearly 27 000 t in 2002–03 to a low of about 8000 t in 2015–16 (Table 7, Figure 28), with a strongly significant decline over time (Table 8). Bycatch in this category was notably high, with wide confidence intervals, in the first four years of the series and became lower and more stable thereafter, with narrower confidence intervals.

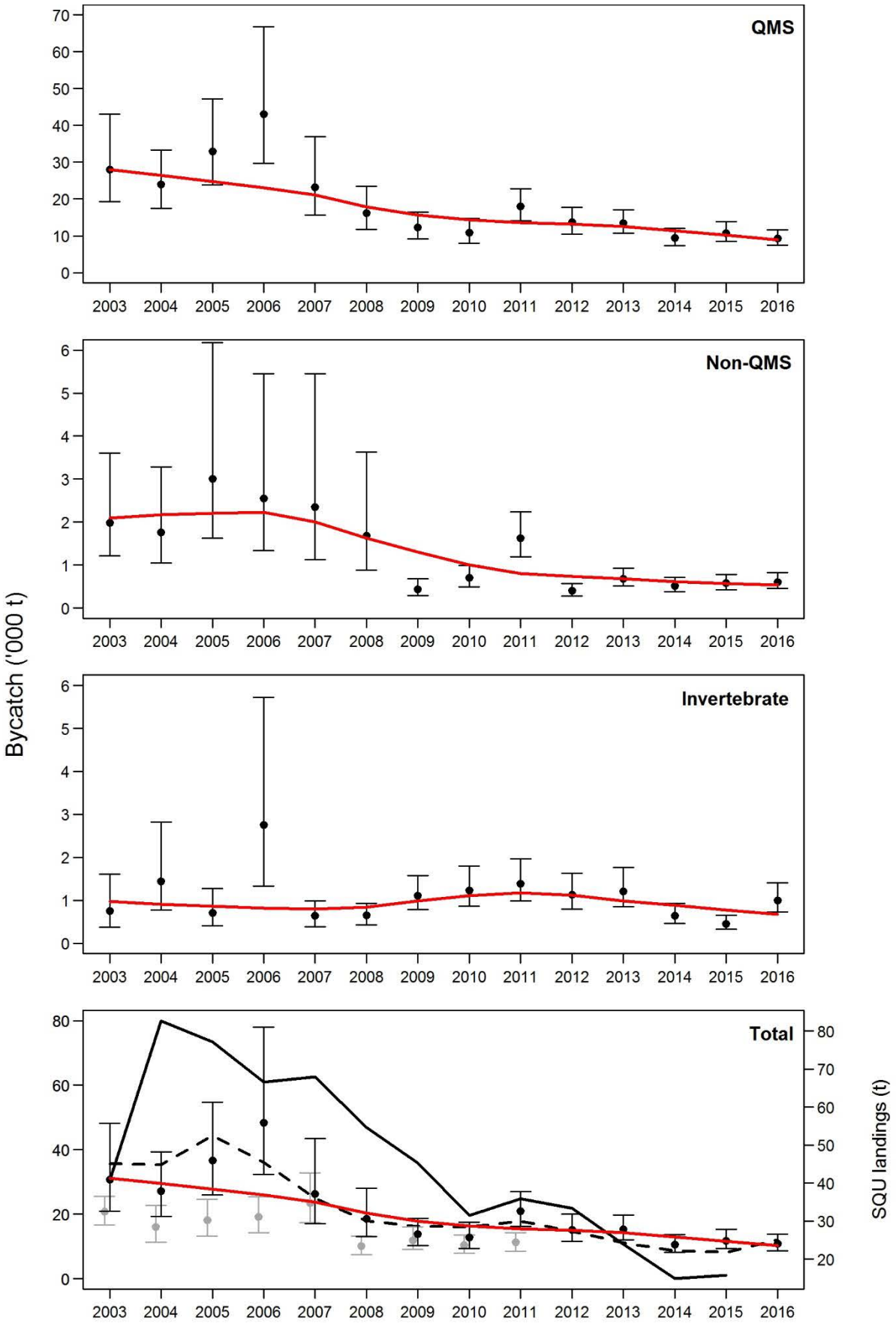
The bycatch of non-QMS species declined from about 2100 t in 2002–03 to about 300–500 t per year in the last four years of the series. Annual levels fluctuated somewhat, with a high value in 2010–11 standing out in particular, but overall levels were an order of magnitude lower than QMS species bycatch (Figure 28).

Annual invertebrate bycatch was at a similar level to non-QMS bycatch, fluctuating up and down over the first four years, then showing an increasing and decreasing trend over the last ten years. Bycatch was especially low in the last three years compared to the previous eleven, a pattern also evident in the other two species categories.

Total bycatch is composed mostly of QMS species and so follows a similar pattern of higher levels in the first four years of the series (about 26 000–40 000 t per year), and decreasing levels thereafter (about 9000–18 000 t), with a strongly significant downward trend. The pattern of total annual bycatch mirrors that of effort in the fishery which has also declined over the period and more loosely, reported annual arrow squid landings. The total bycatch estimates of Anderson (2013) are generally similar to the current estimates for much of the overlapping period (2002–03 to 2010–11) but are lower in most years, particularly in 2005–06 where the confidence intervals do not overlap (Figure 28). A breakdown of estimated bycatch in each of the standard areas, for each catch category and overall, is shown in Table A4. Of particular note is the concentration of invertebrate bycatch in the Auckland islands area (AUCK), largely due to the frequent and sometimes large catches of smooth red swimming crabs (Table A4c).

Table 7: Estimates of total annual bycatch (t) in the arrow squid target trawl fishery, by species category and fishing year; 95% confidence intervals in parentheses.

Fishing year	QMS		Non-QMS		Invertebrate		Total bycatch	
2002–03	26 775	(19 548–46 653)	2 114	(1 450–3 137)	608	(425–882)	29 497	(21 423–50 672)
2003–04	23 665	(17 642–32 299)	1 113	(750–1 693)	1 635	(1 120–2 445)	26 413	(19 512–36 437)
2004–05	26 638	(20 473–37 590)	1 552	(1 140–2 153)	991	(686–1 463)	29 181	(22 299–41 206)
2005–06	36 870	(27 791–50 358)	1 343	(866–2 064)	1 629	(1 047–2 495)	39 842	(29 704–54 917)
2006–07	16 350	(12 163–22 778)	934	(616–1 446)	591	(440–817)	17 875	(13 219–25 041)
2007–08	12 577	(10 284–15 529)	762	(550–1 083)	681	(581–827)	14 020	(11 415–17 439)
2008–09	10 804	(9 084–13 105)	392	(321–493)	1 013	(818–1 300)	12 209	(10 223–14 898)
2009–10	10 199	(8 377–12 617)	698	(521–954)	1 150	(854–1 614)	12 047	(9 752–15 185)
2010–11	15 815	(13 040–19 593)	1 569	(1 193–2 124)	1 211	(912–1 644)	18 595	(15 145–23 361)
2011–12	11 740	(9 789–14 393)	396	(301–530)	864	(626–1 226)	13 000	(10 716–16 149)
2012–13	9 701	(9 300–10 233)	501	(464–555)	813	(746–916)	11 015	(10 510–11 704)
2013–14	8 790	(8 533–9 147)	337	(316–368)	309	(272–366)	9 436	(9 121–9 881)
2014–15	8 463	(7 930–13 381)	461	(419–526)	274	(261–296)	9 198	(8 610–14 203)
2015–16	8 067	(7 601–8 757)	526	(446–646)	283	(255–326)	8 876	(8 302–9 729)


QMS
Non-QMS
Invertebrate
Total
Bycatch ('000 t)
SQU landings (t)
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016

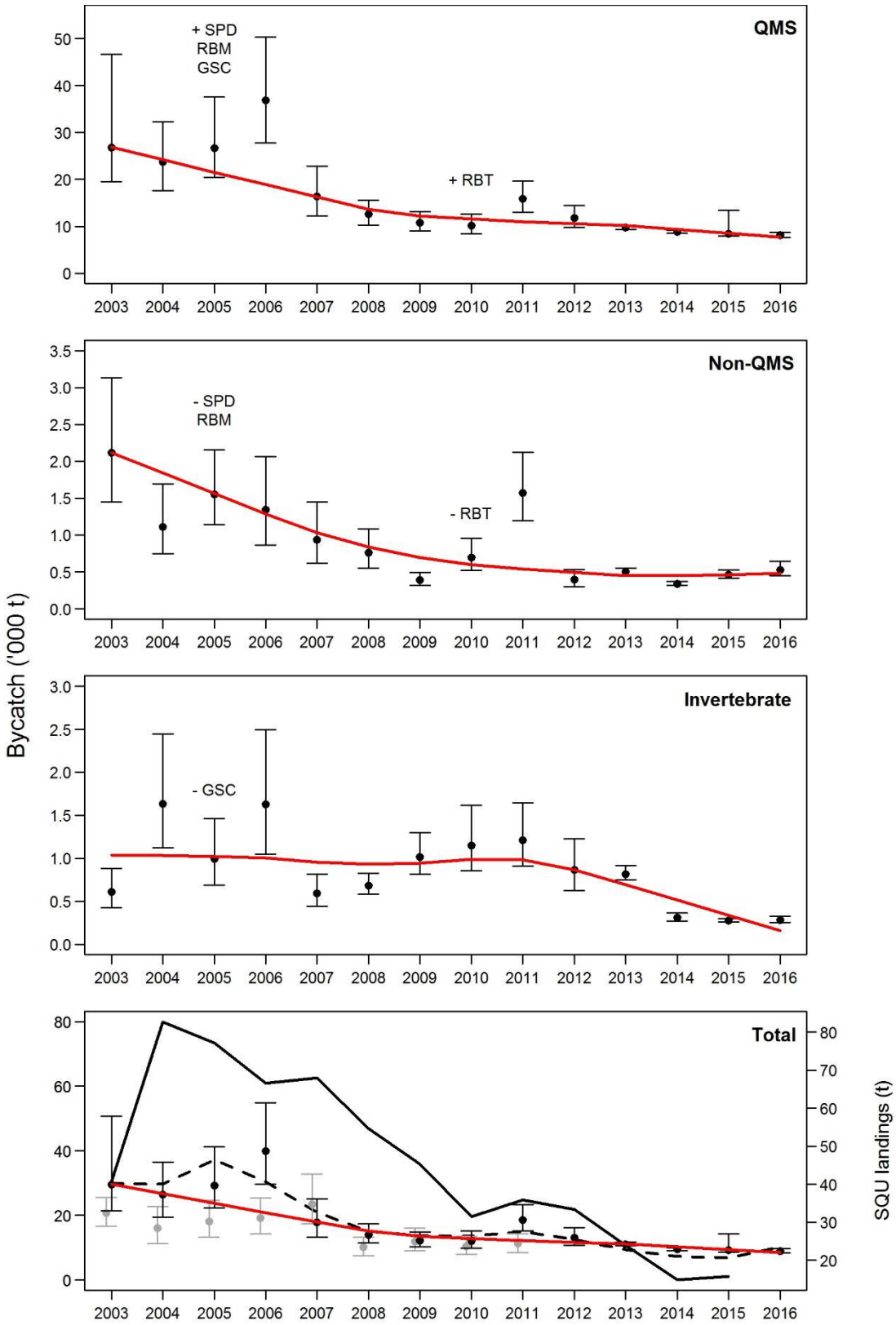


Figure 28: Annual estimates of bycatch in the arrow squid target trawl fishery, by species category, for 2002–03 to 2015–16 (black dots). Also shown (in grey) are earlier estimates of total bycatch calculated for 2002–03 to 2010–11 (Anderson 2013). Error bars indicate 95% confidence intervals. The red lines show the fit of a locally-weighted polynomial regression to annual bycatch. In the bottom panel the solid black line shows the total annual reported landings of arrow squid, and the dashed line shows annual effort (number of tows), scaled to have mean equal to that of total bycatch. Species codes in the plots indicate the year of entry or exit of bycatch species within the top 25 observed (see Table A1 for code details).

Table 8: Summary of results of linear regression analyses for trends in annual bycatch, by species category, in the arrow squid fishery. The *p* values indicate whether the slopes differed significantly from zero. Those results where *p* values are less than 0.01 (generally considered highly significant) are shown in bold.

Species category	Slope	*p*
QMS	**-0.099**	**0.000**
NONQMS	**-0.110**	**0.001**
INV	**-0.117**	**0.003**
Total	**-0.101**	**0.000**

Total annual bycatch calculated directly from commercial catch records was lower than the estimate based on observer data in all of the 14 years examined, and all but one or two years are outside the 95% confidence intervals of the estimates based on observer data (Table 9, Figure 29). Over time the two estimates have become closer, however, with the catch-effort based estimate over 80% of the observer-based estimate in three of the last four years when more than 80 percent of the tows have been observed.

Table 9: Total annual bycatch estimates for the target arrow squid fishery based on catch effort records compared with estimates from the statistical model, observer-based method. Estimates are derived by summing the difference between the recorded total catch and arrow squid catch for each trawl (TCP and TCE type forms) or group of trawls (CEL type forms).

Fishing year	Total bycatch (t)	% of observer-based estimate
2002–03	13 549	45.9
2003–04	14 208	53.8
2004–05	13 556	46.5
2005–06	14 433	36.2
2006–07	11 411	63.8
2007–08	7 621	54.4
2008–09	10 066	82.4
2009–10	9 292	77.1
2010–11	11 781	63.4
2011–12	8 360	64.3
2012–13	8 856	80.4
2013–14	8 707	92.3
2014–15	6 704	72.9
2015–16	7 148	80.5
All years	145 692	58.0

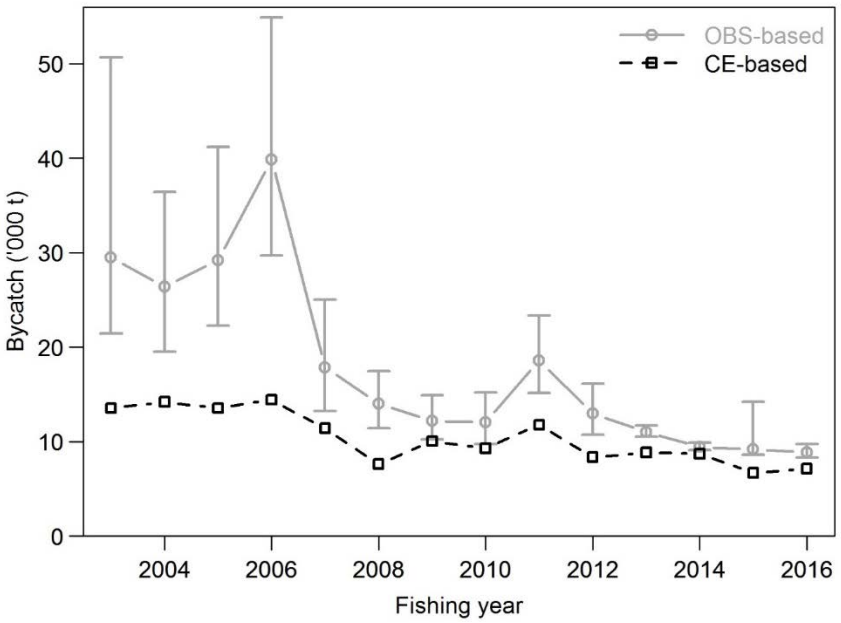


Figure 29: Total annual bycatch in the arrow squid target trawl fishery from scaled up observer catch rates and commercial catch effort records.

Scampi fishery

In the scampi fishery, the estimated annual bycatch of QMS species was highly variable, particularly in the early part of the period, but generally declined over time from a high of about 3000 t in 2002–03 to a low of just under 900 t in 2015–16 (Table 10, Figure 30). The estimated annual catch of non-QMS species was also variable from year to year, with a maximum of about 2600 t in 2004–05 and a minimum of about 1100 t the following year and showed no apparent temporal trend. Estimated bycatch of invertebrate species was highest in the early part of the period, with broad confidence intervals; annual levels were low compared with the other main categories, 200–300 t in most years, with a slight decline over time. Total annual bycatch followed a similar pattern to QMS and non-QMS bycatch, ranging from a high of 5600 t in 2004–05 to a low of 2400 t the following year, but was more stable thereafter with a range of 2400–4300 t. The variation in total bycatch over time was partially matched by total effort in the fishery, which also became more stable over time (Figure 30). Estimates of total bycatch from the previous review were similar to the current estimates for most years, with mostly similar or wider, but strongly overlapping, confidence intervals. There were no highly significant trends in annual bycatch over time in any of these four categories (Table 11). A breakdown of estimated bycatch in each of the standard areas, for each catch category and overall, is shown in Table B4.

Table 10: Estimates of total annual bycatch (t) in the scampi target trawl fishery, by species category and fishing year; 95% confidence intervals in parentheses.

Fishing year	QMS		Non-QMS		Invertebrate		Total bycatch	
2002–03	3 061	(2 525–4 650)	1 971	(1 712–2 423)	329	(272–506)	5 361	(4 509–7 579)
2003–04	1 642	(1 496–1 814)	1 806	(1 637–1 996)	320	(239–553)	3 768	(3 372–4 363)
2004–05	2 725	(2 292–3 232)	2 623	(2 178–3 177)	258	(126–785)	5 606	(4 596–7 194)
2005–06	921	(823–1 034)	1 068	(948–1 206)	415	(300–861)	2 404	(2 071–3 101)
2006–07	1 866	(1 732–2 015)	2 342	(2 147–2 549)	171	(154–190)	4 379	(4 033–4 754)
2007–08	1 161	(1 093–1 236)	1 636	(1 531–1 752)	278	(254–304)	3 075	(2 878–3 292)
2008–09	1 044	(958–1 139)	1 309	(1 208–1 419)	228	(206–253)	2 581	(2 372–2 811)
2009–10	900	(838– 969)	2 276	(2 092–2 472)	226	(204–250)	3 402	(3 134–3 691)
2010–11	911	(857–969)	1 605	(1 502–1 720)	170	(155–186)	2 686	(2 514–2 875)
2011–12	1 105	(1 027–1 192)	1 500	(1 385–1 624)	200	(180–221)	2 805	(2 592–3 037)
2012–13	1 505	(1 382–1 640)	1 672	(1 526–1 834)	188	(168–211)	3 365	(3 076–3 685)
2013–14	1 879	(1 722–2 058)	2 214	(2 014–2 434)	199	(175–225)	4 292	(3 911–4 717)
2014–15	1 402	(1 297–1 521)	1 841	(1 695–2 009)	237	(210–271)	3 480	(3 202–3 801)
2015–16	889	(787–1 007)	1 426	(1 251–1 623)	110	(92–131)	2 425	(2 130–2 761)

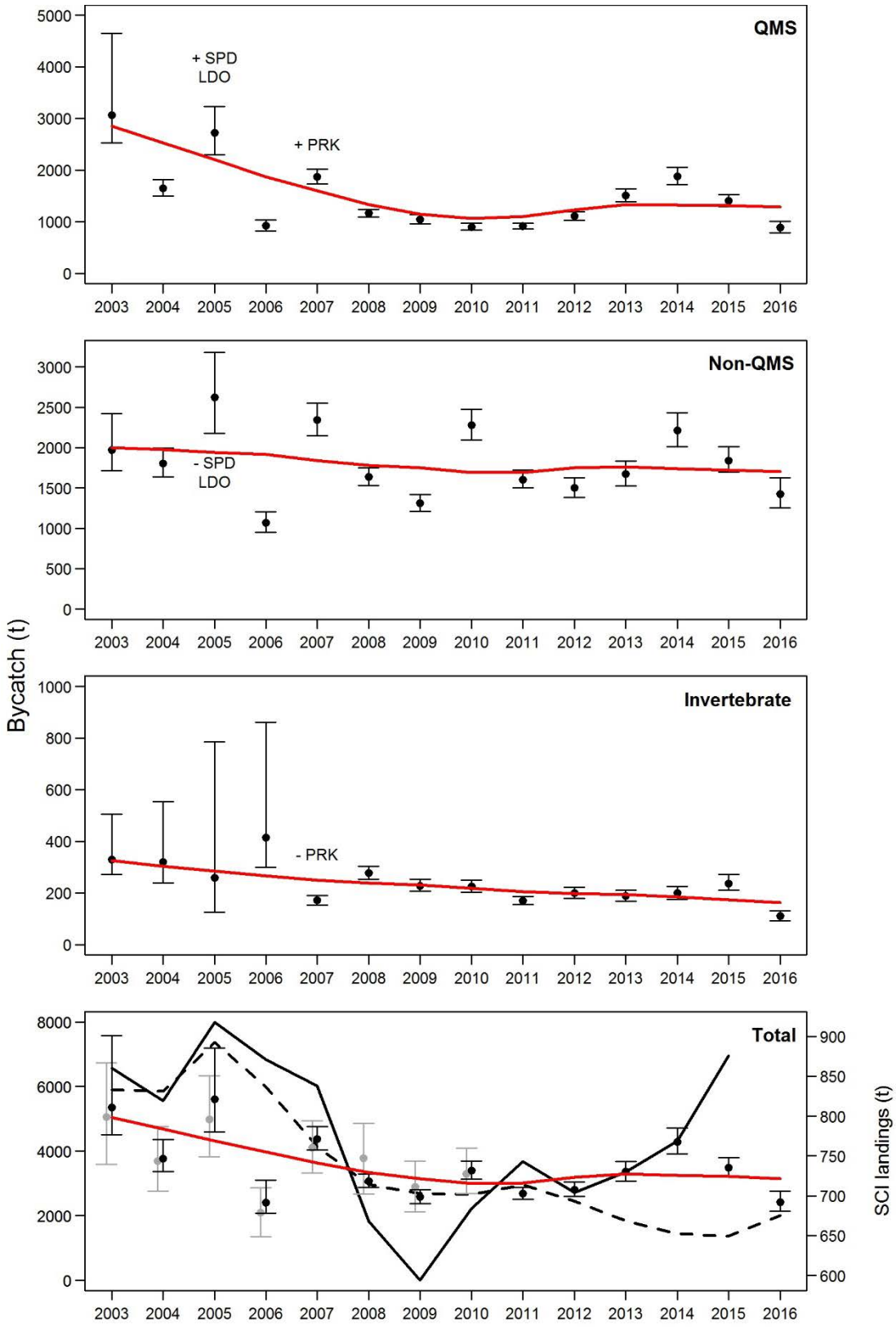


Figure 30: Annual estimates of bycatch in the scampi target trawl fishery, by species category, for 2002–03 to 2015–16 (black dots). Also shown (in grey) are earlier estimates of total bycatch calculated for 2002–03 to 2009–10 (Anderson 2012). Error bars indicate 95% confidence intervals. The red lines show the fit of a locally-weighted polynomial regression to annual bycatch. In the bottom panel the solid black line shows the total annual reported landings of scampi, and the dashed line shows annual effort (number of tows), scaled to have mean equal to that of total bycatch. Species codes in the plots indicate the year of entry or exit of bycatch species within the top 25 observed (see Table B1 for code details).

Table 11: Summary of results of linear regression analyses for trends in annual bycatch in the scampi fishery, by species category. The *p* values indicate whether the slopes differed significantly from zero, none here are less than 0.01 (generally considered highly significant).

Species category	Slope	*p*
QMS	-0.026	0.322
Non-QMS	-0.004	0.805
INV	-0.044	0.035
Total	-0.021	0.258

Total annual bycatch calculated directly from commercial catch records was substantially lower than the observer-based estimates in all but the final year of the series (2015–16), and was outside the confidence intervals of the observer-based estimates in each year (Table 12, Figure 31). There was little evidence of these alternative estimates becoming closer over time and it seems that catch-effort based estimates may be a less reliable alternative estimate in this fishery compared to the arrow squid fishery.

Table 12: Total annual bycatch estimates for the scampi trawl fishery based on catch effort records compared with estimates from the observer-based statistical model method. Estimates were derived by summing the difference between the recorded total catch and scampi catch for each trawl (TCP and TCE type forms) or group of trawls (CEL type forms).

Fishing year	Total bycatch (t)	% of observer-based estimate
2002–03	3 035	57
2003–04	2 842	75
2004–05	1 811	32
2005–06	1 578	66
2006–07	1 796	41
2007–08	1 857	60
2008–09	1 136	44
2009–10	1 569	46
2010–11	1 569	58
2011–12	1 930	69
2012–13	1 920	57
2013–14	1 914	45
2014–15	1 915	55
2015–16	2 011	83
All years	26 883	54

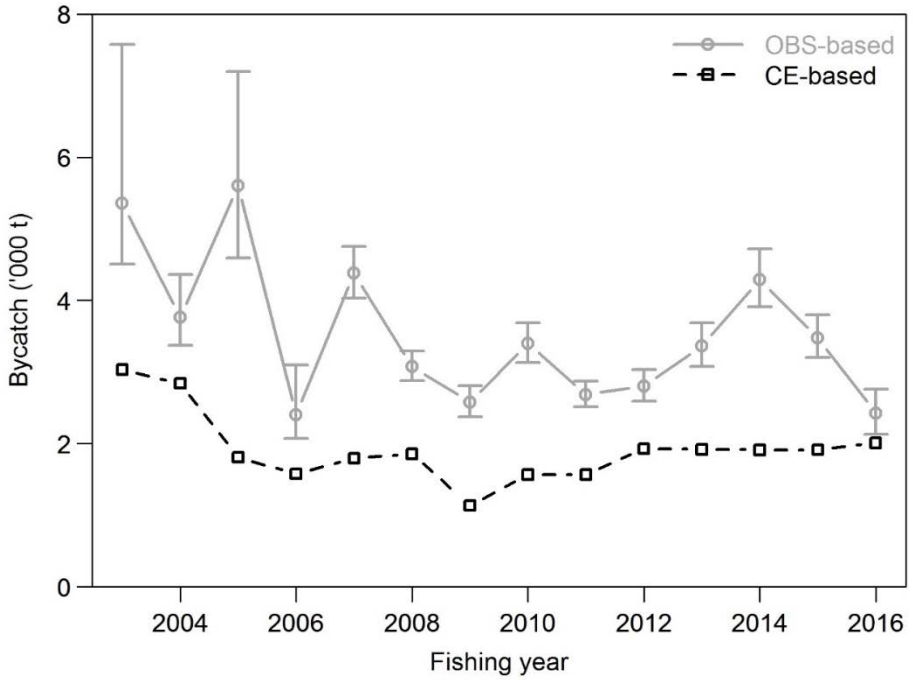


Figure 31: Total annual bycatch in the scampi target trawl fishery from scaled up observer catch rates and commercial catch effort records.

3.6 Estimation of discards

3.6.1 Annual discard levels

Negative slopes in the linear regressions on discard levels over time indicate that discards of all but the target species in the arrow squid fishery generally decreased, significantly so for the non-QMS and invertebrate species categories (Figure 32, Table 14). Discards within species categories were more stable in the scampi fishery, with no significant slope identified in any category (Figure 33, Table 16).

Arrow squid fishery

Total estimated annual discards in each species category are shown in Table 13 and Figure 32. Discards of arrow squid ranged from about 50 to about 1300 t per year, and although highest in the most recent year, no trend over time is obvious. Most estimates were higher than those calculated in Anderson (2013) but where they were most different the current estimates have wide confidence intervals (Figure 32). Discards of QMS species were relatively high (3000–5000 t per year) in a few of the earlier years but for the first year in the series, and the years after 2006–07, they were less than 2500 t. No significant trend was detected. Annual discards of non-QMS species were at a similar level to QMS discards overall, but generally not in individual years. The largest value by far was in 2002–03 (nearly 15 000 t) and the lowest values (250–420 t) were in the last four years of the series – leading to a statistically significant decline over time (Table 14). Annual discards of invertebrates also showed a declining trend over time (Figure 32), from 1000–2000 t between 2003–04 and 2005–06 to about 200 t in the last three years (Table 13), and likewise this trend was significant (Table 14). Estimates of total annual discards also showed a decreasing trend (Figure 32), ranging from a high of about 16 000 t in 2002–03 to 1000–3000 t in the last five years, and this trend was also significant (Table 14). Estimates of total discards from the previous review were generally similar to the current estimates for most years although they were slightly lower in most years, especially 2002–03 and 2006–07 where confidence intervals do not overlap (Figure 32). A breakdown of estimated discards in each of the standard areas, for each catch category and overall, is shown in Table A5.

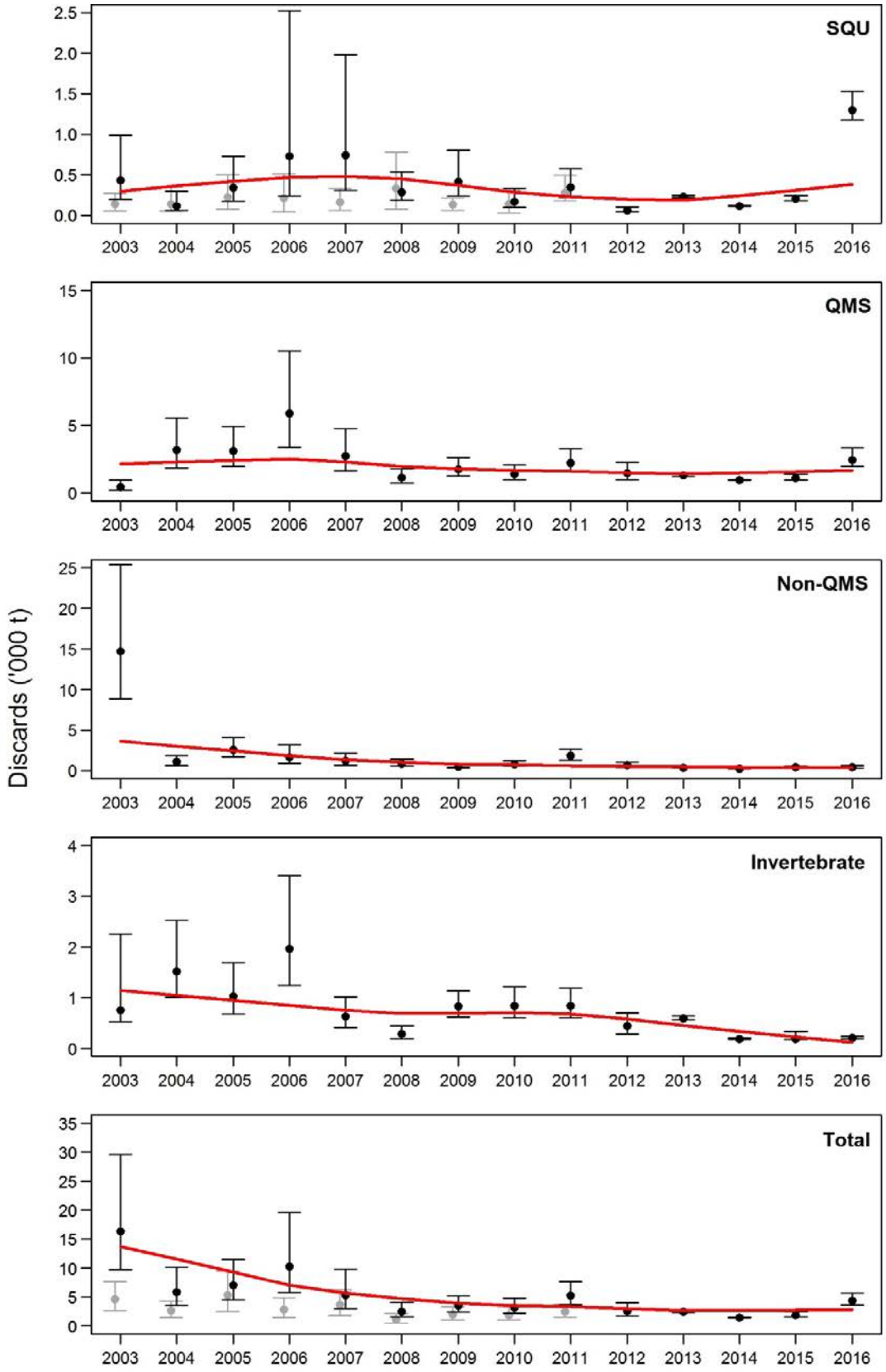


Figure 32: Annual estimates of discards in the arrow squid fishery, by species category, for 2002–03 to 2015–16. Also shown (in grey) are earlier estimates of arrow squid and total discards calculated for 2002–03 to 2010–11 (Anderson 2013). Error bars indicate 95% confidence intervals. The red lines show the fit of a locally-weighted polynomial regression to annual discards.

Table 13: Estimates of total annual discards (t) in the arrow squid target trawl fishery, by species category and fishing year; 95% confidence intervals in parentheses.

Fishing year	Arrow squid		QMS		Non-QMS		Invertebrate		Total discards	
2002–03	430	(197–984)	425	(221–944)	14 729	(8 845–25 371)	753	(519–2 256)	15 907	(9 782–29 555)
2003–04	115	(59–296)	3 168	(1 873–5 552)	1 065	(620–1 840)	1 518	(1 005–2 530)	5 751	(3 557–10 218)
2004–05	340	(172–730)	3 086	(1 985–4 938)	2 576	(1 703–4 081)	1 029	(671–1 686)	6 691	(4 531–11 435)
2005–06	728	(233–2 522)	5 889	(3 360–10 499)	1 668	(885–3 138)	1 966	(1 246–3 407)	9 523	(5 724–19 566)
2006–07	744	(309–1 980)	2 742	(1 623–4 742)	1 195	(669–2 132)	628	(412–1 012)	4 565	(3 013–9 866)
2007–08	283	(184–537)	1 107	(721–1 786)	853	(546–1 399)	288	(184–442)	2 248	(1 635–4 164)
2008–09	410	(233–803)	1 763	(1 248–2 610)	492	(352–720)	831	(618–1 136)	3 086	(2 451–5 269)
2009–10	167	(92–335)	1 389	(977–2 074)	807	(546–1 230)	838	(592–1 212)	3 034	(2 207–4 851)
2010–11	345	(225–572)	2 234	(1 581–3 273)	1 824	(1 290–2 615)	843	(600–1 190)	4 901	(3 696–7 650)
2011–12	56	(37–101)	1 460	(975–2 275)	642	(418–1 005)	442	(282–699)	2 544	(1 712–4 080)
2012–13	229	(219–248)	1 298	(1 183–1 499)	365	(332–418)	586	(561–633)	2 249	(2 295–2 798)
2013–14	111	(107–120)	931	(899–983)	253	(240–273)	185	(174–204)	1 369	(1 420–1 580)
2014–15	204	(183–243)	1 087	(958–1 370)	422	(368–516)	186	(181–336)	1 695	(1 690–2 465)
2015–16	1 294	(1 175–1 531)	2 457	(1 957–3 336)	409	(313–579)	202	(187–232)	3 068	(3 632–5 678)

Table 14: Summary of results of linear regression analyses for trends in annual discards, by species category, for the arrow squid fishery. The *p* values indicate whether the slopes differed significantly from zero. Those results where *p* values are less than 0.01 (generally considered highly significant) are shown in bold.

Species category	Slope	*p*
SQU	0.009	0.907
QMS	-0.067	0.093
NONQMS	**-0.210**	**<0.000**
INV	**-0.158**	**0.001**
Total	**-0.132**	**0.002**

Scampi fishery

Annual discards of scampi were generally estimated to be low but exceeded 10 t in two years (2002–03 and 2009–10) (Figure 33, Table 15). Discards of QMS species were more variable, ranging from 73 t in 2003–04 to 1521 t in 2004–05, with a general but slight increase over time. Non-QMS species were the main group discarded, in most years at a level of two to three times that of QMS species discards, with a range of 505–2659 t per year and no trend over time. Discard levels of non-QMS invertebrates were steadier over time, with a range of 108–449 t, but estimates for the earlier years were slightly higher and had much wider confidence intervals. Total discards showed a similar pattern to total bycatch, but at a lower level, ranging from a low of 900 t in 2003–04 to a high of about 4100 t in the following year, and showing no trend over time (Figure 33). Estimates of total discards from the previous review were similar to the current estimates for most years with mostly wider, and always overlapping, confidence intervals (Figure 33). The main species discarded were also those caught in the greatest amounts, i.e., javelinfish, other rattails, and sea perch. Regression analysis showed a mixture of positive and negative slopes in annual discards for each species category, and none were statistically significant (Table 16). A breakdown of estimated discards in each of the standard areas, for each catch category and overall, is shown in Table B5.

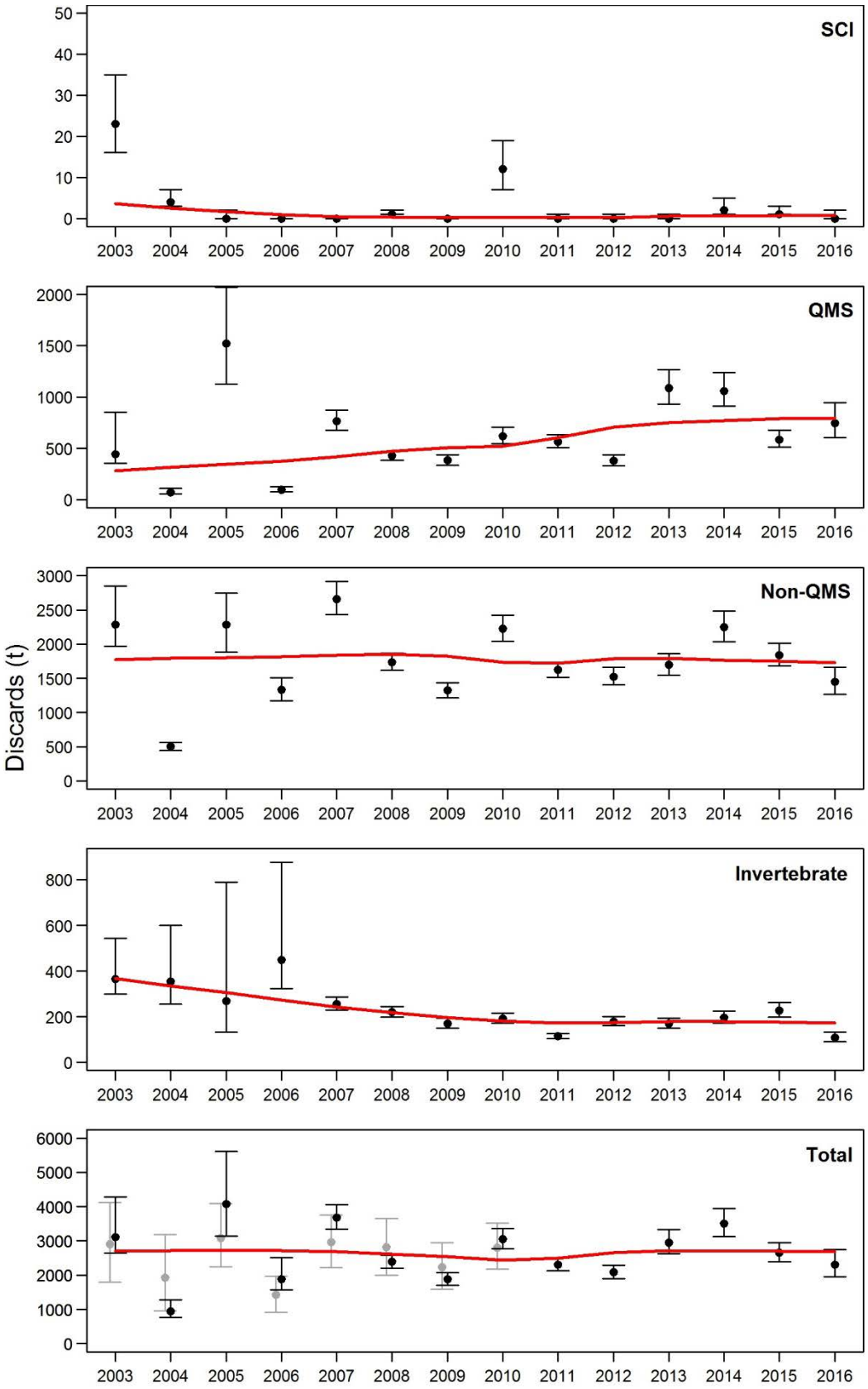


Figure 33: Annual estimates of discards in the scampi fishery, by species category, for 2002–03 to 2015–16. Also shown (in grey) are earlier estimates of total discards calculated for 2002–03 to 2009–10 (Anderson 2012). Error bars indicate 95% confidence intervals. The red lines show the fit of a locally-weighted polynomial regression to annual discards.

Table 15: Estimates of total annual discards (t) in the scampi target trawl fishery, by species category and fishing year; 95% confidence intervals in parentheses.

Fishing year	Scampi		QMS		Non-QMS		Invertebrate		Total discards	
2002–03	23	(16–35)	443	(353–852)	2 283	(1 968–2 847)	366	(299–543)	3 115	(2 636–4 277)
2003–04	4	(3–7)	73	(55–112)	505	(449–563)	355	(256–599)	937	(763–1 281)
2004–05	0	(0–2)	1 521	(1 127–2 069)	2 282	(1 882–2 749)	269	(131–790)	4 072	(3 140–5 610)
2005–06	0	(0–1)	97	(76–124)	1 331	(1 172–1 508)	449	(323–877)	1 877	(1 571–2 510)
2006–07	0	(0–0)	767	(676–871)	2 659	(2 433–2 911)	255	(228–286)	3 681	(3 337–4 068)
2007–08	1	(1–2)	426	(382–473)	1 738	(1 619–1 865)	220	(199–245)	2 385	(2 201–2 585)
2008–09	0	(0–0)	382	(335–438)	1 323	(1 217–1 436)	170	(150–193)	1 875	(1 702–2 067)
2009–10	12	(7–19)	621	(546–707)	2 224	(2 045–2 423)	191	(171–215)	3 048	(2 769–3 364)
2010–11	0	(0–1)	567	(505–634)	1 624	(1 516–1 738)	114	(103–126)	2 305	(2 124–2 499)
2011–12	0	(0–1)	380	(332–436)	1 524	(1 402–1 659)	179	(161–200)	2 083	(1 895–2 296)
2012–13	0	(0–1)	1 085	(933–1 270)	1 696	(1 544–1 863)	169	(149–194)	2 950	(2 626–3 328)
2013–14	2	(1–5)	1 060	(911–1 241)	2 248	(2 035–2 481)	196	(172–225)	3 506	(3 119–3 952)
2014–15	1	(1–3)	586	(512–677)	1 839	(1 683–2 010)	226	(198–262)	2 652	(2 394–2 952)
2015–16	0	(0–2)	746	(603–947)	1 450	(1 263–1 662)	108	(90–132)	2 304	(1 956–2 743)

Table 16: Summary of results of linear regression analyses for trends in annual discards, by species category, for the scampi fishery. The *p* values indicate whether the slopes differed significantly from zero, none here are less than 0.01 (generally considered highly significant).

Species category	Slope	*p*
SCI	-0.198	0.085
QMS	0.083	0.121
NONQMS	0.025	0.400
INV	-0.060	0.019
Total	0.011	0.649

3.6.2 Observer-authorised discarding

Section 72 of the Fisheries Act (1996) allows for the legal discarding of QMS species not listed in Schedule 6 if authorised by an observer (or fishery officer) who is present at the time. Such discarding is recorded at sea on an "Authority to return or abandon fish to the sea" form and, since 1 October 2013, on CLR forms. To assess the extent of discarding reported in this way, an examination of CLR data was made, based on all fishing trips which mainly targeted arrow squid (over 50% of tows per trip) or exclusively targeted scampi (the different criteria necessary due to the more mixed targeting on arrow squid trips). This showed that in the arrow squid fishery the approximate level of observer authorised discards has grown strongly, from 470 t in 2013–14 to 1719 t in 2015–16, whereas in the scampi fishery observer authorised discards have been much less (5–35 t per year), which is likely to be due to the smaller size of the scampi fishery and the lower level of observer coverage.

In addition to the CLR system of recording these discards, observers also provide a summary of all approved discarding for each trip in their trip report, but again this is not recorded in a database. A complicating factor with the data from both of these sources (if they were to have been incorporated into this study) is that usually the records relate to the combined discards from several fishing events, or the entire trip, and reconciling these data with the catch from individual tows is usually not possible.

Observer authorised discarding clearly has the potential to bias estimation of discards which are based on observed discard ratios. Ideally such discards would be ignored in the calculation of these ratios but this could be done only by assuming that all QMS species discards in the observer databases were properly approved. Disregarding these discards would lead to a discard ratio of zero and imply zero discarding of

(non-Schedule 6, or fish smaller then MLS) QMS species in the unobserved portion of the fishery. The annual QMS species discard estimates presented in this report therefore implicitly assume that the level of discarding of QMS species not listed in Schedule 6 and MLS of the Fisheries Act (1996) is unaffected by the presence of an observer on the vessel.

3.7 Utilisation rates of bycatch in the arrow squid and scampi trawl fisheries

Annual bycatch and discard estimates in the arrow squid and scampi trawl fisheries were divided by the estimated annual target species catch, and annual discards were divided by annual bycatch in the respective fisheries, to provide measures of utilisation rates in these fisheries (Tables 17 and 18, Figures 34 and 35). The bycatch fraction (kg of bycatch/kg of target species catch) is a measure of how effective the fishery is at restricting the catch to the target species (with any value below 1 indicating that the target species comprises most of the catch), in a form that can easily be compared across any fishery. Similarly, the discard fraction (kg of discards/kg of target species catch) provides a measure of the utilisation rate that can be compared across fisheries. Total discards as a fraction of total bycatch provides an alternative measure of the utilisation of bycatch that may be useful for fishery managers.

The bycatch fraction in the arrow squid fishery ranged from 0.78 in 2002–03 to 0.23 in 2015–16, but despite these extremes occurring at opposite ends of the time series the wide fluctuation in annual values mask any evidence of a general decline over time (Figure 34). The discard fraction was less variable over time, although the value of 0.43 in 2002–03 stands out from the lower range (0.05–0.16) in the rest of the series, and shows little correlation with the bycatch fraction. Total discards as a fraction of bycatch was also relatively steady throughout the time series, although in the first and last years it was at about twice the level of that of the intervening years (Figure 34).

In the scampi fishery, the bycatch fraction ranged from a high of almost 7 in 2002–03 to a low of 2.7 in 2015–16 and, although variable, generally declined over time. The discard fraction was also variable among years, roughly following a similar pattern to the bycatch fraction and also to the pattern of discards over time due to the relatively steady annual catch of scampi. The discard fraction ranged from about 1.3 to 4.9 with an overall value for the 14-year period of 3.6 (Table 18). Total discards as a fraction of bycatch was steady throughout the period at a level of about 0.75–0.95, apart from the first two years when it was slightly lower, suggesting that there has been little change in the level of utilisation of bycatch over time (Figure 35).

Table 17: Estimated annual arrow squid catch (t), total bycatch (t), and total discards (t) in the target arrow squid trawl fishery; bycatch fraction (kg of total bycatch per kg of arrow squid caught), discard fraction (kg of total discards per kg of arrow squid caught); and discards as a fraction of bycatch.

Fishing year	SQU estimated catch	Total bycatch	Total discards	Bycatch fraction	Discard fraction	Discards / bycatch
2002–03	37 648	29 497	16 337	0.78	0.43	0.55
2003–04	76 661	26 413	5 866	0.34	0.08	0.22
2004–05	73 317	29 181	7 031	0.40	0.10	0.24
2005–06	62 169	39 842	10 251	0.64	0.16	0.26
2006–07	62 086	17 875	5 309	0.29	0.09	0.30
2007–08	51 136	14 020	2 531	0.27	0.05	0.18
2008–09	42 931	12 209	3 496	0.28	0.08	0.29
2009–10	29 214	12 047	3 201	0.41	0.11	0.27
2010–11	33 277	18 595	5 246	0.56	0.16	0.28
2011–12	30 828	13 000	2 600	0.42	0.08	0.20
2012–13	21 418	11 015	2 478	0.51	0.12	0.22
2013–14	13 341	9 436	1 480	0.71	0.11	0.16
2014–15	13 912	9 198	1 899	0.66	0.14	0.21
2015–16	39 291	8 876	4 362	0.23	0.11	0.49
All years	–	–	–	0.43	0.12	0.29

Table 18: Estimated annual scampi catch (t), total bycatch (t), and total discards (t) in the target scampi trawl fishery; bycatch fraction (kg of total bycatch per kg of scampi caught), discard fraction (kg of total discards per kg of scampi caught); and discards as a fraction of bycatch.

Fishing year	SCI estimated catch	Total bycatch	Total discards	Bycatch fraction	Discard fraction	Discards / bycatch
2002–03	783	5 361	3 115	6.85	3.98	0.58
2003–04	733	3 768	937	5.14	1.28	0.25
2004–05	840	5 606	4 072	6.67	4.85	0.73
2005–06	795	2 404	1 877	3.02	2.36	0.78
2006–07	773	4 379	3 681	5.66	4.76	0.84
2007–08	607	3 075	2 385	5.07	3.93	0.78
2008–09	550	2 581	1 875	4.69	3.41	0.73
2009–10	641	3 402	3 048	5.31	4.76	0.90
2010–11	689	2 686	2 305	3.90	3.35	0.86
2011–12	652	2 805	2 083	4.30	3.19	0.74
2012–13	641	3 365	2 950	5.25	4.60	0.88
2013–14	720	4 292	3 506	5.96	4.87	0.82
2014–15	813	3 480	2 652	4.28	3.26	0.76
2015–16	893	2 425	2 304	2.72	2.58	0.95
All years	–	–	–	4.90	3.63	0.74

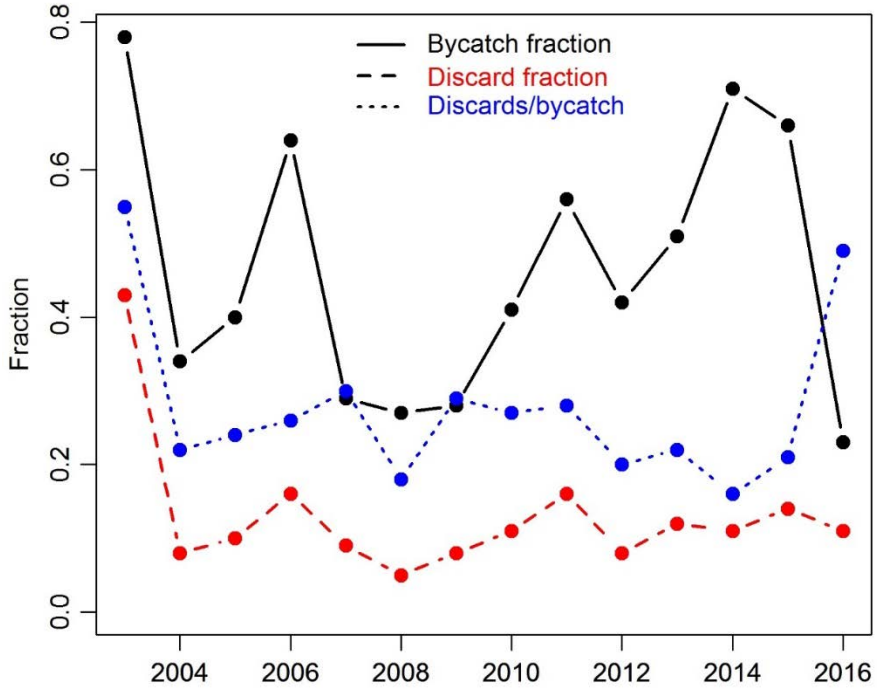


Figure 34. Bycatch and discard fractions in the target arrow squid fishery. Bycatch fraction, total bycatch divided by total estimated arrow squid catch; Discard fraction, total discards divided by total estimated arrow squid catch; Discards/bycatch, total discards divided by total bycatch.

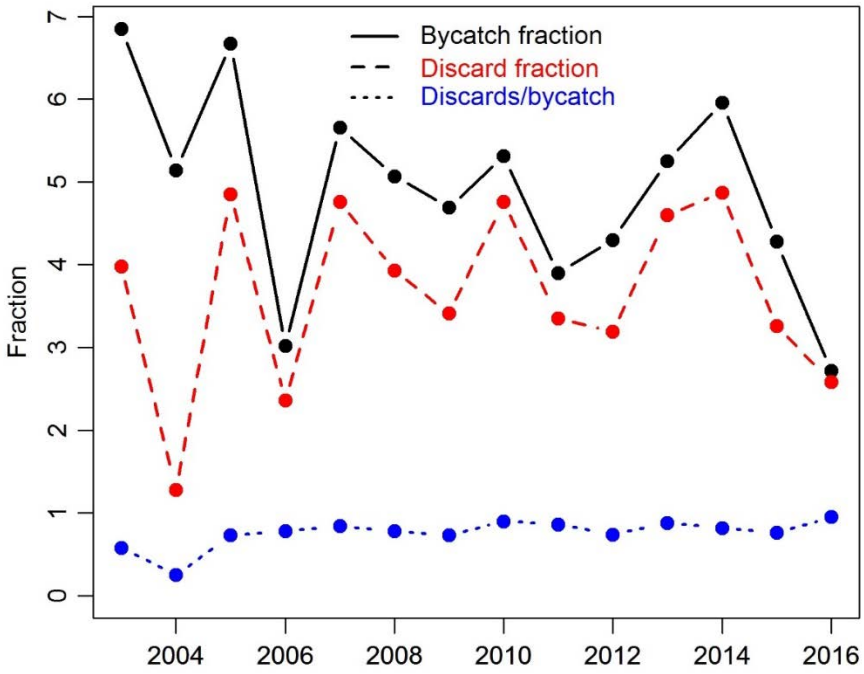


Figure 35: Bycatch and discard fractions in the target scampi fishery. Bycatch fraction, total bycatch divided by total estimated scampi catch; Discard fraction, total discards divided by total estimated scampi catch; Discards/bycatch, total discards divided by total bycatch.

3.8 Annual bycatch by individual species in the arrow squid and scampi trawl fisheries

Annual bycatch estimates for the most commonly caught individual species (the top 30 species/species groups observed in the arrow squid fishery and the top 22 species/species groups observed in the scampi fishery), along with regression slopes indicating general trends in abundance, are presented in Tables A6 and B6 and (for the top 12 species in each fishery) Figures 36 and 37. Breakdown of these catch estimates by standard area are shown in Tables A7 and B7.

Based on these estimates, for the arrow squid target fishery, the most commonly caught bycatch species over the entire commercial fishery were (in decreasing order) barracouta (BAR), silver warehou (WAR), spiny dogfish (SPD), red cod (RCO), rattails (RAT), blue warehou (WAR), ling (LIN), and hoki (HOK) (Table A6, Figure 36). Of the 30 bycatch species examined, 5 have shown a significant decrease in catch over time, and 2 an increase in catch over time (the remaining species showing no change at the 1% level of significance). The species showing significant declines were the three top bycatch species, i.e., barracouta, silver warehou, and spiny dogfish, along with ling and hapuka (HAP); those showing significant increases were basking shark (BSK – although no catches have been recorded in the last 3 years) and hake (HAK) (Table A6).

For the scampi target trawls, the most commonly caught bycatch species over the entire commercial fishery were (in decreasing order) javelinfish (JAV), rattails (RAT), sea perch (SPE), ling (LIN), hoki (HOK), and dark ghost shark (GSH) (Table B6, Figure 37). Of the 22 bycatch species examined, 5 have shown a significant decrease in catch over time, while none have shown an increase in catch (the remaining species showing no change at the 1% level of significance). The species showing significant declines were ling, gemfish (*Rexea* spp.), silver warehou, hake, and toadfish (*Neophrynichthys* sp.) (Table B6).

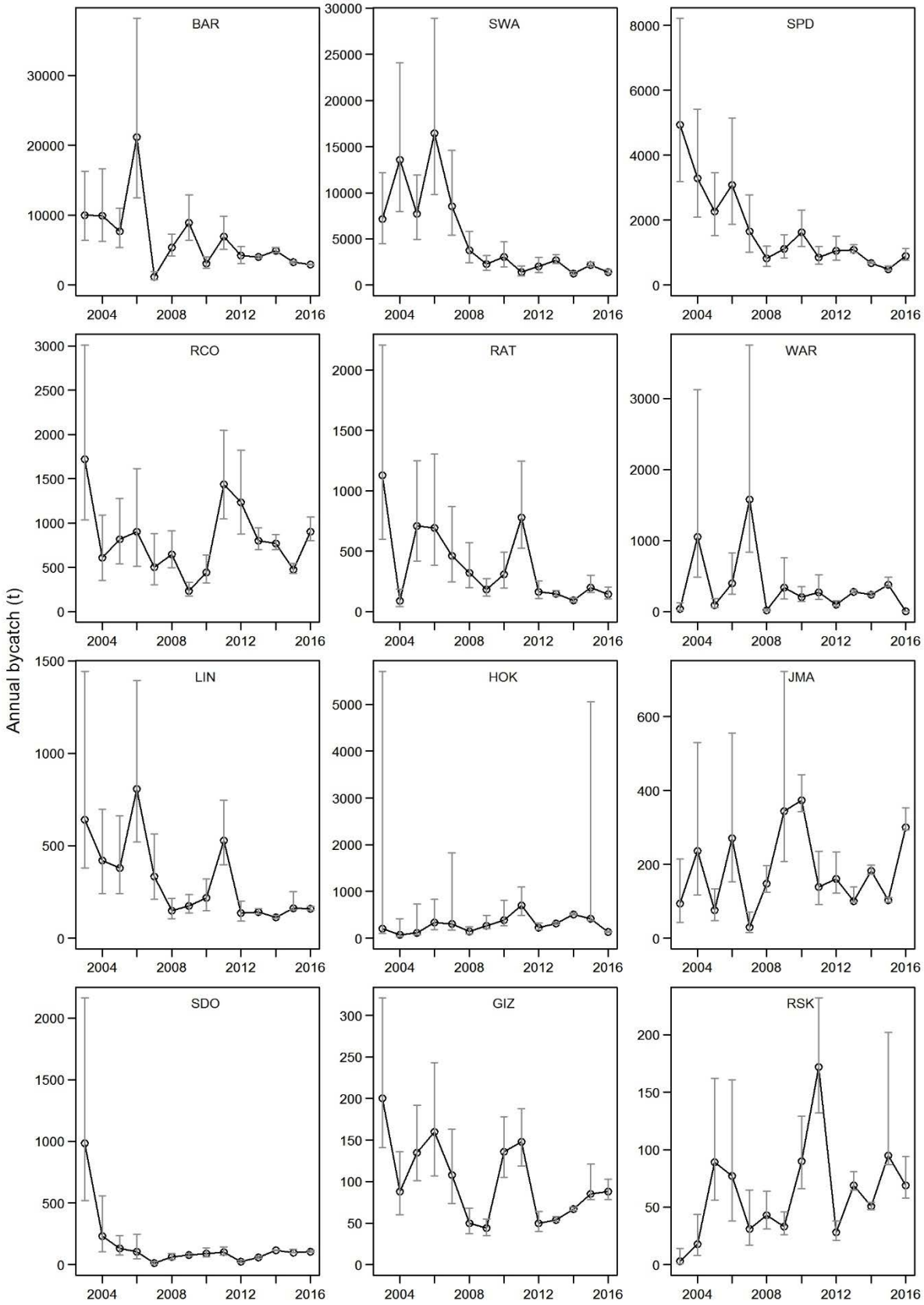


Figure 36: Annual bycatch estimates in the target arrow squid trawl fishery for the species which have the most bycatch between 2002–03 and 2015–16, with 95% CIs, in descending order of total catch. See Table A1 for species code definitions. Note: the scale changes on the y-axis between plots.

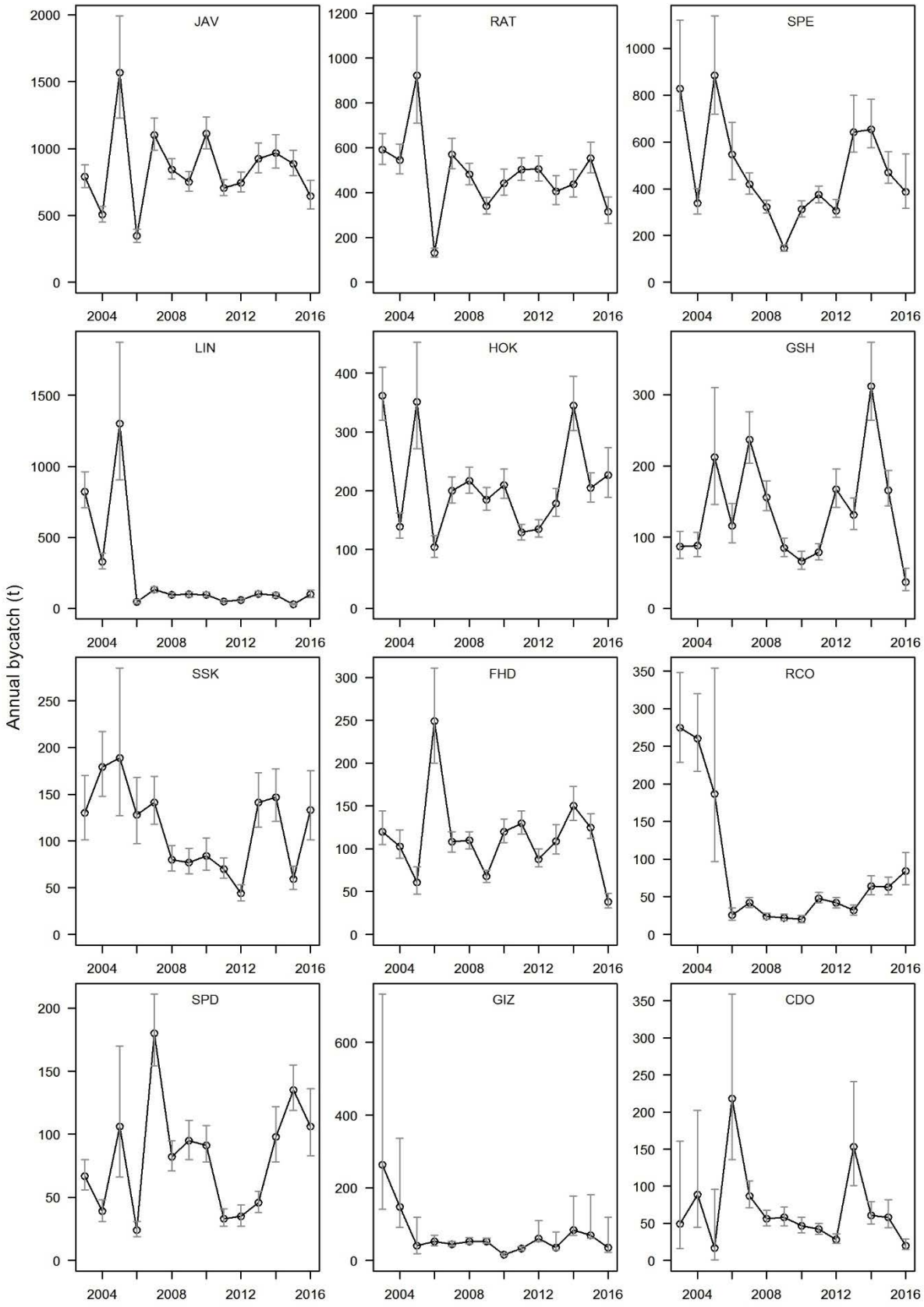


Figure 37: Annual bycatch estimates in the target scampi trawl fishery for the species which have the most bycatch between 2002–03 and 2015–16, with 95% CIs, in descending order of total catch. See Table B1 for species code definitions. Note: the scale changes on the y-axis between plots.

4. SUMMARY AND DISCUSSION

Observer coverage

The annual estimates of bycatch and discards for the entire arrow squid and scampi target trawl fisheries rely on bycatch and discard rates from only the observed fraction of the fishery and, as such, the precision of these estimates is strongly dependent on the level and spread of observer coverage as well as the quality of the coverage. No attempt has been made to account for any difference in fishing and processing behaviour that might exist between the observed and unobserved sectors of the fisheries. The available information on such differences is largely anecdotal (e.g. Simmons et al., 2015), not easily incorporated into the analysis carried out for this report, and not a requirement of the project objectives.

The level of observer coverage over the 14-year period has averaged 39% and 9% of the total estimated target species catch in the arrow squid and scampi target trawl fisheries, respectively. Coverage in the arrow squid fishery was occasionally very high, over 90% between 2012–13 and 2015–16, but in the scampi fishery coverage was never more than about 12% and was below 5% in 2004–05 and 2015–16. For comparison with other offshore fisheries during approximately the same period, observer coverage averaged 41% in the jack mackerel, southern blue whiting, and orange roughy fisheries, 29% in the oreo fishery, 22% in the hoki/hake/ling trawl fishery, and 11% in the ling longline fishery (Anderson 2009; Anderson 2014, Anderson et al. 2017a; Anderson et al. 2017b; Ballara & O'Driscoll 2015).

In the arrow squid fishery, the distribution of observer effort has been fairly representative of total commercial effort across the range of available fishery parameters. The major fisheries around the Auckland Islands, Stewart-Snares Shelf, and Puysegur Banks were well sampled by observers in most years, however the East Coast South Island and western Chatham Rise fisheries were relatively poorly covered in a number of years; the main vessels and vessel sizes operating in the fishery all received relatively high levels of coverage, although the largest were oversampled and the smallest under-sampled to a degree. Coverage was tightly focussed on the main period of the fishery, with a degree of oversampling in February and March, and under-sampling in other months, especially in January, but was close to ideal in more recent years when overall coverage of the fleet was 90% or higher.

In the scampi fishery, the distribution of observer coverage was relatively well matched to total fishing effort for most fishery parameters, despite the relatively low level of coverage in this fishery. However, generally poorer representation was noted in 2001–05, 2011–12, 2013–14, and 2015–16, and there was some oversampling and under-sampling of the main fisheries on the Chatham Rise, Wairarapa, Bay of Plenty, and Auckland Islands at various times. The full range of vessel sizes was covered, although there was some oversampling of vessels of the main size range (500–700 t) in some years. Observer effort was characterised in most years by short bursts of intense coverage in two or three distinct periods while total fishery effort tended to be evenly spread over the year, but when considering all years combined observer coverage represented all times of the year relatively well.

Model structure and output

The selection of standard fishery area as the primary variable for stratification of the analyses was a choice made to align the outputs from this analysis with those from each of the other offshore fisheries that are examined under this programme. Although these standard areas do not match the management QMAs for either fishery, they align sufficiently well for the arrow squid fishery for most purposes (only the Auckland Islands fishery has a separate QMA from the remainder of the EEZ), and also for the scampi fishery especially with the added division of the CHAT standard area at 180° longitude to align with the boundary between the Chatham Rise SCI 3 and SCI 4A QMAs.

One of the advantages of the model-based method over the ratio-based method used in all previous analyses for New Zealand offshore fisheries is that it allows for a natural inclusion of other covariates. It facilitates this by providing a formal testing framework for decisions concerning which covariates should be included, can more easily accommodate missing covariate data, and is likely to be less biased when the observer sampling design is unbalanced with respect to the fishing effort (Edwards et al. 2015). The

covariates thus selected for the scampi analysis comprised area and fishing year but for the larger arrow squid fishery with higher levels of observer coverage gear type (midwater or bottom trawl) and meal plant usage (discards only), were also used.

Estimation of bycatch and discards focussed on three broad categories of catch; QMS species, non-QMS fish species, and non-QMS invertebrates. These categories do not match the QMS, non-QMS, and invertebrate species categories used in previous analyses of these and other fisheries (except for the most recent analyses of the orange roughy, oreo, and jack mackerel fisheries, Anderson et al. 2017a, Anderson et al. 2017b). Here the allocation of species to these categories took into account their date of entry into the QMS, thus altering the composition of each category from year to year. These categorisations limited the comparison of results from earlier analyses of the arrow squid and scampi fisheries with those from the current study to estimates of *total* bycatch and *total* discards, and discards of the target species, for the nine (arrow squid) or eight (scampi) years in which the studies overlap. The updated estimates of total annual bycatch and discards for these overlapping years were however similar to the earlier estimates in most cases. The larger differences seen in a few years for total bycatch and discards (particularly for the arrow squid fishery) are likely to be related to the change in estimation model from the ratio method used previously to the statistical model method used here, which more naturally estimates rates in data poor strata, as well as slight differences in data grooming methods.

Composition and level of bycatch and discards

Since 2001–02, arrow squid have accounted for about 79% of the total estimated catch weight recorded by observers in the target trawl fishery. The remainder of the (observed) catch comprised mainly QMS fish species including barracouta (9.1%), silver warehou (3.3%), spiny dogfish (1.7%), and red cod (1.2%), with non-QMS fish species mainly comprising silver dory (0.2%), rattails (0.2%), and a range of other bony fishes and chondrichthyans. Non-QMS invertebrate species bycatch was dominated by crabs, especially the smooth red swimming crab (0.85% of the catch) and the giant spider crab (0.2%). Most of the remaining species or species groups recorded by observers each accounted for less than 0.01% of the observed catch during the period.

The range of total annual bycatch in the arrow squid fishery during the 14-year period analysed was about 9200–40 000 t, and declined significantly over time. Bycatch in this fishery was dominated by QMS species, which together accounted for over 85% of the total bycatch in each year and therefore also declined significantly over time. Significant declines in bycatch were also seen for non-QMS species (range 300–2100 t per year) and invertebrate bycatch (range 300–1600 t per year). Discards in the arrow squid fishery followed a similar pattern to bycatch, with declining levels in each category. Total discards ranged from about 1400 t to about 16 000 t per year and were a mixture of (in overall decreasing order) QMS, non-QMS, invertebrate, and target species.

Since 2001–02, scampi has accounted for about 19% of the total estimated catch weight recorded by observers in the target trawl fishery. The remainder of the (observed) catch was dominated by the non-QMS species javelinfish (18%) and other rattails (12%), with the QMS species sea perch (10%), hoki (5%), ling (4%), and ghost shark (3%) also forming a substantial component of the bycatch. Unspecified crab species (0.9%), unspecified starfish (0.8%), and the QMS species arrow squid (0.7%) and prawn killers (*Ibacus alticrenatus*) (0.5%) were the top invertebrate species recorded by observers, with many other crustacean, mollusc, and echinoderm groups also contributing.

Total annual bycatch in the scampi fishery during the 14-year period analysed was highly variable but generally declined over time, with a range of 2400–5600 t. Bycatch of QMS species showed a similar pattern, with a range of 900–3000 t, and although non-QMS species bycatch was also variable (1100 t to 2600 t per year) there was no trend over time. Total discards showed a similar pattern to total bycatch but at a lower level, with a range of 900–4100 t per year, and no trend. Discards mostly comprised non-QMS species (a mixture of fish and invertebrates) with a range of 1300 t to 2500 t per year, while invertebrate species discards were less than 550 t in all years and less than 250 t per year after 2005–06. The main

species discarded were those caught in the greatest amounts, i.e., javelinfish, other rattails, and sea perch.

Trends in bycatch and discards of QMS, non-QMS, and invertebrate species are all confounded slightly because the species comprising these categories vary from year to year according to the date of their entry into the QMS. The most relevant of these species (those inside the top 25 most observed bycatch species) were spiny dogfish, redbait, Rays bream, and giant spider crabs in the arrow squid fishery, and spiny dogfish, prawn killers, and lookdown dory in the scampi fishery, but none accounted for more than 2% of the total observed catch in either fishery (see Tables A1, A2, B1, B2). Moreover, the trends identified are still meaningful here, as in the arrow squid fishery bycatch and discards declined over time in each species category, in most cases significantly, and in the scampi fishery there were no significant trends over time in any catch category, for either bycatch or discards.

In both fisheries, total annual bycatch calculated directly from commercial catch records was substantially lower than the observer-based estimates for most years and this method, although attractive due to its ease of calculation and complete coverage of the fishery, doesn't seem to provide a very reliable alternative estimate in these cases.

The estimation of bycatch levels for a range of individual species in the arrow squid and scampi target trawl fisheries has provided an initial overview of the level of annual catch and enabled the highlighting of taxa where catch has changed over time, possibly indicating a change in abundance. In general, negative trends in bycatch levels over time were far more common than positive trends. For five species in both the arrow squid and scampi fisheries these negative trends were statistically significant, while positive trends were only seen for two species, in the arrow squid fishery.

Discards relative to target catch

The discard fraction (kg of discards/kg of arrow squid catch) ranged from 0.05 in 2007–08 to 0.43 in 2002–03, with an overall value for the 14-year period of 0.12, and showed little trend over time. The equivalent fractions of discarded fish in the scampi fishery were much higher than in the arrow squid fishery but variable and also showed no trend over time, with a range of 1.2–4.9 for the whole period and an overall value for the 14-year period of 3.6. These rates can be compared with recent average rates in other New Zealand offshore fisheries which are similarly monitored, as follows: southern blue whiting (0.005 kg), jack mackerel (0.007 kg), hoki, hake, ling (0.06 kg), ling longline (0.3 kg), orange roughy (0.07 kg), and oreos (0.01 kg) (Anderson 2009, 2014, Anderson et al. 2017a, Ballara & O'Driscoll 2015, Anderson et al. 2017b).

5. ACKNOWLEDGMENTS

We would like to acknowledge the observers of the Ministry for Primary Industries for their dedication and continued efforts over a long period to collect the high quality data that made this analysis possible. Thanks also to Sira Ballara (NIWA) and members of the Aquatic Environment Working Group for their reviews of the analyses and report. This work was funded by the Ministry for Primary Industries project DAE201601.

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APPENDIX A: ARROW SQUID

Table A1: Observed arrow squid and FISH catch and discards for target arrow squid trawls. Species codes, common and scientific names, estimated catch, percentage of total catch, and overall percentage discarded of the top 100 fish species or species groups by weight from observer records for the arrow squid trawl fishery from 1 Oct 2002 to 30 Sep 2016. Records are ordered by decreasing percentage of catch. Codes in bold are QMS species (as of 1 October 2015); codes in italics are Schedule 6 QMS species (can legally be returned to the sea).

Species code	Common name	Scientific name	Observed catch (t)	% of catch	% discarded
SQU	Arrow squid	*Nototodarus sloanii* & *N. gouldi*	239 442.5	79.0	0.8
BAR	Barracouta	*Thyrsites atun*	27 559.1	9.1	1.6
SWA	Silver warehou	*Seriolella punctata*	10 115.1	3.3	2.5
SPD	Spiny dogfish	*Squalus acanthias*	5 210.7	1.7	81.4
RCO	Red cod	*Pseudophycis bachus*	3 756.5	1.2	8.5
HOK	Hoki	*Macruronus novaezelandiae*	2 158.1	0.7	20.9
JMA	Slender jack mackerel	*Trachurus murphyi*	1 787.7	0.6	0.3
WAR	Common warehou	*Seriolella brama*	1 689.3	0.6	0.1
LIN	Ling	*Genypterus blacodes*	1 008.0	0.3	1.5
RBT	Redbait	*Emmelichthys nitidus*	851.1	0.3	34.3
SDO	Silver dory	*Cyttus novaezealandiae*	740.0	0.2	87.2
RAT	Rattails	*Macrouridae*	688.4	0.2	88.4
GIZ	Giant stargazer	*Kathetostoma* spp.	375.0	0.1	6.4
GSH	Dark ghost shark	*Hydrolagus novaezealandiae*	366.0	0.1	22.9
RSK	Rough skate	*Zearaja nasuta*	322.9	0.1	3.2
STU	Slender tuna	*Allothunnus fallai*	299.3	0.1	6.9
HAP	Hapuku	*Polyprion oxygeneios*	273.4	0.1	1.8
SCH	School shark	*Galeorhinus galeus*	249.9	0.1	10.9
WWA	White warehou	*Seriolella caerulea*	206.4	0.1	3.3
JAV	Javelin fish	*Lepidorhynchus denticulatus*	187.8	0.1	84.2
RSO	Gemfish	*Rexea* spp.	184.2	0.1	22.0
BSK	Basking shark	*Cetorhinus maximus*	143.0	0.0	51.1
SSK	Smooth skate	*Dipturus innominatus*	129.7	0.0	5.3
RBM	Rays bream	*Brama brama*	127.6	0.0	3.5
CAR	Carpet shark	*Cephaloscyllium isabellum*	120.9	0.0	97.8
SPE	Sea perch	*Helicolenus* spp.	115.0	0.0	7.7
FRO	Frostfish	*Lepidopus caudatus*	77.2	0.0	1.8
SSI	Silverside	*Argentina elongata*	54.7	0.0	71.8
NMP	Tarakihi	*Nemadactylus macropterus*	53.9	0.0	7.6
GON		*Gonorynchus forsteri* & *G. greyi*	48.2	0.0	86.9
HPB	Hapuku & bass	*Polyprion oxygeneios* & *P. americanus*	47.1	0.0	3.2
HAK	Hake	*Merluccius australis*	46.7	0.0	4.3
POS	Porbeagle shark	*Lamna nasus*	40.9	0.0	66.1
WIT	Witch	*Arnoglossus scapha*	38.5	0.0	89.3
SBW	Southern blue whiting	*Micromesistius australis*	38.2	0.0	24.2
BCO	Blue cod	*Parapercis colias*	38.1	0.0	6.2
CAS	Oblique banded rattail	*Coelorinchus aspercephalus*	32.1	0.0	95.3
RDO	Rosy dory	*Cyttopsis roseus*	30.1	0.0	97.3
SUN	Sunfish	*Mola mola*	29.5	0.0	21.5
PIG	Pigfish	*Congiopodus leucopaecilus*	29.0	0.0	85.0
BCD	Black cod	*Paranotothenia magellanica*	28.5	0.0	56.9
OPE	Orange perch	*Lepidoperca aurantia*	28.0	0.0	90.6
SPO	Rig	*Mustelus lenticulatus*	27.6	0.0	36.9
GFL	Greenback flounder	*Rhombosolea tapirina*	20.1	0.0	21.2
CDO	Capro dory	*Capromimus abbreviatus*	19.8	0.0	64.5
MAK	Mako shark	*Isurus oxyrinchus*	17.1	0.0	59.6
BEL	Bellowsfish	*Centriscops* spp.	16.5	0.0	68.5
STN	Southern bluefin tuna	*Thunnus maccoyii*	15.0	0.0	45.2
CBE	Crested bellowsfish	*Notopogon lilliei*	14.9	0.0	74.5

Table A1: continued

Species code	Common name	Scientific name	Observed catch (t)	% of catch	% discarded
TOA	Toadfish	*Neophrynichthys* sp.	14.0	0.0	71.1
GSP	Pale ghost shark	*Hydrolagus bemisi*	13.1	0.0	11.0
BWS	Blue shark	*Prionace glauca*	12.8	0.0	62.1
LAN	Lantern fish	Myctophidae	12.3	0.0	4.6
BGZ	Banded stargazer	*Kathetostoma binigrasella*	12.2	0.0	0.1
OPA	Opalfish	*Hemerocoetes* spp.	12.1	0.0	88.1
FLA	Flatfish		9.0	0.0	5.2
LDO	Lookdown dory	*Cyttus traversi*	8.2	0.0	10.2
YCO	Yellow cod	*Parapercis gilliesi*	6.7	0.0	83.8
SCD	Smallscaled cod	*Notothenia microlepidota*	6.4	0.0	61.0
SNA	Snapper	*Pagrus auratus*	5.8	0.0	0.1
OSD	Other sharks and dogs	Selachii	5.4	0.0	100.0
BAS	Bass groper	*Polyprion americanus*	4.8	0.0	0.4
WPS	White pointer shark	*Carcharodon carcharias*	4.8	0.0	60.7
CON	Conger eel	*Conger* spp.	4.5	0.0	32.3
THR	Thresher shark	*Alopias vulpinus*	4.3	0.0	100.0
SQI	Squirrelfish	*Pristilepis oligolepis*	4.3	0.0	1.4
BBE	Banded bellowsfish	*Centriscops humerosus*	4.2	0.0	98.4
SKA	Skate	Rajidae & Arhynchobatidae	3.9	0.0	70.7
BNS	Bluenose	*Hyperoglyphe antarctica*	3.8	0.0	13.0
GUR	Gurnard	*Chelidonichthys kumu*	3.7	0.0	5.2
CSQ	Leafscale gulper shark	*Centrophorus squamosus*	3.6	0.0	100.0
TOD	Dark toadfish	*Neophrynichthys latus*	3.6	0.0	53.3
DSP	Deepsea pigfish	*Congiopodus coriaceus*	3.6	0.0	77.3
FHD	Deepsea flathead	*Hoplichthys haswelli*	3.5	0.0	100.0
ETL	Lucifer dogfish	*Etmopterus lucifer*	3.2	0.0	100.0
SND	Shovelnose spiny dogfish	*Deania calcea*	3.1	0.0	100.0
SHA	Shark		2.8	0.0	100.0
HEX	Sixgill shark	*Hexanchus griseus*	2.7	0.0	84.1
UFISH	Unidentified fish		2.6	0.0	100.0
RIB	Ribaldo	*Mora moro*	2.5	0.0	17.7
TOR	Pacific bluefin tuna	*Thunnus orientalis*	2.6	0.0	7.8
PDG	Prickly dogfish	*Oxynotus bruniensis*	2.5	0.0	45.1
ERA	Electric ray	*Torpedo fairchildi*	2.5	0.0	97.2
SBR	Southern bastard cod	*Pseudophycis barbata*	2.5	0.0	96.4
DRE	Regans lanternfish	*Diaphus regani*	2.3	0.0	0.0
PHO	Lighthouse fish	*Phosichthys argenteus*	2.2	0.0	1.6
SEV	Broadnose sevengill shark	*Notorynchus cepedianus*	2.2	0.0	76.9
MDO	Mirror dory	*Zenopsis nebulosa*	2.2	0.0	70.4
SFL	Sand flounder	*Rhombosolea plebeia*	2.1	0.0	16.4
SSH	Slender smooth-hound	*Gollum attenuatus*	2.1	0.0	85.2
ETB	Baxters lantern dogfish	*Etmopterus baxteri*	2.0	0.0	100.0
EMA	Blue mackerel	*Scomber australasicus*	1.8	0.0	0.0
RBY	Rubyfish	*Plagiogeneion rubiginosum*	1.7	0.0	1.8
EPL	Bigeye cardinalfish	*Epigonus lenimen*	1.7	0.0	100.0
CSH	Catshark	Scyliorhinidae	1.6	0.0	100.0
BIG	Bigeye tuna	*Thunnus obesus*	1.5	0.0	12.0
CBO	Bollons rattail	*Coelorinchus bollonsi*	1.3	0.0	100.0
LSO	Lemon sole	*Pelotretis flavilatus*	1.2	0.0	36.9
HAG	Hagfish	*Eptatretus cirrhatus*	1.2	0.0	91.0
MOK	Moki	*Latridopsis ciliaris*	1.1	0.0	33.5

Table A2: Observed INVERTEBRATE bycatch and discards for target arrow squid trawls. Species codes, common and scientific names, estimated catch, percentage of total catch, and overall percentage discarded of the top 100 invertebrate species or species groups by weight from observer records for the arrow squid trawl fishery from 1 Oct 2002 to 30 Sep 2016. Records are ordered by decreasing percentage of catch. Codes in bold are QMS species; codes in italics are Schedule 6 QMA species (can legally be returned to the sea).

Species code	Common name	Scientific name	Observed catch (t)	% of catch	% discarded
NCB	Smooth red swimming crab	*Nectocarcinus bennetti*	2 562.5	0.85	70.31
GSC	Giant spider crab	*Jacquinotia edwardsii*	716.1	0.24	77.42
CRB	Crab		334.4	0.11	92.97
SAL	Salps		127.2	0.04	51.50
NCA	Hairy red swimming crab	*Nectocarcinus antarcticus*	57.9	0.02	96.27
JFI	Jellyfish		34.8	0.01	93.47
QSC	Queen scallop	*Zygochlamys delicatula*	23.8	0.01	68.21
OCT	Octopus	*Pinnoctopus cordiformis*	19.8	0.01	45.25
SPI	Spider crab		15.8	0.01	98.68
PYR		*Pyrosoma atlanticum*	15.3	0.01	84.42
ONG	Sponges	Porifera	14.6	0.00	5.99
SFI	Starfish	Asteroidea & Ophiuroidea	9.4	0.00	98.58
CBD	Coral rubble - dead		9.2	0.00	100.00
PAD	Paddle crab	*Ovalipes catharus*	8.0	0.00	21.85
WSQ	Warty squid	*Onykia* spp.	6.7	0.00	96.45
LLC	Long-legged masking crab	*Leptomithrax longipes*	6.7	0.00	100.00
CHQ	Cranchiid squid	Cranchiidae	6.0	0.00	99.97
EZE	Yellow octopus	*Enteroctopus zealandicus*	3.6	0.00	41.14
CRM	Airy finger sponge	*Callyspongia* cf *ramosa*	3.5	0.00	17.33
NCR	Northern smooth shore crab	*Cyclograpsus insularum*	3.2	0.00	100.00
SMO	Cross-fish	*Sclerasterias mollis*	2.6	0.00	96.86
GMC	Garricks masking crab	*Leptomithrax garricki*	2.3	0.00	95.65
HYA	Floppy tubular sponge	*Hyalascus* sp.	2.2	0.00	100.00
EEX		*Enypniastes eximia*	2.1	0.00	100.00
HMT	Deepsea anemone	Hormathiidae	2.0	0.00	3.75
HTH	Sea cucumber	Holothurian unidentified	1.6	0.0	174.1
CBB	Coral rubble		1.4	0.00	42.88
ZME	Medusae		1.3	0.00	89.20
ACS	Smooth deepsea anemones	Actinostolidae	1.3	0.00	5.91
FMA		*Fusitriton magellanicus*	1.1	0.00	96.71
CHC	Red crab	*Chaceon bicolor*	1.1	0.00	66.55
ANT	Anemones	Anthozoa	1.0	0.00	44.29
COF	Flabellum coral	*Flabellum* spp.	1.0	0.00	88.61
COU	Coral (unspecified)		0.9	0.00	2.58
SMK	Spiny masking crab	*Teratomaia richardsoni*	0.9	0.00	100.00
GSQ	Giant squid	*Architeuthis* spp.	0.9	0.00	72.43
PAZ	Rocky dumpling sponge	*Pachymatisma* spp.	0.7	0.00	100.00
PHW		*Psammocinia* cf *hawere*	0.7	0.00	100.00
MIQ	Warty squid	*Onykia ingens*	0.6	0.00	100.00
PNR	Golden brown crater sponge	*Penares* spp.	0.6	0.00	100.00
DEN		*Dendrobathypathes* spp.	0.6	0.00	100.00
CRN	Sea lily (stalked crinoid)		0.6	0.00	16.52
OCO	Octopus	*Octopus* spp.	0.6	0.00	91.32
BIV	Bivalves unidentified	Bivalvia	0.5	0.00	30.38
CMT	Feather star	Comatulida	0.4	0.00	14.39
SMX	Mixed shell		0.4	0.00	100.00
SCA	Scallop	*Pecten novaezelandiae*	0.4	0.00	86.49
GAS	Gastropods	Gastropoda	0.4	0.00	86.81
CJA	Sun star	*Crossaster multispinus*	0.4	0.00	98.67
VIT	Deep sea spider crab	*Vitjazmaia latidactyla*	0.4	0.00	100.00
CIC	Orange frond sponge	*Crella incrustans*	0.4	0.00	100.00
ANZ	Knobbly sandpaper sponge	*Ecionemia novaezelandiae*	0.4	0.00	100.00

Table A2: continued

Species code	Common name	Scientific name	Observed catch (t)	% of catch	% discarded
DSO	Demosponges	Demospongiae	0.3	0.00	100.00
DAP	Antlered crab	*Dagnaudus petterdi*	0.3	0.00	95.93
URP		*Uroptychus* spp.	0.3	0.00	99.28
PHB	Grey fibrous massive sponge	*Phorbas* spp.	0.3	0.00	100.00
BOC	Deepsea anemone	*Bolocera* spp.	0.3	0.00	1.89
WHE	Whelks		0.3	0.00	99.21
RSQ		*Ommastrephes bartrami*	0.2	0.00	100.00
NUD	Nudibranchs	Nudibranchia	0.3	0.00	52.59
HDF	Feathery hydroids		0.2	0.00	100.00
SCI	Scampi	*Metanephrops challengeri*	0.2	0.00	8.54
PSI	Geometric star	*Psilaster acuminatus*	0.2	0.00	95.35
LCO	Dwarf swimming crab	*Liocarcinus corrugatus*	0.2	0.00	0.92
ASR	Asteroid (starfish)		0.2	0.00	95.89
PRU		*Pseudechinaster rubens*	0.2	0.00	69.22
OPL	Opheliids	Opheliidae	0.2	0.00	86.46
MOL	Molluscs		0.2	0.00	100.00
KIC	King crab	Lithodidae	0.2	0.00	82.22
DIR	Pagurid	*Diacanthurus rubricatus*	0.2	0.00	100.00
CRA	Rock lobster	*Jasus edwardsii*	0.2	0.00	80.70
COZ	Bryozoan	Bryozoa	0.2	0.00	71.21
BPD	Lamp shells	Brachiopoda	0.2	0.00	28.03
BCH		*Brisinga chathamica*	0.2	0.00	100.00
OPI	Umbrella octopus	*Opisthoteuthis* spp.	0.1	0.00	100.00
OPH	Ophiuroid (brittle star)		0.1	0.00	89.59
NTO	Masking crab	*Notomithrax* spp.	0.1	0.00	100.00
MIN	Worm	*Minuisis* spp.	0.1	0.00	0.70
GLS	Glass sponges	Hexactinellida	0.1	0.00	100.00
ASC	Sea squirt	Ascidiacea	0.1	0.00	100.00
VKI		*Veprichlamys kiwaensis*	0.1	0.00	2.73
SSC	Giant masking crab	*Leptomithrax australis*	0.1	0.00	60.63
SOT		*Solaster torulatus*	0.1	0.00	90.23
SIA	Stony corals	Scleractinia	0.1	0.00	100.00
RGR		*Radiaster gracilis*	0.1	0.00	100.00
MNI	Munida unidentified	*Munida* spp.	0.1	0.00	100.00
GAT		*Gastroptychus* spp.	0.1	0.00	100.00
EGA		*Euciroa galatheae*	0.1	0.00	15.19
CSS	Maurea	*Calliostoma selectum*	0.1	0.00	92.42
BAM		*Bathyplotes* spp.	0.1	0.00	100.00
ZOR	Rat-tail star	*Zoroaster* spp.	0.1	0.00	85.00
TSQ		*Todarodes filippovae*	0.1	0.00	100.00
SQX	Squid		0.1	0.00	100.00
SLG	Sea slug	*Scutus breviculus*	0.1	0.00	95.53
SDM	Pagurid	*Sympagurus dimorphus*	0.1	0.00	100.00
PAM		*Pannychia moseleyi*	0.1	0.00	96.63
MSL	Starfish	*Mediaster sladeni*	0.1	0.00	100.00
MOQ	Giant warty squid	*Onykia* sp.	0.1	0.00	100.00

Table A3: Observed bycatch by species group for target arrow squid trawls. Estimated catch, percentage of total catch, and overall percentage discarded from observer records for the arrow squid trawl fishery from 1 Oct 2002 to 30 Sep 2016.

Group	Observed catch (t)	% of catch	% discarded
Fish			
Fish (other)	48 323	15.94	5.33
Sharks	5 871	1.94	78.85
Morid	3 762	1.24	8.61
Rattails	910	0.3	87.8
Rays & Skates	462	0.15	5.63
Chimaeras	379	0.13	22.43
Eels	6	0	33.33
Invertebrates			
Crustacea	3 712	1.22	74.25
Invertebrate (other)	145	0.05	55.17
Cnidaria	51	0.02	84.31
Other molluscs	28	0.01	71.43
Sponges	24	0.01	33.33
Octopuses	24	0.01	45.83
Echinoderms	19	0.01	94.74
Squid	15	0	93.33

Table A4: Estimates of annual bycatch (t) in the arrow squid target trawl fishery, by species category and standard area. 0 is less than 0.1; 95% confidence intervals in parentheses.

(a) QMS species

Fishing year	CHAT4		COOK		EAST		NORTH	
2002–03	5844	(3920–8672)	2	(0–56)	9	(0–327)	8	(2–28)
2003–04	1776	(1158–2704)	0	(0–0)	0	(0–0)	6	(2–16)
2004–05	3960	(2675–5785)	0	(0–0)	0	(0–0)	1	(0–2)
2005–06	6257	(4198–9424)	0	(0–0)	0	(0–0)	9	(2–29)
2006–07	4230	(2827–6269)	2	(0–46)	0	(0–0)	8	(4–20)
2007–08	1850	(1262–2728)	0	(0–0)	0	(0–0)	1	(0–5)
2008–09	456	(310–660)	0	(0–0)	0	(0–0)	4	(1–13)
2009–10	802	(539–1206)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	1802	(1279–2569)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	882	(613–1276)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	178	(138–236)	0	(0–0)	0	(0–0)	6	(2–19)
2013–14	54	(41–74)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	641	(488–864)	0	(0–0)	0	(0–0)	0	(0–0)
2015–16	1858	(1440–2449)	2	(0–72)	0	(0–0)	6	(2–19)

Fishing year	PUYS		AUCK		STEW		SUBA	
2002–03	2206	(1449–3370)	618	(477–816)	15017	(11431–19891)	412	(239–733)
2003–04	394	(240–644)	1036	(784–1386)	19201	(14391–25498)	487	(258–898)
2004–05	413	(277–632)	767	(599–987)	20108	(15729–25831)	89	(50–161)
2005–06	476	(290–782)	1415	(1046–1946)	28249	(21328–38224)	100	(54–186)
2006–07	28	(17–45)	439	(345–569)	10686	(8126–14223)	167	(90–307)
2007–08	26	(16–41)	547	(478–641)	10121	(8364–12422)	12	(12–12)
2008–09	12	(10–16)	755	(629–923)	9483	(8002–11491)	2	(1–4)
2009–10	49	(31–77)	501	(409–621)	8746	(7226–10733)	7	(4–13)
2010–11	109	(75–163)	945	(788–1162)	12926	(10656–15962)	15	(11–23)
2011–12	40	(27–63)	725	(615–878)	10092	(8429–12375)	4	(3–6)
2012–13	49	(37–67)	772	(744–808)	8670	(8326–9128)	22	(22–22)
2013–14	97	(97–97)	409	(389–437)	8225	(7994–8547)	4	(4–4)
2014–15	53	(53–53)	411	(399–427)	6879	(6778–7012)	6	(4–8)
2015–16	89	(85–97)	637	(626–652)	5465	(5390–5559)	4	(4–4)

Fishing year	WCNI		WCSI	
2002–03	58	(7–346)	1562	(209–18601)
2003–04	4	(0–23)	362	(50–4263)
2004–05	0	(0–0)	750	(101–9093)
2005–06	0	(0–0)	184	(25–2197)
2006–07	1	(0–6)	412	(86–4568)
2007–08	0	(0–3)	0	(0–0)
2008–09	0	(0–0)	37	(5–450)
2009–10	0	(0–0)	40	(6–479)
2010–11	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)
2012–13	1	(0–8)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)
2014–15	0	(0–0)	441	(61–5294)
2015–16	0	(0–0)	0	(0–0)

Table A4: continued

(b) Non-QMS species

Fishing year	CHAT4		COOK		EAST		NORTH	
2002–03	1006	(612–1662)	0	(0–1)	1	(0–7)	4	(1–16)
2003–04	308	(187–529)	0	(0–0)	0	(0–0)	2	(1–8)
2004–05	660	(417–1057)	0	(0–0)	0	(0–0)	0	(0–1)
2005–06	603	(346–1024)	0	(0–0)	0	(0–0)	2	(1–9)
2006–07	614	(368–1036)	0	(0–1)	0	(0–0)	3	(2–9)
2007–08	378	(228–623)	0	(0–0)	0	(0–0)	1	(0–3)
2008–09	52	(33–83)	0	(0–0)	0	(0–0)	1	(0–4)
2009–10	172	(105–279)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	467	(300–730)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	90	(56–144)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	42	(33–56)	0	(0–0)	0	(0–0)	3	(1–11)
2013–14	18	(14–23)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	131	(96–187)	0	(0–0)	0	(0–0)	0	(0–0)
2015–16	256	(181–369)	0	(0–1)	0	(0–0)	2	(1–9)

Fishing year	PUYS		AUCK		STEW		SUBA	
2002–03	488	(300–832)	188	(138–265)	291	(214–408)	59	(31–113)
2003–04	89	(50–163)	292	(194–449)	363	(249–545)	39	(20–80)
2004–05	81	(48–139)	327	(263–419)	451	(339–609)	10	(5–21)
2005–06	59	(32–110)	317	(208–485)	343	(226–514)	7	(4–15)
2006–07	5	(3–10)	124	(97–167)	155	(108–227)	20	(10–40)
2007–08	6	(4–12)	162	(133–208)	208	(162–280)	1	(1–1)
2008–09	1	(1–2)	166	(132–215)	170	(147–202)	0	(0–0)
2009–10	13	(8–23)	194	(139–277)	313	(250–405)	1	(1–3)
2010–11	42	(28–66)	474	(350–663)	580	(458–759)	2	(1–4)
2011–12	7	(5–11)	127	(95–177)	170	(135–218)	1	(0–1)
2012–13	16	(13–22)	144	(129–167)	293	(279–313)	1	(1–1)
2013–14	29	(29–29)	65	(54–80)	226	(217–238)	0	(0–0)
2014–15	36	(36–36)	91	(87–97)	193	(191–196)	1	(0–1)
2015–16	16	(15–17)	112	(106–120)	139	(136–143)	0	(0–0)

Fishing year	WCNI		WCSI	
2002–03	30	(6–98)	23	(6–78)
2003–04	2	(0–6)	5	(1–18)
2004–05	0	(0–0)	11	(3–36)
2005–06	0	(0–0)	1	(0–5)
2006–07	0	(0–1)	5	(1–16)
2007–08	0	(0–1)	0	(0–0)
2008–09	0	(0–0)	0	(0–1)
2009–10	0	(0–0)	1	(0–3)
2010–11	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)
2012–13	1	(0–2)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)
2014–15	0	(0–0)	7	(2–24)
2015–16	0	(0–0)	0	(0–0)

Table A4: continued

(c) INVERTEBRATE species

Fishing year	CHAT4		COOK		EAST		NORTH	
2002–03	26	(15–46)	0	(0–1)	0	(0–6)	0	(0–5)
2003–04	12	(7–21)	0	(0–0)	0	(0–0)	0	(0–4)
2004–05	22	(13–38)	0	(0–0)	0	(0–0)	0	(0–0)
2005–06	26	(15–47)	0	(0–0)	0	(0–0)	0	(0–5)
2006–07	19	(10–35)	0	(0–1)	0	(0–0)	0	(0–3)
2007–08	13	(8–22)	0	(0–0)	0	(0–0)	0	(0–2)
2008–09	3	(2–5)	0	(0–0)	0	(0–0)	0	(0–2)
2009–10	10	(6–17)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	13	(8–20)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	7	(5–12)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–10)
2013–14	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	6	(4–8)	0	(0–0)	0	(0–0)	0	(0–0)
2015–16	19	(14–26)	0	(0–2)	0	(0–0)	0	(0–8)

Fishing year	PUYS		AUCK		STEW		SUBA	
2002–03	14	(8–25)	520	(364–749)	18	(12–26)	15	(7–34)
2003–04	4	(2–7)	1549	(1060–2329)	42	(30–60)	22	(14–41)
2004–05	3	(2–5)	916	(630–1357)	40	(28–57)	4	(2–8)
2005–06	3	(1–5)	1551	(996–2375)	42	(27–64)	3	(1–7)
2006–07	0	(0–0)	542	(407–745)	18	(13–25)	7	(3–17)
2007–08	0	(0–0)	640	(548–775)	27	(23–33)	0	(0–0)
2008–09	0	(0–0)	993	(800–1271)	17	(13–21)	0	(0–0)
2009–10	1	(0–1)	1095	(810–1546)	41	(32–56)	1	(1–2)
2010–11	1	(1–2)	1155	(864–1574)	41	(33–53)	1	(0–1)
2011–12	0	(0–1)	823	(593–1171)	33	(26–45)	0	(0–0)
2012–13	1	(0–1)	772	(707–868)	37	(35–40)	1	(1–1)
2013–14	1	(1–1)	277	(240–332)	31	(30–32)	0	(0–0)
2014–15	1	(1–1)	211	(200–226)	54	(54–54)	0	(0–0)
2015–16	2	(1–2)	240	(215–276)	21	(21–22)	0	(0–0)

Fishing year	WCNI		WCSI	
2002–03	1	(0–7)	5	(1–44)
2003–04	0	(0–1)	2	(0–17)
2004–05	0	(0–0)	3	(0–28)
2005–06	0	(0–0)	0	(0–4)
2006–07	0	(0–0)	1	(0–13)
2007–08	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–1)
2009–10	0	(0–0)	0	(0–3)
2010–11	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)
2012–13	0	(0–0)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)
2014–15	0	(0–0)	2	(0–15)
2015–16	0	(0–0)	0	(0–0)

Table A4: continued

(d) ALL species

Fishing year	CHAT4		COOK		EAST		NORTH	
2002–03	6876	(4547–10380)	2	(0–58)	10	(0–340)	12	(3–49)
2003–04	2096	(1352–3254)	0	0	0	0	8	(3–28)
2004–05	4642	(3105–6880)	0	0	0	0	1	(0–3)
2005–06	6886	(4559–10495)	0	0	0	0	11	(3–43)
2006–07	4863	(3205–7340)	2	(0–48)	0	0	11	(6–32)
2007–08	2241	(1498–3373)	0	0	0	0	2	(0–10)
2008–09	511	(345–748)	0	0	0	0	5	(1–19)
2009–10	984	(650–1502)	0	0	0	0	0	0
2010–11	2282	(1587–3319)	0	0	0	0	0	0
2011–12	979	(674–1432)	0	0	0	0	0	0
2012–13	221	(172–294)	0	0	0	0	9	(3–40)
2013–14	72	(55–98)	0	0	0	0	0	0
2014–15	778	(588–1059)	0	0	0	0	0	(0–0)
2015–16	2133	(1635–2844)	2	(0–75)	0	0	8	(3–36)

Fishing year	PUYS		AUCK		STEW		SUBA	
2002–03	2708	(1757–4227)	1326	(979–1830)	15326	(11657–20325)	486	(277–880)
2003–04	487	(292–814)	2877	(2038–4164)	19606	(14670–26103)	548	(292–1019)
2004–05	497	(327–776)	2010	(1492–2763)	20599	(16096–26497)	103	(57–190)
2005–06	538	(323–897)	3283	(2250–4806)	28634	(21581–38802)	110	(59–208)
2006–07	33	(20–55)	1105	(849–1481)	10859	(8247–14475)	194	(103–364)
2007–08	32	(20–53)	1349	(1159–1624)	10356	(8549–12735)	13	(13–13)
2008–09	13	(11–18)	1914	(1561–2409)	9670	(8162–11714)	2	(1–4)
2009–10	63	(39–101)	1790	(1358–2444)	9100	(7508–11194)	9	(6–18)
2010–11	152	(104–231)	2574	(2002–3399)	13547	(11147–16774)	18	(12–28)
2011–12	47	(32–75)	1675	(1303–2226)	10295	(8590–12638)	5	(3–7)
2012–13	66	(50–90)	1688	(1580–1843)	9000	(8640–9481)	24	(24–24)
2013–14	127	(127–127)	751	(683–849)	8482	(8241–8817)	4	(4–4)
2014–15	90	(90–90)	713	(686–750)	7126	(7023–7262)	7	(4–9)
2015–16	107	(101–116)	989	(947–1048)	5625	(5547–5724)	4	(4–4)

Fishing year	WCNI		WCSI	
2002–03	89	(13–451)	1590	(216–18723)
2003–04	6	(0–30)	369	(51–4298)
2004–05	0	0	764	(104–9157)
2005–06	0	0	185	(25–2206)
2006–07	1	(0–7)	418	(87–4597)
2007–08	0	(0–4)	0	0
2008–09	0	0	37	(5–452)
2009–10	0	0	41	(6–485)
2010–11	0	0	0	0
2011–12	0	0	0	0
2012–13	2	(0–10)	0	0
2013–14	0	0	0	0
2014–15	0	0	450	(63–5333)
2015–16	0	0	0	0

Table A5: Estimates of annual discards (t) in the arrow squid target trawl fishery, by species category and standard area. 0 is less than 0.1; 95% confidence intervals in parentheses.

(a) Arrow squid

Fishing year	CHAT4		COOK		EAST		NORTH	
2002–03	136	(54–348)	0	(0–0)	0	(0–1)	1	(0–2)
2003–04	11	(3–36)	0	(0–0)	0	(0–0)	0	(0–0)
2004–05	75	(30–195)	0	(0–0)	0	(0–0)	0	(0–0)
2005–06	148	(43–563)	0	(0–0)	0	(0–0)	1	(0–4)
2006–07	289	(105–851)	0	(0–1)	0	(0–0)	1	(0–5)
2007–08	51	(19–141)	0	(0–0)	0	(0–0)	0	(0–1)
2008–09	29	(13–72)	0	(0–0)	0	(0–0)	1	(0–2)
2009–10	17	(7–43)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	44	(21–96)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	4	(2–10)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	3	(2–6)	0	(0–0)	0	(0–0)	0	(0–1)
2013–14	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	41	(27–71)	0	(0–0)	0	(0–0)	0	(0–0)
2015–16	271	(172–474)	1	(0–2)	0	(0–0)	4	(1–8)

Fishing year	PUYS		AUCK		STEW		SUBA	
2002–03	107	(46–286)	32	(15–73)	117	(58–250)	13	(3–35)
2003–04	6	(2–21)	32	(19–73)	64	(33–163)	2	(0–7)
2004–05	17	(7–47)	48	(24–104)	194	(105–398)	2	(0–5)
2005–06	29	(8–116)	181	(53–646)	358	(121–1211)	3	(1–14)
2006–07	4	(2–14)	101	(44–265)	320	(140–826)	15	(3–52)
2007–08	2	(1–5)	116	(98–160)	112	(63–234)	0	(0–0)
2008–09	1	(0–2)	194	(117–364)	183	(96–374)	0	(0–0)
2009–10	2	(1–6)	53	(31–103)	93	(50–190)	0	(0–1)
2010–11	6	(4–12)	110	(74–181)	183	(120–304)	1	(0–1)
2011–12	0	(0–1)	9	(4–22)	42	(31–68)	0	(0–0)
2012–13	6	(6–6)	41	(39–44)	179	(172–192)	0	(0–0)
2013–14	5	(5–6)	20	(19–23)	85	(82–90)	0	(0–0)
2014–15	4	(4–4)	25	(24–27)	128	(125–135)	0	(0–0)
2015–16	25	(24–26)	663	(654–678)	330	(316–358)	0	(0–0)

Fishing year	WCNI		WCSI	
2002–03	10	(2–29)	7	(1–19)
2003–04	0	(0–1)	0	(0–2)
2004–05	0	(0–0)	3	(1–8)
2005–06	0	(0–0)	1	(0–4)
2006–07	1	(0–2)	5	(1–17)
2007–08	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–1)
2009–10	0	(0–0)	0	(0–0)
2010–11	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)
2012–13	0	(0–0)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)
2014–15	0	(0–0)	5	(1–11)
2015–16	0	(0–0)	0	(0–0)

Table A5: continued

(b) QMS species

Fishing year	CHAT4		COOK		EAST		NORTH	
2002–03	191	(83–441)	0	(0–1)	0	(0–5)	0	(0–0)
2003–04	606	(300–1213)	0	(0–0)	0	(0–0)	0	(0–1)
2004–05	1017	(558–1860)	0	(0–0)	0	(0–0)	0	(0–0)
2005–06	1864	(936–3753)	0	(0–0)	0	(0–0)	0	(0–2)
2006–07	1363	(709–2630)	0	(0–7)	0	(0–0)	0	(0–1)
2007–08	408	(214–781)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	222	(120–417)	0	(0–0)	0	(0–0)	0	(0–1)
2009–10	217	(115–422)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	502	(288–892)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	242	(129–464)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	59	(35–104)	0	(0–0)	0	(0–0)	0	(0–1)
2013–14	12	(7–22)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	289	(184–468)	0	(0–0)	0	(0–0)	0	(0–0)
2015–16	1324	(861–2141)	1	(0–25)	0	(0–0)	0	(0–3)

Fishing year	PUYS		AUCK		STEW		SUBA	
2002–03	19	(9–43)	6	(4–10)	182	(104–347)	8	(3–25)
2003–04	44	(20–100)	168	(97–302)	2218	(1336–3783)	61	(22–164)
2004–05	30	(15–63)	78	(50–130)	1902	(1255–2997)	14	(6–37)
2005–06	50	(22–115)	316	(173–585)	3593	(2065–6373)	22	(8–63)
2006–07	3	(1–7)	72	(45–120)	1210	(751–1974)	40	(15–107)
2007–08	2	(1–4)	48	(35–72)	641	(439–974)	1	(1–1)
2008–09	1	(1–2)	185	(124–287)	1346	(967–1978)	1	(0–2)
2009–10	4	(2–9)	86	(58–136)	1071	(777–1561)	2	(1–4)
2010–11	8	(4–15)	145	(105–213)	1568	(1116–2296)	2	(1–4)
2011–12	3	(2–7)	107	(75–164)	1097	(738–1717)	1	(0–1)
2012–13	1	(1–2)	135	(131–141)	1092	(1002–1235)	5	(5–5)
2013–14	6	(6–6)	52	(50–55)	859	(833–903)	1	(1–1)
2014–15	3	(3–3)	139	(138–140)	637	(617–669)	0	(0–1)
2015–16	32	(32–33)	274	(269–281)	819	(765–903)	1	(1–1)

Fishing year	WCNI		WCSI	
2002–03	1	(0–98)	1	(0–31)
2003–04	2	(0–102)	4	(0–108)
2004–05	0	(0–0)	6	(0–155)
2005–06	0	(0–0)	2	(0–50)
2006–07	0	(0–27)	4	(0–107)
2007–08	0	(0–7)	0	(0–0)
2008–09	0	(0–0)	1	(0–16)
2009–10	0	(0–0)	0	(0–9)
2010–11	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)
2012–13	1	(0–40)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)
2014–15	0	(0–0)	7	(0–178)
2015–16	0	(0–0)	0	(0–0)

Table A5: continued

(c) Non-QMS species

Fishing year	CHAT4		COOK		EAST		NORTH	
2002–03	6942	(3700–13263)	2	(0–10)	11	(1–56)	34	(11–132)
2003–04	269	(136–539)	0	(0–0)	0	(0–0)	2	(1–8)
2004–05	1029	(581–1883)	0	(0–0)	0	(0–0)	0	(0–2)
2005–06	625	(303–1321)	0	(0–0)	0	(0–0)	3	(1–12)
2006–07	706	(355–1381)	0	(0–1)	0	(0–0)	4	(2–11)
2007–08	398	(214–763)	0	(0–0)	0	(0–0)	1	(0–4)
2008–09	73	(41–138)	0	(0–0)	0	(0–0)	1	(0–6)
2009–10	178	(98–328)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	526	(312–890)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	145	(79–267)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	42	(32–62)	0	(0–0)	0	(0–0)	3	(1–12)
2013–14	16	(12–22)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	143	(97–223)	0	(0–0)	0	(0–0)	0	(0–0)
2015–16	249	(158–409)	0	(0–1)	0	(0–0)	2	(1–10)

Fishing year	PUYS		AUCK		STEW		SUBA	
2002–03	3050	(1647–5910)	587	(350–1009)	3047	(1953–4947)	423	(190–917)
2003–04	66	(32–142)	164	(93–291)	518	(303–893)	26	(11–60)
2004–05	144	(87–257)	213	(140–344)	1120	(765–1710)	17	(8–38)
2005–06	63	(28–139)	262	(136–505)	683	(367–1281)	8	(3–20)
2006–07	5	(2–11)	109	(76–166)	334	(195–573)	21	(9–49)
2007–08	6	(3–12)	107	(77–162)	331	(223–518)	1	(1–1)
2008–09	2	(1–3)	142	(95–218)	271	(201–388)	0	(0–1)
2009–10	12	(7–25)	145	(90–237)	462	(326–689)	1	(1–3)
2010–11	34	(21–60)	333	(226–509)	908	(652–1308)	2	(1–4)
2011–12	9	(5–17)	126	(80–203)	357	(233–557)	1	(1–1)
2012–13	1	(1–1)	68	(66–72)	250	(229–283)	0	(0–0)
2013–14	25	(25–25)	21	(19–24)	191	(183–204)	0	(0–0)
2014–15	26	(26–26)	62	(62–62)	181	(176–189)	0	(0–0)
2015–16	13	(13–13)	24	(22–27)	120	(114–130)	0	(0–0)

Fishing year	WCNI		WCSI	
2002–03	128	(2–952)	200	(20–882)
2003–04	0	(0–2)	4	(0–22)
2004–05	0	(0–0)	18	(0–86)
2005–06	0	(0–0)	2	(0–8)
2006–07	0	(0–1)	4	(0–25)
2007–08	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–2)
2009–10	0	(0–0)	1	(0–4)
2010–11	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)
2012–13	0	(0–1)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)
2014–15	0	(0–0)	7	(0–36)
2015–16	0	(0–0)	0	(0–0)

Table A5: continued

(d) INVERTEBRATE species

Fishing year	CHAT4		COOK		EAST		NORTH	
2002–03	55	(30–99)	0	(0–4)	0	(0–33)	0	(0–17)
2003–04	16	(9–30)	0	(0–0)	0	(0–0)	0	(0–7)
2004–05	35	(19–64)	0	(0–0)	0	(0–0)	0	(0–1)
2005–06	44	(24–83)	0	(0–0)	0	(0–0)	0	(0–16)
2006–07	34	(17–63)	0	(0–3)	0	(0–0)	0	(0–8)
2007–08	7	(4–15)	0	(0–0)	0	(0–0)	0	(0–1)
2008–09	3	(1–5)	0	(0–0)	0	(0–0)	0	(0–3)
2009–10	7	(4–13)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	11	(6–18)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	4	(2–7)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–10)
2013–14	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	5	(3–7)	0	(0–0)	0	(0–0)	0	(0–0)
2015–16	15	(11–22)	0	(0–4)	0	(0–0)	0	(0–7)

Fishing year	PUYS		AUCK		STEW		SUBA	
2002–03	28	(16–51)	537	(372–802)	37	(25–55)	53	(23–126)
2003–04	6	(3–11)	1377	(904–2221)	58	(40–92)	40	(20–89)
2004–05	5	(3–10)	895	(580–1356)	61	(41–90)	10	(4–25)
2005–06	5	(3–11)	1815	(1137–3109)	79	(51–131)	9	(4–24)
2006–07	0	(0–1)	530	(353–791)	28	(17–44)	20	(8–50)
2007–08	0	(0–0)	267	(170–412)	12	(8–18)	0	(0–0)
2008–09	0	(0–0)	810	(603–1103)	16	(11–21)	0	(0–0)
2009–10	1	(0–1)	795	(558–1149)	30	(22–42)	2	(1–3)
2010–11	1	(1–2)	798	(566–1136)	31	(23–42)	1	(0–2)
2011–12	0	(0–1)	420	(266–668)	17	(12–26)	0	(0–0)
2012–13	0	(0–0)	560	(536–599)	23	(22–26)	1	(1–1)
2013–14	1	(1–1)	166	(156–185)	17	(17–18)	0	(0–0)
2014–15	1	(1–1)	163	(160–168)	15	(15–15)	0	(0–0)
2015–16	1	(1–1)	169	(158–188)	15	(14–16)	0	(0–0)

Fishing year	WCNI		WCSI	
2002–03	1	(0–15)	4	(0–766)
2003–04	0	(0–1)	1	(0–180)
2004–05	0	(0–0)	2	(0–370)
2005–06	0	(0–0)	0	(0–78)
2006–07	0	(0–0)	1	(0–153)
2007–08	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–11)
2009–10	0	(0–0)	0	(0–18)
2010–11	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)
2012–13	0	(0–0)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)
2014–15	0	(0–0)	1	(0–150)
2015–16	0	(0–0)	0	(0–0)

Table A5: continued

(e) ALL species

Fishing year	CHAT4		COOK		EAST		NORTH	
2002–03	7324	(3867–14151)	2	(0–15)	11	(1–95)	35	(11–151)
2003–04	902	(448–1818)	0	0	0	0	2	(1–16)
2004–05	2156	(1188–4002)	0	0	0	0	0	(0–3)
2005–06	2681	(1306–5720)	0	0	0	0	4	(1–34)
2006–07	2392	(1186–4925)	0	(0–12)	0	0	5	(2–25)
2007–08	864	(451–1700)	0	0	0	0	1	(0–6)
2008–09	327	(175–632)	0	0	0	0	2	(0–12)
2009–10	419	(224–806)	0	0	0	0	0	0
2010–11	1083	(627–1896)	0	0	0	0	0	0
2011–12	395	(212–748)	0	0	0	0	0	0
2012–13	105	(70–174)	0	0	0	0	3	(1–24)
2013–14	29	(20–46)	0	0	0	0	0	0
2014–15	478	(311–769)	0	0	0	0	0	(0–0)
2015–16	1859	(1202–3046)	2	(0–32)	0	0	6	(2–28)

Fishing year	PUYS		AUCK		STEW		SUBA	
2002–03	3204	(1718–6290)	1162	(741–1894)	3383	(2140–5599)	497	(219–1103)
2003–04	122	(57–274)	1741	(1113–2887)	2858	(1712–4931)	129	(53–320)
2004–05	196	(112–377)	1234	(794–1934)	3277	(2166–5195)	43	(18–105)
2005–06	147	(61–381)	2574	(1499–4845)	4713	(2604–8996)	42	(16–121)
2006–07	12	(5–33)	812	(518–1342)	1892	(1103–3417)	96	(35–258)
2007–08	10	(5–21)	538	(380–806)	1096	(733–1744)	2	(2–2)
2008–09	4	(2–7)	1331	(939–1972)	1816	(1275–2761)	1	(0–3)
2009–10	19	(10–41)	1079	(737–1625)	1656	(1175–2482)	5	(3–11)
2010–11	49	(30–89)	1386	(971–2039)	2690	(1911–3950)	6	(2–11)
2011–12	12	(7–26)	662	(425–1057)	1513	(1014–2368)	2	(1–2)
2012–13	8	(8–9)	804	(772–856)	1544	(1425–1736)	6	(6–6)
2013–14	37	(37–38)	259	(244–287)	1152	(1115–1215)	1	(1–1)
2014–15	34	(34–34)	389	(384–397)	961	(933–1008)	0	(0–1)
2015–16	71	(70–73)	1130	(1103–1174)	1284	(1209–1407)	1	(1–1)

Fishing year	WCNI		WCSI	
2002–03	140	(4–1094)	212	(21–1698)
2003–04	2	(0–106)	9	(0–312)
2004–05	0	0	29	(1–619)
2005–06	0	0	5	(0–140)
2006–07	1	(0–30)	14	(1–302)
2007–08	0	(0–7)	0	0
2008–09	0	0	1	(0–30)
2009–10	0	0	1	(0–31)
2010–11	0	0	0	0
2011–12	0	0	0	0
2012–13	1	(0–41)	0	0
2013–14	0	0	0	0
2014–15	0	0	20	(1–375)
2015–16	0	0	0	0

Table A6: Target arrow squid trawl fishery. Total annual bycatch estimates (t) (with estimated 95% CIs in parenthesis) for individual species (the main bycatch species, those with an average of over 3 t of observed bycatch in each year). Species are ordered by decreasing total catch. The slope of a regression through the data points is shown (in bold if significant) in the bottom row for each species code (see Table A1 for species code definitions.

Fishing year	BAR		SWA		SPD		RCO		RAT		WAR		LIN		HOK	
2002–03	10017	(6371–16272)	7172	(4489–12191)	4935	(3193–8216)	1722	(1035–3011)	1128	(599–2209)	38	(18–126)	641	(378–1443)	204	(100–5708)
2003–04	9934	(6274–16622)	13595	(7979–24117)	3292	(2088–5420)	608	(350–1091)	88	(42–188)	1049	(482–3121)	420	(242–698)	70	(29–418)
2004–05	7690	(5347–11011)	7721	(4956–11937)	2266	(1518–3468)	816	(540–1274)	709	(419–1249)	94	(61–183)	380	(240–660)	111	(68–730)
2005–06	21187	(12524–38181)	16423	(9837–28904)	3078	(1873–5135)	903	(512–1611)	694	(382–1307)	400	(247–821)	808	(520–1393)	332	(182–833)
2006–07	1167	(764–1897)	8525	(5385–14620)	1653	(1010–2778)	503	(301–879)	461	(245–870)	1579	(835–3753)	334	(209–563)	307	(170–1821)
2007–08	5378	(4129–7301)	3761	(2454–5840)	824	(577–1202)	647	(497–910)	321	(197–572)	21	(14–39)	148	(105–214)	145	(96–242)
2008–09	8883	(6420–12927)	2257	(1628–3196)	1107	(842–1548)	232	(174–330)	185	(128–275)	341	(179–756)	175	(137–236)	259	(201–487)
2009–10	3048	(2428–4009)	3024	(1953–4701)	1626	(1188–2315)	444	(327–642)	310	(196–494)	205	(143–351)	219	(148–320)	389	(262–814)
2010–11	6931	(5087–9848)	1401	(1000–2085)	856	(642–1184)	1437	(1045–2046)	781	(524–1245)	270	(169–516)	527	(397–745)	702	(483–1093)
2011–12	4222	(3107–5500)	2004	(1348–2977)	1056	(758–1515)	1233	(873–1821)	163	(108–253)	100	(79–148)	137	(93–199)	228	(180–327)
2012–13	4000	(3887–4169)	2696	(2321–3301)	1091	(994–1243)	798	(701–947)	146	(129–175)	278	(267–306)	141	(130–159)	313	(297–343)
2013–14	4888	(4606–5365)	1260	(1138–1463)	680	(655–717)	766	(701–871)	94	(81–113)	237	(223–268)	113	(107–123)	511	(496–541)
2014–15	3260	(3153–3422)	2172	(2037–2458)	493	(455–586)	474	(434–546)	200	(159–300)	378	(350–484)	162	(154–250)	417	(373–5062)
2015–16	2936	(2896–3005)	1413	(1282–1638)	899	(763–1131)	902	(800–1069)	142	(106–203)	4	(4–4)	159	(152–172)	129	(117–155)
Slope	**-0.084**		**-0.154**		**-0.135**		-0.005		-0.132		-0.262		**-0.099**		0.020	-0.084

Fishing year	JMA		SDO		GIZ		RSK		RSO		HAP		JAV		SCH	
2002–03	93	(42–214)	983	(520–2163)	200	(141–321)	3	(1–14)	488	(293–1087)	95	(67–149)	73	(31–219)	148	(97–280)
2003–04	236	(117–530)	231	(106–560)	88	(60–136)	18	(8–44)	72	(40–142)	104	(76–150)	30	(11–91)	23	(13–41)
2004–05	76	(47–133)	131	(79–235)	135	(101–192)	89	(56–162)	76	(45–138)	118	(91–160)	64	(31–156)	62	(44–96)
2005–06	271	(153–555)	105	(48–248)	160	(107–243)	77	(38–161)	33	(14–63)	88	(62–126)	89	(39–247)	50	(30–81)
2006–07	30	(16–70)	11	(6–24)	108	(74–163)	31	(17–65)	11	(5–27)	63	(44–91)	123	(54–385)	22	(14–40)
2007–08	148	(125–196)	61	(44–91)	50	(37–68)	43	(31–64)	6	(4–11)	32	(26–41)	22	(11–55)	14	(10–19)
2008–09	343	(208–722)	77	(71–89)	44	(35–55)	33	(26–46)	2	(1–3)	61	(52–74)	22	(14–45)	16	(13–22)
2009–10	373	(342–442)	89	(64–134)	136	(105–178)	90	(66–129)	10	(6–17)	60	(49–76)	21	(11–44)	26	(20–34)
2010–11	138	(91–235)	102	(77–145)	148	(119–188)	172	(132–232)	23	(17–35)	34	(28–43)	54	(31–109)	44	(36–57)
2011–12	160	(122–234)	23	(16–35)	50	(40–64)	28	(21–38)	5	(3–8)	31	(25–39)	14	(7–31)	23	(19–30)
2012–13	100	(97–138)	57	(51–69)	54	(52–58)	69	(65–81)	9	(7–11)	30	(29–31)	47	(46–50)	35	(33–39)
2013–14	182	(173–198)	116	(112–122)	67	(65–69)	51	(48–54)	17	(17–18)	34	(33–35)	21	(19–24)	44	(43–45)
2014–15	102	(98–110)	99	(98–123)	85	(78–121)	95	(87–202)	16	(15–26)	44	(43–49)	36	(31–56)	36	(35–45)
2015–16	300	(292–353)	106	(101–117)	88	(78–103)	69	(58–94)	68	(66–73)	33	(30–37)	7	(6–13)	52	(48–61)
Slope	0.005		0.000		-0.051		0.046		0.030		**-0.088**		-0.078		0.027	

Table A6: Continued

Fishing year	RBT		SSK		FRO		STU		SPE		CAR		GSH		RBM	
2002–03	17	(17–17)	126	(65–1004)	264	(90–4236)	11	(6–21)	43	(22–115)	29	(17–63)	28	(28–28)	4	(3–6)
2003–04	82	(82–82)	128	(55–763)	14	(1–402)	6	(3–13)	30	(15–80)	30	(18–53)	2	(2–2)	4	(3–8)
2004–05	146	(146–146)	67	(38–213)	44	(13–1056)	135	(126–157)	24	(9–61)	17	(9–34)	8	(8–8)	35	(29–45)
2005–06	16	(16–16)	24	(12–72)	13	(3–171)	9	(7–12)	38	(15–97)	31	(16–55)	2	(2–2)	16	(11–25)
2006–07	9	(9–9)	95	(40–569)	43	(6–913)	8	(5–15)	10	(3–33)	10	(6–18)	6	(6–6)	7	(4–12)
2007–08	46	(46–46)	13	(9–21)	1	(1–3)	24	(18–36)	17	(9–37)	9	(6–15)	6	(6–6)	14	(11–20)
2008–09	34	(34–34)	6	(4–9)	4	(1–59)	21	(15–34)	7	(4–13)	13	(9–18)	4	(4–4)	2	(1–3)
2009–10	56	(56–56)	2	(2–5)	6	(2–86)	8	(6–11)	30	(20–54)	27	(19–40)	14	(14–14)	2	(2–3)
2010–11	4	(4–4)	15	(11–23)	4	(2–7)	11	(9–16)	65	(43–112)	54	(42–74)	33	(33–33)	9	(7–12)
2011–12	31	(31–31)	8	(6–13)	2	(1–4)	16	(16–18)	21	(14–38)	17	(11–25)	7	(7–7)	8	(7–9)
2012–13	80	(80–80)	14	(14–17)	3	(2–5)	32	(32–32)	21	(20–22)	17	(16–20)	40	(40–40)	43	(43–45)
2013–14	27	(27–27)	13	(12–13)	4	(4–4)	19	(18–21)	15	(14–15)	22	(22–24)	51	(51–51)	5	(5–5)
2014–15	9	(9–9)	14	(13–27)	21	(6–422)	8	(8–9)	12	(11–15)	35	(35–39)	47	(47–47)	4	(4–4)
2015–16	26	(26–26)	16	(14–20)	2	(1–6)	70	(70–70)	18	(15–25)	8	(7–9)	56	(56–56)	13	(12–13)
Slope	NA		-0.035		-0.087		-0.020		-0.063		-0.003		NA		-0.046	

Fishing year	NMP		BSK		HPB		GON		SSI		HAK	
2002–03	50	(33–136)	12	(11–33)	21	(9–71)	3	(2–5)	9	(6–17)	3	(1–10)
2003–04	14	(6–52)	4	(4–11)	0	(0–1)	3	(2–5)	1	(1–2)	1	(1–3)
2004–05	19	(8–56)	3	(2–13)	24	(11–75)	7	(5–9)	12	(9–19)	2	(1–4)
2005–06	11	(4–34)	1	(0–8)	4	(1–24)	3	(2–5)	2	(1–4)	1	(0–2)
2006–07	17	(7–54)	14	(13–27)	3	(1–10)	3	(2–4)	6	(5–9)	1	(0–3)
2007–08	4	(2–11)	5	(5–7)	2	(2–4)	9	(8–10)	16	(15–17)	1	(1–1)
2008–09	1	(0–6)	4	(4–5)	1	(1–2)	6	(6–8)	2	(2–3)	1	(1–2)
2009–10	2	(1–4)	0	(0–2)	1	(0–1)	13	(11–16)	4	(3–5)	1	(1–2)
2010–11	6	(4–12)	14	(13–16)	1	(0–1)	14	(12–18)	7	(6–10)	3	(2–4)
2011–12	2	(2–5)	8	(8–10)	2	(1–3)	4	(3–5)	2	(1–2)	4	(4–5)
2012–13	3	(2–10)	62	(62–63)	1	(1–1)	12	(12–13)	9	(9–10)	3	(3–3)
2013–14	1	(1–2)	0	(0–0)	12	(12–12)	5	(5–5)	2	(2–2)	23	(23–23)
2014–15	2	(1–5)	0	(0–0)	10	(10–12)	6	(6–7)	6	(5–7)	3	(3–4)
2015–16	9	(7–17)	0	(0–1)	18	(16–23)	3	(3–3)	3	(3–4)	7	(7–8)
Slope	-0.176		**0.422**		0.180		-0.033		-0.084		**0.235**	

Table A7: Target arrow squid trawl fishery. Total annual bycatch estimates (t) (with estimated 95% CIs in parenthesis) for main bycatch species, those with an average of over 3 t of observed bycatch in each year) and area. Species are ordered by decreasing total catch. See Table A1 for species code definitions.

BAR (Barracouta)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	297	(156–594)	0	(0–6)	0	(0–34)	1	(0–10)	282	(153–549)	42	(38–49)	9300	(5901–14941)	0	(0–4)	3	(0–256)	3	(0–46)
2003–04	68	(35–143)	0	(0–0)	0	(0–0)	0	(0–3)	36	(17–80)	10	(6–18)	9812	(6195–16388)	1	(0–9)	0	(0–10)	1	(0–10)
2004–05	117	(59–230)	0	(0–0)	0	(0–0)	0	(0–0)	36	(18–70)	21	(19–25)	7504	(5216–10756)	0	(0–1)	0	(0–0)	1	(0–16)
2005–06	580	(273–1259)	0	(0–0)	0	(0–0)	1	(0–22)	95	(42–221)	70	(60–91)	20367	(12074–36878)	0	(0–3)	0	(0–0)	1	(0–10)
2006–07	19	(9–39)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–1)	1	(1–1)	1147	(751–1861)	0	(0–0)	0	(0–0)	0	(0–1)
2007–08	51	(26–100)	0	(0–0)	0	(0–0)	0	(0–1)	3	(1–5)	10	(8–11)	5314	(4083–7199)	0	(0–0)	0	(0–1)	0	(0–0)
2008–09	30	(15–60)	0	(0–0)	0	(0–0)	1	(0–10)	1	(0–2)	14	(9–21)	8838	(6382–12866)	0	(0–0)	0	(0–0)	0	(0–2)
2009–10	27	(14–54)	0	(0–0)	0	(0–0)	0	(0–0)	4	(2–8)	3	(2–4)	3013	(2400–3957)	0	(0–0)	0	(0–0)	0	(0–1)
2010–11	114	(67–206)	0	(0–0)	0	(0–0)	0	(0–0)	16	(9–28)	12	(9–16)	6792	(4979–9658)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	30	(17–54)	0	(0–0)	0	(0–0)	0	(0–0)	3	(2–6)	2	(1–3)	4185	(3083–5453)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	11	(8–15)	0	(0–0)	0	(0–0)	0	(0–5)	4	(3–7)	10	(10–10)	3974	(3864–4135)	0	(0–0)	0	(0–4)	0	(0–0)
2013–14	3	(2–7)	0	(0–0)	0	(0–0)	0	(0–0)	13	(13–13)	6	(6–8)	4865	(4585–5338)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	25	(14–43)	0	(0–0)	0	(0–0)	0	(0–0)	5	(5–5)	25	(24–25)	3203	(3102–3358)	0	(0–0)	0	(0–0)	1	(0–11)
2015–16	82	(60–122)	0	(0–5)	0	(0–0)	0	(0–4)	5	(5–6)	3	(3–3)	2844	(2820–2880)	0	(0–0)	0	(0–0)	0	(0–0)

SWA (Silver warehou)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	2002	(1068–3984)	0	(0–7)	1	(0–40)	1	(0–10)	373	(194–760)	84	(50–146)	4473	(2858–7353)	6	(1–24)	17	(0–610)	47	(4–621)
2003–04	1102	(533–2327)	0	(0–0)	0	(0–0)	1	(0–15)	144	(63–336)	499	(324–830)	11739	(6872–20980)	16	(4–64)	3	(0–106)	24	(2–311)
2004–05	1227	(672–2304)	0	(0–0)	0	(0–0)	0	(0–1)	57	(27–120)	150	(105–225)	6199	(3979–9698)	1	(0–4)	0	(0–0)	21	(2–257)
2005–06	2726	(1380–5590)	0	(0–0)	0	(0–0)	2	(0–17)	118	(52–269)	480	(292–836)	12987	(7739–22786)	3	(1–11)	0	(0–0)	8	(1–101)
2006–07	2333	(1255–4610)	0	(0–11)	0	(0–0)	2	(0–15)	9	(4–21)	180	(126–282)	5885	(3679–9996)	8	(2–30)	1	(0–28)	23	(2–257)
2007–08	686	(358–1348)	0	(0–0)	0	(0–0)	0	(0–3)	5	(2–11)	98	(71–141)	2950	(1950–4554)	0	(0–0)	0	(0–7)	0	(0–0)
2008–09	117	(61–224)	0	(0–0)	0	(0–0)	0	(0–3)	4	(4–5)	140	(115–182)	1989	(1423–2843)	0	(0–0)	0	(0–0)	1	(0–11)
2009–10	263	(133–513)	0	(0–0)	0	(0–0)	0	(0–0)	9	(5–20)	140	(102–208)	2598	(1671–4045)	0	(0–1)	0	(0–0)	1	(0–17)
2010–11	165	(90–310)	0	(0–0)	0	(0–0)	0	(0–0)	4	(2–8)	54	(43–73)	1174	(839–1740)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	162	(86–310)	0	(0–0)	0	(0–0)	0	(0–0)	4	(2–8)	78	(58–112)	1752	(1181–2616)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	78	(50–132)	0	(0–0)	0	(0–0)	1	(0–14)	9	(5–19)	247	(229–277)	2351	(2020–2893)	0	(0–0)	1	(0–31)	0	(0–0)
2013–14	16	(10–27)	0	(0–0)	0	(0–0)	0	(0–0)	3	(3–3)	65	(58–76)	1176	(1063–1361)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	206	(122–358)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	20	(16–25)	1917	(1870–1990)	0	(0–0)	0	(0–0)	15	(1–191)
2015–16	336	(222–536)	0	(0–4)	0	(0–0)	0	(0–3)	26	(25–27)	21	(19–23)	1028	(1005–1066)	0	(0–0)	0	(0–0)	0	(0–0)

Table A7: Continued.

SPD (Spiny dogfish)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	1877	(1025–3450)	0	(0–17)	1	(0–64)	1	(0–46)	853	(451–1640)	7	(5–11)	1887	(1303–2885)	112	(43–302)	12	(1–139)	13	(0–789)
2003–04	542	(284–1035)	0	(0–0)	0	(0–0)	0	(0–16)	149	(71–316)	9	(6–15)	2475	(1595–4035)	62	(22–172)	1	(0–9)	2	(0–158)
2004–05	656	(379–1166)	0	(0–0)	0	(0–0)	0	(0–0)	64	(33–130)	2	(1–3)	1506	(1014–2254)	7	(2–19)	0	(0–0)	1	(0–111)
2005–06	942	(489–1774)	0	(0–0)	0	(0–0)	0	(0–12)	86	(41–183)	7	(4–12)	2004	(1243–3283)	10	(4–30)	0	(0–0)	0	(0–35)
2006–07	773	(417–1442)	0	(0–7)	0	(0–0)	0	(0–10)	6	(3–13)	4	(3–5)	819	(523–1264)	23	(8–65)	0	(0–1)	1	(0–91)
2007–08	269	(147–475)	0	(0–0)	0	(0–0)	0	(0–2)	4	(2–8)	3	(3–4)	544	(405–750)	1	(1–1)	0	(0–0)	0	(0–0)
2008–09	124	(69–220)	0	(0–0)	0	(0–0)	0	(0–12)	2	(1–4)	52	(50–54)	922	(697–1272)	0	(0–1)	0	(0–0)	0	(0–15)
2009–10	241	(133–424)	0	(0–0)	0	(0–0)	0	(0–0)	18	(9–35)	7	(5–10)	1349	(1009–1874)	2	(1–5)	0	(0–0)	0	(0–19)
2010–11	173	(108–295)	0	(0–0)	0	(0–0)	0	(0–0)	11	(6–20)	2	(1–2)	668	(507–907)	1	(0–2)	0	(0–0)	0	(0–0)
2011–12	165	(92–288)	0	(0–0)	0	(0–0)	0	(0–0)	8	(4–17)	15	(15–17)	863	(624–1234)	0	(0–1)	0	(0–0)	0	(0–0)
2012–13	37	(22–62)	0	(0–0)	0	(0–0)	0	(0–18)	17	(12–27)	43	(43–44)	986	(904–1110)	4	(4–4)	0	(0–3)	0	(0–0)
2013–14	7	(5–12)	0	(0–0)	0	(0–0)	0	(0–0)	12	(12–12)	2	(2–2)	658	(635–692)	1	(1–1)	0	(0–0)	0	(0–0)
2014–15	107	(76–158)	0	(0–0)	0	(0–0)	0	(0–0)	11	(11–11)	1	(1–1)	369	(363–377)	0	(0–1)	0	(0–0)	1	(0–76)
2015–16	372	(248–566)	0	(0–12)	0	(0–0)	0	(0–10)	17	(15–20)	11	(11–12)	494	(481–515)	0	(0–0)	0	(0–0)	0	(0–0)

RCO (Red cod)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	758	(400–1477)	0	(0–4)	1	(0–16)	0	(0–6)	15	(11–23)	460	(291–767)	326	(204–541)	73	(30–181)	9	(0–296)	14	(1–170)
2003–04	88	(42–192)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–1)	316	(177–569)	178	(103–318)	18	(7–50)	0	(0–6)	1	(0–15)
2004–05	231	(124–433)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	314	(214–482)	251	(166–389)	6	(2–16)	0	(0–0)	3	(0–38)
2005–06	219	(106–472)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–1)	431	(239–788)	241	(145–414)	5	(2–13)	0	(0–0)	0	(0–5)
2006–07	229	(118–461)	0	(0–1)	0	(0–0)	0	(0–1)	0	(0–0)	135	(84–225)	117	(74–195)	13	(5–34)	0	(0–2)	1	(0–16)
2007–08	147	(75–287)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	321	(269–410)	177	(140–241)	0	(0–0)	0	(0–1)	0	(0–0)
2008–09	14	(8–28)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	159	(117–229)	58	(45–79)	0	(0–0)	0	(0–0)	0	(0–1)
2009–10	44	(23–88)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	258	(190–378)	138	(105–192)	1	(0–1)	0	(0–0)	0	(0–2)
2010–11	194	(112–347)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	810	(568–1201)	421	(322–580)	6	(5–8)	0	(0–0)	0	(0–0)
2011–12	125	(67–235)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	724	(499–1094)	381	(283–544)	0	(0–1)	0	(0–0)	0	(0–0)
2012–13	22	(12–39)	0	(0–0)	0	(0–0)	0	(0–5)	0	(0–0)	445	(378–548)	327	(301–367)	1	(1–1)	0	(0–9)	0	(0–0)
2013–14	8	(4–15)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	331	(284–410)	426	(410–454)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	88	(61–135)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	213	(203–230)	165	(163–169)	1	(0–1)	0	(0–0)	4	(0–40)
2015–16	235	(150–381)	0	(0–5)	0	(0–0)	0	(0–4)	0	(0–0)	485	(462–520)	178	(173–185)	2	(2–2)	0	(0–0)	0	(0–0)

Table A7: Continued.

RAT (Rattails)

Fishing year	CHAT	COOK	EAST	NORTH	PUYS	AUCK	STEW	SUBA	WCNI	WCSI
2002–03	958 (483–1909)	0 (0–1)	0 (0–7)	0 (0–5)	2 (1–3)	85 (57–137)	36 (22–60)	22 (9–60)	2 (0–24)	3 (0–156)
2003–04	59 (25–134)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)	21 (11–42)	6 (3–12)	2 (1–6)	0 (0–0)	0 (0–5)
2004–05	542 (301–1005)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)	87 (54–141)	64 (46–95)	3 (1–9)	0 (0–0)	1 (0–56)
2005–06	512 (264–1013)	0 (0–0)	0 (0–0)	0 (0–3)	0 (0–0)	133 (79–237)	45 (27–77)	2 (1–7)	0 (0–0)	0 (0–9)
2006–07	398 (201–779)	0 (0–1)	0 (0–0)	0 (0–2)	0 (0–0)	38 (27–56)	15 (9–25)	5 (2–14)	0 (0–0)	0 (0–19)
2007–08	250 (138–482)	0 (0–0)	0 (0–0)	0 (0–1)	0 (0–0)	47 (35–66)	23 (17–33)	0 (0–0)	0 (0–0)	0 (0–0)
2008–09	65 (37–120)	0 (0–0)	0 (0–0)	0 (0–2)	0 (0–0)	94 (68–134)	23 (17–32)	0 (0–0)	0 (0–0)	0 (0–4)
2009–10	159 (87–294)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)	95 (61–151)	50 (37–71)	1 (0–2)	0 (0–0)	0 (0–6)
2010–11	425 (245–764)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–1)	240 (164–366)	111 (82–158)	1 (0–3)	0 (0–0)	0 (0–0)
2011–12	76 (41–137)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)	58 (41–89)	27 (21–37)	0 (0–1)	0 (0–0)	0 (0–0)
2012–13	36 (28–51)	0 (0–0)	0 (0–0)	0 (0–3)	0 (0–0)	68 (59–81)	41 (39–45)	0 (0–0)	0 (0–1)	0 (0–0)
2013–14	18 (14–26)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)	33 (25–45)	42 (40–45)	0 (0–0)	0 (0–0)	0 (0–0)
2014–15	101 (64–168)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)	60 (58–63)	35 (35–36)	0 (0–1)	0 (0–0)	1 (0–64)
2015–16	108 (72–168)	0 (0–1)	0 (0–0)	0 (0–1)	0 (0–0)	17 (16–19)	17 (16–17)	0 (0–0)	0 (0–0)	0 (0–0)

WAR (blue warehou)

Fishing year	CHAT	COOK	EAST	NORTH	PUYS	AUCK	STEW	SUBA	WCNI	WCSI
2002–03	0 (0–2)	0 (0–0)	0 (0–0)	0 (0–0)	2 (0–8)	0 (0–0)	35 (17–93)	0 (0–2)	0 (0–10)	0 (0–4)
2003–04	3 (1–18)	0 (0–0)	0 (0–0)	0 (0–3)	10 (2–45)	0 (0–0)	1005 (468–2557)	1 (0–290)	0 (0–17)	0 (0–31)
2004–05	0 (0–2)	0 (0–0)	0 (0–0)	0 (0–0)	1 (1–4)	0 (0–0)	91 (60–166)	0 (0–2)	0 (0–0)	0 (0–5)
2005–06	2 (0–13)	0 (0–0)	0 (0–0)	0 (0–1)	3 (1–11)	0 (0–0)	392 (244–770)	0 (0–5)	0 (0–0)	0 (0–4)
2006–07	20 (4–102)	0 (0–5)	0 (0–0)	0 (0–9)	2 (0–7)	0 (0–0)	1527 (811–3158)	0 (0–79)	0 (0–11)	0 (0–88)
2007–08	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)	20 (14–39)	0 (0–0)	0 (0–0)	0 (0–0)
2008–09	1 (0–3)	0 (0–0)	0 (0–0)	0 (0–3)	0 (0–0)	0 (0–0)	339 (177–741)	0 (0–0)	0 (0–0)	0 (0–2)
2009–10	1 (0–4)	0 (0–0)	0 (0–0)	0 (0–0)	1 (0–3)	0 (0–0)	203 (141–340)	0 (0–1)	0 (0–0)	0 (0–2)
2010–11	2 (0–8)	0 (0–0)	0 (0–0)	0 (0–0)	1 (0–4)	0 (0–0)	266 (167–504)	0 (0–1)	0 (0–0)	0 (0–0)
2011–12	0 (0–1)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–1)	0 (0–0)	99 (79–147)	0 (0–0)	0 (0–0)	0 (0–0)
2012–13	0 (0–1)	0 (0–0)	0 (0–0)	0 (0–2)	1 (0–2)	0 (0–0)	276 (266–299)	0 (0–0)	0 (0–3)	0 (0–0)
2013–14	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)	1 (1–1)	0 (0–0)	236 (222–266)	0 (0–0)	0 (0–0)	0 (0–0)
2014–15	2 (1–8)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)	372 (347–425)	0 (0–1)	0 (0–0)	0 (0–65)
2015–16	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)	4 (3–4)	0 (0–0)	0 (0–0)	0 (0–0)

Table A7: Continued.

LIN (Ling)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	67	(35–136)	0	(0–4)	0	(0–16)	0	(0–2)	28	(14–60)	4	(3–5)	278	(180–472)	148	(57–409)	15	(1–206)	35	(3–617)
2003–04	14	(7–28)	0	(0–0)	0	(0–0)	0	(0–1)	3	(1–8)	3	(2–4)	311	(185–499)	65	(24–182)	1	(0–11)	6	(0–101)
2004–05	25	(13–49)	0	(0–0)	0	(0–0)	0	(0–0)	3	(1–6)	1	(1–2)	310	(199–485)	17	(6–49)	0	(0–0)	10	(1–186)
2005–06	71	(37–142)	0	(0–0)	0	(0–0)	0	(0–2)	7	(3–15)	8	(5–15)	684	(437–1182)	26	(10–74)	0	(0–0)	3	(0–56)
2006–07	43	(22–83)	0	(0–3)	0	(0–0)	0	(0–1)	0	(0–1)	5	(4–5)	211	(135–332)	51	(19–141)	0	(0–3)	7	(1–120)
2007–08	16	(8–29)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	1	(1–1)	125	(88–183)	5	(5–5)	0	(0–1)	0	(0–0)
2008–09	4	(2–8)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	2	(2–3)	166	(131–222)	1	(0–1)	0	(0–0)	1	(0–10)
2009–10	8	(4–16)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–1)	2	(1–3)	204	(139–295)	2	(1–6)	0	(0–0)	1	(0–12)
2010–11	24	(13–46)	0	(0–0)	0	(0–0)	0	(0–0)	2	(1–4)	6	(4–9)	491	(371–691)	3	(1–9)	0	(0–0)	0	(0–0)
2011–12	5	(2–9)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	3	(3–4)	128	(86–187)	0	(0–1)	0	(0–0)	0	(0–0)
2012–13	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–1)	2	(2–2)	127	(116–144)	10	(10–10)	0	(0–3)	0	(0–0)
2013–14	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	2	(2–2)	1	(1–1)	109	(104–118)	1	(1–1)	0	(0–0)	0	(0–0)
2014–15	5	(3–8)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	2	(1–2)	148	(146–150)	1	(0–2)	0	(0–0)	5	(0–92)
2015–16	12	(7–22)	0	(0–3)	0	(0–0)	0	(0–1)	1	(0–1)	2	(2–2)	143	(141–147)	0	(0–0)	0	(0–0)	0	(0–0)

HOK (Hoki)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	54	(22–139)	0	(0–1)	0	(0–113)	0	(0–2)	17	(7–44)	11	(7–20)	66	(39–118)	7	(2–31)	3	(0–189)	13	(1–2862)
2003–04	9	(4–25)	0	(0–0)	0	(0–0)	0	(0–1)	2	(0–5)	9	(4–20)	38	(16–93)	3	(1–13)	0	(0–6)	2	(0–297)
2004–05	25	(15–52)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–4)	6	(3–13)	65	(44–112)	1	(0–3)	0	(0–0)	3	(0–613)
2005–06	100	(55–214)	0	(0–0)	0	(0–0)	0	(0–2)	5	(2–13)	34	(17–73)	171	(91–335)	2	(1–9)	0	(0–0)	2	(0–396)
2006–07	98	(40–239)	0	(0–2)	0	(0–0)	0	(0–3)	1	(0–2)	23	(16–38)	106	(55–211)	7	(2–30)	0	(0–8)	40	(33–1506)
2007–08	36	(15–86)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–1)	21	(17–28)	82	(55–133)	4	(4–4)	0	(0–3)	0	(0–0)
2008–09	14	(6–32)	0	(0–0)	0	(0–0)	0	(0–2)	1	(1–1)	49	(36–74)	187	(152–253)	0	(0–0)	0	(0–0)	1	(0–211)
2009–10	42	(17–102)	0	(0–0)	0	(0–0)	0	(0–0)	3	(2–6)	44	(25–81)	282	(203–430)	1	(0–3)	0	(0–0)	2	(0–383)
2010–11	111	(54–244)	0	(0–0)	0	(0–0)	0	(0–0)	7	(4–14)	104	(67–176)	472	(337–712)	1	(0–5)	0	(0–0)	0	(0–0)
2011–12	15	(6–38)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–2)	53	(46–71)	158	(126–224)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	8	(6–13)	0	(0–0)	0	(0–0)	0	(0–3)	1	(1–2)	32	(29–37)	270	(260–288)	0	(0–0)	0	(0–11)	0	(0–0)
2013–14	2	(1–6)	0	(0–0)	0	(0–0)	0	(0–0)	4	(4–4)	16	(12–24)	489	(477–510)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	34	(18–70)	0	(0–0)	0	(0–0)	0	(0–0)	2	(2–2)	35	(33–38)	316	(312–322)	0	(0–1)	0	(0–0)	21	(2–4652)
2015–16	20	(10–44)	0	(0–1)	0	(0–0)	0	(0–2)	0	(0–1)	20	(20–21)	88	(87–90)	0	(0–0)	0	(0–0)	0	(0–0)

Table A7: Continued.

JMA (Jack mackerels)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	9	(3–26)	0	(0–0)	0	(0–2)	2	(0–38)	1	(1–4)	0	(0–0)	74	(33–168)	0	(0–0)	0	(0–11)	0	(0–5)
2003–04	14	(10–28)	0	(0–0)	0	(0–0)	5	(1–64)	0	(0–1)	0	(0–0)	208	(100–476)	1	(0–11)	0	(0–2)	0	(0–4)
2004–05	5	(2–13)	0	(0–0)	0	(0–0)	0	(0–3)	1	(1–1)	0	(0–0)	69	(43–120)	0	(0–0)	0	(0–0)	0	(0–3)
2005–06	22	(8–62)	0	(0–0)	0	(0–0)	4	(0–73)	0	(0–1)	0	(0–0)	236	(137–468)	0	(0–0)	0	(0–0)	0	(0–1)
2006–07	2	(1–7)	0	(0–0)	0	(0–0)	1	(0–17)	0	(0–0)	0	(0–0)	25	(14–56)	0	(0–0)	0	(0–0)	0	(0–1)
2007–08	2	(1–6)	0	(0–0)	0	(0–0)	0	(0–8)	0	(0–0)	0	(0–0)	144	(123–187)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	5	(2–14)	0	(0–0)	0	(0–0)	13	(1–249)	0	(0–0)	0	(0–0)	312	(197–563)	0	(0–0)	0	(0–0)	0	(0–1)
2009–10	6	(2–17)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	367	(339–429)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	12	(6–28)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	125	(83–211)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	7	(3–16)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	152	(118–221)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	1	(1–2)	0	(0–0)	0	(0–0)	2	(0–40)	0	(0–0)	0	(0–0)	96	(95–98)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	4	(4–5)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	177	(169–193)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	3	(2–5)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	99	(96–104)	0	(0–0)	0	(0–0)	0	(0–3)
2015–16	10	(5–21)	0	(0–1)	0	(0–0)	3	(0–52)	0	(0–0)	0	(0–0)	285	(285–286)	0	(0–0)	0	(0–0)	0	(0–0)

SDO (Silver dory)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	17	(10–32)	0	(0–3)	0	(0–12)	0	(0–4)	802	(390–1696)	0	(0–0)	129	(86–210)	0	(0–3)	0	(0–182)	1	(0–140)
2003–04	5	(4–8)	0	(0–0)	0	(0–0)	0	(0–1)	122	(45–329)	0	(0–0)	98	(48–219)	0	(0–1)	0	(0–5)	0	(0–19)
2004–05	2	(1–4)	0	(0–0)	0	(0–0)	0	(0–0)	56	(26–123)	0	(0–0)	71	(48–109)	0	(0–0)	0	(0–0)	0	(0–20)
2005–06	2	(1–5)	0	(0–0)	0	(0–0)	0	(0–1)	47	(18–132)	0	(0–0)	55	(27–116)	0	(0–0)	0	(0–0)	0	(0–3)
2006–07	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	2	(1–4)	0	(0–0)	9	(5–16)	0	(0–0)	0	(0–0)	0	(0–3)
2007–08	2	(1–4)	0	(0–0)	0	(0–0)	0	(0–0)	6	(2–12)	0	(0–0)	53	(39–77)	0	(0–0)	0	(0–1)	0	(0–0)
2008–09	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–1)	0	(0–0)	76	(70–86)	0	(0–0)	0	(0–0)	0	(0–1)
2009–10	1	(1–3)	0	(0–0)	0	(0–0)	0	(0–0)	12	(5–26)	0	(0–0)	75	(57–108)	0	(0–0)	0	(0–0)	0	(0–3)
2010–11	2	(1–4)	0	(0–0)	0	(0–0)	0	(0–0)	20	(12–38)	0	(0–0)	80	(62–110)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	4	(3–7)	0	(0–0)	19	(13–29)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	13	(10–19)	0	(0–0)	43	(40–49)	0	(0–0)	0	(0–3)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	23	(23–23)	0	(0–0)	93	(90–99)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	1	(0–2)	0	(0–0)	0	(0–0)	0	(0–0)	35	(35–35)	0	(0–0)	63	(62–64)	0	(0–0)	0	(0–0)	0	(0–24)
2015–16	4	(2–9)	0	(0–4)	0	(0–0)	0	(0–3)	16	(14–20)	0	(0–0)	85	(83–87)	0	(0–0)	0	(0–0)	0	(0–0)

Table A7: Continued.

GIZ (Giant stargazer)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	71	(45–113)	0	(0–0)	0	(0–2)	0	(0–0)	82	(54–127)	0	(0–0)	36	(27–50)	2	(1–6)	1	(0–38)	1	(0–37)
2003–04	21	(12–34)	0	(0–0)	0	(0–0)	0	(0–0)	14	(8–24)	0	(0–0)	51	(36–75)	1	(0–4)	0	(0–2)	0	(0–9)
2004–05	49	(32–76)	0	(0–0)	0	(0–0)	0	(0–0)	14	(9–23)	0	(0–0)	69	(54–92)	0	(0–1)	0	(0–0)	0	(0–18)
2005–06	65	(39–106)	0	(0–0)	0	(0–0)	0	(0–0)	15	(9–26)	0	(0–0)	78	(54–114)	0	(0–1)	0	(0–0)	0	(0–4)
2006–07	65	(41–104)	0	(0–1)	0	(0–0)	0	(0–0)	1	(1–2)	0	(0–0)	38	(28–53)	1	(0–3)	0	(0–1)	0	(0–12)
2007–08	23	(14–36)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	0	(0–0)	26	(21–32)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	8	(5–12)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	1	(0–1)	34	(28–42)	0	(0–0)	0	(0–0)	0	(0–1)
2009–10	34	(22–51)	0	(0–0)	0	(0–0)	0	(0–0)	6	(4–9)	1	(1–1)	94	(75–120)	0	(0–1)	0	(0–0)	0	(0–4)
2010–11	45	(31–65)	0	(0–0)	0	(0–0)	0	(0–0)	7	(5–11)	1	(1–1)	94	(77–117)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	11	(8–17)	0	(0–0)	0	(0–0)	0	(0–0)	2	(1–3)	0	(0–1)	36	(30–45)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	4	(3–5)	0	(0–0)	0	(0–0)	0	(0–0)	3	(3–4)	0	(0–0)	47	(45–49)	0	(0–0)	0	(0–2)	0	(0–0)
2013–14	2	(2–3)	0	(0–0)	0	(0–0)	0	(0–0)	18	(18–18)	0	(0–0)	46	(45–48)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	21	(16–29)	0	(0–0)	0	(0–0)	0	(0–0)	6	(6–6)	1	(1–1)	56	(55–56)	0	(0–0)	0	(0–0)	1	(0–38)
2015–16	47	(38–60)	0	(0–1)	0	(0–0)	0	(0–1)	9	(9–9)	1	(1–1)	31	(31–32)	0	(0–0)	0	(0–0)	0	(0–0)

RSK (Rough skate)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	1	(0–4)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–2)	1	(0–5)	0	(0–2)	0	(0–3)
2003–04	3	(1–7)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	8	(4–18)	5	(2–18)	0	(0–1)	0	(0–5)
2004–05	27	(14–53)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	1	(1–1)	51	(33–81)	6	(3–16)	0	(0–0)	0	(0–42)
2005–06	26	(12–60)	0	(0–0)	0	(0–0)	0	(0–3)	0	(0–1)	1	(1–3)	43	(22–83)	4	(1–12)	0	(0–0)	0	(0–6)
2006–07	13	(6–27)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	1	(1–1)	10	(6–18)	6	(2–18)	0	(0–1)	0	(0–9)
2007–08	15	(8–28)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	2	(1–2)	26	(20–35)	0	(0–0)	0	(0–1)	0	(0–0)
2008–09	4	(3–7)	0	(0–0)	0	(0–0)	0	(0–2)	0	(0–0)	2	(2–3)	26	(21–33)	0	(0–0)	0	(0–0)	0	(0–3)
2009–10	16	(9–28)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	3	(3–5)	69	(51–94)	1	(1–3)	0	(0–0)	0	(0–7)
2010–11	40	(25–64)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	8	(6–10)	121	(95–162)	2	(1–4)	0	(0–0)	0	(0–0)
2011–12	5	(3–8)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	22	(17–30)	0	(0–1)	0	(0–0)	0	(0–0)
2012–13	2	(2–4)	0	(0–0)	0	(0–0)	0	(0–8)	0	(0–0)	6	(5–6)	59	(56–63)	1	(1–1)	0	(0–3)	0	(0–0)
2013–14	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	2	(2–2)	46	(44–49)	1	(1–1)	0	(0–0)	0	(0–0)
2014–15	26	(20–36)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	3	(3–3)	62	(61–63)	1	(0–2)	0	(0–0)	1	(0–110)
2015–16	35	(25–52)	0	(0–4)	0	(0–0)	0	(0–10)	0	(0–0)	3	(3–3)	29	(28–30)	0	(0–0)	0	(0–0)	0	(0–0)

Table A7: Continued.

RSO (Gemfish)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	76	(36–177)	0	(0–1)	0	(0–7)	0	(0–0)	373	(216–705)	0	(0–0)	16	(13–26)	0	(0–29)	0	(0–79)	0	(0–105)
2003–04	9	(4–21)	0	(0–0)	0	(0–0)	0	(0–0)	51	(25–96)	0	(0–0)	9	(6–13)	0	(0–6)	0	(0–2)	0	(0–14)
2004–05	14	(6–32)	0	(0–0)	0	(0–0)	0	(0–0)	49	(26–88)	0	(0–0)	9	(7–12)	0	(0–1)	0	(0–0)	0	(0–22)
2005–06	6	(2–15)	0	(0–0)	0	(0–0)	0	(0–0)	23	(9–47)	0	(0–0)	3	(2–5)	0	(0–0)	0	(0–0)	0	(0–2)
2006–07	6	(3–16)	0	(0–0)	0	(0–0)	0	(0–0)	2	(1–4)	0	(0–0)	2	(1–2)	0	(0–1)	0	(0–0)	0	(0–5)
2007–08	3	(1–6)	0	(0–0)	0	(0–0)	0	(0–0)	2	(1–3)	0	(0–0)	2	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	2	(1–5)	0	(0–0)	0	(0–0)	0	(0–0)	5	(2–9)	0	(0–0)	3	(2–4)	0	(0–0)	0	(0–0)	0	(0–1)
2010–11	5	(2–11)	0	(0–0)	0	(0–0)	0	(0–0)	13	(9–20)	0	(0–0)	5	(4–7)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	1	(0–2)	0	(0–0)	0	(0–0)	0	(0–0)	3	(1–5)	0	(0–0)	2	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	4	(3–6)	0	(0–0)	4	(4–4)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	15	(15–15)	0	(0–0)	2	(2–2)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	2	(1–4)	0	(0–0)	0	(0–0)	0	(0–0)	10	(10–10)	0	(0–0)	4	(3–4)	0	(0–0)	0	(0–0)	0	(0–10)
2015–16	62	(60–67)	0	(0–0)	0	(0–0)	0	(0–0)	3	(3–4)	0	(0–0)	3	(3–3)	0	(0–0)	0	(0–0)	0	(0–0)

HAP (Hapuku)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	31	(19–50)	0	(0–0)	0	(0–1)	0	(0–0)	28	(18–45)	0	(0–0)	32	(24–42)	0	(0–1)	0	(0–16)	0	(0–12)
2003–04	19	(12–31)	0	(0–0)	0	(0–0)	0	(0–1)	10	(6–18)	0	(0–0)	73	(54–100)	0	(0–2)	0	(0–2)	0	(0–6)
2004–05	37	(24–57)	0	(0–0)	0	(0–0)	0	(0–0)	9	(5–14)	0	(0–0)	71	(57–89)	0	(0–0)	0	(0–0)	0	(0–10)
2005–06	31	(19–51)	0	(0–0)	0	(0–0)	0	(0–0)	6	(3–10)	0	(0–0)	50	(36–69)	0	(0–0)	0	(0–0)	0	(0–1)
2006–07	32	(19–51)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	29	(22–39)	0	(0–1)	0	(0–0)	0	(0–4)
2007–08	9	(6–15)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	22	(19–26)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	5	(4–8)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	55	(48–64)	0	(0–0)	0	(0–0)	0	(0–1)
2009–10	10	(7–16)	0	(0–0)	0	(0–0)	0	(0–0)	2	(1–3)	0	(0–0)	48	(40–58)	0	(0–0)	0	(0–0)	0	(0–1)
2010–11	8	(5–12)	0	(0–0)	0	(0–0)	0	(0–0)	3	(2–3)	0	(0–0)	24	(20–29)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	6	(4–9)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–1)	0	(0–0)	24	(20–30)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	2	(2–3)	0	(0–0)	26	(25–27)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	4	(4–4)	0	(0–0)	29	(28–30)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	5	(4–7)	0	(0–0)	0	(0–0)	0	(0–0)	4	(4–4)	0	(0–0)	34	(34–34)	0	(0–0)	0	(0–0)	0	(0–5)
2015–16	14	(12–18)	0	(0–0)	0	(0–0)	0	(0–0)	2	(2–2)	0	(0–0)	16	(16–17)	0	(0–0)	0	(0–0)	0	(0–0)

Table A7: Continued.

JAV (Javelin-fish)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	30	(9–114)	0	(0–0)	0	(0–1)	0	(0–2)	10	(3–31)	1	(1–2)	18	(9–38)	5	(1–28)	1	(0–25)	1	(0–18)
2003–04	6	(2–26)	0	(0–0)	0	(0–0)	0	(0–1)	1	(0–5)	2	(1–3)	16	(5–49)	2	(0–13)	0	(0–1)	0	(0–3)
2004–05	19	(6–76)	0	(0–0)	0	(0–0)	0	(0–0)	2	(1–5)	1	(1–2)	38	(21–76)	1	(0–6)	0	(0–0)	0	(0–9)
2005–06	35	(12–133)	0	(0–0)	0	(0–0)	0	(0–2)	2	(1–8)	3	(1–7)	44	(19–116)	1	(0–7)	0	(0–0)	0	(0–2)
2006–07	64	(18–256)	0	(0–0)	0	(0–0)	0	(0–3)	0	(0–1)	9	(9–12)	38	(17–101)	5	(1–32)	0	(0–1)	0	(0–11)
2007–08	9	(3–36)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	10	(5–22)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	3	(1–13)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	2	(2–4)	16	(10–30)	0	(0–0)	0	(0–0)	0	(0–1)
2009–10	4	(1–15)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	1	(0–2)	16	(9–30)	0	(0–1)	0	(0–0)	0	(0–0)
2010–11	14	(4–47)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–2)	2	(2–5)	35	(22–65)	0	(0–1)	0	(0–0)	0	(0–0)
2011–12	2	(1–10)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	10	(6–21)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–1)	46	(45–48)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	2	(2–2)	18	(16–21)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	6	(2–21)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	5	(5–5)	24	(23–25)	0	(0–0)	0	(0–0)	0	(0–9)
2015–16	2	(1–7)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	5	(5–5)	0	(0–0)	0	(0–0)	0	(0–0)

SCH (School shark)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	19	(10–35)	0	(0–1)	0	(0–2)	2	(0–13)	93	(55–162)	2	(2–2)	23	(18–32)	0	(0–1)	1	(0–41)	1	(0–40)
2003–04	2	(1–4)	0	(0–0)	0	(0–0)	1	(0–4)	7	(3–15)	0	(0–1)	11	(7–18)	0	(0–0)	0	(0–1)	0	(0–4)
2004–05	10	(6–19)	0	(0–0)	0	(0–0)	0	(0–1)	14	(8–26)	1	(0–1)	35	(27–47)	0	(0–0)	0	(0–0)	0	(0–16)
2005–06	10	(5–20)	0	(0–0)	0	(0–0)	1	(0–7)	11	(6–21)	1	(1–2)	25	(16–39)	0	(0–0)	0	(0–0)	0	(0–3)
2006–07	8	(4–16)	0	(0–0)	0	(0–0)	1	(0–6)	1	(0–2)	0	(0–1)	11	(7–16)	0	(0–0)	0	(0–0)	0	(0–7)
2007–08	3	(1–5)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–1)	2	(2–2)	9	(7–11)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	1	(1–2)	0	(0–0)	0	(0–0)	1	(0–4)	0	(0–0)	2	(1–2)	12	(10–16)	0	(0–0)	0	(0–0)	0	(0–1)
2009–10	3	(2–5)	0	(0–0)	0	(0–0)	0	(0–0)	2	(1–4)	1	(1–1)	20	(16–25)	0	(0–0)	0	(0–0)	0	(0–1)
2010–11	5	(3–10)	0	(0–0)	0	(0–0)	0	(0–0)	5	(3–8)	2	(1–2)	32	(27–40)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	2	(1–4)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–2)	1	(1–1)	18	(15–23)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	1	(1–1)	0	(0–0)	0	(0–0)	1	(0–4)	2	(1–3)	3	(3–3)	28	(27–28)	0	(0–0)	0	(0–1)	0	(0–0)
2013–14	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	15	(15–15)	3	(3–3)	25	(24–26)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	5	(4–6)	0	(0–0)	0	(0–0)	0	(0–0)	6	(6–6)	3	(3–3)	22	(22–23)	0	(0–0)	0	(0–0)	0	(0–10)
2015–16	11	(8–15)	0	(0–1)	0	(0–0)	1	(0–8)	19	(19–20)	2	(2–2)	18	(17–18)	0	(0–0)	0	(0–0)	0	(0–0)

Table A7: Continued.

RBT (Redbait)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	0	(0–0)	0	(0–0)	5	(5–5)	0	(0–0)	12	(12–12)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2003–04	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	82	(82–82)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2004–05	0	(0–0)	0	(0–0)	22	(22–22)	0	(0–0)	123	(123–123)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2005–06	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	16	(16–16)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2006–07	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	9	(9–9)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2007–08	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	46	(46–46)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	34	(34–34)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2009–10	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	56	(56–56)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2010–11	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	4	(4–4)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2011–12	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	31	(31–31)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2012–13	3	(3–3)	0	(0–0)	0	(0–0)	0	(0–0)	78	(78–78)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2013–14	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	27	(27–27)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2014–15	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	8	(8–8)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2015–16	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	25	(25–25)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)

SSK (Smooth skate)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	14	(7–31)	0	(0–2)	0	(0–10)	0	(0–2)	16	(8–32)	0	(0–1)	22	(16–34)	58	(16–491)	1	(0–220)	1	(0–83)
2003–04	8	(3–19)	0	(0–0)	0	(0–0)	0	(0–2)	5	(2–12)	2	(1–3)	52	(31–94)	51	(5–565)	0	(0–29)	0	(0–36)
2004–05	10	(4–22)	0	(0–0)	0	(0–0)	0	(0–0)	3	(1–6)	1	(1–1)	37	(23–63)	10	(1–115)	0	(0–0)	0	(0–48)
2005–06	4	(2–10)	0	(0–0)	0	(0–0)	0	(0–1)	1	(0–2)	0	(0–1)	14	(7–26)	3	(0–40)	0	(0–0)	0	(0–3)
2006–07	18	(8–43)	0	(0–3)	0	(0–0)	0	(0–2)	0	(0–1)	1	(1–2)	29	(17–50)	38	(4–443)	0	(0–7)	0	(0–42)
2007–08	2	(1–6)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	10	(7–14)	0	(0–0)	0	(0–1)	0	(0–0)
2008–09	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–1)	4	(3–7)	0	(0–1)	0	(0–0)	0	(0–1)
2009–10	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(1–3)	0	(0–1)	0	(0–0)	0	(0–0)
2010–11	2	(1–4)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	1	(1–1)	12	(9–16)	1	(0–6)	0	(0–0)	0	(0–0)
2011–12	1	(0–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	7	(5–10)	0	(0–1)	0	(0–0)	0	(0–0)
2012–13	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–1)	1	(1–1)	13	(12–14)	0	(0–0)	0	(0–2)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	0	(0–0)	11	(11–12)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	11	(11–11)	0	(0–2)	0	(0–0)	0	(0–13)
2015–16	3	(2–6)	0	(0–2)	0	(0–0)	0	(0–1)	1	(1–1)	1	(1–1)	10	(10–11)	0	(0–0)	0	(0–0)	0	(0–0)

Table A7: Continued.

FRO (Frostfish)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	12	(4–36)	0	(0–7)	0	(0–36)	1	(0–8)	79	(48–155)	0	(0–0)	2	(1–4)	0	(0–33)	4	(0–78)	135	(6–3921)
2003–04	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–2)	1	(0–3)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–2)	12	(0–390)
2004–05	2	(2–4)	0	(0–0)	0	(0–0)	0	(0–0)	10	(9–13)	0	(0–0)	0	(0–1)	0	(0–1)	0	(0–0)	31	(1–1022)
2005–06	2	(1–6)	0	(0–0)	0	(0–0)	0	(0–3)	3	(1–7)	0	(0–0)	1	(0–2)	0	(0–1)	0	(0–0)	5	(0–162)
2006–07	2	(1–8)	0	(0–3)	0	(0–0)	1	(0–5)	0	(0–1)	0	(0–0)	0	(0–1)	0	(0–2)	0	(0–2)	37	(2–887)
2007–08	1	(0–2)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–2)	0	(0–0)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	2	(0–57)
2009–10	1	(0–2)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–2)	0	(0–0)	1	(1–2)	0	(0–0)	0	(0–0)	3	(0–81)
2010–11	1	(0–3)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–2)	0	(0–0)	2	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	1	(0–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–2)	0	(0–1)	0	(0–0)	1	(1–2)	0	(0–0)	0	(0–1)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	3	(3–3)	0	(0–0)	2	(2–2)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	4	(4–4)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	15	(1–416)
2015–16	1	(0–2)	0	(0–3)	0	(0–0)	0	(0–2)	0	(0–0)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)

STU (Slender tuna)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	9	(5–17)	1	(1–3)	0	(0–0)	0	(0–0)	0	(0–0)
2003–04	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	5	(2–11)	1	(0–1)	0	(0–2)	0	(0–0)	0	(0–0)
2004–05	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	127	(118–146)	8	(7–10)	0	(0–1)	0	(0–0)	0	(0–0)
2005–06	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	8	(6–10)	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	7	(4–12)	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	21	(16–31)	3	(2–5)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	20	(15–32)	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	6	(5–9)	2	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	9	(7–13)	2	(2–3)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	4	(4–5)	12	(12–12)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	24	(24–24)	8	(8–8)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	9	(8–10)	10	(10–10)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	5	(5–6)	3	(3–3)	0	(0–0)	0	(0–0)	0	(0–0)
2015–16	3	(3–3)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	61	(61–61)	6	(6–6)	0	(0–0)	0	(0–0)	0	(0–0)

Table A7: Continued.

SPE (Sea perch)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	32	(16–73)	0	(0–0)	0	(0–1)	0	(0–0)	1	(0–2)	0	(0–0)	5	(3–10)	0	(0–2)	0	(0–5)	2	(0–38)
2003–04	14	(5–39)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	14	(8–31)	0	(0–2)	0	(0–1)	1	(0–14)
2004–05	15	(5–39)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	7	(3–15)	0	(0–0)	0	(0–0)	1	(0–15)
2005–06	25	(9–72)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	11	(5–27)	0	(0–0)	0	(0–0)	0	(0–3)
2006–07	8	(3–25)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–4)	0	(0–0)	0	(0–0)	0	(0–6)
2007–08	11	(5–29)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	6	(4–10)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	2	(1–6)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	5	(3–7)	0	(0–0)	0	(0–0)	0	(0–1)
2009–10	11	(5–26)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	19	(14–29)	0	(0–0)	0	(0–0)	0	(0–2)
2010–11	31	(16–64)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	34	(25–51)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	8	(4–18)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	14	(10–22)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	2	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	19	(18–20)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	14	(14–15)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	1	(1–3)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	10	(10–10)	0	(0–0)	0	(0–0)	0	(0–3)
2015–16	12	(9–19)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	5	(5–6)	0	(0–0)	0	(0–0)	0	(0–0)

CAR (Carpet shark)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	1	(0–4)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	27	(16–48)	0	(0–1)	0	(0–3)	0	(0–5)
2003–04	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	29	(18–50)	0	(0–0)	0	(0–0)	0	(0–1)
2004–05	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	16	(9–33)	0	(0–0)	0	(0–0)	0	(0–1)
2005–06	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	30	(15–54)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	10	(6–17)	0	(0–0)	0	(0–0)	0	(0–1)
2007–08	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	9	(6–15)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	12	(9–17)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	27	(18–39)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	53	(41–73)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	17	(11–25)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	17	(16–20)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	22	(21–24)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	35	(35–35)	0	(0–0)	0	(0–0)	0	(0–3)
2015–16	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	7	(6–7)	0	(0–0)	0	(0–0)	0	(0–0)

Table A7: Continued.

GSH (Ghost shark)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	4	(4–4)	0	(0–0)	3	(3–3)	4	(4–4)	17	(17–17)	1	(1–1)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2003–04	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(2–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2004–05	5	(5–5)	0	(0–0)	0	(0–0)	0	(0–0)	3	(3–3)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2005–06	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2006–07	1	(1–1)	0	(0–0)	0	(0–0)	4	(4–4)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2007–08	0	(0–0)	0	(0–0)	0	(0–0)	2	(2–2)	4	(4–4)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	3	(3–3)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2009–10	0	(0–0)	0	(0–0)	0	(0–0)	2	(2–2)	12	(12–12)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2010–11	3	(3–3)	0	(0–0)	0	(0–0)	4	(4–4)	26	(26–26)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2011–12	1	(1–1)	0	(0–0)	0	(0–0)	1	(1–1)	4	(4–4)	1	(1–1)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2012–13	6	(6–6)	0	(0–0)	0	(0–0)	5	(5–5)	23	(23–23)	5	(5–5)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2013–14	0	(0–0)	0	(0–0)	0	(0–0)	6	(6–6)	44	(44–44)	1	(1–1)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2014–15	4	(4–4)	0	(0–0)	0	(0–0)	5	(5–5)	37	(37–37)	1	(1–1)	0	(0–0)	0	(0–0)	0	(–)	0	(–)
2015–16	22	(22–22)	0	(0–0)	0	(0–0)	12	(12–12)	22	(22–22)	0	(0–0)	0	(0–0)	0	(0–0)	0	(–)	0	(–)

RBM (Rays bream)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	2	(2–3)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)
2003–04	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–1)	3	(2–6)	0	(0–0)	0	(0–0)	0	(0–0)
2004–05	4	(2–9)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–1)	2	(2–2)	28	(24–35)	0	(0–0)	0	(0–0)	0	(0–1)
2005–06	3	(1–7)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	12	(9–18)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	2	(1–5)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	5	(3–8)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	2	(1–4)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	12	(10–16)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(2–2)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	7	(6–9)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	7	(6–8)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	42	(42–43)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	0	(0–0)	4	(4–4)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	3	(3–3)	0	(0–0)	0	(0–0)	0	(0–0)
2015–16	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	11	(11–11)	0	(0–0)	0	(0–0)	0	(0–0)

Table A7: Continued.

NMP (Tarakihi)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	43	(30–86)	0	(0–0)	0	(0–1)	2	(0–22)	0	(0–1)	0	(0–0)	1	(1–2)	0	(0–5)	0	(0–11)	0	(0–30)
2003–04	9	(3–28)	0	(0–0)	0	(0–0)	1	(0–14)	0	(0–0)	0	(0–0)	2	(1–4)	0	(0–4)	0	(0–1)	0	(0–9)
2004–05	16	(7–42)	0	(0–0)	0	(0–0)	0	(0–2)	0	(0–0)	0	(0–0)	2	(1–3)	0	(0–1)	0	(0–0)	0	(0–17)
2005–06	9	(3–25)	0	(0–0)	0	(0–0)	1	(0–11)	0	(0–0)	0	(0–0)	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–1)
2006–07	13	(5–37)	0	(0–0)	0	(0–0)	2	(1–13)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–2)	0	(0–0)	0	(0–6)
2007–08	3	(1–10)	0	(0–0)	0	(0–0)	0	(0–2)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	1	(0–2)	0	(0–0)	0	(0–0)	0	(0–5)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	1	(0–4)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	5	(3–11)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	1	(0–4)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	0	(0–1)	0	(0–0)	0	(0–0)	1	(0–8)	0	(0–0)	0	(0–0)	2	(2–2)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	1	(0–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–3)
2015–16	7	(6–10)	0	(0–0)	0	(0–0)	1	(0–8)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)

BSK (Basking shark)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	0	(0–7)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–3)	11	(11–12)	0	(0–3)	0	(0–1)	0	(0–1)	0	(0–1)
2003–04	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	4	(4–5)	0	(0–2)	0	(0–1)	0	(0–0)	0	(0–0)
2004–05	0	(0–4)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–2)	2	(2–5)	0	(0–0)	0	(0–0)	0	(0–0)
2005–06	0	(0–3)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–2)	0	(0–2)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	0	(0–8)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	13	(13–14)	1	(0–3)	0	(0–1)	0	(0–0)	0	(0–0)
2007–08	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	5	(5–5)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	4	(4–5)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	13	(13–14)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	8	(8–9)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	62	(62–62)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2015–16	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)

Table A7: Continued.

HPB (Hapuku & Bass)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	5	(1–22)	0	(0–0)	0	(0–1)	0	(0–1)	6	(2–21)	0	(0–0)	7	(4–18)	0	(0–2)	0	(0–7)	0	(0–7)
2003–04	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)
2004–05	5	(1–22)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–6)	0	(0–0)	16	(8–45)	0	(0–1)	0	(0–0)	0	(0–6)
2005–06	1	(0–8)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–2)	0	(0–0)	3	(1–15)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	1	(0–5)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(1–5)	0	(0–0)	0	(0–0)	0	(0–1)
2007–08	0	(0–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(1–3)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–3)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(2–2)	0	(0–0)	10	(10–10)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	0	(0–0)	8	(8–8)	0	(0–0)	0	(0–0)	0	(0–1)
2015–16	4	(2–8)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–1)	0	(0–0)	13	(13–13)	0	(0–0)	0	(0–0)	0	(0–0)

GON (Sandfish)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–1)	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)
2003–04	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–2)	2	(1–3)	0	(0–0)	0	(0–0)	0	(0–0)
2004–05	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–2)	4	(3–6)	0	(0–0)	0	(0–0)	0	(0–0)
2005–06	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–2)	2	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(1–2)	6	(5–7)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	3	(3–4)	3	(2–4)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	4	(3–5)	9	(8–11)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	6	(5–7)	7	(6–9)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(1–2)	3	(2–3)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	5	(5–5)	7	(7–7)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(2–2)	3	(3–3)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(2–2)	4	(4–4)	0	(0–0)	0	(0–0)	0	(0–0)
2015–16	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)

Table A7: Continued.

SSI (Silverside)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	2	(1–5)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–2)	1	(1–2)	2	(1–3)	1	(0–3)	0	(0–2)	0	(0–4)
2003–04	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–1)	0	(0–1)	0	(0–0)	0	(0–0)
2004–05	2	(1–5)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	4	(3–5)	5	(4–8)	0	(0–1)	0	(0–0)	0	(0–3)
2005–06	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–1)	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	1	(0–3)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	4	(4–4)	1	(1–2)	0	(0–1)	0	(0–0)	0	(0–1)
2007–08	1	(0–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	13	(13–13)	2	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(1–2)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	2	(2–3)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(2–3)	4	(3–5)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	5	(5–5)	4	(4–4)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	3	(3–3)	3	(3–3)	0	(0–0)	0	(0–0)	0	(0–1)
2015–16	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–2)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)

HAK (Hake)

Fishing year	CHAT		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	0	(0–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–1)	1	(0–4)	0	(0–2)	0	(0–1)
2003–04	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–1)	0	(0–0)	0	(0–0)
2004–05	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(1–2)	0	(0–1)	0	(0–0)	0	(0–1)
2005–06	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–1)	0	(0–0)	0	(0–0)
2007–08	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	3	(2–3)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	4	(4–5)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(2–2)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	23	(23–23)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	3	(3–3)	0	(0–0)	0	(0–0)	0	(0–0)
2015–16	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	7	(7–7)	0	(0–0)	0	(0–0)	0	(0–0)

APPENDIX B: SCAMPI

Table B1: Observed scampi and FISH catch and discards for target scampi trawls. Species codes, common and scientific names, estimated catch, percentage of total catch, and overall percentage discarded of the top 100 fish species or species groups by weight from observer records for the scampi trawl fishery from 1 Oct 2002 to 30 Sep 2016. Records are ordered by decreasing percentage of catch. Codes in bold are QMS species (as of 1 October 2015); codes in italics are Schedule 6 QMA species (can legally be returned to the sea).

Species code	Common name	Scientific name	Observed catch (t)	% of catch	% discarded
SCI	Scampi	*Metanephrops challengeri*	1 016.3	18.55	0.34
JAV	Javelin fish	*Lepidorhynchus denticulatus*	958.3	17.50	95.16
RAT	Rattails	Macrouridae	680.6	12.42	91.26
SPE	Sea perch	*Helicolenus* spp.	560.5	10.23	68.08
HOK	Hoki	*Macruronus novaezelandiae*	255.6	4.67	11.73
LIN	Ling	*Genypterus blacodes*	215.9	3.94	2.49
GSH	Ghost shark	*Hydrolagus novaezealandiae*	164.2	3.00	4.89
FHD	Deepsea flathead	*Hoplichthys haswelli*	136.8	2.50	99.95
SPD	Spiny dogfish	*Squalus acanthias*	104.7	1.91	96.09
SSK	Smooth skate	*Dipturus innominatus*	95.3	1.74	29.51
GIZ	Giant stargazer	*Kathetostoma* spp.	95.0	1.73	1.65
RCO	Red cod	*Pseudophycis bachus*	93.5	1.71	12.38
SWA	Silver warehou	*Seriolella punctata*	60.4	1.10	1.08
CDO	Capro dory	*Capromimus abbreviatus*	55.2	1.01	100.00
RHY	Common roughy	*Paratrachichthys trailli*	53.3	0.97	100.00
SRH	Silver roughy	*Hoplostethus mediterraneus*	47.3	0.86	100.00
SSI	Silverside	*Argentina elongata*	45.6	0.83	91.33
HAK	Hake	*Merluccius australis*	32.0	0.58	1.73
SKA	Skate	Rajidae & Arhynchobatidae	31.8	0.58	84.27
RSK	Rough skate	*Zearaja nasuta*	27.5	0.50	32.71
RSO	Gemfish	*Rexea* spp.	23.7	0.43	1.06
BBE	Banded bellowsfish	*Centriscops humerosus*	22.5	0.41	100.00
LDO	Lookdown dory	*Cyttus traversi*	22.4	0.41	28.56
WWA	White warehou	*Seriolella caerulea*	22.4	0.41	0.57
TOA	Toadfish	*Neophrynichthys* sp.	22.4	0.41	94.68
MDO	Mirror dory	*Zenopsis nebulosa*	15.1	0.27	80.51
ERA	Electric ray	*Torpedo fairchildi*	13.7	0.25	100.00
CSH	Catshark	Scyliorhinidae	12.4	0.23	100.00
BEL	Bellowsfish	*Centriscops spp.*	11.9	0.22	100.00
YBO	Yellow boarfish	*Pentaceros decacanthus*	11.4	0.21	99.74
CDX	Dark banded rattail	*Coelorinchus maurofasciatus*	11.4	0.21	100.00
CAR	Carpet shark	*Cephaloscyllium isabellum*	11.2	0.21	99.89
HAG	Hagfish	*Eptatretus cirrhatus*	8.5	0.15	100.00
BWH	Bronze whaler shark	*Carcharhinus brachyurus*	8.0	0.15	98.68
SDO	Silver dory	*Cyttus novaezealandiae*	7.5	0.14	95.82
CON	Conger eel	*Conger* spp.	6.6	0.12	100.00
BNS	Bluenose	*Hyperoglyphe antarctica*	6.2	0.11	0.02
ETL	Lucifer dogfish	*Etmopterus lucifer*	6.2	0.11	99.66
SCH	School shark	*Galeorhinus galeus*	5.5	0.10	10.19
BRZ	Brown stargazer	*Xenocephalus armatus*	5.5	0.10	47.71
BER	Numbfish	*Typhlonarke* spp.	5.4	0.10	98.88
GSP	Pale ghost shark	*Hydrolagus bemisi*	5.1	0.09	18.41
OSK	Skate other	Rajidae	4.9	0.09	98.24
HAP	Hapuku	*Polyprion oxygeneios*	4.6	0.08	0.09
SND	Shovelnose spiny dogfish	*Deania calcea*	4.3	0.08	100.00
WIT	Witch	*Arnoglossus scapha*	4.2	0.08	100.00
PSK	Longnosed deepsea skate	*Bathyraja shuntovi*	4.1	0.08	60.28
FLA	Flats		3.8	0.07	97.88
SBW	Southern blue whiting	*Micromesistius australis*	3.7	0.07	2.63

Table B1: Continued

Species code	Common name	Scientific name	Observed catch (t)	% of catch	% discarded
DCS	Dawsons catshark	*Bythaelurus dawsoni*	3.5	0.06	98.50
TOP	Pale toadfish	*Ambophthalmos angustus*	3.3	0.06	98.28
BSH	Seal shark	*Dalatias licha*	3.1	0.06	100.00
OSD	Other sharks and dogs	Selachii	2.8	0.05	99.93
HYM	Hymenocephalus spp	*Hymenocephalus* spp.	2.6	0.05	100.00
TAY	Blind electric ray	*Typhlonarke aysoni*	2.5	0.05	99.01
NMP	Tarakihi	*Nemadactylus macropterus*	2.5	0.04	0.20
LSK	Softnose skate (longtail skate)	*Arhynchobatis asperrimus*	2.4	0.04	97.40
NSD	Northern spiny dogfish	*Squalus griffini*	2.3	0.04	99.33
PIG	Pigfish	*Congiopodus leucopaecilus*	2.2	0.04	100.00
BTH	Bluntnose skates deepsea skates	*Notoraja* spp.	2.2	0.04	98.17
BYS	Alfonsino	*Beryx splendens*	2.1	0.04	13.73
EEL	Eels marine		2.1	0.04	99.91
HPB	Hapuku & bass	*Polyprion oxygeneios* & *P. americanus*	2.1	0.04	0.00
SCO	Swollenhead conger	*Bassanago bulbiceps*	2.1	0.04	85.44
SBR	Southern bastard cod	*Pseudophycis barbata*	2.1	0.04	98.95
PDG	Prickly dogfish	*Oxynotus bruniensis*	2.0	0.04	100.00
HCO	Hairy conger	*Bassanago hirsutus*	1.8	0.03	100.00
DSK	Deepwater spiny skate	*Amblyraja hyperborea*	1.7	0.03	99.07
RIB	Ribaldo	*Mora moro*	1.7	0.03	10.02
BOA	Sowfish	*Paristiopterus labiosus*	1.5	0.03	100.00
BTA	Smooth deepsea skate	*Brochiraja asperula*	1.4	0.02	100.00
CAS	Oblique banded rattail	*Coelorinchus aspercephalus*	1.4	0.02	100.00
CUC	Cucumber fish	*Paraulopus nigripinnis*	1.3	0.02	88.29
LAN	Lantern fish	Myctophidae	1.3	0.02	100.00
STR	Stingray		1.2	0.02	100.00
COL	Olivers rattail	*Coelorinchus oliverianus*	1.2	0.02	100.00
SSH	Slender smooth-hound	*Gollum attenuatus*	1.1	0.02	98.77
APR	Catshark	*Apristurus* spp.	1.1	0.02	100.00
API	Alert pigfish	*Alertichthys blacki*	1.0	0.02	100.00
RCK	Rockfish	*Acanthoclinidae*	1.0	0.02	95.29
BYX	Alfonsino & long-finned beryx	*Beryx splendens* & *B. decadactylus*	0.8	0.02	0.95
SPZ	Spotted stargazer	*Genyagnus monopterygius*	0.8	0.01	78.78
SBO	Southern boarfish	*Pseudopentaceros richardsoni*	0.8	0.01	99.61
TTA	Oval electric ray	*Typhlonarke tarakea*	0.7	0.01	97.85
HEX	Sixgill shark	*Hexanchus griseus*	0.7	0.01	64.57
FRO	Frostfish	*Lepidopus caudatus*	0.6	0.01	31.20
SMC	Small-headed cod	*Lepidion microcephalus*	0.6	0.01	41.60
BAS	Bass groper	*Polyprion americanus*	0.6	0.01	0.00
SOL	Sole	Pleuronectidae	0.6	0.01	100.00
DWD	Deepwater dogfish		0.6	0.01	97.11
LCH	Long-nosed chimaera	*Harriotta raleighana*	0.6	0.01	93.83
ODO	Smalltooth sand tiger shark	*Odontaspis ferox*	0.5	0.01	100.00
BEE	Basketwork eel	*Diastobranchus capensis*	0.5	0.01	97.58
SEE	Silver conger	*Gnathophis habenatus*	0.5	0.01	100.00
LSO	Lemon sole	*Pelotretis flavilatus*	0.5	0.01	1.42
OPE	Orange perch	*Lepidoperca aurantia*	0.5	0.01	96.14
YSG	Yellow spotted gurnard	*Pterygotrigla pauli*	0.5	0.01	35.05
JGU	Spotted gurnard	*Pterygotrigla picta*	0.4	0.01	82.13
SNI	Snipefish	*Macroramphosus scolopax*	0.4	0.01	100.00
ETB	Baxters lantern dogfish	*Etmopterus baxteri*	0.4	0.01	99.07

Table B2: Observed INVERTEBRATE bycatch and discards for scampi target trawls. Species codes, common and scientific names, estimated catch, percentage of total catch, and overall percentage discarded of all invertebrate species or species groups by weight from observer records for the scampi trawl fishery from 1 Oct 2002 to 30 Sep 2016. Records are ordered by decreasing percentage of catch. Codes in bold are QMS species; codes in italics are Schedule 6 QMA species (can legally be returned to the sea).

Species code	Common name	Scientific name	Observed catch (t)	% of catch	% discarded
CRB	Crab	Unspecified crabs	50.3	0.92	100.00
SFI	Starfish	Asteroidea & Ophiuroidea	41.2	0.75	97.85
SQU	Arrow squid	*Nototodarus sloanii* & *N. gouldi*	40.3	0.74	0.43
PRK	Prawn killer	*Ibacus alticrenatus*	25.6	0.47	95.73
SMK	Spiny masking crab	*Teratomaia richardsoni*	17.4	0.32	95.78
HSI	Jackknife prawn	*Haliporoides sibogae*	15.7	0.29	55.37
PSI	Geometric star	*Psilaster acuminatus*	10.3	0.19	99.31
ANT	Anemones	Anthozoa	9.9	0.18	82.58
GSC	Giant spider crab	*Jacquinotia edwardsii*	9.5	0.17	79.57
GAS	Gastropods	Gastropoda	8.9	0.16	97.53
OCT	Octopus	*Pinnoctopus cordiformis*	8.4	0.15	76.96
HTH	Sea cucumber	Holothurian unidentified	7.7	0.14	90.55
WSQ	Warty squid	*Onykia* spp.	7.6	0.14	99.29
ECN	Echinoid (sea urchin)		7.1	0.13	100.00
TFA	Frilled crab	*Trichopeltarion fantasticum*	7.0	0.13	99.77
CRU	Crustacea		5.5	0.10	100.00
PRA	Prawn		5.5	0.10	88.68
GMC	Garricks masking crab	*Leptomithrax garricki*	5.0	0.09	100.00
SPT	Heart urchin	*Spatangus multispinus*	4.8	0.09	100.00
ACS	Smooth deepsea anemones	Actinostolidae	4.7	0.09	28.38
SCC	Sea cucumber	*Stichopus mollis*	4.4	0.08	82.56
FMA		*Fusitriton magellanicus*	4.1	0.07	100.00
ECH	Echinoderms	Echinodermata	3.9	0.07	100.00
ZOR	Rat-tail star	*Zoroaster* spp.	3.8	0.07	98.79
HMT	Deepsea anemone	Hormathiidae	3.6	0.07	24.22
ASR	Asteroid (starfish)		3.4	0.06	81.98
URO	Sea urchin other		3.0	0.05	97.75
SDM	Pagurid	*Sympagurus dimorphus*	2.8	0.05	99.82
OPI	Umbrella octopus	*Opisthoteuthis* spp.	2.2	0.04	99.27
DAP	Antlered crab	*Dagnaudus petterdi*	2.2	0.04	98.52
ONG	Sponges	Porifera	2.1	0.04	19.98
PNE		*Proserpinaster neozelanicus*	2.0	0.04	100.00
DMG	Magnificent sea star	*Dipsacaster magnificus*	1.9	0.03	98.79
SAL	Salps		1.6	0.03	99.50
MOL	Molluscs		1.6	0.03	84.81
PMU	Heart urchin	*Paramaretia peloria*	1.4	0.03	100.00
HYA	Floppy tubular sponge	*Hyalascus* sp.	1.4	0.03	37.31
LHO	Omega prawn	*Lipkius holthuisi*	1.4	0.02	93.62
CPA	Pentagon star	*Ceramaster patagonicus*	1.2	0.02	99.10
WHE	Whelks		1.2	0.02	97.90
LAG		*Laetmogone* spp.	1.2	0.02	98.54
ALL		*Alcithoe larochei*	1.2	0.02	99.66
MSL	Starfish	*Mediaster sladeni*	1.2	0.02	99.48
MNI	Munida unidentified	*Munida* spp.	1.1	0.02	96.77
GVO	Golden volute	*Provocator mirabilis*	1.1	0.02	99.77
SHL	Shovelnosed lobster	*Scyllarus* sp.	1.0	0.02	26.42
NUD	Nudibranchs	Nudibranchia	1.0	0.02	100.00
DIR	Pagurid	*Diacanthurus rubricatus*	1.0	0.02	92.00
SPI	Spider crab		0.9	0.02	100.00
LMI	Masking crabs	*Leptomithrax* spp.	0.9	0.02	100.00
CAL	Giant purple pedinid	*Caenopedina porphyrogigas*	0.7	0.01	98.01
HTR	Trojan starfish	*Hippasteria phrygiana*	0.7	0.01	100.00

Table B2: Continued

Species code	Common name	Scientific name	Observed catch (t)	% of catch	% discarded
VOL	Volute	Volutidae	0.7	0.01	79.97
EZE	Yellow octopus	*Enteroctopus zealandicus*	0.6	0.01	23.79
CJA	Sun star	*Crossaster multispinus*	0.6	0.01	100.00
OCP	Octopod		0.6	0.01	85.38
CAM	Sabre prawn	*Camplyonotus rathbunae*	0.6	0.01	99.32
BOC	Deepsea anemone	*Bolocera* spp.	0.6	0.01	14.87
COU	Coral (unspecified)		0.5	0.01	86.48
PNO		*Pteropeltarion novaezelandiae*	0.5	0.01	91.57
PAM		*Pannychia moseleyi*	0.5	0.01	99.03
CBB	Coral rubble		0.5	0.01	100.00
JFI	Jellyfish		0.5	0.01	96.95
AFO	Royal red prawn	*Aristaeomorpha foliacea*	0.5	0.01	82.69
LNV	Rock star	*Lithosoma novaezelandiae*	0.5	0.01	100.00
PCH		*Penion chathamensis*	0.5	0.01	99.57
GPA	Sea urchin	*Goniocidaris parasol*	0.4	0.01	100.00
SMT		*Spatangus mathesoni*	0.4	0.01	72.02
PRU		*Pseudechinaster rubens*	0.4	0.01	99.07
TAM	Tam O shanter urchin	*Echinothuriidae* & *Phormosomatidae*	0.4	0.01	51.23
GDU	Bushy hard coral	*Goniocorella dumosa*	0.4	0.01	80.99
PAG	Pagurid	*Paguroidea*	0.4	0.01	100.00
CVI	Two-spined crab	*Pycnoplax victoriensis*	0.3	0.01	96.76
AWI		*Alcithoe wilsonae*	0.3	0.01	100.00
ZDL	Salp	*Doliolum* sp.	0.3	0.01	100.00
PFL	Sea urchin	*Pseudechinus flemingi*	0.3	0.01	100.00
BAM		*Bathyplotes* spp.	0.3	0.01	100.00
GAT		*Gastroptychus* spp.	0.3	0.00	100.00
PMO		*Pseudostichopus mollis*	0.2	0.00	80.17
MIQ	Warty squid	*Onykia ingens*	0.2	0.00	100.00
DDI		*Desmophyllum dianthus*	0.2	0.00	1.72
SMO	Cross-fish	*Sclerasterias mollis*	0.2	0.00	98.28
AER		*Aeneator recens*	0.2	0.00	99.57
PSE	Sea urchin	*Pseudechinus* spp.	0.2	0.00	100.00
CDY		*Cosmasterias dyscrita*	0.2	0.00	93.19
EHI	Echiurans	Echiura	0.2	0.00	50.84
EGG	Fish eggs		0.2	0.00	99.36
PNN	Feathery sea pens	*Pennatula* spp.	0.2	0.00	10.28
ADT	Sea mice	*Aphrodita* spp.	0.2	0.00	48.34
LLC	Long-legged masking crab	*Leptomithrax longipes*	0.2	0.00	96.69
DWO	Deepwater octopus	*Graneledone* spp.	0.1	0.00	92.31
DHO	Sea urchin	*Dermechinus horridus*	0.1	0.00	26.43
ARE	Heart urchin	*Apatopygus recens*	0.1	0.00	90.29
OCO	Octopus	*Octopus* spp.	0.1	0.00	89.80
SLG	Sea slug	*Scutus breviculus*	0.1	0.00	100.00
HEC		*Henricia compacta*	0.1	0.00	100.00
URP		*Uroptychus* spp.	0.1	0.00	94.85
SSQ	Bobtail squid	*Sepioloidea* spp.	0.1	0.00	97.89
SER	Sergestid prawn	*Sergestes* spp.	0.1	0.00	100.00
SIP	Unsegmented worms	Sipuncula	0.1	0.00	14.10

Table B3: Observed bycatch by species group for scampi target trawls. Estimated catch, percentage of total catch, and overall percentage discarded from observer records for the scampi trawl fishery from 1 Oct 2002 to 30 Sep 2016.

Group	Observed catch (t)	% of catch	% discarded
Fish			
Fish (other)	1 783	32.56	49.8
Rattails	1 656	30.24	93.6
Rays & Skates	195	3.56	52.82
Sharks	173	3.16	94.8
Chimaeras	169	3.09	5.33
Morid	99	1.81	15.15
Eels	14	0.26	100
Invertebrates			
Crustacea	156	2.85	92.95
Echinoderms	106	1.94	97.17
Squid	48	0.88	16.67
Cnidaria	21	0.38	57.14
Other molluscs	21	0.38	100
Octopuses	12	0.22	83.33
Sponges	4	0.07	25
Invertebrate (other)	2	0.04	100

Table B4: Estimates of annual bycatch (t) in the scampi target trawl fishery, by species category and standard area. 0 is less than 0.1; 95% confidence intervals in parentheses.

(a) QMS species

Fishing year	CHAT3		CHAT4		COOK		EAST	
2002–03	674	(608–747)	235	(174–317)	5	(1–18)	802	(618–1038)
2003–04	435	(398–477)	73	(59–92)	0	(0–0)	376	(323–435)
2004–05	969	(816–1149)	474	(362–621)	13	(5–33)	399	(329–485)
2005–06	368	(327–415)	147	(117–186)	0	(0–1)	137	(116–162)
2006–07	952	(866–1046)	168	(139–204)	0	(0–1)	254	(222–292)
2007–08	633	(585–687)	38	(30–47)	1	(0–2)	152	(136–170)
2008–09	476	(435–523)	0	(0–0)	0	(0–0)	70	(57–87)
2009–10	432	(396–471)	1	(1–1)	0	(0–0)	143	(128–161)
2010–11	371	(342–402)	65	(57–75)	0	(0–0)	135	(122–150)
2011–12	572	(522–626)	82	(72–94)	0	(0–0)	87	(80–95)
2012–13	792	(723–869)	120	(104–139)	0	(0–0)	92	(81–104)
2013–14	1008	(917–1111)	245	(210–285)	0	(0–0)	120	(106–137)
2014–15	762	(705–825)	179	(159–201)	0	(0–0)	110	(97–125)
2015–16	413	(362–470)	105	(88–124)	0	(0–0)	75	(65–86)

Fishing year	NORTH		PUYS		AUCK		STEW	
2002–03	508	(126–2050)	138	(64–317)	492	(434–559)	118	(47–305)
2003–04	276	(243–313)	10	(3–40)	412	(378–449)	19	(5–71)
2004–05	387	(319–470)	4	(1–14)	460	(381–555)	3	(1–10)
2005–06	115	(99–133)	0	(0–0)	152	(137–169)	0	(0–1)
2006–07	209	(188–232)	0	(0–0)	281	(256–310)	0	(0–0)
2007–08	146	(133–160)	0	(0–0)	190	(173–208)	0	(0–1)
2008–09	63	(55–73)	0	(0–0)	433	(364–513)	0	(0–1)
2009–10	228	(209–248)	0	(0–0)	95	(87–104)	0	(0–0)
2010–11	192	(178–208)	0	(0–0)	147	(136–157)	0	(0–0)
2011–12	212	(194–233)	0	(0–0)	144	(132–156)	0	(0–0)
2012–13	326	(292–363)	0	(0–0)	160	(147–175)	0	(0–0)
2013–14	321	(292–353)	0	(0–0)	160	(145–177)	0	(0–0)
2014–15	249	(223–280)	0	(0–0)	74	(66–82)	0	(0–0)
2015–16	161	(143–181)	0	(0–0)	113	(100–128)	0	(0–0)

Fishing year	SUBA		WCNI		WCSI	
2002–03	26	(6–102)	0	(0–0)	5	(1–20)
2003–04	27	(7–102)	0	(0–0)	0	(0–0)
2004–05	0	(0–0)	4	(1–13)	4	(1–16)
2005–06	0	(0–0)	0	(0–0)	0	(0–1)
2006–07	0	(0–1)	0	(0–0)	0	(0–0)
2007–08	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)	6	(2–24)
2012–13	0	(0–0)	2	(1–8)	10	(3–37)
2013–14	5	(3–9)	0	(0–0)	14	(4–55)
2014–15	8	(4–14)	0	(0–0)	14	(4–56)
2015–16	1	(1–2)	0	(0–0)	16	(4–61)

Table B4: Continued

(b) Non-QMS species

Fishing year	CHAT3		CHAT4		COOK		EAST	
2002–03	604	(544–674)	42	(31–58)	2	(1–6)	455	(345–598)
2003–04	457	(414–505)	29	(23–37)	0	(0–0)	385	(325–451)
2004–05	973	(810–1177)	182	(136–244)	21	(10–49)	391	(317–483)
2005–06	446	(392–506)	68	(53–88)	0	(0–1)	161	(135–193)
2006–07	1199	(1077–1331)	81	(65–99)	1	(0–2)	312	(268–361)
2007–08	860	(790–939)	19	(15–24)	2	(1–4)	201	(178–228)
2008–09	682	(615–755)	0	(0–0)	0	(0–0)	142	(113–179)
2009–10	1081	(982–1192)	1	(1–2)	0	(0–0)	425	(377–481)
2010–11	630	(576–686)	46	(40–54)	0	(0–0)	273	(245–305)
2011–12	775	(702–854)	46	(40–54)	0	(0–0)	141	(128–155)
2012–13	915	(827–1014)	58	(49–68)	0	(0–0)	126	(111–144)
2013–14	1271	(1145–1411)	128	(109–151)	0	(0–0)	181	(157–206)
2014–15	1105	(1015–1204)	108	(95–122)	0	(0–0)	190	(166–218)
2015–16	676	(586–781)	71	(59–86)	0	(0–0)	146	(124–172)

Fishing year	NORTH		PUYS		AUCK		STEW	
2002–03	271	(108–691)	26	(14–51)	501	(437–574)	35	(16–72)
2003–04	386	(337–442)	10	(4–26)	484	(439–532)	19	(8–47)
2004–05	518	(417–642)	4	(1–9)	516	(421–636)	3	(1–6)
2005–06	186	(158–217)	0	(0–0)	205	(183–231)	0	(0–0)
2006–07	351	(314–391)	0	(0–0)	395	(357–441)	0	(0–0)
2007–08	264	(239–292)	0	(0–0)	288	(260–318)	0	(0–1)
2008–09	161	(138–188)	0	(0–0)	321	(267–387)	0	(0–1)
2009–10	310	(281–341)	0	(0–0)	457	(415–503)	0	(0–0)
2010–11	177	(163–194)	0	(0–0)	479	(444–519)	0	(0–0)
2011–12	157	(142–173)	0	(0–0)	374	(342–410)	0	(0–0)
2012–13	205	(182–231)	0	(0–0)	355	(322–392)	0	(0–0)
2013–14	220	(199–244)	0	(0–0)	387	(347–431)	0	(0–0)
2014–15	197	(175–223)	0	(0–0)	206	(184–232)	0	(0–0)
2015–16	144	(127–164)	0	(0–0)	361	(316–411)	0	(0–0)

Fishing year	SUBA		WCNI		WCSI	
2002–03		SUBA		WCNI		WCSI
2003–04	13	(5–33)	0	(0–0)	3	(1–7)
2004–05	28	(11–69)	0	(0–0)	0	(0–0)
2005–06	0	(0–0)	4	(1–9)	4	(2–10)
2006–07	0	(0–0)	0	(0–0)	0	(0–1)
2007–08	0	(0–1)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	0	(0–1)	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	0	(0–0)	0	(0–0)	7	(3–17)
2013–14	0	(0–0)	2	(1–4)	9	(4–22)
2014–15	9	(5–15)	0	(0–0)	15	(6–37)
2015–16	16	(9–28)	0	(0–0)	17	(7–42)

Table B4: Continued

(c) INVERTEBRATE species

Fishing year	CHAT3		CHAT4		COOK		EAST	
2002–03	14	(12–16)	12	(8–18)	0	(0–2)	25	(14–43)
2003–04	10	(8–12)	2	(0–22)	0	(0–0)	34	(3–234)
2004–05	30	(20–42)	30	(3–200)	2	(0–12)	55	(35–88)
2005–06	48	(38–61)	34	(4–229)	0	(0–1)	38	(5–258)
2006–07	46	(41–52)	12	(10–14)	0	(0–1)	25	(22–29)
2007–08	78	(71–87)	7	(6–8)	1	(0–3)	38	(34–43)
2008–09	51	(46–57)	0	(0–0)	0	(0–0)	24	(21–27)
2009–10	57	(51–64)	0	(0–0)	0	(0–0)	51	(45–59)
2010–11	30	(27–34)	8	(6–9)	0	(0–0)	33	(29–37)
2011–12	52	(46–59)	11	(9–13)	0	(0–0)	23	(21–26)
2012–13	55	(49–63)	13	(11–16)	0	(0–0)	17	(15–20)
2013–14	62	(54–70)	23	(19–28)	0	(0–0)	20	(17–23)
2014–15	79	(71–88)	28	(24–33)	0	(0–0)	32	(27–37)
2015–16	25	(21–30)	10	(8–12)	0	(0–0)	13	(11–15)

Fishing year	NORTH		PUYS		AUCK		STEW	
2002–03	32	(4–204)	1	(0–4)	232	(195–274)	3	(1–11)
2003–04	84	(39–180)	1	(0–8)	167	(142–197)	2	(0–15)
2004–05	43	(4–283)	0	(0–2)	59	(6–419)	0	(0–2)
2005–06	46	(6–290)	0	(0–0)	219	(184–261)	0	(0–0)
2006–07	20	(17–22)	0	(0–0)	69	(61–77)	0	(0–0)
2007–08	35	(32–39)	0	(0–0)	119	(107–132)	0	(0–0)
2008–09	31	(28–35)	0	(0–0)	122	(108–137)	0	(0–0)
2009–10	38	(34–43)	0	(0–0)	79	(70–89)	0	(0–0)
2010–11	21	(18–23)	0	(0–0)	79	(71–87)	0	(0–0)
2011–12	25	(22–29)	0	(0–0)	86	(76–96)	0	(0–0)
2012–13	29	(25–33)	0	(0–0)	71	(63–79)	0	(0–0)
2013–14	25	(22–28)	0	(0–0)	62	(54–70)	0	(0–0)
2014–15	33	(29–38)	0	(0–0)	49	(42–56)	0	(0–0)
2015–16	13	(11–15)	0	(0–0)	45	(38–53)	0	(0–0)

Fishing year	SUBA		WCNI		WCSI	
2002–03	2	(0–10)	0	(0–0)	0	(0–2)
2003–04	3	(0–21)	0	(0–0)	0	(0–0)
2004–05	0	(0–0)	0	(0–2)	0	(0–3)
2005–06	0	(0–0)	0	(0–0)	0	(0–1)
2006–07	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)	1	(0–8)
2012–13	0	(0–0)	0	(0–2)	2	(0–9)
2013–14	4	(2–9)	0	(0–0)	2	(0–12)
2014–15	11	(4–26)	0	(0–0)	3	(0–20)
2015–16	1	(0–2)	0	(0–0)	2	(0–13)

Table B4: Continued

(d) ALL species

Fishing year	CHAT3		CHAT4		COOK		EAST	
2002–03	1292	(1164–1437)	289	(213–393)	7	(2–26)	1282	(977–1679)
2003–04	902	(820–994)	104	(82–151)	0	(0–0)	795	(651–1120)
2004–05	1972	(1646–2368)	686	(501–1065)	36	(15–94)	845	(681–1056)
2005–06	862	(757–982)	249	(174–503)	0	(0–3)	336	(256–613)
2006–07	2197	(1984–2429)	261	(214–317)	1	(0–4)	591	(512–682)
2007–08	1571	(1446–1713)	64	(51–79)	4	(1–9)	391	(348–441)
2008–09	1209	(1096–1335)	0	(0–0)	0	(0–0)	236	(191–293)
2009–10	1570	(1429–1727)	2	(2–3)	0	(0–0)	619	(550–701)
2010–11	1031	(945–1122)	119	(103–138)	0	(0–0)	441	(396–492)
2011–12	1399	(1270–1539)	139	(121–161)	0	(0–0)	251	(229–276)
2012–13	1762	(1599–1946)	191	(164–223)	0	(0–0)	235	(207–268)
2013–14	2341	(2116–2592)	396	(338–464)	0	(0–0)	321	(280–366)
2014–15	1946	(1791–2117)	315	(278–356)	0	(0–0)	332	(290–380)
2015–16	1114	(969–1281)	186	(155–222)	0	(0–0)	234	(200–273)

Fishing year	NORTH		PUYS		AUCK		STEW	
2002–03	811	(238–2945)	165	(78–372)	1225	(1066–1407)	156	(64–388)
2003–04	746	(619–935)	21	(7–74)	1063	(959–1178)	40	(13–133)
2004–05	948	(740–1395)	8	(2–25)	1035	(808–1610)	6	(2–18)
2005–06	347	(263–640)	0	(0–0)	576	(504–661)	0	(0–1)
2006–07	580	(519–645)	0	(0–0)	745	(674–828)	0	(0–0)
2007–08	445	(404–491)	0	(0–0)	597	(540–658)	0	(0–2)
2008–09	255	(221–296)	0	(0–0)	876	(739–1037)	0	(0–2)
2009–10	576	(524–632)	0	(0–0)	631	(572–696)	0	(0–0)
2010–11	390	(359–425)	0	(0–0)	705	(651–763)	0	(0–0)
2011–12	394	(358–435)	0	(0–0)	604	(550–662)	0	(0–0)
2012–13	560	(499–627)	0	(0–0)	586	(532–646)	0	(0–0)
2013–14	566	(513–625)	0	(0–0)	609	(546–678)	0	(0–0)
2014–15	479	(427–541)	0	(0–0)	329	(292–370)	0	(0–0)
2015–16	318	(281–360)	0	(0–0)	519	(454–592)	0	(0–0)

Fishing year	SUBA		WCNI		WCSI	
2002–03	41	(11–145)	0	(0–0)	8	(2–29)
2003–04	58	(18–192)	0	(0–0)	0	(0–0)
2004–05	0	(0–0)	8	(2–24)	8	(3–29)
2005–06	0	(0–0)	0	(0–0)	0	(0–3)
2006–07	0	(0–2)	0	(0–0)	0	(0–0)
2007–08	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	0	(0–1)	0	(0–0)	0	(0–0)
2010–11	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)	14	(5–49)
2012–13	0	(0–0)	4	(2–14)	21	(7–68)
2013–14	18	(10–33)	0	(0–0)	31	(10–104)
2014–15	35	(17–68)	0	(0–0)	34	(11–118)
2015–16	5	(2–9)	0	(0–0)	39	(13–126)

Table B5: Estimates of annual discards (t) in the scampi target trawl fishery, by species category and standard area. 0 is less than 0.1; 95% confidence intervals in parentheses.

(a) Scampi

Fishing year	CHAT3		CHAT4		COOK		EAST	
2002–03	2	(2–3)	0	(0–1)	0	(0–0)	16	(9–26)
2003–04	1	(0–1)	0	(0–0)	0	(0–0)	2	(1–4)
2004–05	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)
2005–06	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–1)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	3	(2–4)	0	(0–0)	0	(0–0)	7	(3–13)
2010–11	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)
2012–13	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	1	(0–2)	0	(0–1)	0	(0–0)	1	(0–2)
2014–15	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–1)
2015–16	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)

Fishing year	NORTH		PUYS		AUCK		STEW	
2002–03	0	(0–1)	0	(0–2)	3	(2–4)	0	(0–2)
2003–04	0	(0–0)	0	(0–0)	1	(1–1)	0	(0–0)
2004–05	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2005–06	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	0	(0–1)	0	(0–0)	2	(1–3)	0	(0–0)
2010–11	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)
2014–15	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2015–16	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)

Fishing year	SUBA		WCNI		WCSI	
2002–03	0	(0–1)	0	(0–0)	0	(0–0)
2003–04	0	(0–1)	0	(0–0)	0	(0–0)
2004–05	0	(0–0)	0	(0–0)	0	(0–0)
2005–06	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	0	(0–0)	0	(0–0)	0	(0–0)
2015–16	0	(0–0)	0	(0–0)	0	(0–0)

Table B5: Continued

(b) QMS species

Fishing year	CHAT3		CHAT4		COOK		EAST	
2002–03	300	(241–367)	0	(0–1)	0	(0–4)	99	(63–154)
2003–04	21	(17–27)	7	(4–11)	0	(0–0)	13	(7–22)
2004–05	499	(375–666)	370	(239–576)	7	(1–43)	192	(138–266)
2005–06	37	(29–47)	25	(16–38)	0	(0–0)	11	(8–17)
2006–07	381	(322–450)	101	(74–140)	0	(0–1)	95	(76–119)
2007–08	234	(204–268)	21	(15–30)	0	(0–2)	52	(43–63)
2008–09	305	(261–357)	0	(0–0)	0	(0–0)	22	(16–31)
2009–10	299	(258–347)	1	(1–1)	0	(0–0)	136	(113–165)
2010–11	246	(213–282)	39	(31–49)	0	(0–0)	126	(106–150)
2011–12	209	(177–245)	28	(23–34)	0	(0–0)	46	(40–53)
2012–13	606	(518–710)	81	(63–103)	0	(0–0)	95	(78–117)
2013–14	601	(510–707)	127	(99–164)	0	(0–0)	98	(79–120)
2014–15	324	(283–370)	68	(56–83)	0	(0–0)	65	(52–80)
2015–16	375	(299–468)	85	(64–114)	0	(0–0)	95	(74–121)

Fishing year	NORTH		PUYS		AUCK		STEW	
2002–03	17	(0–406)	1	(0–9)	1	(1–2)	1	(0–33)
2003–04	18	(12–27)	0	(0–9)	7	(5–9)	1	(0–16)
2004–05	274	(198–384)	2	(0–32)	148	(106–208)	1	(0–23)
2005–06	16	(11–21)	0	(0–0)	7	(6–9)	0	(0–0)
2006–07	115	(98–136)	0	(0–0)	71	(60–84)	0	(0–0)
2007–08	74	(64–87)	0	(0–0)	42	(36–50)	0	(0–1)
2008–09	48	(36–63)	0	(0–0)	6	(4–10)	0	(0–1)
2009–10	174	(151–202)	0	(0–0)	9	(8–11)	0	(0–0)
2010–11	144	(125–164)	0	(0–0)	12	(10–14)	0	(0–0)
2011–12	89	(76–105)	0	(0–0)	5	(4–7)	0	(0–0)
2012–13	273	(228–328)	0	(0–0)	20	(17–23)	0	(0–0)
2013–14	209	(179–246)	0	(0–0)	16	(13–19)	0	(0–0)
2014–15	118	(98–143)	0	(0–0)	4	(3–6)	0	(0–0)
2015–16	164	(134–201)	0	(0–0)	14	(10–18)	0	(0–0)

Fishing year	SUBA		WCNI		WCSI	
2002–03	1	(0–21)	0	(0–0)	0	(0–5)
2003–04	1	(0–23)	0	(0–0)	0	(0–0)
2004–05	0	(0–0)	2	(0–35)	2	(0–38)
2005–06	0	(0–0)	0	(0–0)	0	(0–1)
2006–07	0	(0–2)	0	(0–0)	0	(0–0)
2007–08	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)	1	(0–16)
2012–13	0	(0–0)	1	(0–12)	3	(0–56)
2013–14	1	(0–2)	0	(0–0)	3	(0–66)
2014–15	1	(0–2)	0	(0–0)	2	(0–44)
2015–16	0	(0–1)	0	(0–0)	5	(0–104)

Table B5: Continued

(c) Non-QMS species

Fishing year	CHAT3		CHAT4		COOK		EAST	
2002–03	662	(591–740)	64	(46–90)	3	(1–7)	553	(411–736)
2003–04	167	(150–185)	8	(6–11)	0	(0–0)	110	(87–131)
2004–05	1030	(850–1244)	154	(113–209)	19	(9–46)	334	(268–415)
2005–06	667	(584–760)	81	(63–105)	1	(0–1)	195	(161–235)
2006–07	1587	(1424–1772)	86	(69–107)	1	(0–2)	334	(287–390)
2007–08	1066	(975–1165)	19	(15–25)	2	(1–5)	201	(176–229)
2008–09	690	(621–768)	0	(0–0)	0	(0–0)	142	(113–180)
2009–10	1061	(961–1174)	1	(1–2)	0	(0–0)	410	(361–465)
2010–11	640	(584–699)	47	(41–55)	0	(0–0)	272	(242–304)
2011–12	788	(711–877)	48	(41–55)	0	(0–0)	140	(127–155)
2012–13	931	(840–1031)	59	(50–70)	0	(0–0)	126	(110–144)
2013–14	1295	(1160–1444)	132	(112–156)	0	(0–0)	180	(156–208)
2014–15	1108	(1015–1213)	109	(96–125)	0	(0–0)	187	(162–215)
2015–16	690	(591–800)	74	(60–89)	0	(0–0)	146	(124–173)

Fishing year	NORTH		PUYS		AUCK		STEW	
2002–03	316	(115–834)	30	(15–62)	571	(498–655)	40	(18–90)
2003–04	107	(91–125)	3	(1–9)	92	(83–103)	6	(2–15)
2004–05	428	(344–532)	3	(1–9)	298	(239–366)	2	(1–6)
2005–06	216	(184–255)	0	(0–0)	168	(149–188)	0	(0–1)
2006–07	363	(324–406)	0	(0–0)	287	(257–320)	0	(0–0)
2007–08	255	(230–283)	0	(0–0)	194	(175–216)	0	(0–1)
2008–09	161	(138–188)	0	(0–0)	326	(269–395)	0	(0–1)
2009–10	300	(272–331)	0	(0–0)	450	(407–495)	0	(0–0)
2010–11	178	(163–194)	0	(0–0)	487	(450–527)	0	(0–0)
2011–12	157	(141–175)	0	(0–0)	381	(347–420)	0	(0–0)
2012–13	206	(182–233)	0	(0–0)	362	(326–400)	0	(0–0)
2013–14	221	(199–247)	0	(0–0)	394	(352–442)	0	(0–0)
2014–15	194	(171–221)	0	(0–0)	207	(183–233)	0	(0–0)
2015–16	145	(126–166)	0	(0–0)	368	(321–422)	0	(0–0)

Fishing year	SUBA		WCNI		WCSI	
2002–03	16	(6–41)	0	(0–0)	3	(1–9)
2003–04	9	(3–22)	0	(0–0)	0	(0–0)
2004–05	0	(0–0)	3	(1–9)	4	(1–10)
2005–06	0	(0–0)	0	(0–0)	0	(0–1)
2006–07	0	(0–1)	0	(0–0)	0	(0–0)
2007–08	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	0	(0–1)	0	(0–0)	0	(0–0)
2010–11	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)	7	(2–18)
2012–13	0	(0–0)	2	(1–5)	9	(3–23)
2013–14	9	(5–16)	0	(0–0)	14	(5–38)
2014–15	15	(8–27)	0	(0–0)	16	(6–43)
2015–16	3	(1–5)	0	(0–0)	21	(8–54)

Table B5: Continued

(d) INVERTEBRATE species

Fishing year	CHAT3		CHAT4		COOK		EAST	
2002–03	15	(13–18)	13	(8–20)	0	(0–2)	31	(17–55)
2003–04	12	(10–15)	2	(0–22)	0	(0–0)	36	(3–218)
2004–05	32	(22–47)	32	(3–212)	2	(0–11)	59	(36–97)
2005–06	51	(39–66)	37	(5–216)	0	(0–1)	41	(6–247)
2006–07	76	(67–86)	18	(15–22)	0	(0–1)	41	(36–48)
2007–08	72	(65–81)	5	(4–7)	0	(0–2)	36	(32–42)
2008–09	46	(41–51)	0	(0–0)	0	(0–0)	22	(19–26)
2009–10	53	(47–60)	0	(0–0)	0	(0–0)	48	(42–57)
2010–11	24	(22–27)	6	(5–7)	0	(0–0)	25	(22–29)
2011–12	54	(48–61)	11	(9–13)	0	(0–0)	23	(21–26)
2012–13	54	(47–63)	12	(10–15)	0	(0–0)	17	(15–21)
2013–14	66	(57–75)	23	(19–28)	0	(0–0)	22	(18–26)
2014–15	82	(73–93)	27	(22–32)	0	(0–0)	33	(28–39)
2015–16	28	(23–33)	10	(8–13)	0	(0–0)	14	(11–17)

Fishing year	NORTH		PUYS		AUCK		STEW	
2002–03	34	(4–201)	1	(0–4)	257	(213–310)	3	(1–13)
2003–04	110	(46–258)	1	(0–7)	170	(142–201)	2	(0–14)
2004–05	44	(4–300)	0	(0–2)	62	(7–386)	0	(0–2)
2005–06	49	(7–298)	0	(0–0)	239	(199–288)	0	(0–0)
2006–07	29	(25–33)	0	(0–0)	90	(80–103)	0	(0–0)
2007–08	26	(23–30)	0	(0–0)	80	(70–91)	0	(0–0)
2008–09	22	(19–26)	0	(0–0)	80	(68–93)	0	(0–0)
2009–10	31	(28–36)	0	(0–0)	59	(51–67)	0	(0–0)
2010–11	13	(12–15)	0	(0–0)	46	(41–52)	0	(0–0)
2011–12	22	(19–25)	0	(0–0)	67	(59–76)	0	(0–0)
2012–13	26	(22–30)	0	(0–0)	57	(49–65)	0	(0–0)
2013–14	24	(21–28)	0	(0–0)	54	(46–62)	0	(0–0)
2014–15	30	(25–35)	0	(0–0)	39	(33–46)	0	(0–0)
2015–16	12	(10–15)	0	(0–0)	39	(33–47)	0	(0–0)

Fishing year	SUBA		WCNI		WCSI	
2002–03	2	(0–10)	0	(0–0)	0	(0–2)
2003–04	3	(0–21)	0	(0–0)	0	(0–0)
2004–05	0	(0–0)	0	(0–2)	0	(0–3)
2005–06	0	(0–0)	0	(0–0)	0	(0–1)
2006–07	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)	1	(0–7)
2012–13	0	(0–0)	0	(0–2)	2	(0–9)
2013–14	4	(2–9)	0	(0–0)	2	(0–12)
2014–15	9	(3–24)	0	(0–0)	3	(0–19)
2015–16	1	(0–2)	0	(0–0)	2	(0–14)

Table B5: Continued

(e) ALL species

Fishing year	CHAT3		CHAT4		COOK		EAST	
2002–03	979	(847–1128)	77	(54–112)	3	(1–13)	699	(500–971)
2003–04	201	(177–228)	17	(10–44)	0	(0–0)	161	(98–375)
2004–05	1561	(1247–1957)	556	(355–997)	28	(10–100)	585	(442–779)
2005–06	755	(652–873)	143	(84–359)	1	(0–2)	247	(175–499)
2006–07	2044	(1813–2308)	205	(158–269)	1	(0–4)	470	(399–557)
2007–08	1372	(1244–1515)	45	(34–62)	2	(1–9)	289	(251–335)
2008–09	1041	(923–1176)	0	(0–0)	0	(0–0)	186	(148–237)
2009–10	1416	(1268–1585)	2	(2–3)	0	(0–0)	601	(519–700)
2010–11	910	(819–1008)	92	(77–111)	0	(0–0)	423	(370–483)
2011–12	1051	(936–1183)	87	(73–102)	0	(0–0)	209	(188–235)
2012–13	1591	(1405–1804)	152	(123–188)	0	(0–0)	238	(203–282)
2013–14	1963	(1727–2228)	282	(230–349)	0	(0–0)	301	(253–356)
2014–15	1514	(1371–1677)	204	(174–240)	0	(0–0)	285	(242–335)
2015–16	1093	(913–1301)	169	(132–216)	0	(0–0)	255	(209–312)

Fishing year	NORTH		PUYS		AUCK		STEW	
2002–03	367	(119–1442)	32	(15–77)	832	(714–971)	44	(19–138)
2003–04	235	(149–410)	4	(1–25)	270	(231–314)	9	(2–45)
2004–05	746	(546–1216)	5	(1–43)	508	(352–960)	3	(1–31)
2005–06	281	(202–574)	0	(0–0)	414	(354–485)	0	(0–1)
2006–07	507	(447–575)	0	(0–0)	448	(397–507)	0	(0–0)
2007–08	355	(317–400)	0	(0–0)	316	(281–357)	0	(0–2)
2008–09	231	(193–277)	0	(0–0)	412	(341–498)	0	(0–2)
2009–10	505	(451–570)	0	(0–0)	520	(467–576)	0	(0–0)
2010–11	335	(300–373)	0	(0–0)	545	(501–593)	0	(0–0)
2011–12	268	(236–305)	0	(0–0)	453	(410–503)	0	(0–0)
2012–13	505	(432–591)	0	(0–0)	439	(392–488)	0	(0–0)
2013–14	454	(399–521)	0	(0–0)	464	(411–524)	0	(0–0)
2014–15	342	(294–399)	0	(0–0)	250	(219–285)	0	(0–0)
2015–16	321	(270–382)	0	(0–0)	421	(364–487)	0	(0–0)

Fishing year	SUBA		WCNI		WCSI	
2002–03	19	(6–73)	0	(0–0)	3	(1–16)
2003–04	13	(3–67)	0	(0–0)	0	(0–0)
2004–05	0	(0–0)	5	(1–46)	6	(1–51)
2005–06	0	(0–0)	0	(0–0)	0	(0–3)
2006–07	0	(0–3)	0	(0–0)	0	(0–0)
2007–08	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	0	(0–1)	0	(0–0)	0	(0–0)
2010–11	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)	9	(2–41)
2012–13	0	(0–0)	3	(1–19)	14	(3–88)
2013–14	14	(7–27)	0	(0–0)	19	(5–116)
2014–15	25	(11–53)	0	(0–0)	21	(6–106)
2015–16	4	(1–8)	0	(0–0)	28	(8–172)

Table B6: Target scampi trawl fishery. Total annual bycatch estimates (t) (with estimated 95% CIs in parenthesis) for individual species (the main bycatch species, those with an average of over 1 t of observed bycatch in each year). Species are ordered by decreasing total catch. The slope of a regression through the data points is shown (in bold if significant) in the bottom row for each species code (see Table B1 for species code definitions).

Fishing year	JAV		RAT		SPE		LIN		HOK		GSH		SSK		FHD	
2002–03	790	(710–878)	591	(526–663)	828	(733–1121)	822	(708–963)	362	(320–410)	87	(70–108)	130	(101–170)	120	(105–144)
2003–04	507	(452–568)	545	(483–617)	339	(293–401)	330	(280–390)	139	(120–162)	88	(73–107)	179	(148–217)	103	(89–122)
2004–05	1568	(1229–1991)	922	(710–1188)	885	(718–1139)	1303	(905–1876)	351	(272–453)	212	(146–310)	189	(127–285)	61	(47–79)
2005–06	346	(300–399)	131	(112–153)	547	(439–685)	47	(35–63)	104	(87–124)	116	(92–147)	128	(97–168)	249	(200–311)
2006–07	1100	(987–1227)	571	(508–643)	419	(377–467)	131	(113–152)	200	(179–223)	237	(204–276)	141	(118–169)	108	(96–120)
2007–08	843	(773–923)	481	(436–530)	322	(296–351)	95	(83–108)	217	(196–240)	156	(137–179)	80	(68–95)	110	(100–120)
2008–09	750	(679–827)	340	(304–379)	147	(133–161)	99	(83–116)	185	(167–206)	85	(73–99)	77	(65–92)	68	(61–75)
2009–10	1112	(997–1237)	442	(388–505)	312	(280–348)	96	(81–115)	210	(187–237)	66	(55–80)	84	(69–103)	120	(107–135)
2010–11	704	(648–770)	503	(455–556)	374	(341–411)	50	(43–58)	129	(116–143)	79	(68–91)	70	(60–82)	130	(117–144)
2011–12	745	(676–824)	504	(452–565)	307	(278–355)	60	(51–70)	135	(121–151)	167	(142–196)	44	(36–53)	88	(79–100)
2012–13	923	(819–1041)	406	(347–475)	642	(557–800)	102	(86–121)	178	(157–204)	131	(111–155)	141	(115–173)	109	(94–128)
2013–14	966	(853–1103)	437	(380–502)	654	(576–783)	91	(76–109)	345	(302–395)	312	(264–374)	147	(121–177)	150	(133–173)
2014–15	886	(797–987)	553	(489–625)	469	(424–558)	30	(25–36)	205	(181–231)	166	(144–194)	59	(48–73)	125	(112–141)
2015–16	646	(549–763)	316	(263–380)	387	(316–548)	100	(77–130)	227	(189–273)	37	(25–56)	133	(101–175)	38	(31–48)
slope	0.016		-0.010		-0.005		**-0.176**		-0.006		0.017		-0.043		-0.012	0.016

Fishing year	RCO		SPD		GIZ		CDO		RHY		SRH		SSI		RSK	
2002–03	275	(229–348)	67	(56–80)	264	(141–733)	49	(16–161)	54	(36–81)	75	(47–123)	23	(18–31)	38	(27–52)
2003–04	260	(217–320)	39	(31–48)	147	(92–336)	89	(45–202)	76	(50–118)	9	(3–23)	26	(21–32)	16	(12–23)
2004–05	187	(97–354)	106	(66–170)	41	(18–119)	17	(1–96)	17	(5–50)	2	(0–12)	3	(0–11)	58	(27–121)
2005–06	26	(19–35)	24	(19–31)	52	(41–69)	218	(136–359)	47	(26–88)	4	(1–19)	43	(35–52)	17	(12–23)
2006–07	42	(36–49)	180	(154–211)	45	(39–53)	87	(71–107)	25	(20–32)	80	(64–99)	49	(42–56)	23	(18–30)
2007–08	24	(20–28)	82	(71–95)	53	(46–63)	56	(47–68)	91	(75–111)	48	(39–60)	35	(30–41)	30	(25–36)
2008–09	22	(18–27)	95	(80–111)	53	(47–61)	58	(47–72)	50	(40–61)	39	(28–53)	54	(47–63)	18	(15–23)
2009–10	20	(16–25)	91	(78–107)	16	(13–20)	47	(37–58)	40	(31–53)	52	(41–68)	38	(32–45)	11	(8–15)
2010–11	48	(42–56)	33	(27–41)	33	(28–38)	42	(35–50)	24	(18–31)	71	(59–86)	34	(30–39)	20	(17–24)
2011–12	42	(35–49)	35	(27–44)	60	(52–110)	28	(23–36)	44	(33–60)	22	(18–27)	46	(39–54)	30	(25–37)
2012–13	32	(26–39)	46	(38–55)	35	(29–79)	153	(101–241)	44	(33–61)	34	(24–50)	35	(30–41)	17	(14–22)
2013–14	64	(53–78)	98	(78–122)	84	(69–178)	61	(49–79)	17	(13–24)	38	(30–52)	30	(25–37)	33	(27–41)
2014–15	63	(53–76)	135	(119–155)	70	(61–181)	58	(44–82)	11	(8–16)	13	(10–17)	69	(60–81)	13	(9–18)
2015–16	84	(66–109)	106	(83–136)	35	(22–119)	20	(15–29)	7	(3–13)	49	(35–73)	43	(31–61)	8	(5–13)
slope	-0.074		0.031		-0.063		-0.073		-0.117		-0.050		0.039		-0.037	

Table B6: Continued

Fishing year	RSO		BBE		SWA		HAK		LDO		TOA	
2002–03	60	(38–98)	82	(67–101)	131	(109–160)	47	(40–55)	26	(21–33)	32	(27–38)
2003–04	26	(9–74)	67	(56–82)	19	(15–25)	45	(38–52)	11	(8–14)	54	(46–62)
2004–05	51	(25–102)	1	(0–8)	6	(2–20)	67	(43–103)	27	(17–41)	5	(2–13)
2005–06	18	(4–81)	12	(9–17)	5	(2–10)	3	(2–4)	9	(6–13)	15	(12–18)
2006–07	33	(27–41)	6	(4–7)	14	(11–18)	14	(11–17)	18	(16–22)	13	(11–16)
2007–08	21	(18–25)	17	(14–20)	3	(2–4)	8	(6–10)	21	(19–24)	13	(11–15)
2008–09	8	(6–11)	4	(3–5)	6	(5–8)	7	(5–9)	14	(12–16)	19	(16–22)
2009–10	23	(18–28)	11	(10–14)	14	(10–18)	7	(5–9)	10	(8–12)	4	(4–6)
2010–11	23	(20–28)	11	(9–13)	4	(3–6)	2	(2–3)	6	(5–8)	9	(7–10)
2011–12	12	(10–15)	8	(7–10)	4	(2–5)	6	(5–9)	14	(11–16)	17	(14–19)
2012–13	7	(3–14)	27	(22–33)	4	(3–6)	11	(10–14)	18	(16–22)	8	(6–10)
2013–14	10	(8–13)	7	(5–9)	4	(3–7)	6	(4–9)	13	(11–17)	7	(6–9)
2014–15	15	(3–66)	8	(7–9)	4	(3–5)	2	(2–3)	15	(13–17)	1	(0–2)
2015–16	8	(6–11)	8	(5–11)	9	(5–17)	1	(0–2)	11	(7–16)	1	(0–2)
slope	**-0.140**		-0.134		**-0.209**		**-0.225**		-0.029		**-0.168**	

Table B7: Target scampi trawl fishery. Total annual bycatch estimates (t) (with estimated 95% CIs in parenthesis) for main bycatch species, those with an average of over 1 t of observed bycatch in each year) and area. Species are ordered by decreasing total catch. See Table B1 for species code definitions.

JAV (Javelin-fish)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	242	(218–270)	15	(12–17)	1	(0–5)	241	(209–276)	40	(35–46)	8	(3–20)	226	(203–253)	8	(2–23)	4	(2–9)	0	(0–0)	1	(0–5)
2003–04	149	(133–168)	10	(9–12)	0	(0–0)	93	(80–108)	35	(30–40)	2	(1–6)	207	(183–232)	3	(1–8)	6	(3–13)	0	(0–0)	0	(0–0)
2004–05	659	(516–835)	133	(101–176)	14	(5–55)	196	(153–252)	96	(74–125)	2	(1–4)	457	(355–584)	1	(0–2)	0	(0–0)	2	(0–9)	2	(0–10)
2005–06	161	(138–186)	27	(22–32)	0	(0–1)	43	(36–51)	19	(16–22)	0	(0–0)	97	(84–111)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	618	(551–695)	45	(38–53)	0	(0–2)	120	(104–138)	50	(44–56)	0	(0–0)	267	(237–300)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	489	(446–540)	12	(10–14)	1	(0–4)	85	(76–96)	41	(37–46)	0	(0–0)	214	(193–237)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	379	(343–419)	0	(0–0)	0	(0–0)	63	(56–72)	44	(39–50)	0	(0–0)	263	(235–294)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	598	(533–671)	1	(1–1)	0	(0–0)	196	(170–224)	75	(67–85)	0	(0–0)	242	(215–270)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	307	(279–340)	23	(20–27)	0	(0–0)	111	(98–125)	39	(35–43)	0	(0–0)	224	(204–246)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	420	(377–469)	26	(22–30)	0	(0–0)	63	(57–70)	38	(34–43)	0	(0–0)	194	(175–217)	0	(0–0)	0	(0–0)	0	(0–0)	3	(1–14)
2012–13	555	(491–628)	36	(30–43)	0	(0–0)	63	(55–74)	55	(48–64)	0	(0–0)	206	(183–233)	0	(0–0)	0	(0–0)	1	(0–4)	4	(1–21)
2013–14	601	(530–687)	63	(52–76)	0	(0–0)	71	(61–83)	46	(40–52)	0	(0–0)	174	(152–200)	0	(0–0)	4	(2–8)	0	(0–0)	5	(1–25)
2014–15	579	(521–644)	59	(51–68)	0	(0–0)	83	(71–96)	46	(40–53)	0	(0–0)	103	(91–117)	0	(0–0)	7	(3–16)	0	(0–0)	7	(1–33)
2015–16	335	(283–395)	37	(30–45)	0	(0–0)	60	(50–72)	32	(27–37)	0	(0–0)	171	(145–201)	0	(0–0)	1	(1–3)	0	(0–0)	8	(2–39)

RAT (Rattails)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	235	(209–263)	7	(6–8)	1	(0–4)	120	(101–142)	28	(24–32)	6	(2–18)	177	(157–199)	8	(2–30)	4	(2–9)	0	(0–0)	1	(0–4)
2003–04	201	(178–228)	7	(5–8)	0	(0–0)	62	(50–76)	34	(29–39)	2	(1–7)	224	(199–255)	4	(1–15)	8	(3–19)	0	(0–0)	0	(0–0)
2004–05	479	(372–613)	45	(32–61)	8	(2–33)	67	(47–91)	49	(37–65)	1	(0–3)	266	(204–346)	1	(0–2)	0	(0–0)	1	(0–6)	1	(0–6)
2005–06	73	(62–85)	6	(5–7)	0	(0–0)	10	(8–13)	6	(5–7)	0	(0–0)	36	(31–42)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	373	(330–423)	13	(10–15)	0	(0–1)	34	(28–40)	21	(19–24)	0	(0–0)	129	(114–147)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	326	(293–361)	3	(3–4)	1	(0–2)	22	(19–26)	18	(16–20)	0	(0–0)	112	(100–125)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	202	(181–226)	0	(0–0)	0	(0–0)	13	(10–15)	15	(13–17)	0	(0–0)	109	(96–124)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	299	(262–342)	0	(0–0)	0	(0–0)	30	(23–38)	22	(19–26)	0	(0–0)	91	(79–105)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	278	(249–310)	9	(7–11)	0	(0–0)	37	(31–45)	22	(20–25)	0	(0–0)	157	(142–175)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	323	(287–364)	10	(8–12)	0	(0–0)	26	(23–29)	21	(19–24)	0	(0–0)	121	(108–136)	0	(0–0)	0	(0–0)	0	(0–0)	2	(0–10)
2012–13	307	(263–358)	5	(3–7)	0	(0–0)	5	(4–8)	12	(9–16)	0	(0–0)	74	(61–89)	0	(0–0)	0	(0–0)	0	(0–2)	1	(0–8)
2013–14	312	(271–360)	14	(11–18)	0	(0–0)	16	(13–20)	16	(14–19)	0	(0–0)	72	(63–83)	0	(0–0)	2	(1–4)	0	(0–0)	2	(0–11)
2014–15	414	(367–464)	19	(16–23)	0	(0–0)	28	(22–34)	23	(20–27)	0	(0–0)	59	(51–68)	0	(0–0)	5	(2–12)	0	(0–0)	4	(1–21)
2015–16	194	(161–233)	10	(7–12)	0	(0–0)	16	(12–20)	13	(11–15)	0	(0–0)	79	(66–94)	0	(0–0)	1	(0–2)	0	(0–0)	3	(1–19)

Table B7: Continued.

SPE (Sea perch)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	314	(279–352)	27	(23–32)	1	(0–6)	323	(283–373)	149	(130–171)	0	(0–44)	0	(0–0)	0	(0–106)	0	(0–22)	0	(0–0)	0	(0–35)
2003–04	139	(121–159)	13	(10–16)	0	(0–0)	91	(77–107)	94	(80–110)	0	(0–3)	0	(0–0)	0	(0–14)	0	(0–8)	0	(0–0)	0	(0–0)
2004–05	431	(352–533)	121	(90–157)	7	(1–32)	134	(108–167)	183	(147–228)	0	(0–2)	0	(0–0)	0	(0–3)	0	(0–0)	0	(0–30)	0	(0–35)
2005–06	298	(242–370)	65	(43–86)	0	(0–1)	84	(67–106)	99	(79–125)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–4)
2006–07	272	(243–305)	28	(24–32)	0	(0–1)	55	(48–63)	64	(57–71)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	220	(201–242)	7	(6–9)	0	(0–2)	40	(36–44)	54	(49–59)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	97	(88–107)	0	(0–0)	0	(0–0)	17	(15–19)	32	(29–36)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	182	(162–205)	0	(0–0)	0	(0–0)	63	(55–72)	67	(59–75)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	203	(183–225)	21	(17–25)	0	(0–0)	76	(68–86)	74	(67–82)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	203	(182–226)	18	(15–21)	0	(0–0)	32	(29–35)	53	(47–59)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–39)
2012–13	425	(369–488)	39	(32–47)	0	(0–0)	50	(43–59)	122	(104–143)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–16)	1	(0–87)
2013–14	434	(382–492)	64	(52–76)	0	(0–0)	53	(46–62)	97	(85–110)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–5)	0	(0–0)	1	(0–102)
2014–15	309	(280–342)	40	(34–47)	0	(0–0)	46	(40–53)	70	(62–80)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–2)	0	(0–0)	0	(0–79)
2015–16	236	(193–287)	36	(28–45)	0	(0–0)	44	(36–54)	65	(53–77)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–2)	0	(0–0)	1	(0–149)

LIN (Ling)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	128	(110–149)	31	(24–39)	1	(0–2)	201	(165–247)	152	(127–184)	16	(9–47)	260	(222–305)	19	(10–49)	6	(3–12)	0	(0–0)	1	(1–3)
2003–04	43	(36–51)	12	(9–16)	0	(0–0)	44	(35–55)	78	(64–95)	3	(1–7)	139	(118–165)	4	(2–10)	5	(3–10)	0	(0–0)	0	(0–0)
2004–05	253	(176–366)	211	(139–320)	9	(4–20)	123	(84–182)	287	(196–418)	2	(1–7)	408	(279–593)	1	(1–4)	0	(0–0)	2	(1–5)	2	(1–6)
2005–06	9	(6–12)	7	(5–10)	0	(0–0)	4	(3–6)	10	(8–14)	0	(0–0)	16	(12–21)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	40	(34–48)	12	(10–15)	0	(0–0)	13	(10–16)	25	(21–30)	0	(0–0)	41	(35–48)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	29	(25–34)	3	(2–4)	0	(0–0)	9	(7–10)	21	(18–24)	0	(0–0)	32	(28–38)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	24	(20–28)	0	(0–0)	0	(0–0)	7	(5–9)	24	(20–29)	0	(0–0)	44	(36–52)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	25	(20–31)	0	(0–0)	0	(0–0)	14	(11–18)	29	(24–35)	0	(0–0)	28	(23–33)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	10	(8–12)	3	(2–4)	0	(0–0)	6	(5–8)	11	(10–13)	0	(0–0)	20	(17–23)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	17	(14–20)	5	(4–6)	0	(0–0)	4	(4–5)	13	(11–16)	0	(0–0)	20	(17–24)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)
2012–13	33	(28–40)	9	(7–11)	0	(0–0)	6	(5–8)	25	(20–31)	0	(0–0)	28	(24–33)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–2)
2013–14	30	(25–37)	13	(10–17)	0	(0–0)	6	(5–8)	19	(16–23)	0	(0–0)	21	(18–26)	0	(0–0)	1	(0–1)	0	(0–0)	1	(0–2)
2014–15	10	(9–13)	5	(3–6)	0	(0–0)	3	(2–3)	7	(6–9)	0	(0–0)	5	(4–6)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–1)
2015–16	25	(18–33)	12	(8–17)	0	(0–0)	8	(6–10)	21	(16–27)	0	(0–0)	33	(26–43)	0	(0–0)	0	(0–1)	0	(0–0)	2	(1–5)

Table B7: Continued.

HOK (Hoki)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	80	(71–90)	16	(13–19)	0	(0–1)	132	(114–154)	56	(48–64)	6	(3–15)	59	(51–67)	9	(4–20)	2	(1–4)	0	(0–0)	1	(0–2)
2003–04	33	(28–38)	7	(6–9)	0	(0–0)	35	(29–41)	31	(26–37)	1	(1–3)	28	(23–34)	2	(1–5)	2	(1–4)	0	(0–0)	0	(0–0)
2004–05	105	(82–134)	69	(51–92)	3	(1–5)	52	(40–68)	65	(50–86)	1	(0–1)	56	(41–75)	0	(0–1)	0	(0–0)	1	(0–1)	1	(0–2)
2005–06	36	(30–43)	19	(15–24)	0	(0–0)	16	(13–20)	17	(14–21)	0	(0–0)	15	(13–19)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	88	(78–99)	21	(18–25)	0	(0–0)	28	(25–33)	31	(27–34)	0	(0–0)	32	(28–36)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	106	(95–119)	8	(7–10)	0	(0–1)	31	(27–35)	38	(33–42)	0	(0–0)	33	(29–39)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	79	(71–88)	0	(0–0)	0	(0–0)	22	(19–25)	39	(35–45)	0	(0–0)	44	(39–51)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	88	(77–99)	0	(0–0)	0	(0–0)	48	(41–55)	47	(41–54)	0	(0–0)	27	(23–31)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	45	(40–51)	11	(9–13)	0	(0–0)	27	(24–31)	23	(21–26)	0	(0–0)	22	(19–26)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	62	(55–71)	12	(10–15)	0	(0–0)	16	(14–18)	23	(20–26)	0	(0–0)	20	(17–23)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–2)
2012–13	83	(72–95)	18	(15–22)	0	(0–0)	16	(14–19)	35	(30–41)	0	(0–0)	25	(22–29)	0	(0–0)	0	(0–0)	0	(0–1)	1	(0–3)
2013–14	162	(142–186)	55	(45–67)	0	(0–0)	32	(27–38)	53	(46–61)	0	(0–0)	38	(32–44)	0	(0–0)	2	(1–3)	0	(0–0)	3	(1–7)
2014–15	99	(88–112)	32	(27–38)	0	(0–0)	24	(20–28)	33	(28–38)	0	(0–0)	12	(10–15)	0	(0–0)	2	(1–4)	0	(0–0)	2	(1–6)
2015–16	91	(75–109)	32	(25–41)	0	(0–0)	27	(22–33)	36	(30–43)	0	(0–0)	35	(29–43)	0	(0–0)	1	(0–1)	0	(0–0)	4	(2–11)

GSH (Dark ghost shark)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	40	(32–49)	8	(6–10)	0	(0–1)	2	(1–3)	4	(3–5)	1	(0–6)	29	(23–35)	2	(0–15)	0	(0–0)	0	(0–0)	0	(0–1)
2003–04	35	(28–43)	8	(6–10)	0	(0–0)	1	(1–2)	5	(4–6)	0	(0–2)	37	(31–45)	1	(0–7)	0	(0–1)	0	(0–0)	0	(0–0)
2004–05	92	(64–132)	58	(38–87)	0	(0–8)	2	(1–4)	10	(6–15)	0	(0–1)	47	(33–69)	0	(0–1)	0	(0–0)	0	(0–2)	0	(0–2)
2005–06	56	(44–71)	29	(21–40)	0	(0–0)	1	(1–2)	4	(3–6)	0	(0–0)	25	(20–32)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	145	(124–171)	33	(26–41)	0	(0–0)	3	(2–5)	9	(8–11)	0	(0–0)	46	(39–54)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	105	(91–121)	8	(6–10)	0	(0–1)	2	(2–3)	7	(6–8)	0	(0–0)	34	(29–39)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	52	(45–61)	0	(0–0)	0	(0–0)	1	(1–1)	5	(4–6)	0	(0–0)	27	(23–32)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	47	(38–57)	0	(0–0)	0	(0–0)	1	(1–1)	4	(3–5)	0	(0–0)	14	(12–17)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	41	(35–48)	10	(8–12)	0	(0–0)	1	(1–2)	4	(3–4)	0	(0–0)	22	(19–26)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	102	(86–121)	20	(16–24)	0	(0–0)	2	(1–2)	7	(6–9)	0	(0–0)	35	(29–41)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–6)
2012–13	82	(70–97)	16	(13–21)	0	(0–0)	2	(1–2)	7	(6–9)	0	(0–0)	22	(19–26)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–6)
2013–14	191	(161–227)	61	(47–78)	0	(0–0)	4	(3–6)	13	(11–15)	0	(0–0)	40	(34–48)	0	(0–0)	0	(0–1)	0	(0–0)	1	(0–16)
2014–15	107	(92–124)	33	(27–41)	0	(0–0)	3	(2–4)	7	(6–9)	0	(0–0)	14	(12–17)	0	(0–0)	0	(0–1)	0	(0–0)	1	(0–11)
2015–16	20	(13–30)	7	(4–12)	0	(0–0)	0	(0–0)	1	(1–1)	0	(0–0)	8	(6–12)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–4)

Table B7: Continued.

SSK (Smooth skate)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	16	(12–22)	6	(4–8)	0	(0–1)	81	(62–106)	11	(8–15)	1	(0–5)	11	(8–15)	2	(0–8)	1	(0–3)	0	(0–0)	0	(0–1)
2003–04	36	(29–44)	10	(8–13)	0	(0–0)	57	(45–71)	25	(20–32)	1	(0–3)	44	(35–54)	2	(0–6)	4	(2–8)	0	(0–0)	0	(0–0)
2004–05	45	(29–70)	44	(28–70)	2	(0–5)	48	(33–69)	24	(16–36)	0	(0–1)	25	(15–42)	0	(0–1)	0	(0–0)	0	(0–1)	0	(0–1)
2005–06	37	(27–49)	27	(19–38)	0	(0–0)	31	(23–41)	14	(11–19)	0	(0–0)	18	(13–25)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	55	(44–68)	18	(14–23)	0	(0–0)	33	(27–41)	15	(12–18)	0	(0–0)	19	(15–25)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	33	(27–41)	4	(3–5)	0	(0–0)	21	(18–25)	10	(9–12)	0	(0–0)	11	(9–15)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	31	(25–37)	0	(0–0)	0	(0–0)	17	(14–20)	12	(10–15)	0	(0–0)	17	(13–22)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	28	(22–36)	0	(0–0)	0	(0–0)	34	(28–42)	13	(11–16)	0	(0–0)	9	(7–12)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	19	(16–24)	7	(5–9)	0	(0–0)	24	(20–29)	9	(7–10)	0	(0–0)	11	(9–14)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	16	(12–20)	5	(4–7)	0	(0–0)	11	(9–13)	6	(5–7)	0	(0–0)	5	(4–7)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)
2012–13	62	(50–78)	17	(13–23)	0	(0–0)	20	(16–25)	20	(16–25)	0	(0–0)	20	(15–25)	0	(0–0)	0	(0–0)	0	(0–1)	1	(0–3)
2013–14	65	(53–80)	27	(21–36)	0	(0–0)	20	(16–24)	15	(13–19)	0	(0–0)	17	(13–22)	0	(0–0)	1	(0–2)	0	(0–0)	1	(0–4)
2014–15	23	(18–30)	12	(9–15)	0	(0–0)	12	(10–16)	7	(5–9)	0	(0–0)	3	(2–4)	0	(0–0)	1	(0–2)	0	(0–0)	1	(0–2)
2015–16	48	(35–64)	22	(16–31)	0	(0–0)	24	(19–32)	15	(11–19)	0	(0–0)	20	(15–29)	0	(0–0)	0	(0–1)	0	(0–0)	2	(0–8)

FHD (Deep-sea flathead)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	45	(40–51)	1	(1–1)	0	(0–1)	53	(46–62)	10	(8–11)	3	(1–11)	1	(1–2)	4	(1–22)	0	(0–0)	0	(0–0)	0	(0–2)
2003–04	45	(40–52)	1	(1–1)	0	(0–0)	34	(29–40)	15	(12–17)	2	(1–5)	3	(2–4)	3	(1–14)	0	(0–1)	0	(0–0)	0	(0–0)
2004–05	39	(30–49)	1	(1–2)	0	(0–2)	13	(10–17)	6	(4–9)	0	(0–1)	0	(0–1)	0	(0–1)	0	(0–0)	0	(0–1)	0	(0–1)
2005–06	165	(133–205)	6	(4–9)	0	(0–0)	52	(41–67)	24	(18–30)	0	(0–0)	2	(1–3)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)
2006–07	77	(69–87)	2	(2–2)	0	(0–0)	18	(16–21)	9	(8–10)	0	(0–0)	2	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	82	(74–90)	1	(0–1)	0	(0–1)	17	(15–19)	9	(8–10)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	49	(45–55)	0	(0–0)	0	(0–0)	10	(9–11)	8	(7–9)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	77	(68–87)	0	(0–0)	0	(0–0)	30	(26–34)	13	(11–15)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	80	(71–89)	1	(1–2)	0	(0–0)	34	(30–38)	13	(12–15)	0	(0–0)	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	66	(59–75)	1	(1–1)	0	(0–0)	12	(11–13)	8	(7–9)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–4)
2012–13	84	(72–97)	2	(1–2)	0	(0–0)	11	(10–13)	11	(9–13)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–6)
2013–14	114	(100–129)	4	(3–5)	0	(0–0)	16	(14–19)	12	(11–14)	0	(0–0)	2	(2–3)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–10)
2014–15	94	(85–105)	3	(2–3)	0	(0–0)	16	(14–19)	10	(9–11)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–10)
2015–16	27	(22–34)	1	(1–1)	0	(0–0)	6	(5–7)	3	(3–4)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–6)

Table B7: Continued.

RCO (Red cod)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	26	(21–32)	19	(15–25)	0	(0–2)	43	(33–56)	73	(59–89)	9	(3–39)	93	(78–112)	4	(0–36)	1	(0–8)	0	(0–0)	0	(0–3)
2003–04	21	(18–26)	17	(13–23)	0	(0–0)	22	(17–28)	79	(65–97)	3	(1–14)	110	(92–131)	2	(0–18)	2	(0–17)	0	(0–0)	0	(0–0)
2004–05	15	(7–29)	50	(25–98)	1	(0–6)	8	(4–16)	59	(31–110)	1	(0–3)	51	(26–98)	0	(0–1)	0	(0–0)	0	(0–2)	0	(0–2)
2005–06	3	(2–4)	7	(5–10)	0	(0–0)	1	(1–2)	7	(5–10)	0	(0–0)	7	(6–10)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	8	(7–10)	7	(6–9)	0	(0–0)	3	(2–3)	11	(9–12)	0	(0–0)	13	(11–16)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	4	(4–5)	2	(1–2)	0	(0–0)	1	(1–2)	8	(7–9)	0	(0–0)	8	(7–10)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	3	(2–4)	0	(0–0)	0	(0–0)	1	(1–1)	8	(7–10)	0	(0–0)	10	(8–12)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	3	(2–4)	0	(0–0)	0	(0–0)	2	(1–2)	10	(8–12)	0	(0–0)	6	(4–7)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	6	(5–7)	6	(5–8)	0	(0–0)	4	(3–5)	14	(12–16)	0	(0–0)	18	(15–21)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	7	(6–9)	6	(5–8)	0	(0–0)	2	(2–2)	12	(10–15)	0	(0–0)	14	(11–16)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–2)
2012–13	6	(5–7)	5	(4–7)	0	(0–0)	1	(1–2)	10	(8–13)	0	(0–0)	9	(7–11)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–2)
2013–14	13	(11–17)	16	(12–21)	0	(0–0)	3	(2–3)	16	(14–20)	0	(0–0)	14	(12–18)	0	(0–0)	0	(0–2)	0	(0–0)	0	(0–4)
2014–15	15	(13–18)	16	(13–20)	0	(0–0)	3	(3–4)	17	(14–20)	0	(0–0)	9	(8–11)	0	(0–0)	0	(0–4)	0	(0–0)	1	(0–5)
2015–16	13	(10–18)	18	(13–24)	0	(0–0)	4	(3–5)	21	(17–26)	0	(0–0)	26	(20–33)	0	(0–0)	0	(0–1)	0	(0–0)	1	(0–10)

SPD (Spiny dogfish)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	37	(32–43)	10	(8–12)	0	(0–0)	1	(0–2)	1	(1–2)	2	(1–7)	10	(8–13)	3	(0–12)	1	(0–2)	0	(0–0)	0	(0–1)
2003–04	21	(17–25)	8	(6–10)	0	(0–0)	0	(0–0)	1	(0–1)	1	(0–2)	7	(5–9)	1	(0–5)	1	(0–3)	0	(0–0)	0	(0–0)
2004–05	43	(25–70)	56	(35–90)	0	(0–2)	0	(0–0)	1	(0–1)	0	(0–1)	5	(3–10)	0	(0–1)	0	(0–0)	0	(0–1)	0	(0–1)
2005–06	12	(9–16)	10	(7–13)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	121	(102–142)	37	(30–45)	0	(0–0)	1	(0–2)	3	(2–5)	0	(0–0)	18	(15–22)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	64	(56–74)	7	(5–8)	0	(0–0)	0	(0–1)	2	(1–2)	0	(0–0)	9	(8–11)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	77	(66–90)	0	(0–0)	0	(0–0)	0	(0–1)	2	(1–3)	0	(0–0)	15	(12–19)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	75	(64–88)	0	(0–0)	0	(0–0)	1	(0–2)	4	(3–5)	0	(0–0)	11	(9–14)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	21	(17–26)	8	(6–11)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	3	(3–4)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	23	(18–30)	8	(7–11)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(2–3)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)
2012–13	32	(26–38)	9	(7–12)	0	(0–0)	0	(0–0)	1	(0–1)	0	(0–0)	3	(3–4)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–2)
2013–14	60	(48–76)	30	(23–39)	0	(0–0)	0	(0–0)	1	(1–1)	0	(0–0)	5	(3–6)	0	(0–0)	1	(0–1)	0	(0–0)	0	(0–4)
2014–15	87	(76–100)	38	(32–45)	0	(0–0)	0	(0–1)	2	(1–3)	0	(0–0)	5	(4–6)	0	(0–0)	1	(1–3)	0	(0–0)	1	(0–6)
2015–16	60	(47–77)	26	(19–34)	0	(0–0)	1	(0–2)	3	(2–5)	0	(0–0)	13	(10–17)	0	(0–0)	0	(0–1)	0	(0–0)	1	(0–9)

Table B7: Continued.

GIZ (Giant stargazer)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	37	(32–42)	9	(7–11)	0	(0–21)	28	(23–35)	2	(1–3)	87	(20–315)	18	(15–21)	62	(8–373)	0	(0–1)	0	(0–0)	0	(0–30)
2003–04	31	(27–36)	8	(7–10)	0	(0–0)	14	(11–18)	2	(1–3)	32	(7–119)	21	(18–25)	31	(4–189)	0	(0–2)	0	(0–0)	0	(0–0)
2004–05	16	(8–33)	11	(5–24)	0	(0–25)	2	(1–5)	0	(0–1)	3	(0–19)	4	(2–8)	1	(0–9)	0	(0–0)	0	(0–7)	0	(0–10)
2005–06	25	(20–31)	15	(11–21)	0	(0–2)	4	(3–6)	1	(0–1)	0	(0–0)	7	(5–8)	0	(0–2)	0	(0–0)	0	(0–0)	0	(0–3)
2006–07	26	(23–30)	7	(6–9)	0	(0–2)	4	(3–5)	1	(1–1)	0	(0–0)	6	(5–7)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	35	(31–39)	3	(3–4)	0	(0–8)	5	(4–6)	1	(1–1)	0	(0–0)	8	(7–9)	0	(0–2)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	34	(30–38)	0	(0–0)	0	(0–0)	5	(4–6)	2	(1–2)	0	(0–0)	13	(11–15)	0	(0–2)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	11	(9–14)	0	(0–0)	0	(0–0)	2	(2–3)	0	(0–0)	0	(0–0)	2	(2–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	17	(15–20)	5	(4–6)	0	(0–0)	4	(3–5)	1	(0–1)	0	(0–0)	6	(5–7)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	36	(31–42)	9	(7–11)	0	(0–0)	4	(3–5)	1	(1–1)	0	(0–0)	8	(7–10)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–50)
2012–13	22	(19–26)	5	(4–7)	0	(0–0)	2	(1–2)	1	(0–1)	0	(0–0)	4	(3–5)	0	(0–0)	0	(0–0)	0	(0–5)	0	(0–35)
2013–14	48	(41–57)	20	(15–25)	0	(0–0)	4	(4–6)	1	(1–2)	0	(0–0)	7	(6–9)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–95)
2014–15	40	(36–45)	16	(14–19)	0	(0–0)	5	(4–6)	2	(1–2)	0	(0–0)	4	(4–5)	0	(0–0)	0	(0–1)	0	(0–0)	1	(0–112)
2015–16	19	(12–28)	7	(5–12)	0	(0–0)	2	(1–3)	0	(0–1)	0	(0–0)	4	(3–6)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–82)

CDO (Capro dory)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	0	(0–0)	0	(0–1)	0	(0–0)	5	(1–19)	43	(14–136)	0	(0–2)	0	(0–0)	0	(0–4)	0	(0–0)	0	(0–0)	0	(0–1)
2003–04	0	(0–0)	2	(0–5)	0	(0–0)	12	(5–31)	74	(38–160)	0	(0–3)	0	(0–0)	0	(0–6)	0	(0–0)	0	(0–0)	0	(0–0)
2004–05	0	(0–0)	0	(0–2)	0	(0–0)	0	(0–4)	16	(1–90)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2005–06	7	(4–10)	58	(36–97)	0	(0–1)	31	(19–52)	121	(74–203)	0	(0–0)	0	(0–1)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–2)
2006–07	1	(0–1)	10	(7–15)	0	(0–0)	14	(10–18)	62	(50–76)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	0	(0–0)	1	(1–2)	0	(0–0)	6	(4–8)	49	(41–59)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)	6	(5–8)	52	(42–64)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	0	(0–0)	0	(0–0)	0	(0–0)	6	(4–8)	41	(33–51)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	0	(0–0)	3	(2–5)	0	(0–0)	8	(6–10)	31	(26–37)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	1	(1–2)	0	(0–0)	2	(2–3)	25	(20–31)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)
2012–13	2	(1–3)	19	(12–31)	0	(0–0)	13	(9–21)	117	(76–178)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–2)	0	(0–13)
2013–14	2	(1–2)	15	(10–22)	0	(0–0)	6	(5–8)	37	(30–46)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–8)
2014–15	2	(1–2)	14	(11–18)	0	(0–0)	7	(5–10)	35	(25–48)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–2)	0	(0–0)	0	(0–9)
2015–16	0	(0–0)	1	(0–2)	0	(0–0)	2	(1–3)	18	(13–24)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–3)

Table B7: Continued.

RHY (Common roughy)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	2	(1–3)	2	(1–3)	0	(0–0)	7	(4–11)	42	(28–63)	0	(0–1)	0	(0–0)	0	(0–2)	0	(0–1)	0	(0–0)	0	(0–1)
2003–04	2	(2–4)	2	(1–4)	0	(0–0)	5	(3–10)	65	(43–99)	0	(0–1)	0	(0–0)	0	(0–2)	0	(0–3)	0	(0–0)	0	(0–0)
2004–05	1	(0–2)	2	(1–6)	0	(0–1)	1	(0–2)	14	(4–40)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2005–06	3	(1–5)	6	(3–12)	0	(0–0)	3	(1–5)	36	(20–67)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	2	(1–3)	2	(1–3)	0	(0–0)	1	(1–2)	20	(15–25)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	8	(6–11)	3	(2–4)	0	(0–1)	5	(3–8)	74	(61–91)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	4	(3–5)	0	(0–0)	0	(0–0)	3	(2–4)	43	(34–53)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	2	(2–3)	0	(0–0)	0	(0–0)	3	(2–4)	35	(27–45)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	1	(1–2)	1	(1–2)	0	(0–0)	1	(1–2)	20	(15–26)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	4	(3–5)	3	(2–4)	0	(0–0)	2	(1–3)	35	(26–48)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–2)
2012–13	4	(3–6)	3	(2–4)	0	(0–0)	2	(1–3)	34	(25–47)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–2)
2013–14	1	(1–2)	2	(1–3)	0	(0–0)	1	(0–1)	13	(10–18)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)
2014–15	1	(1–1)	1	(1–2)	0	(0–0)	0	(0–1)	9	(6–12)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)
2015–16	0	(0–1)	1	(0–1)	0	(0–0)	0	(0–0)	5	(3–10)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)

SRH (Silver roughy)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	1	(1–2)	0	(0–1)	0	(0–0)	64	(40–99)	8	(5–14)	0	(0–3)	0	(0–0)	0	(0–6)	0	(0–0)	0	(0–0)	0	(0–1)
2003–04	0	(0–1)	0	(0–0)	0	(0–0)	7	(2–17)	2	(1–4)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)
2004–05	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–8)	0	(0–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2005–06	0	(0–1)	0	(0–1)	0	(0–0)	3	(0–14)	1	(0–4)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	9	(7–11)	2	(2–3)	0	(0–0)	43	(34–55)	25	(19–32)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	5	(4–7)	0	(0–1)	0	(0–0)	28	(22–34)	15	(11–20)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	3	(2–5)	0	(0–0)	0	(0–0)	22	(16–30)	13	(9–19)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	4	(3–5)	0	(0–0)	0	(0–0)	33	(25–43)	16	(12–21)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	5	(4–6)	1	(1–2)	0	(0–0)	43	(35–53)	22	(17–27)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	3	(2–3)	1	(0–1)	0	(0–0)	11	(9–13)	8	(6–10)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–2)
2012–13	4	(3–6)	1	(1–2)	0	(0–0)	14	(10–19)	15	(10–22)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–3)
2013–14	5	(4–7)	2	(1–3)	0	(0–0)	16	(12–21)	14	(11–19)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–4)
2014–15	2	(1–2)	1	(0–1)	0	(0–0)	6	(5–8)	4	(3–6)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–2)
2015–16	6	(4–9)	2	(1–3)	0	(0–0)	20	(15–29)	19	(14–26)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–12)

Table B7: Continued.

SSI (Silverside)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	4	(3–5)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–1)	17	(13–22)	0	(0–2)	0	(0–2)	0	(0–0)	0	(0–0)
2003–04	4	(3–5)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	20	(17–25)	0	(0–1)	1	(0–3)	0	(0–0)	0	(0–0)
2004–05	1	(0–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(0–8)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2005–06	14	(11–17)	2	(1–3)	0	(0–0)	1	(0–1)	0	(0–1)	0	(0–0)	26	(22–31)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	21	(18–25)	2	(1–2)	0	(0–0)	1	(1–1)	1	(1–1)	0	(0–0)	24	(21–28)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	15	(13–17)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	19	(16–22)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	18	(16–21)	0	(0–0)	0	(0–0)	1	(0–1)	1	(0–1)	0	(0–0)	35	(30–41)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	17	(14–20)	0	(0–0)	0	(0–0)	1	(1–1)	1	(0–1)	0	(0–0)	20	(17–24)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	10	(9–12)	1	(1–1)	0	(0–0)	1	(0–1)	0	(0–0)	0	(0–0)	22	(19–25)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	18	(15–22)	1	(1–1)	0	(0–0)	0	(0–1)	0	(0–1)	0	(0–0)	25	(21–30)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)
2012–13	16	(14–19)	1	(1–1)	0	(0–0)	0	(0–1)	1	(0–1)	0	(0–0)	16	(14–19)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)
2013–14	15	(12–18)	2	(1–2)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	12	(10–15)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–2)
2014–15	40	(35–46)	4	(4–5)	0	(0–0)	1	(1–2)	2	(1–2)	0	(0–0)	18	(16–22)	0	(0–0)	2	(1–5)	0	(0–0)	0	(0–6)
2015–16	14	(10–21)	1	(1–2)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	26	(20–35)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–4)

RSK (Rough skate)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	3	(2–4)	0	(0–0)	0	(0–0)	5	(3–8)	4	(3–6)	0	(0–2)	24	(18–33)	0	(0–3)	1	(0–2)	0	(0–0)	0	(0–0)
2003–04	1	(1–1)	0	(0–0)	0	(0–0)	1	(1–2)	2	(1–3)	0	(0–0)	12	(9–17)	0	(0–1)	1	(0–2)	0	(0–0)	0	(0–0)
2004–05	7	(3–17)	1	(0–2)	0	(0–2)	4	(2–9)	9	(4–19)	0	(0–0)	37	(18–75)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)
2005–06	2	(1–3)	0	(0–0)	0	(0–0)	1	(1–2)	2	(1–3)	0	(0–0)	11	(8–15)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	4	(3–6)	0	(0–0)	0	(0–0)	1	(1–2)	3	(2–4)	0	(0–0)	15	(12–19)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	7	(5–9)	0	(0–0)	0	(0–0)	2	(1–3)	4	(3–5)	0	(0–0)	17	(14–20)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	3	(2–4)	0	(0–0)	0	(0–0)	1	(1–1)	2	(2–3)	0	(0–0)	12	(10–15)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	1	(1–2)	0	(0–0)	0	(0–0)	1	(1–1)	2	(1–3)	0	(0–0)	7	(5–9)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	3	(2–4)	0	(0–0)	0	(0–0)	2	(1–2)	3	(2–3)	0	(0–0)	13	(11–16)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	7	(5–10)	0	(0–1)	0	(0–0)	2	(1–2)	4	(3–5)	0	(0–0)	16	(14–20)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)
2012–13	4	(3–5)	0	(0–0)	0	(0–0)	1	(1–1)	3	(2–4)	0	(0–0)	10	(8–12)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)
2013–14	12	(9–16)	1	(0–2)	0	(0–0)	2	(2–3)	5	(4–6)	0	(0–0)	13	(11–15)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–1)
2014–15	4	(3–6)	0	(0–1)	0	(0–0)	1	(1–2)	2	(2–4)	0	(0–0)	4	(3–6)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–1)
2015–16	1	(0–2)	0	(0–0)	0	(0–0)	0	(0–1)	1	(0–1)	0	(0–0)	5	(3–9)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)

Table B7: Continued.

RSO (Gemfish)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	0	(0–0)	0	(0–0)	0	(0–0)	35	(22–57)	24	(15–40)	0	(0–1)	0	(0–0)	0	(0–3)	0	(0–0)	0	(0–0)	0	(0–0)
2003–04	0	(0–0)	0	(0–0)	0	(0–0)	9	(3–27)	16	(6–46)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)
2004–05	0	(0–0)	0	(0–1)	0	(0–1)	16	(8–32)	35	(17–69)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)
2005–06	0	(0–0)	0	(0–1)	0	(0–0)	6	(1–29)	12	(3–53)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	0	(0–0)	0	(0–1)	0	(0–0)	12	(10–16)	21	(17–25)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	0	(0–0)	0	(0–0)	0	(0–0)	7	(6–8)	14	(12–17)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	0	(0–0)	0	(0–0)	0	(0–0)	2	(1–2)	6	(5–8)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	0	(0–0)	0	(0–0)	0	(0–0)	8	(7–11)	14	(12–17)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	0	(0–0)	0	(0–0)	0	(0–0)	10	(8–12)	14	(12–16)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	0	(0–0)	0	(0–0)	0	(0–0)	3	(3–4)	9	(7–11)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–3)	5	(2–11)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	0	(0–0)	0	(0–0)	0	(0–0)	2	(2–3)	7	(6–9)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)
2014–15	0	(0–0)	0	(0–0)	0	(0–0)	4	(1–18)	11	(2–46)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–2)
2015–16	0	(0–0)	0	(0–0)	0	(0–0)	2	(2–3)	5	(4–7)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)

BBE (Banded bellowsfish)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	9	(7–10)	0	(0–0)	0	(0–0)	66	(53–82)	5	(4–7)	0	(0–3)	1	(1–1)	0	(0–1)	0	(0–1)	0	(0–0)	0	(0–0)
2003–04	10	(9–12)	0	(0–1)	0	(0–0)	44	(36–54)	9	(7–12)	0	(0–2)	2	(2–3)	0	(0–1)	1	(0–2)	0	(0–0)	0	(0–0)
2004–05	0	(0–1)	0	(0–0)	0	(0–0)	1	(0–6)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2005–06	3	(2–4)	0	(0–0)	0	(0–0)	7	(5–10)	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	2	(1–2)	0	(0–0)	0	(0–0)	3	(3–4)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	6	(5–7)	0	(0–0)	0	(0–0)	9	(8–11)	2	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	1	(1–2)	0	(0–0)	0	(0–0)	2	(2–2)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	3	(2–3)	0	(0–0)	0	(0–0)	7	(6–9)	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	2	(2–3)	0	(0–0)	0	(0–0)	8	(6–9)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	3	(2–4)	0	(0–0)	0	(0–0)	4	(3–5)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	12	(10–14)	0	(0–1)	0	(0–0)	9	(7–11)	5	(4–6)	0	(0–0)	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)
2013–14	3	(2–4)	0	(0–0)	0	(0–0)	3	(2–4)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	3	(3–4)	0	(0–0)	0	(0–0)	3	(3–4)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)
2015–16	3	(2–4)	0	(0–0)	0	(0–0)	4	(3–5)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)

Table B7: Continued.

SWA (Silver warehou)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	44	(38–51)	10	(7–12)	0	(0–1)	50	(38–67)	10	(6–15)	1	(0–5)	12	(9–17)	2	(0–6)	1	(0–3)	0	(0–0)	0	(0–1)
2003–04	8	(6–10)	2	(1–3)	0	(0–0)	5	(3–7)	2	(1–2)	0	(0–0)	2	(1–3)	0	(0–1)	0	(0–1)	0	(0–0)	0	(0–0)
2004–05	3	(1–9)	2	(1–8)	0	(0–0)	1	(0–2)	0	(0–1)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2005–06	2	(1–5)	2	(1–3)	0	(0–0)	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	9	(7–11)	2	(2–3)	0	(0–0)	2	(1–2)	1	(0–1)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	2	(2–3)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	5	(4–6)	0	(0–0)	0	(0–0)	1	(1–1)	0	(0–1)	0	(0–0)	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	9	(7–12)	0	(0–0)	0	(0–0)	3	(2–4)	1	(1–2)	0	(0–0)	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	2	(2–3)	1	(0–1)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	2	(2–3)	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	3	(2–4)	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	3	(2–4)	1	(1–2)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	2	(2–3)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2015–16	5	(3–9)	2	(1–4)	0	(0–0)	1	(0–2)	0	(0–1)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)

HAK (Hake)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	11	(9–13)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–1)	34	(29–39)	0	(0–3)	0	(0–2)	0	(0–0)	0	(0–1)
2003–04	8	(6–9)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	36	(31–41)	0	(0–1)	1	(0–3)	0	(0–0)	0	(0–0)
2004–05	19	(11–30)	1	(0–2)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	46	(30–70)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–1)
2005–06	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(2–3)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	6	(4–7)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	8	(7–10)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	3	(2–4)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	5	(4–7)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	2	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	5	(4–7)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	3	(2–4)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	4	(3–6)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	2	(1–3)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	2	(1–3)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	4	(3–6)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	5	(4–6)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	6	(5–7)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	3	(2–4)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	3	(2–5)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2015–16	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)

Table B7: Continued.

LDO (Lookdown dory)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	10	(8–12)	1	(1–2)	0	(0–0)	11	(9–14)	1	(1–2)	1	(0–3)	2	(1–2)	0	(0–2)	0	(0–0)	0	(0–0)	0	(0–0)
2003–04	5	(4–6)	1	(0–1)	0	(0–0)	3	(2–4)	1	(1–1)	0	(0–1)	1	(1–2)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)
2004–05	13	(8–20)	6	(3–9)	0	(0–1)	4	(3–7)	1	(1–3)	0	(0–0)	2	(1–3)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2005–06	5	(3–7)	2	(1–3)	0	(0–0)	1	(1–2)	0	(0–1)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	11	(10–13)	2	(2–3)	0	(0–0)	3	(2–3)	1	(1–1)	0	(0–0)	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	14	(12–16)	1	(1–1)	0	(0–0)	3	(2–3)	2	(1–2)	0	(0–0)	2	(2–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	9	(8–11)	0	(0–0)	0	(0–0)	2	(1–2)	1	(1–2)	0	(0–0)	2	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	6	(5–8)	0	(0–0)	0	(0–0)	2	(2–3)	1	(0–1)	0	(0–0)	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	3	(3–4)	1	(0–1)	0	(0–0)	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	9	(8–11)	1	(1–2)	0	(0–0)	2	(1–2)	1	(1–1)	0	(0–0)	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	11	(10–13)	2	(2–2)	0	(0–0)	2	(1–2)	2	(1–2)	0	(0–0)	2	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	9	(7–11)	2	(1–3)	0	(0–0)	1	(1–2)	1	(0–1)	0	(0–0)	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	10	(8–11)	2	(2–3)	0	(0–0)	2	(1–2)	1	(1–1)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2015–16	6	(4–9)	2	(1–2)	0	(0–0)	1	(1–2)	1	(0–1)	0	(0–0)	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)

TOA (Toadfish)

Fishing year	CHAT3		CHAT4		COOK		EAST		NORTH		PUYS		AUCK		STEW		SUBA		WCNI		WCSI	
2002–03	3	(2–3)	0	(0–0)	0	(0–0)	4	(3–5)	5	(4–7)	0	(0–1)	19	(16–22)	0	(0–2)	0	(0–1)	0	(0–0)	0	(0–0)
2003–04	4	(3–5)	0	(0–0)	0	(0–0)	3	(2–4)	10	(8–13)	0	(0–1)	35	(30–39)	0	(0–1)	1	(0–2)	0	(0–0)	0	(0–0)
2004–05	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–2)	0	(0–0)	4	(1–9)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2005–06	2	(2–3)	0	(0–1)	0	(0–0)	1	(1–1)	3	(2–4)	0	(0–0)	9	(8–11)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2006–07	2	(2–3)	0	(0–0)	0	(0–0)	1	(0–1)	2	(2–3)	0	(0–0)	8	(7–10)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2007–08	2	(2–2)	0	(0–0)	0	(0–0)	0	(0–1)	2	(2–3)	0	(0–0)	8	(7–10)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2008–09	2	(2–3)	0	(0–0)	0	(0–0)	1	(0–1)	3	(3–4)	0	(0–0)	13	(11–15)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2009–10	1	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–1)	0	(0–0)	3	(2–3)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2010–11	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–1)	1	(1–2)	0	(0–0)	6	(5–7)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2011–12	3	(2–3)	0	(0–0)	0	(0–0)	1	(0–1)	3	(2–4)	0	(0–0)	10	(9–12)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2012–13	1	(1–1)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–2)	0	(0–0)	5	(4–6)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2013–14	1	(1–2)	0	(0–0)	0	(0–0)	0	(0–0)	1	(1–2)	0	(0–0)	4	(3–5)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2014–15	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–1)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)
2015–16	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)	1	(0–2)	0	(0–0)	0	(0–0)	0	(0–0)	0	(0–0)

APPENDIX C: QMS species list

Table C1: Complete list of QMS species codes as at 01 October 2016, ordered from most recent to oldest addition, along with: year of entry into the QMS; broad taxonomic group (Algae, Fish, Invertebrate); common and scientific names; and total observed catch (kg) in the arrow squid and scampi fisheries between 2002–03 and 2015–16. * listed under Schedule 6 of the Fisheries Act 1996 (stocks which may be returned to the sea or other waters).

Species code	QMS year of entry	Group	Common name	Scientific name	SCI fishery (kg)	SQU fishery (kg)
KBB*	2010	Algae	Bladder kelp	*Macrocystis pyrifera*		
PTO*	2010	Fish	Patagonian toothfish	*Dissostichus eleginoides*	2	
RBT	2009	Fish	Redbait	*Emmelichthys nitidus*	225	851135
PRK*	2007	Inv.	Prawn killer	*Ibacus alticrenatus*	25620	5
KWH*	2006	Inv.	Knobbed whelk	*Austrofucus glans*	89	45
PZL	2006	Inv.	King clam	*Panopea zelandica*		
OYS*	2005	Inv.	Oysters dredge	*Ostrea chilensis*		
PPI*	2005	Inv.	Pipi	*Paphies australis*		
TUA	2005	Inv.	Tuatua	*Paphies subtriangulata*		
BIG	2004	Fish	Bigeye tuna	*Thunnus obesus*		1494
BWS*	2004	Fish	Blue shark	*Prionace glauca*		12758
BYA*	2004	Inv.	Frilled venus shell	*Bassina yatei*		
CHC*	2004	Inv.	Red crab	*Chaceon bicolor*		1097
DAN*	2004	Inv.	Ringed dosinia	*Dosinia anus*		
DSU*	2004	Inv.	Silky dosinia	*Dosinia subrosea*		
GLM*	2004	Inv.	Green-lipped mussel	*Perna canaliculus*		1
GSC*	2004	Inv.	Giant spider crab	*Jacquinotia edwardsii*	9459	716054
HOR	2004	Inv.	Horse mussel	*Atrina zelandica*		1
KAH	2004	Fish.	Kahawai	*Arripis trutta, A. xylabion*		
ATT	2004	Fish	Kahawai	*Arripis trutta*		30
KIC*	2004	Inv.	King crab	*Lithodes murrayi, Neolithodes brodiei*		180
LDO	2004	Fish	Lookdown dory	*Cyttus traversi*	22402	8182
LFE*	2004	Fish	Long-finned eel	*Anguilla dieffenbachii*		
MAK*	2004	Fish	Mako shark	*Isurus oxyrinchus*		17066
MDI*	2004	Inv.	Trough shell	*Mactra discors*		
MMI*	2004	Inv.	Large trough shell	*Mactra murchisoni*		
MOO	2004	Fish	Moonfish	*Lampris guttatus*		170
PAR	2004	Fish	Parore	*Girella tricuspidata*		2
PDO*	2004	Inv.	Southern tuatua	*Paphies donacina*	89	
POR	2004	Fish	Porae	*Nemadactylus douglasii*		335
POS*	2004	Fish	Porbeagle shark	*Lamna nasus*	80	40856
RBM	2004	Fish	Rays bream	*Brama brama*	54	127616
RSN	2004	Fish	Red snapper	*Centroberyx affinis*	3	
SAE*	2004	Inv.	Triangle shell	*Spisula aequilatera*		
SCC*	2004	Inv.	Sea cucumber	*Stichopus mollis*	4374	242
SCI	2004	Inv.	Scampi	*Metanephrops challengeri*	1016328	199
SPD*	2004	Fish	Spiny dogfish	*Squalus acanthias*	104674	5210691
STN*	2004	Fish	Southern bluefin tuna	*Thunnus maccoyii*		15039
SWO*	2004	Fish	Broadbill swordfish	*Xiphias gladius*		10
TOR	2004	Fish	Pacific bluefin tuna	*Thunnus orientalis*		2556
YFN	2004	Fish	Yellowfin tuna	*Thunnus albacares*		681
KIN*	2003	Fish	Kingfish	*Seriola lalandi*		27
LEA	2003	Fish	Leatherjacket	*Meuschenia scaber*		8
RSK*	2003	Fish	Rough skate	*Zearaja nasuta*	27503	322851
SFE*	2003	Fish	Short-finned eel	*Anguilla australis, Anguilla reinhardtii*		
SSK*	2003	Fish	Smooth skate	*Dipturus innominatus*	95315	129713
ANC	2002	Fish	Anchovy	*Engraulis australis*		97
BUT	2002	Fish	Butterfish	*Odax pullus*		
COC*	2002	Inv.	Cockle	*Austrovenus stutchburyi*	3	10
EMA	2002	Fish	Blue mackerel	*Scomber australasicus*		1809
GAR	2002	Fish	Garfish	*Hyporhamphus ihi*	15	50
PAD*	2002	Inv.	Paddle crab	*Ovalipes catharus*	5	7978
PIL	2002	Fish	Pilchard	*Sardinops sagax*		65
QSC*	2002	Inv.	Queen scallop	*Zygochlamys delicatula*		23823
SPR	2002	Fish	Sprats	*Sprattus antipodum, S. muelleri*		
SUR*	2002	Inv.	Kina	*Evechinus chloroticus*		2
ANG	2000	Fish	Anguillidae	Anguillidae		
GSP	1999	Fish	Pale ghost shark	*Hydrolagus bemisi*	5100	13062
SBW	1999	Fish	Southern blue whiting	*Micromesistius australis*	3730	38175

Table C1: Continued

Species code	QMS year of entry	Group	Common name	Scientific name	SCI fishery (kg)	SQU fishery (kg)
CDL	1998	Fish	Cardinalfish	Epigonidae	62	295
EPT	1998	Fish	Deepsea cardinalfish	*Epigonus telescopus*	32	
FRO	1998	Fish	Frostfish	*Lepidopus caudatus*	641	77162
GSH	1998	Fish	Ghost shark	*Hydrolagus novaezealandiae*	164215	366003
OYU	1998	Inv.	NA			
RBY	1998	Fish	Rubyfish	*Plagiogeneion rubiginosum*	194	1692
RIB	1998	Fish	Ribaldo	*Mora moro*	1657	2535
SPE	1998	Fish	Sea perch	*Helicolenus* spp.	560462	114974
TRU	1998	Fish	Trumpeter	*Latris lineata*	1	801
WWA	1998	Fish	White warehou	*Seriolella caerulea*	22371	206362
YEM	1998	Fish	Yellow-eyed mullet	*Aldrichetta forsteri*		
SCA*	1992	Inv.	Scallop	*Pecten novaezelandiae*		407
CRA*	1990	Inv.	Rock lobster	*Jasus edwardsii*	9	171
PHC	1990	Inv.	Packhorse rock lobster	*Jasus verreauxi*		3
JMA	1987	Fish	Jack mackerel	*Trachurus declivis, T. murphyi, T. nz*	171	1787670
JMD	1987	Fish	Greenback jack mackerel	*Trachurus declivis*		
JMN	1987	Fish	Yellowtail jack mackerel	*Trachurus novaezelandiae*		
JMM	1987	Fish	Slender jack mackerel	*Trachurus murphyi*		
PAU	1987	Inv.	Black paua & yellowfoot paua	*Haliotis iris & H. australis*		
SQU	1987	Inv.	Arrow squid	*Nototodarus sloanii & N. gouldi*	40284	239442515
NOS	1987	Inv.	NZ southern arrow squid	*Nototodarus sloanii*	68	
NOG	1987	Inv.	NZ northern arrow squid	*Nototodarus gouldi*		
ASQ	1987	Inv.	NA			
BAR	1986	Fish	Barracouta	*Thyrsites atun*	23	27559062
BCO	1986	Fish	Blue cod	*Parapercis colias*	8	38076
BNS	1986	Fish	Bluenose	*Hyperoglyphe antarctica*	6232	3792
BYX	1986	Fish	Alfonsino & long-finned beryx	*Beryx splendens & B. decadactylus*	846	276
ELE	1986	Fish	Elephant fish	*Callorhinchus milii*		147
FLA	1986	Fish	Flats		3773	8988
ESO	1986	Fish	N.Z. sole	*Peltorhamphus novaezeelandiae*		23
LSO	1986	Fish	Lemon sole	*Pelotretis flavilatus*	493	1248
SFL	1986	Fish	Sand flounder	*Rhombosolea plebeia*		2137
TUR	1986	Fish	Turbot	*Colistium nudipinnis*		483
YBF	1986	Fish	Yellowbelly flounder	*Rhombosolea leporina*	16	210
BFL	1986	Fish	Black flounder	*Rhombosolea retiaria*		474
GFL	1986	Fish	Greenback flounder	*Rhombosolea tapirina*		20120
BRI	1986	Fish	Brill	*Colistium guntheri*	1	11
GMU	1986	Fish	Grey mullet	*Mugil cephalus*		
GUR	1986	Fish	Gurnard	*Chelidonichthys kumu*	62	3650
HAK	1986	Fish	Hake	*Merluccius australis*	32017	46664
HOK	1986	Fish	Hoki	*Macruronus novaezelandiae*	255611	2158140
HPB	1986	Fish	Hapuku & bass	*Polyprion oxygeneios & P americanus*	2109	47145
BAS	1986	Fish	Bass groper	*Polyprion americanus*	576	4826
HAP	1986	Fish	Hapuku	*Polyprion oxygeneios*	4577	273353
JDO	1986	Fish	John dory	*Zeus faber*	2	288
LIN	1986	Fish	Ling	*Genypterus blacodes*	215941	1008043
MOK	1986	Fish	Moki	*Latridopsis ciliaris*		1126
OEO	1986	Fish	Oreos	*P. maculatus, A. niger, & N. rhomboidalis*		
BOE	1986	Fish	Black oreo	*Allocyttus niger*		21
SSO	1986	Fish	Smooth oreo	*Pseudocyttus maculatus*		313
SOR	1986	Fish	Spiky oreo	*Neocyttus rhomboidalis*		30
WOE	1986	Fish	Warty oreo	*Allocyttus verrucosus*		
ORH	1986	Fish	Orange roughy	*Hoplostethus atlanticus*	3	29
RCO	1986	Fish	Red cod	*Pseudophycis bachus*	93464	3756548
SCH	1986	Fish	School shark	*Galeorhinus galeus*	5547	249879
SKI	1986	Fish	Gemfish	*Rexea* spp.		
RSO	1986	Fish	Gemfish	*Rexea solandri*	23650	184168
SNA	1986	Fish	Snapper	*Pagrus auratus*		5835
SPO*	1986	Fish	Rig	*Mustelus lenticulatus*	166	27596
STA	1986	Fish	Giant stargazer	*Kathetostoma spp.*		
GIZ	1986	Fish	Giant stargazer	*Kathetostoma giganteum*	94957	375048
SWA	1986	Fish	Silver warehou	*Seriolella punctata*	60418	10115097
TAR	1986	Fish	Tarakihi	*Nemadactylus macropterus & N. sp.* (King tarakihi)		
NMP	1986	Fish	Tarakihi	*Nemadactylus macropterus*	2460	53855
TRE	1986	Fish	Trevally	*Pseudocaranx georgianus*		3
WAR	1986	Fish	Common warehou	*Seriolella brama*	31	1689300